Research integrity in reporting health research: Perceptions and experiences around plagiarism, conflict of interest and authorship criteria in low- and middle-income countries

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Declaration

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Date: 13 October 2017

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Abstract

Background

There is little research on research integrity in low- and middle-income countries (LMICs). This thesis investigates perceived and actual research reporting practices in relation to authorship, plagiarism, redundant publication and conflicts of interest amongst LMIC health researchers.

Methods

To take stock of existing research, we summarised prevalence and causes of research misconduct amongst health researchers from LMICs in a systematic review. We then explored perceptions and awareness of poor practices through an online survey of Cochrane authors based in LMICs, using hypothetical scenarios to elicit responses. We gained more insight through follow-up, in-depth interviews with willing survey respondents. Next, we described actual practices in African biomedical journals indexed on the Africa Journals Online database. We measured plagiarism by screening articles with text-matching software, and analysed those with an overall similarity index (OSI) >10% with a pre-specified plagiarism framework. We analysed journal policies and author guidelines and assessed adherence to these in a random selection of articles. Lastly, we piloted a workshop to introduce good reporting practices in two academic institutions in Malawi and Nigeria. We used a variety of teaching approaches to facilitate learning, and based discussions on scenarios.

Results

Existing studies from LMICs reported high prevalence of research misconduct. However, studies had limitations related to selection of participants and outcome measurements. One hundred and ninety-nine (34%) Cochrane authors from LMICs responded to the online survey. Of those, 77% reported that guest authorship occurred at their institution, 60% reported text-recycling, 43% reported plagiarism of ideas and 40% indicated that their colleagues had not declared conflicts of interest in the past. Four themes emerged from the qualitative data: 1) authorship rules are simple in theory, but not consistently applied; 2) academic status and power underpin behaviours; 3) institutions and culture fuel bad

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practices; and 4) researchers are uncertain about what conflicts of interest means, and how this may influence research. We screened 495 published articles from 100 journals for plagiarism. Of the 358 articles with an OSI >10%, we found plagiarism in 73% (95%CI 67 to 78), comprising one to two copied sentences in 26% (95%CI 22 to 31), three to six copied sentences in 25% (95%CI 20 to 29), and at least four linked or more than six copied sentences in 22% (95%CI 18 to 28). Journal policies and author guidelines were lacking, especially amongst non-commercial journals. Existing guidelines were poorly implemented. Workshop participants acknowledged the importance of research integrity and engaged in discussions and activities.

Conclusions

Researchers across LMICs report that poor research reporting practices are common. They are mostly concerned about widespread guest authorship. Actual rates of plagiarism in African biomedical articles are very high. Conflicts of interest are poorly understood and not declared. The desire for academic status, institutional systems linked to promotions and organisational culture fuel bad practices. Efforts to promote research integrity should be multi-faceted and targeted at various stakeholders, including institutions and journals. Future research should identify effective interventions to promote research integrity in LMICs. Further testing of our plagiarism framework is needed.

Abstrak

Agtergrond

Min studies oor navorsingsintegriteit in lae- en middel-inkomstelande (LMILe) is beskikbaar. Hierdie skripsie ondersoek vermeende en werklike praktyke rondom navorsingsverslaggewing met betrekking tot outeurskap, plagiaat, onnodige publikasie en botsende belange van gesondheidsnavorsers in LMILe.

Metodes

Om bestaande navorsing te evalueer, is die voorkoms en oorsake van wangedrag onder gesondheidsnavorsers van LMILe in 'n stelselmatige oorsig opgesom. Daarna is die bewustheid van praktyke deur 'n aanlyn-opname van Cochrane outeurs uit LMILe ondersoek. Denkbeeldige scenarios is ontplooi om reaksies in terme van aanvaarbaarheid en voorkoms van swak praktyke te ontlok. Deur middel van daaropvolgende, in-diepte onderhoude met gewillige navorsers is verdere insig verkry. Vervolgens is werklike praktyke in biomediese tydskrifte van die "Africa Journals Online" databasis beskryf. Plagiaat is gemeet deur artikels met teks-vergelykende sagteware te toets. Dié met 'n algemene similariteitsindeks (ASI) >10% is met 'n vooraf-gespesifiseerde plagiaatraamwerk ontleed. Joernaalbeleide en outeursriglyne, en die toepassing daarvan, is in 'n steekproef van artikels ondersoek. Werkswinkels oor goeie verslaggewingsgebruike is in Malawi en Nigerië geloods. 'n Verskeidenheid onderrigstrategieë is aangewend en besprekings is op denkbeeldige scenarios gebaseer.

Resultate

'n Hoë voorkoms van navorsingswangedrag word in bestaande studies van LMILe aangemeld. Studies was nietemin beperk met betrekking tot die keuse van deelnemers en die meet van uitslae. Eenhonderd-nege-en-negentig (34%) Cochrane outeurs van LMILe het op die aanlyn-opname gereageer. Hiervan het 77% verklaar dat "gas-outeurskap" by hul instelling voorkom, 60% het verklaar dat werk sonder erkenning hergebruik word, 43% het plagiaat ten opsigte van idees verklaar en 40% het aangedui kollegas het nie in die verlede botsende belange verklaar nie. Vanuit die kwalitatiewe gegewens het vier temas tevoorskyn getree: 1. Reëls ten opsigte van outeurskap is teoreties eenvoudig, maar word nie

Abstrak

konsekwent toegepas nie; 2. Akademiese status en mag onderlê gedrag; 3. Instellings en kultuur gee aanleiding tot slegte praktyke; 4. Navorsers is onseker wat botsende belange beteken en hoe dit navorsing kan beïnvloed. Ons het 495 artikels uit 100 joernale vir plagiaat getoets. Plagiaat is in 73% (95% vertrouensinterval (VI) 67 tot 78) van die 358 artikels met 'n ASI>10% gevind, bestaande uit een tot twee gekopiëerde sinne in 26% (95%VI 22 tot 31), drie tot ses gekopiëerde sinne in 25% (95%VI 20 tot 29) en 'n verband tussen minstens vier, of meer as ses in total, gekopiëerde sinne in 22% (95%VI 18 tot 28). Joernaalbeleide en outeursriglyne skiet tekort, veral met betrekking tot nie-kommersiële joernale. Bestaande riglyne word swak geïmplementeer. Deelnemers aan die werkswinkel het die belangrikheid van navorsingsintegriteit begryp en was aktief by groepsessies betrokke.

Gevolgtrekkings

Navorsers regoor LMILe meld dat swak praktyke algemeen voorkom, en is veral bekommerd oor wyd-verspreide "gas-outeurskap". Die werklike voorkoms van plagiaat in biomediese artikels uit Afrika is baie hoog. Navorsers is onseker oor botsende belange. Die begeerte na akademiese status, instellingstelsels wat met bevordering verband hou asook organisatoriese kultuur vuur wangedrag aan. Pogings om navorsingsintegriteit te bevorder moet toegespits word op verskeie belanghebbendes, insluitende instellings en joernale. Toekomstige navorsing moet doeltreffende ingryping, wat navorsingsintegriteit in LMILe aanmoedig, identifiseer. Verdere toetsing van ons plagiaat-raamwerk word aanbeveel.

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"Many people say that it is the intellect which makes a great scientist.

They are wrong: it is character"

Albert Einstein

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Abbreviations

Abbreviation	Explanation
95%CI	95% Confidence Interval
AJOL	African Journals Online
AJPP	African Journal Partnership Program
ATP	Attitude towards Plagiarism
CINAHL	Cumulative Index to Nursing and Allied Health Literature
COPE	Committee on Publication Ethics
ERIC	Education Resource Information Centre
FFP	Falsification, fabrication and plagiarism
ICMJE	International Committee of Medical Journal Editors
INASP	International Network for the Availability of Scientific Publications
JCR	Journal Citation Report
JOL	Journals Online
LILACS	Latin American and Caribbean Health Sciences Literature
LMIC	Low-and middle-income country
ORI	Office of Research Integrity
OSI	Overall Similarity Index
PDF	Portable Document Format
RCR	Responsible conduct of research
SD	Standard deviation
SMQ-R	Scientific Misconduct Questionnaire - Revised
WAME	World Association of Medical Editors

Definition of terms

Term	Definition
Research integrity	"The coherent and consistent application of values and principles essential to encouraging and achieving excellence in the search for, and dissemination of knowledge" (Council of Canadian Academics). These values include honesty, trust, accountability, responsibility, fairness, openness and impartiality.
Responsible conduct of research	Responsible conduct of research represents the "ideal standard institutions and individuals endeavour to meet".
Research misconduct	The Committee on Publication ethics defines research misconduct as "behaviour by a researcher, intentional or not, that falls short of good ethical and scientific standard". The US Office of Research Integrity defines research misconduct as data fabrication, data falsification and plagiarism.
Questionable research practices	Any practice that does not meet ideal standards and best practices when conducting or reporting on research. This is also called sloppy science.
Health researcher	A researcher at any type of institution, involved in any type of biomedical research on a part or full-time basis, including post-graduate students, junior as well as senior researchers
Low-and middle-income countries	Countries defined as low income or middle income according to the classification of the World Bank, which classifies the world's economies based on estimates of gross national income per capita.
Data fabrication	Making up of data and presenting it as research findings
Data falsification	Manipulating, omitting or changing research results in order to make the data look better
Plagiarism	Copying text or part of a text, an idea or an image from another source, without properly referencing the source and using it as one's own.
Redundant publication	Republishing one's own work including copying of an entire manuscript (duplicate publication), publication of parts of the results in separate papers (salami publication) and re-using of text in several publications (text-recycling).
Guest authorship	Adding authors to as manuscript who did not contribute substantially to the work.
Ghost authorship	Omitting authors who have contributed substantially to the manuscript.
Conflicts of interest	A financial or non-financial (personal, political, academic, religious, institutional) interest that can potentially influence professional judgement and bias results.

Chapter 1

Introduction and scope of work

1.1. Background

Research misconduct threatens the public's trust in science. With emerging evidence of problems in a whole variety of areas of science, ranging from data fabrication, selective reporting, and difficulties with replication of experiments, funders are increasingly concerned, and agencies are investing in policies and approaches to assure research integrity.

In the USA, responsible conduct of research has been topical since the 1980's and efforts to promote research integrity have been largely driven by the Office of Research Integrity (ORI) (1). However, at a global level, explicit attention to research integrity and research misconduct has only increased substantially during the last decade, although implicit aspirations to promote research integrity have been considered part of academia for a long time. The first World Conference on Research Integrity was held in Lisbon, Portugal exactly 10 years ago and brought together researchers, policy-makers, funders and other international stakeholders to discuss the importance of research integrity for the first time. During the next few years, the conversation gained momentum and at the second world conference held in Singapore in 2010, the need to increase worldwide efforts to foster integrity when conducting and reporting research was recognised (2). This resulted in the well-known Singapore statement, which highlights the values and principles of ethical research and intended to "to make it easier for others to provide the leadership needed to promote integrity in research on a global basis" (3). However, concerted efforts that drive research integrity in low-and middle-income (LMIC) countries are still far behind those seen in the USA, Europe and other high-income countries (4-6). In addition, research on research integrity from LMICs is limited (7), hindering insight into the magnitude and scope of problems that exist, and tailoring of activities to promote research integrity in these countries.

1.1.1. What is research integrity?

One definition of research integrity is "the coherent and consistent application of values and principles essential to encouraging and achieving excellence in the search for, and dissemination

of knowledge". These values, as defined by the Council of Canadian Academics' expert panel on research integrity, include honesty, fairness, trust, accountability, and openness (8) and overlap with the principles and values of research integrity proposed by other national and international bodies. The European Code of Conduct for Research Integrity describes the principles of research integrity as "honesty in reporting and communicating, reliability in performing research, objectivity, impartiality and independence, openness and accessibility, duty of care, fairness in providing references and giving credits, and responsibility for future science generations" (9). The Singapore Statement promotes principles and professional responsibilities that are essential for the integrity of research and mirrors these core values (3).

When these principles and values are ignored, and researchers engage in dishonest behaviour, the trustworthiness of the whole corporate body of research and science is put at risk. Research misconduct, or scientific misconduct, as it is sometimes called, has been formally defined in various ways by different organisations. The ORI defines research misconduct as "fabrication, falsification, or plagiarism in proposing, performing or reviewing research or in reporting research results". Data fabrication is "making up data or results and recording or reporting them"; falsification is "manipulating research materials, equipment or processes, or changing or omitting data or results such that the research is not accurately represented in the research record"; plagiarism is the "appropriation of another person's ideas, processes, results, or words without giving appropriate credit" (10). A key aspect of research misconduct is that it involves the intention to deceive rather than unintentional error (10, 11). The Committee on Publication Ethics (COPE) defines research misconduct as "behaviour by a researcher, intentional or not, that falls short of good ethical and scientific standard" (11). Other irresponsible research practices, like duplicate publication of studies, inappropriate analysis of data, not declaring conflicts of interests, selective outcome reporting and various problems around authorship (such as guest and ghost authorship) fit under the umbrella term of research misconduct. The Swedish Research Council's expert group for the investigation of suspected misconduct's broader definition states that "research misconduct entails actions or omissions in research, which – consciously or through carelessness – lead to falsified or manipulated results or give misleading information about someone's contribution to the research" (12).

Fanelli (2013) argues that research misconduct should be re-defined as "distorted reporting" and that the emphasis should be more on what researchers report and publish and less on what they actually do. He proposes that distorted reporting should be defined as "any omission or misrepresentation of the information necessary and sufficient to evaluate the validity and significance of research, at the level appropriate to the context in which the research is communicated" (13). According to this definition misconduct occurs every time there is a "mismatch between what was done and what was reported".

Even though these definitions vary to some extent, they all refer to dishonest and unethical behaviour of researchers when planning, conducting and reporting research. Different forms of misconduct link to different stages of the research process (9). Table 1-1 lists and describes the various types of unethical behaviour when reporting or publishing research.

Literature and reports in the media frequently report on blatant misconduct, as seen in the widely used US ORI definition of research misconduct that includes only the "serious" crimes of falsification, fabrication and plagiarism (FFP). But other, "less serious" behaviours such as not disclosing conflicts of interests, or issues around authorship (for example, guest or ghost authorship) can possibly pose as big a (or greater) threat to the integrity of research and occur more often (14, 15). When adding up all the times where researchers have engaged in "minor" cases of misconduct, often referred to as questionable research practices, the totality of unacceptable behaviours can have a much greater impact than the relatively rare cases of data fabrication and falsification. Indeed, scientist have pointed out that, on a day-to-day basis, these questionable research practices were more relevant than FFP (16). The presence of unethical behaviours when reporting research is indicative of the absence of research integrity within a department or an institution. Therefore, plagiarism, redundant publication, conflicts of interest and authorship practices are tracers to examine research integrity. Not only do these areas of misbehaviour represent a variety of aspects, but they are also practices where the line between what is acceptable and not can differ considerably between individuals, departments and institutions. This thesis focuses on good research reporting practices and the term "research misconduct" will refer to any poor practice and irresponsible behaviour related to research reporting.

Table 1-1 Research misconduct related to reporting research

Area of misconduct	Description
Data fabrication	Concocting data and reporting on it is seen as one of the two most serious forms of research misconduct.
Data falsification	Manipulating, omitting or changing research results is the other serious form of research misconduct.
Plagiarism	Copying text or part of a text, an idea or an image from another source, without properly referencing the source and using it as one's own is considered a serious form of research misconduct.
Non-disclosure of conflict of interest	Authors should declare any conflict of interest. This includes financial as well as non-financial (e.g. intellectual, personal, political) conflicts of interest.
Authorship practices	This relates to problems with describing the contribution of authors or the sequence of authors, ghost authorship (excluding authors that have contributed significantly) and guest authorship (adding authors that have not contributed significantly). Authors should follow the criteria outlined by the ICMJE.
Acknowledgement practices	Acknowledge contributions by research assistants, consultants or other collaborators that do not warrant authorship.
Redundant publication	Republishing one's own work, including copying of an entire manuscript (duplicate publication), publication of parts of the results in separate papers (salami publication) and re-using of text in several publications (text-recycling).
Delayed publication	Research results should be published as early as possible.
Reporting of results	All results reported in an accurate, transparent, open and honest manner. Results should not be selectively reported or exaggerated.

1.1.1.1. Conflict of interest

According to the World Association of Medical Editors (WAME), "conflict of interest exists when a participant in the publication process (author, peer reviewer or editor) has a competing interest that could unduly influence (or be reasonably seen to do so) his or her responsibilities in the publication process (submission of manuscripts, peer review, editorial decisions, and communication between authors, reviewers and editors)" (17, 18).

As mentioned in the definition by WAME, all the participants of the publication process should disclose competing interests. Non-disclosure amongst authors may mask the possible causes of biases in the study design, analysis and conclusions; while reviewers and editors not disclosing competing interests can cause mistrust amongst authors and readers respectively.

Conflicts of interest can be financial or non-financial. While the former is associated with any consulting or employment relationship, or any financial interest in the company funding the research, the latter relates to personal, political, academic, religious or institutional interests. All of these can influence professional judgement and thus important to declare when publishing results. Indeed, the main problem with competing interests is not the fact of having them, but rather of not disclosing them (18, 19).

1.1.1.2. Plagiarism

Plagiarism, defined as "the appropriation of another person's ideas, processes, results or words without giving appropriate credit" (10), is often focused on replicated text. In a recent article, Elizabeth Wager describes the features of different types of plagiarism. These include the extent to which words or ideas were plagiarised, the originality of the copied material, the position or context of the material (e.g. a standard method will usually be described in the same manner), how the source was referenced, and whether there was an intention to deceive (20). These features follow a continuum from "least severe" to "most severe" types of plagiarism.

Most commonly, plagiarism refers to copying text (or ideas, images) from others and not all researchers are aware that other forms of plagiarism do exist. Causes of plagiarism may include pressure to publish, limited English ability and proficiency in writing, but influences of cultural values as well as varying attitudes towards plagiarism also seem to play a substantial role. There seems to be a general notion that authors and researchers from Eastern and post-communist countries are more tolerant towards plagiarism than authors from the Western part of the world, mainly due to cultural reasons (21). Others contest this idea. Cameron et al. (2012) states that "the cultural values explanation is built on unexamined assumptions" (22). Wheeler (2009) concluded that "any theory stating plagiarism is perceived differently in Japan due to cultural differences should, at the very least, be questioned". He conducted a survey amongst undergraduate students at a Japanese university and found that overall, students were able to recognise plagiarised texts and were not tolerant towards the idea of reusing another person's ideas without attribution (23). Li (2012) interviewed supervisors from a Chinese university, who believed that plagiarism was unethical and that avoiding it was an "unwritten rule" amongst academics. However, they did acknowledge that citation practices in China were inadequate and not comparable to Western practices (24).

A recent editorial in the Indian Journal of Medical Research describes plagiarism as a "rampant" problem amongst Indian authors. They highlight the need for a national plan of action, involving government and funding agencies, journal editors, national academics, voluntary bodies, readers and the public. Clearly, the lack of policies and guidelines presents authors with an opportunity to engage in research misconduct. The fact that a lot of Indian Journals are not indexed only adds to the problem, since the probability of being caught is very slim (25).

1.1.1.3. Redundant publication

Redundant publication is an umbrella term used to describe the re-use of one's own work that has already been published. This includes duplicate publication, so-called salami publication and text-recycling (26). Duplicate publication refers to republishing of an entire manuscript in another journal, without the knowledge and consent of the primary and secondary journal editor. Salami publication refers to the publication of results linked to a single study in multiple papers. Researchers often engage in this practice to increase the number of publications. Text-recycling refers to reusing large amounts of text that have already been published, in another manuscript. Although reusing text that describes a standard method or a sample is sometimes inevitable, reusing large amounts of one's own text is considered poor practice (27). This practice is sometimes referred to as self-plagiarism. However, since plagiarism refers to "stealing", we do not consider it to be an appropriate term to use when referring to one's own text (26, 28). Throughout the thesis, we will thus use the term text-recycling to describe what some call self-plagiarism.

1.1.1.4. Authorship

According to the recommendations of the International Committee of Medical Journal Editors (ICMJE) (www.icmje.org), a person only qualifies as an author on a publication when s/he has made substantial contributions to the conception or design of the work, or the acquisition, analysis, or interpretation of data for the work; drafted the work or revised it critically for important intellectual content; approved the final version to be published; and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved (29). In addition, they recommend that people who do not meet all of the four criteria should be acknowledged as contributors rather than as authors (29). These criteria are the most widely used criteria amongst ICMJE member and non-member journals. Despite this effort to standardize authorship criteria,

policies and guidelines on authorship and contributions of authors vary widely between journals and sometimes are lacking completely.

A recent systematic review looking at the meaning, ethics and practices of authorship across scholarly disciplines (30) included 123 articles, of which 54% (66/123) were related to health sciences. They found that conception of the research study and writing of the manuscript were believed to be the most important criteria that qualified individuals as authors, and that only 60% of authors in health-related research journals qualify as authors according to the ICMJE criteria, while many journal editors and authors were not even aware of these criteria. The authors were able to pool data from fourteen studies on the prevalence of problems with, or misuse of, authorship and found a rate of 29% (95% CI 24% to 35%), according to self- or non-self-reports. However, of these, only three studies were conducted in LMICs.

Common problems related to the granting of authorship are so-called gift authorship and ghost authorship. According to the COPE, guest authorship refers to "people who are listed as authors but who did not make a significant contribution to the research", while ghost authorship relates to "professional writers whose role is not acknowledged" or "people who made a significant contribution to a research project but are not listed as authors" (31).

Guest authorship is often related to power issues, where senior authors or supervisors receive unwarranted authorship. Another factor driving this practice is the increasing pressure that is put on academics, since promotion and prestige often rely on the number of publications and not on the number of good quality publications.

1.1.2. How common is research misconduct?

It is difficult to assess the extent of research misconduct, as it is not always easy to identify practices and self-reports may be unreliable. Fang et al (2012) recently reviewed all the retracted research articles that were indexed in PubMed and found that 67.4% (1379/2047) of retractions were due to research misconduct, and not due to errors. Authors of retracted articles were from a wide range of countries, but most papers retracted due to fraud originated in the USA, China, Germany and Japan; while publications from China and India accounted for most retractions due to plagiarism (32). Limitations of this study include that publications from the USA are overrepresented in PubMed and that the USA has better systems for handling misconduct than others, so unacceptable behaviours are more likely to be discovered.

A systematic review by Fanelli (2009) pooled data from surveys on research misconduct to estimate its prevalence (33). Included studies were about data fabrication and falsification; while studies on plagiarism and irresponsible research practices were excluded. The author included 21 studies in the review, of which 18 were pooled in meta-analyses. He found that 1.97% (95%CI 0.89 to 4.45) of survey participants admitted to having fabricated or falsified data, or having altered research results themselves and 14.12% (95%CI 9.91 to 19.72) admitted to knowing about colleagues having done the same. All included studies were conducted in high income countries (15 in the USA, three in the UK, two with multinational participants and one in Australia).

There is a paucity of literature on research misconduct in LMICs. The few publications relate mostly to high-profile case reports (4, 7).

1.1.3. Why do researchers engage in bad practices?

Kaiser (2014) describes three common reasons for research misconduct. The first explanation emphasises that we are all human after all and that there will always be some "rotten apples", regardless of the profession. The second explanation involves the lack of training amongst researchers, which goes hand-in-hand with the lack of good role models; while the third reason is that scientists are under increasing pressure to produce publications and that good and ethical practices are sometimes ignored in the process (34).

The environment within which researchers conduct and report research has an important impact on their behaviour. The Institute of Medicine has described the research environment as a dynamic open-systems model, containing the internal research environment (the research organisation) and the external environment (funders, journals, governmental bodies). Key features of the internal environment are the structures (policies, procedures, roles, responsibilities) and processes (leadership, communication, supervision), which are embedded in the organisation's culture and climate. All researchers contribute to this environment in a unique way, based on individual morals, values and attitudes (35). If the environment promotes integrity and sound publication practices, researchers will probably be less likely to acquire bad habits.

Drawing on this model and other international literature, the conceptual framework I have developed on research integrity (Figure 1-1) depicts the researcher with unique characteristics, functioning in a research team within an institution, and influenced by external factors such as national and international bodies and regulations as well as funders and journals. This framework

depicts the entire research system in order to emphasise that the researcher never functions in a vacuum and that all these factors have an impact on research integrity and play a role in the promotion thereof. This PhD focuses on the researcher and his/her internal research environment (department and institution). In addition, it explores the role of journals, as part of the external research environment.
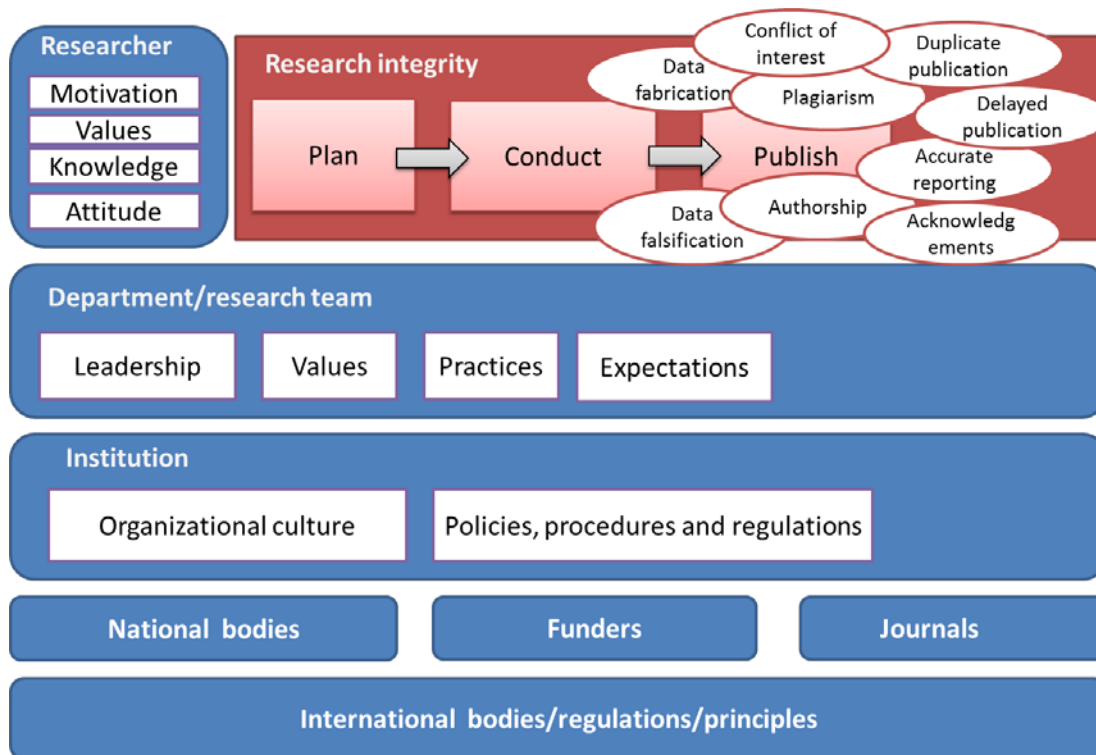
Figure 1-1 Conceptual framework on research integrity

1.2.   Problem statement

Research integrity is a complex concept. As described above, numerous factors can influence a researcher's behaviour. Although efforts can be made to create an environment that is conducive to ethical practices, it is more difficult to address inherent values and beliefs of individual researchers. These values include tacit knowledge about what is right and what is wrong and usually differ between individuals. When considering behaviour related to research reporting practices, there seems to be no clear-cut line between what is accepted and what is not. This idea of a continuum between good and poor practices not only applies to research integrity as a whole, but might vary for different types of poor practices. For example, some researchers might think that adding a senior professor as an author on a publication, although s/he did not contribute to

that particular paper, is acceptable; while copying whole sections of already published papers is unacceptable - however both guest authorship and plagiarism are examples of poor research reporting practices.

In LMICs, research integrity has not been widely researched (7) and the magnitude and scope of problems is poorly understood. Furthermore, efforts to promote and address research integrity, such as institutional systems and structures, training initiatives and national polices are limited, if not lacking (4-6, 36, 37). However, research outputs in these countries are rising, both locally and with international collaborations and the pressure to live up to global expectations and standards is rising (4). In order to address these shortcomings and to tailor interventions that promote research integrity, it is important to gain insight into current practices, perceptions and factors that influence research integrity in LMICs.

1.3.   Study objectives

1.3.1. Overarching research question

How do health researchers from LMICs perceive and experience research integrity related to research reporting practices?

1.3.2. Aim and objectives

The aim of this thesis is to understand perceived and actual research reporting practices related to authorship, plagiarism, redundant publication and conflicts of interest amongst health researchers from LMICs.

Objectives are:

1. To summarise from existing research:
   - The prevalence of research misconduct in reporting research amongst health researchers in LMICs
   - The factors influencing good and poor practices in LMICs
2. To describe, explore and analyse for research reporting practices related to authorship, plagiarism, redundant publication and conflicts of interest:
   - The perceptions of LMIC health researchers of acceptable and unacceptable practices

- The awareness of LMIC health researchers of occurrence of research misconduct in their institutions

3. To describe actual research reporting practices in African biomedical journals by
   - Measuring plagiarism
   - Analysing policies and author guidelines related to authorship, plagiarism and conflicts of interest
   - Assessing author adherence to the guidelines

4. To develop, implement and evaluate a workshop on research reporting practices

1.4. Scope of work

1.4.1. Phases of the study

This thesis consists of various phases (Figure 1-2) and makes use of quantitative and qualitative methods. The qualitative research, situated in the interpretivist paradigm, recognises that the researcher's values and morals play a key role in interpretation of phenomena, that knowledge is created through dialogue and that all events occur at a specific time point, in a specific context. The main aim of research done in this paradigm is to understand concepts rather than explain them (38, 39).
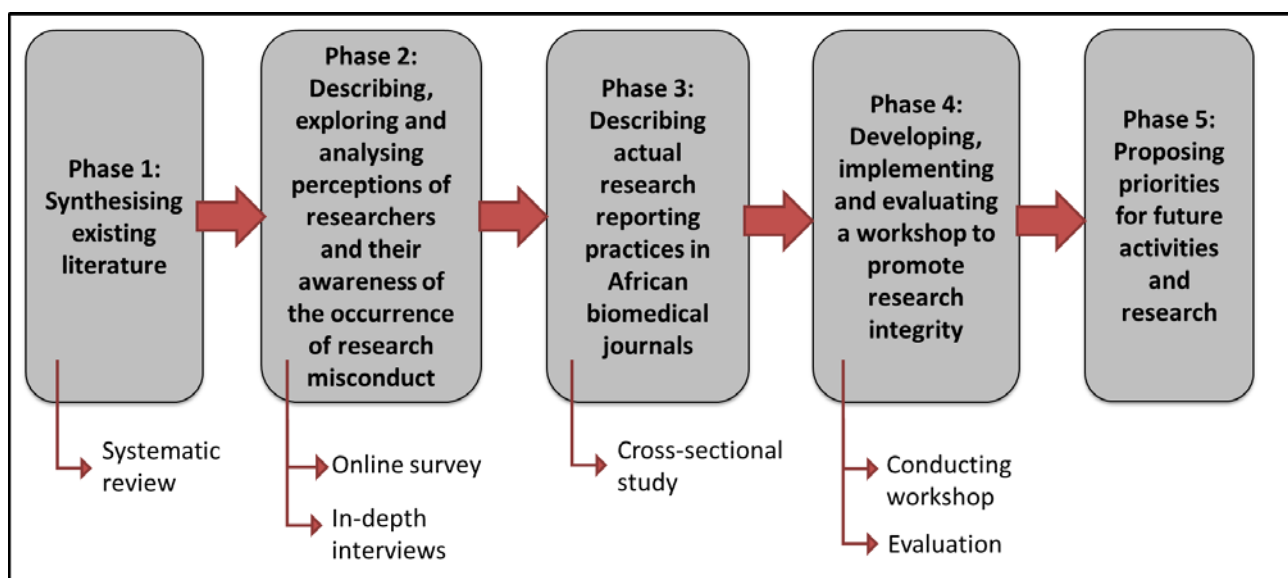
Figure 1-2 Phases of study

Four tracer areas that are important in research reporting, were used to explore perceptions of good research reporting practices: authorship practices, plagiarism, redundant publication and

conflict of interest. These areas were used as indicators for research integrity as a whole, taking into consideration that other issues might have emerged during the course of the study.

Throughout the thesis, LMICs were defined according to the classifications by the World Bank (40) (Appendix 1.1).

1.4.2. Overview of chapters

Table 1-2 provides an overview of the chapters included in this thesis. Chapter 1 gives a general introduction and overview of the methods, while Chapters 2 to 5 represent the phases of the study as shown in Figure 1-2. Each of these chapters contains a short introduction and rationale, methods and results section, as well as the relevant references. Chapter 6 provides an overall summary of findings from Chapters 2 to 5 and an integrated discussion on relevant aspects. The concluding chapter proposes priorities for further research and activities to promote research integrity in LMICs. The individual chapters therefore do not represent complete publishable articles, do not stand on their own and should be read in context of the other chapters.

Table 1-2 Overview of chapters included in thesis

Chapter	Overview
Chapter 1	Short introduction on research integrity and the rationale for conducting this research
Chapter 2 (Phase 1)	A comprehensive synthesis of exsiting literature related to occurrence of research misconduct amongst health researchers from LMICs, using pre-specified objectives and inclusion criteria.
Chapter 3 (Phase 2)	Mixed-method study of LMIC health researchers' perceptions on research reporting practices. Online survey amongst Cochrane authors living in LMICs, using scenarios to elicit responses on perceptions and occurrence of research reporting practices. Follow-up, in-depth interviews with willing respondents.
Chapter 4 (Phase 3)	Cross-sectional study of actual practices in African biomedical journals. Measuring the presence and extent of plagiarism, assessment of journal policies and author guidelines on authorship, plagiarism and conflicts of interest, and author adherence to these.
Chapter 5 (Phase 4)	Development, implementation and evaluation of a workshop to introduce research integrity and publication ethics, offered in Malawi and Nigeira.
Chapter 6	Summary and integrated discussion on the findings of Chapters 2-5.
Chapter 7 (Phase 5)	Concluding chapter. Implications for future activities to promote research integrity and implications for future research on research integrity in LMICs.

1.5.   Ethical considerations

Ethical clearance was obtained from the Stellenbosch University Health Research Ethics Committee prior to commencement of the study (N14/12/158). Appendix 1.2 contains the approved protocol for the study. We obtained ethics exemption for Phase 3 (X17/08/010). As research misconduct is a sensitive topic, the candidate and her supervisors were aware of several potential ethical dilemmas. We were prepared to deal with such dilemmas in the following way: Should individual cases of misconduct come to light during Phase 2 and 4, participants would be counselled and advised to use appropriate channels to report such misconduct. In case we found severe plagiarism in research articles during Phase 3, we would alert the editor of the journal to our findings. Institutions where workshops were held (Phase 4) were provided with general, anonymised feedback on researchers' awareness of research integrity and any concerns about research misconduct.

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Chapter 2

Taking stock of existing research

A systematic review on the prevalence and factors associated with research misconduct
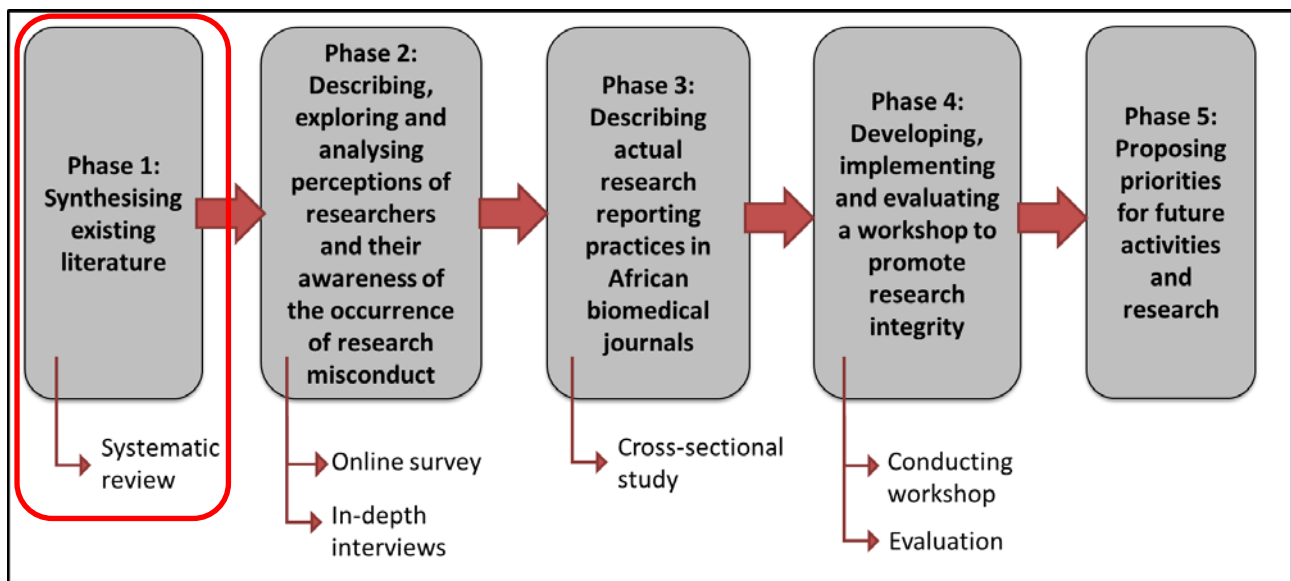
Summary

During the first phase of the PhD, we conducted a systematic review that aimed to summarise existing literature from low-and middle-income countries (LMICs) on health research reporting practices. We included cross-sectional studies of health researchers from LMICs and cross-sectional studies of biomedical research articles from LMIC authors or published in LMIC journals that assessed the prevalence of research misconduct related to research reporting practices; as well as factors influencing research misconduct. We searched a wide range of databases up until 16 February 2017, contacted experts in the field and checked reference lists of included studies. One author screened titles and abstracts to exclude obviously irrelevant studies, and two authors independently screened all potentially relevant citations and full-texts. We extracted data using a pre-specified and piloted data extraction form and assessed risk of bias in duplicate using an adapted version of the tool by Hoy and colleagues. Due to heterogeneity between studies, we were not able to pool prevalence estimates and results were summarised narratively.

We included 32 studies reported in 33 publications, comprising cross-sectional studies of health researchers (n=22) and cross-sectional studies of biomedical research articles (n=10). Cross-sectional studies of health researchers, comprising faculty members, health care practitioners and authors of research articles, were conducted in Latin America (n=3), sub-Saharan Africa (n=3), the Middle East (n=6) and South Asia (n=12) and addressed authorship practices, plagiarism, conflicts of interest and research misconduct in general. Overall risk of bias was judged to be high for 12 and moderate for 10 studies.

Cross-sectional studies of biomedical research articles represented research from Latin America (n=4), sub-Saharan Africa (n=2), Middle East (n=2), South Asia (n=1) and East Asia (n=4) and addressed authorship practices, plagiarism, conflicts of interest, redundant publication and research misconduct in general. Overall risk of bias was judged to be high for one, moderate for seven and low for two.

Studies mostly reported on the prevalence of research misconduct. Cross-sectional studies of health researchers generally reported on the proportion of participants that admitted to having engaged in misconduct or the proportion of participants admitting to knowing of others who have engaged in misconduct. Cross-sectional studies of biomedical research articles reported on the proportion of articles with evidence of misconduct. The reported prevalence of guest authorship ranged from 6% to 66% (n=10), ghost authorship from 6% to 43% (n=4), plagiarism from 5% to 89% (n=8), non-disclosure of conflicts of interest from 45% to 98% (n=7), non-disclosure of funding sources from 28% to 58% (n=4), redundant publication from 5% to 33% (n=6), and data fabrication or falsification from 10% to 91% (n=3). Few cross-sectional studies of health researchers reported on factors influencing research misconduct and reported that factors such as pressure to publish, academic expectations, lack of knowledge and inadequate punishment for research misconduct may influence behaviour.

Appendices

Appendix 2.1: Protocol of systematic review

Appendix 2.2: Search strategies

Appendix 2.3: Data extraction form

Appendix 2.4: Table of excluded studies

Appendix 2.5: Characteristics of included studies

Appendix 2.6: Summary of risk of bias across studies

Appendix 2.7: Prevalence of research misconduct

Appendix 2.8: Summary of results of secondary outcomes

Linked presentations

Rohwer A, Young T, Wager E, Garner P**.** Research integrity in low- and middle-income countries: systematic review of prevalence of poor authorship practice, plagiarism and other misconduct. Global Evidence Summit 2017, Cape Town, South Africa, 12-16 September 2017 (poster presentation)

Rohwer A, Young T, Wager E, Garner P. Mapping the literature on health research reporting practices from LMICs. 5th World Conference on Research Integrity 2017, Amsterdam, The Netherlands, 28-31 May 2017 (poster presentation)

2.1.   Introduction and rationale

Although researchers have studied research misconduct in high-income countries, there is little research on research misconduct in LMICs (1, 2). Ana and colleagues (2013) were the first to provide an overview of existing studies on research misconduct in LMICs, in form of a published essay (2). They found few publications from a search in MEDLINE, which related mostly to high-profile case reports. To supplement their search, they conducted a survey amongst research centres from various LMICs and found that there were limited discussions around the topic and that regulatory bodies were lacking.

Existing systematic reviews on research misconduct

Through a snowball search, we found four systematic reviews that reported on the prevalence of research misconduct. Three of these mostly included studies from high-income countries (3-5), while one only included studies from Brazil (6).

In 2009, Fanelli published a systematic review that assessed the prevalence of research misconduct by synthesising data from surveys. Only studies examining data falsification and data fabrication were included and no other questionable research reporting practices were assessed. Fanelli included 21 surveys in the review, of which 18 contributed data to the meta-analysis. He reported a pooled estimate of 1.97% (95%CI 0.96 to 4.45) for self-reported fabrication or falsification and 14.12% (95%CI 9.91 to 19.72) for participants knowing about others who did this. No studies from LMICs were included in the review (3).

In a subsequent review, Fanelli teamed up with a co-author and assessed the prevalence of plagiarism but did not include any studies from LMICs (4). They included 17 surveys and reported a pooled estimate of 1.7% (95%CI 1.2 to 2.4) for participants admitting to having plagiarised themselves and 30% (95% CI 17 to 46) for participants knowing about others who had done so. Although this study was published in October 2014, the date of the last search was December 2011. As pointed out by the authors in the discussion, they therefore omitted recently published surveys on research misconduct from LMICs.

Marusic and colleagues (2011) examined authorship practices across scholarly disciplines and included 118 studies, of which 54% were related to health sciences (5). They reported a pooled estimate of 29% (95%CI 24 to 35) of researchers reporting misuse of authorship in self or others.

The pooled estimate for studies conducted outside of the USA or UK, namely France, India, Bangladesh and South Africa was 55% (95%CI 45 to 64).

Padua and colleagues (2015) conducted a systematic review of publications on scientific research integrity in Brazil (6). They included 19 articles that addressed plagiarism, conflicts of interest, authorship conflicts, rules and guidelines and general perceptions of research integrity. However, only three of the included articles represented original research and authors of the review did not report data on the prevalence of research misconduct.

To our knowledge, the study by Ana and colleagues (2013) is the only attempt to map the literature on research integrity across LMICs. However, they limited their search to MEDLINE and did not aim to conduct a systematic review. There is thus currently no comprehensive, rigorous, up-to-date summary of the available literature on research integrity and misconduct in LMICs. Taking stock of existing studies by conducting a thorough up-to-date search of various databases is important to inform further phases of this study.

2.2.   Objectives

To summarise from existing studies:

- The prevalence of research misconduct in reporting research amongst health researchers in LMICs
- The factors influencing good and poor practices in LMICs

2.3.   Methods

We conducted a systematic review according to pre-specified objectives and methods. The protocol is available in Appendix 2.1.

2.3.1. Criteria for considering inclusion of studies

2.3.1.1. Types of studies

We considered published and unpublished cross-sectional studies containing data on the prevalence of and the factors associated with research misconduct in a specific population. We included surveys of researchers as well as surveys of biomedical journal articles.

2.3.1.2. Types of participants

We considered studies conducted amongst health researchers in LMICs (as defined by the World Bank) for inclusion. Health researchers comprised faculty members or health care practitioners involved in research and authors of biomedical research articles. Journal articles reporting on health research with authors based in LMICs, or published in journals from LMICs were also included. Studies with participants from a variety of disciplines (i.e. not restricted to health researchers) were only included if results were stratified according to disciplines and data for health researchers could be extracted. Similarly, studies that were conducted across regions were only included if results were stratified according to regions and data for LMICs could be extracted.

2.3.1.3. Content

We included studies on research reporting practices, namely data fabrication, data falsification, plagiarism, conflict of interest, authorship practices, acknowledgement practices, redundant publication (duplicate publication, salami publication and text-recycling), delayed publication and accurate reporting of results.

We excluded studies that investigated research integrity when planning, conducting and reviewing research as well as studies focusing on academic integrity (i.e. student cheating).

2.3.1.4. Types of outcomes

We included studies that addressed the primary or secondary outcomes.

Primary outcome

Prevalence of any type of misconduct related to research reporting, reported as:

- The proportion of health researchers admitting to having engaged in poor practices
- The proportion of health researchers admitting to knowing about others who have engaged in poor practices
- The proportion of biomedical journal articles with evidence of poor practices

Secondary outcomes

Factors influencing research misconduct, reported in cross-sectional studies:

- Knowledge of good practices
- Attitude towards research misconduct

22

- Perceptions on research misconduct and on factors influencing research misconduct

2.3.2. Search methods for identifying studies

2.3.2.1. Electronic searches

We searched MEDLINE via PubMed, Scopus, CINHAL, ERIC, PsychInfo, Web of Science, LILACS and Africa-Wide (date of last search 16 February 2017). The search strategies contained a combination of text words and MeSH terms of the terms "research integrity" and "low-and middle-income countries". The search strategies for the various databases are detailed in Appendix 2.2. We did not impose any restrictions based on language or publication status.

2.3.2.2. Searching other resources

We screened reference lists of included studies for potentially eligible studies. In addition, we contacted experts in the field to find out whether they were aware of any unpublished studies. We specifically contacted experts in China and India to enquire about relevant studies that might not have been identified in the literature search.

2.3.3. Study selection, data collection and analysis

2.3.3.1. Selection of studies

One author (AR) screened all titles and abstracts of search outputs to exclude all the clearly irrelevant studies. Two authors (AR and EW) independently screened titles and abstracts of potentially relevant studies. We retrieved full texts of these studies and two authors (AR and EW) independently screened full texts to determine eligibility. We included cross-sectional studies of health researchers and biomedical research articles from LMICs that addressed research reporting practices and reported on either prevalence or factors influencing research misconduct. We resolved discrepancies through discussion, contacted authors in case of missing information and listed reasons for excluding studies.

2.3.3.2. Data extraction and management

One author (AR) extracted data using a pre-specified and pre-piloted data extraction form (Appendix 2.3). We extracted descriptive data related to study design, objectives, participants, data collection methods and outcomes. Results related to prevalence of research misconduct and factors associated with research misconduct were also extracted. Where studies included participants from various disciplines, only data related to health researchers were extracted.

Similarly, when studies included participants from LMICs and high-income countries, we only extracted data relevant to LMICs. We contacted authors of studies in case of missing data.

2.3.3.3. *Assessment of risk of bias*

For cross-sectional studies of health researchers, we adapted the tool by Hoy et al. (2012) (7) to make judgements about risk of bias of included cross-sectional studies. We assessed risk of selection bias, non-response bias, measurement bias and bias related to the analysis by answering guiding questions for each domain (Table 2-1), according to the guidance provided by Hoy and colleagues (7). As the original tool was designed for population-based prevalence studies, we adapted the questions to be suitable for cross-sectional studies of research articles. This enabled comparison of risk of bias across all included studies. We answered each question with yes (indicating low risk of bias), no (indicating high risk of bias) or unclear (indicating unclear risk of bias). For each included study, we reported a summary risk of bias score for each domain (low risk, high risk or unclear risk) and an overall risk of bias score across domains (low risk, moderate risk, high risk). For overall risk of bias, we used the definitions as per Hoy et al. (2012) (6):

- Low risk of bias: Further research is very unlikely to change our confidence in the estimate
- Moderate risk of bias: Further research is likely to have an important impact on our confidence in the estimate and may change the estimate
- High risk of bias: Further research is very likely to have an important impact on our confidence in the estimate and is likely to change the estimate

One author (AR) and a research assistant independently assessed risk of bias for all included studies. We resolved disagreements through discussions and reported risk of bias across studies in a summary table.

Table 2-1 Risk of bias for cross-sectional studies of health researchers and research articles

Domain	Questions for cross sectional studies of health researchers (Hoy et al. 2012)	Questions for cross-sectional studies of research articles
Selection bias	Was the study's target population a close representation of the national population in relation to relevant variables?	Were eligibility criteria of papers clearly defined and did this link to the question?
	Was the sampling frame a true or close representation of the target population?	Was the sampling frame adequate and representative of the targeted papers?
	Was some form of random selection used to select the sample, OR was a census undertaken?	Was some form of random selection used to select the sample, OR were all eligible papers selected?
		Were papers excluded for a good reason? Are there any papers that were excluded from the analysis without any reason?
Non-response bias	Was the likelihood of nonresponse bias minimal?	N/a
Measurement bias	Were data collected directly from the subjects (as opposed to a proxy)?	Were data collected directly from the papers?
	Was there a sound and acceptable definition of relevant reporting practices in the paper?	Was there a sound and acceptable definition of relevant reporting practices in the paper?
	Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	How did authors define the outcome of interest?
	Was the study instrument that measured the parameter of interest shown to have validity and reliability?	Was data collection done rigorously? How was the outcome of interest measured? Was it done by 2 authors independently?
	Was the same mode of data collection used for all subjects?	Was the same mode of data collection used for all subjects? Was there a standardised data extraction form?
Bias related to the analysis	Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	Were the numerator(s) and denominator(s) for the parameter of interest appropriate?

2.3.3.4. Data analysis

We reported the estimates of prevalence as proportions, as reported in the included studies. Where studies reported results on a Likert scale (e.g. never happens, happens occasionally), we dichotomised data into "ever happened" and "never happened". Due to heterogeneity across included studies primarily related to populations and outcome measurement, we were not able to

pool results in a meta-analysis. We categorised results according to type of misconduct, narratively synthesised our findings and presented results in graphs and tables. We reported dichotomous data linked to secondary outcomes as proportions and continuous data as means and standard deviations (SD) or medians, as reported in the included studies. Clinical heterogeneity was explored and reported in tables of characteristics of included studies.

2.4. Results

2.4.1. Results of the search

Our search yielded 9907 outputs. After removal of duplicates, we screened 6930 titles and abstracts. Of these, we screened 122 full texts for eligibility. We included 32 studies reported in 33 publications (8-40) and excluded 89 studies (41-129) (Figure 2-1). Reasons for excluding studies
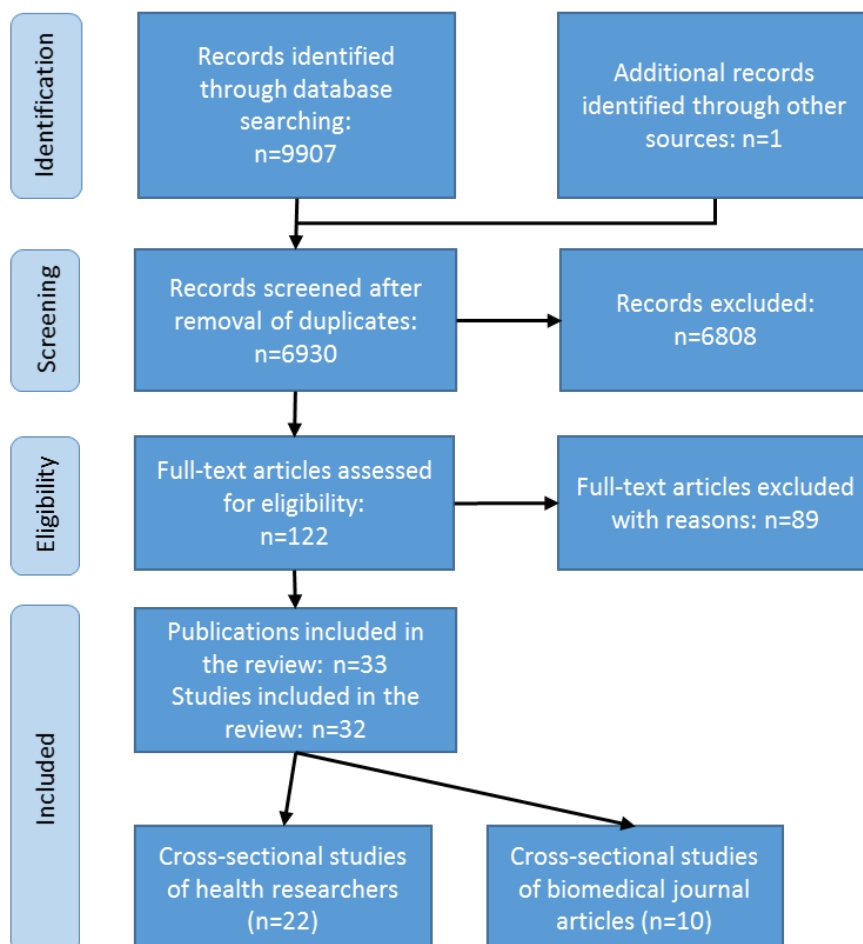
Figure 2-1 Flow diagram of study selection process

are summarised in the Table of excluded studies (Appendix 2.4). Most excluded studies did not report on empirical research, while others included participants from high-income countries, or

researchers from disciplines other than health. Some excluded studies examined academic integrity, such as cheating during exams, which was not relevant to our review.

2.4.2. Description of included studies

We included 32 studies reported in 33 publications, comprising 22 cross-sectional studies of health researchers with a total of 10139 participants; and 10 cross-sectional studies of biomedical research articles with a total of 5263 research articles. Details for each included study are reported in the Characteristics of included studies (Appendix 2.5).

In the following sections, we first report on the characteristics of the included cross-sectional studies of health researchers in terms of participants, regions, topics addressed, data collection and outcomes; and then on the characteristics of included cross-sectional studies of biomedical research articles in terms of sample, regions, topics addressed, data collection and outcomes.

2.4.2.1. *Cross-sectional studies of health researchers (n=22)*

Characteristics of included cross-sectional studies of health researchers are summarised in

Table 2-2. Figure 2-2 depicts the regions where studies were conducted.

2.4.2.1.1. Participants, regions and topics addressed

Studies addressing authorship practices

Eight surveys (9, 10, 13, 15, 18, 21, 24, 36) addressed authorship practices. Health researchers comprised corresponding authors of articles published in medical journals in four studies (9, 10, 15, 24), medical faculty members in three studies (13, 21, 36) and psychiatrists in one study (18). Three studies were conducted in South Asia (13, 21, 36), three in the middle East (15, 18, 24) and one in Latin America (10). One study included participants across South America, Africa and Asia (9).

Studies addressing plagiarism

Eight surveys (16, 17, 27, 31, 32, 37-39) addressed plagiarism. Health researchers comprised medical faculty members in four studies (17, 31, 38, 39), postgraduate medical students in two studies (16, 37), researchers at various levels in one study (27) and dental professionals in one study (32). All studies addressing plagiarism were conducted in Asia, five in South Asia (31, 32, 37-39) and three in the Middle East (16, 17, 27).

Studies addressing conflicts of interest

One survey of authors of articles published in biomedical journals addressed conflicts of interest. The survey was conducted in South Asia (12).

Studies addressing research misconduct in general or more than one topic

Five surveys reported in six publications (8, 14, 25, 26, 30, 33), addressed research misconduct in general or more than one topic. Health researchers comprised medical and dental researchers in four studies (8, 14, 25, 26, 30) and dentists in one study (33). Two surveys were conducted in Sub-Saharan Africa (8, 25, 26), two in South Asia (14, 33) and one in Latin America (30).
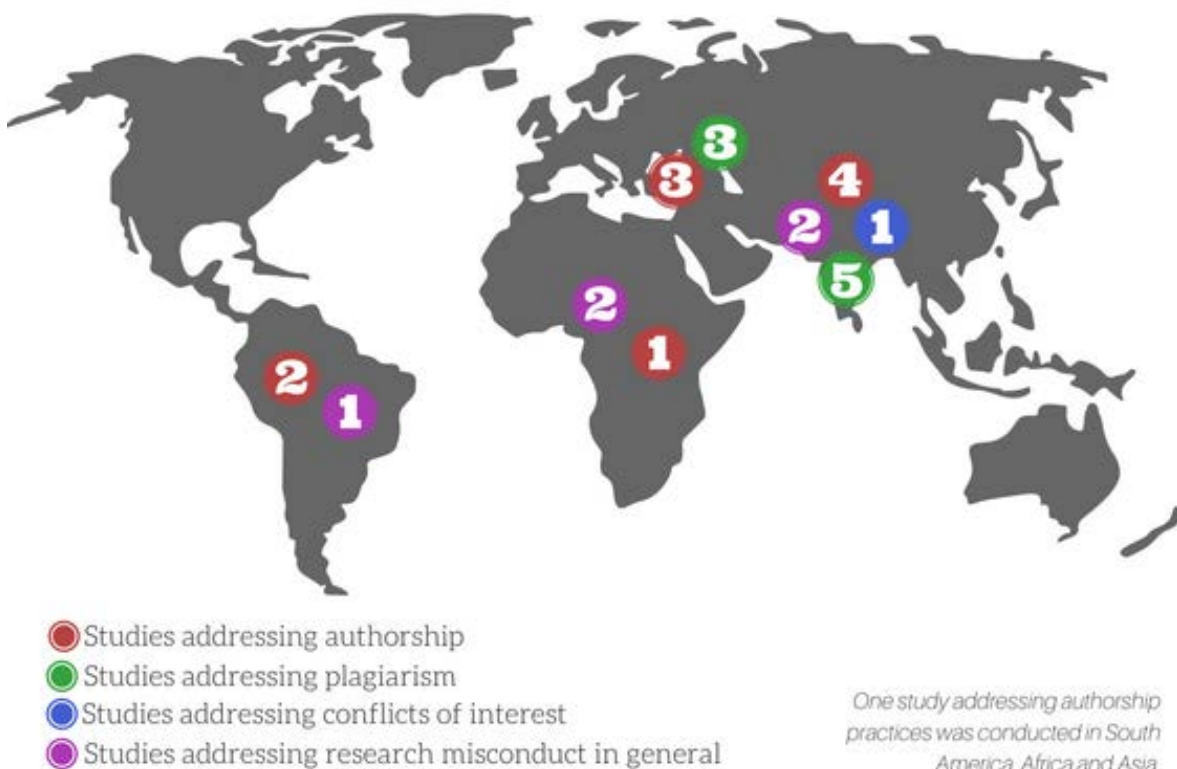
Figure 2-2 Regions where surveys of health researchers were conducted (n=22)

2.4.2.1.2. Survey instruments and data collection

Five surveys (16, 17, 25, 26, 37, 39) used a validated questionnaire to collect data. Four of these (16, 17, 37, 39) used the "Attitude towards Plagiarism" (ATP) questionnaire (130, 131). The ATP questionnaire consists of three factors with a total of 29 items. Respondents are asked to rate the

items using a 5-point Likert scale (from 1: strongly disagree, to 5: strongly disagree). The first factor, containing 12 items (score range 12 to 60), represents a positive attitude towards plagiarism i.e. approval of plagiarism. A low score range (12 to 28) is favourable, as it indicates low tolerance toward plagiarism. The second factor, containing 7 items (score range 7 to 35) represents negative attitude towards plagiarism i.e. disapproval of plagiarism. A high score range is favourable (27 to 35), as this indicates low tolerance towards plagiarism. The third factor, containing 10 items (score range 10 to 50) represents normative beliefs and perception of the prevalence of plagiarism in the academic community. A low score range (10 to 23) indicates that participants find this behaviour unacceptable. In two studies (16, 17) the same author team translated the questionnaire into Persian and only included 25 questions. Rathore et al. (2015) removed four items and modified the 5-point Likert scale to a 3-point Likert scale (agree, neutral, disagree).

Okonta and Rossouw (2013 and 2014) used an adapted version of the validated Scientific Misconduct Questionnaire-Revised (SMQ-R) (132) to assess attitudes and beliefs, perceived behavioural influences, and influence of workplace environment on research misconduct in general (25, 26).

Four studies requested survey participants to indicate the contribution of their co-authors according to a list of possible contributions (10, 15, 24, 33). One study (8) adapted the list of wrongdoings reported in Martinson et al. (2005) for their questionnaire. The remaining studies poorly described how they developed and validated their questionnaires.

In three studies, questionnaires were not self-administered. Das and colleagues (2013) interviewed respondents telephonically (12); Das and colleagues (2016) interviewed some respondents, while others completed a paper-based questionnaire (36); and Shirazi and colleagues (2010) read out the questions at a faculty meeting and asked respondents to write down the answer (31).

Seven studies (8, 10, 13, 14, 21, 25, 26, 37) explicitly reported that the questionnaire was self-administered. The remaining studies did not report this, but it was implicit in the way the questionnaires were distributed.

Six studies used a paper-based questionnaire (13, 14, 21, 25, 26, 37, 39). Dhingra and colleagues (2014) sent the questionnaire via email, but asked participants to return it via regular mail (14).

Jawaid and colleagues (2013) distributed questionnaires at a workshop (21), and Okonta and Rossouw (2013 and 2014) at a conference (25, 26).

Of the five studies that sent an electronic questionnaire via email (9, 10, 18, 30, 33), one reported that it was an online survey (30). Four studies used both paper-based and electronic formats (via email) of the same questionnaire (15, 24, 32, 38). In four studies, it was unclear whether the questionnaire was paper-based or electronic (8, 16, 17, 27).

2.4.2.1.3. Outcomes - Primary outcome: Prevalence of research misconduct

Included surveys used different outcome definitions.

Guest authorship

Eight surveys assessed prevalence of guest authorship (9, 10, 14, 15, 18, 24, 30, 36). Five studies reported on the number of authors that admitted to having inappropriately added authors (9, 18, 21, 30, 36). Four studies asked respondents to indicate individual author contributions according to ICMJE criteria and identified authors that did not meet authorship criteria (10, 15, 19, 24). In two studies, participants admitted to having inappropriately received authorship (21, 30) and in one study, participants admitted knowing that others engaged in this practice (14).

Ghost authorship

Three surveys assessed the prevalence of ghost authorship (14, 21, 24), which was measured differently in each study. One study reported on the number of participants who were not included on a paper when they felt they deserved authorship (21), one study reported on the number of participants that admitted to having omitted colleagues from the authors list (24) and one study participants admitted to knowing about cases where this happened (14).

Plagiarism

Seven surveys assessed the prevalence of plagiarism (8, 14, 25-27, 30-32). Six studies reported on the number of participants that admitted to having plagiarised themselves (8, 25, 27, 30-32) and three studies reported on the number of participants that knew about others having plagiarised (14, 26, 31).

Non-disclosure of conflicts of interest

One survey reported on the number of participants admitting to not declaring conflicts of interest (12).

Redundant publication

Three surveys assessed the prevalence of redundant publication (8, 14, 33). Two studies reported the number of participants that admitted to redundant publication (8, 33) and another the number of participants that were aware of duplicate submissions and salami publications (14).

Data fabrication or falsification

Adeleye et al. (2012) assessed the prevalence of data fabrication (8) and reported the number of participants that admitted to data fabrication (8). One survey assessed the prevalence of data fabrication or falsification (14) and reported on the number of participants that knew of these practices happening. Two surveys assessed the prevalence of data falsification (8, 25, 26). One survey reported the number of participants admitting to having falsified data in one publication (25) and the number of participants who knew about colleagues having falsified data in a second publication (26). Adeleye et al. (2012) reported the number of participants admitting to having falsified data (8).

2.4.2.1.4. Outcomes - Secondary outcomes: factors influencing research misconduct

Knowledge of good practices

Seven surveys assessed knowledge or awareness of good practices (12, 13, 18, 21, 27, 31, 32). Of these, three surveys assessed awareness and use of authorship criteria as outlined by the International Committee of Medical Journal editors (ICMJE) (13, 18, 21) and three surveys assessed knowledge on plagiarism (27, 31, 32). Poorolajal et al. (2012) included nine questions on knowledge of plagiarism with a maximum score of 9, Shirazi et al. (2010) included questions on referencing, paraphrasing, the use of quotations and self-plagiarism in their questionnaire, while Singh et al. (2014) asked participants what constituted plagiarism. One survey (12) assessed understanding of the term conflicts of interest.

Attitude towards research practices

Five surveys assessed attitudes towards plagiarism (16, 17, 27, 37, 39). In one of these studies (27), authors developed nine questions to assess attitudes toward plagiarism using a 3-point Likert scale (disagree, no idea, agree). The other four studies used the ATP questionnaire (130, 131) to assess attitude towards plagiarism.

Perceptions on research misconduct and factors influencing research misconduct

Overall, five surveys assessed perceptions on research misconduct (8, 18, 25, 26, 33, 38). Two surveys addressed perceptions on authorship practices (18, 33), one survey each assessed perceptions on plagiarism (38), conflicts of interest (33), and poor practices in general (33). Okonta and Rossouw (2013 and 2014) used an adapted version of the validated Scientific Misconduct Questionnaire-Revised (SMQ-R) (132) to assess attitudes and beliefs, perceived behavioural influences, and influence of workplace environment on research misconduct in general (25, 26). Adeleye et al. (2012) asked participants to identify perceived barriers to ethical conduct of research (8).

Table 2-2 Summary of characteristics of included cross-sectional studies of health researchers (n=22)

Study ID	Study participants	n	Country	Outcomes
Authorship				
Al-Herz 2013	Corresponding authors of articles published in biomedical journals indexed in PubMed	1246	South America, Asia, Africa	Prevalence of guest authorship
Borracci 2011	Authors of papers published in the Argentine Journal of Cardiology	214	Argentina	Prevalence of guest authorship
Das 2016	Medical and Pharmacy faculty from different parts of India	95	India	Prevalence of guest authorship
Dhaliwal 2006	Faculty members of University College of Medical Sciences in Delhi	77	India	Prevalence of guest authorship Awareness of authorship criteria
Ghajarzadeh 2014	Corresponding authors of the journal: Archives of Iranian Medicine	296	Iran	Prevalence of guest authorship
Gultekin 2010	Psychiatrists	87	Turkey	Prevalence of guest authorship Perceptions on authorship Knowledge of authorship practices
Jawaid 2013	Faculty members of various medical universities	230	Pakistan	Prevalence of guest and ghost authorship Awareness of authorship criteria
Mirazazadeh 2011	Corresponding authors of original papers of two issues of the Iranian Journal of Public Health, Journal of Kerman University of Medical Sciences, Kerman University Medical Journal	536	Iran	Prevalence of guest authorship and ghost authorship
Plagiarism				
Ghajarzadeh 2012a	Medical students (including Internship and residency) at Theran University of Medical Sciences	198	Iran	Attitude towards plagiarism
Ghajarzadeh 2012b	Faculty Members of Medical School at Theran University of Medical Sciences	87	Iran	Attitude towards plagiarism
Jain 2015	Medical and dental postgraduate students of various institutions of Bhopal	164	India	Attitude towards plagiarism
Kurdi 2015	Medical faculty members and consultants	600	India	Reasons for plagiarism

Poorolajal 2012	Researchers at Hamadan University of Medical Sciences	390	Iran	Prevalence of plagiarism Knowledge and attitude towards plagiarism
Rathore 2015	Medical faculty in three private and four public medical colleges in Lahore and Rawalpindi	95	Pakistan	Attitude towards plagiarism
Shirazi 2010	Faculty members of a private and public medical college	82	Pakistan	Prevalence and knowledge of plagiarism
Singh 2014	Dental professionals	5000	India	Prevalence of plagiarism, knowledge of plagiarism
Conflicts of interest				
Das 2013	Authors of 15 Indian medical journals	61	India	Absence of declaration of conflict of interest Knowledge of conflict of interest
Research misconduct in general				
Adeleye 2012	Medical and dental researchers of 3 medical and dental schools	132	Nigeria	Prevalence of plagiarism, redundant publication, data fabrication and data falsification Factors associated with misconduct
Dhingra 2014	Young medical researchers	155	India	Prevalence of guest authorship, ghost authorship, data falsification, data fabrication, plagiarism and "Salami slicing"
Okonta 2013 and 2014	Health researchers attending scientific conference	133	Nigeria	Disagreement about authorship Prevalence of plagiarism, data falsification and selective reporting Factors associated with research misconduct Attitudes and beliefs about misconduct Work environment in relation to misconduct

Roussos 2011	Psychotherapy researchers	76	Argentina, Brazil, Chile, Uruguay	Prevalence of guest authorship and plagiarism
Tadakamadla 2013	Dentists registered with Indian Academy of Oral Medicine and Radiology	185	India	Awareness and perceptions on authorship, duplicate publication, selective reporting

Chapter 2 - Taking stock of existing research

2.4.2.2. *Cross-sectional studies of biomedical research articles (n=10)*

Characteristics of included cross-sectional studies of biomedical research articles are summarised in Table 2-3. Figure 2-3 depicts the regions where studies were conducted.

2.4.2.2.1. Sample, regions and topics addressed

Studies addressing authorship practices

One study addressed authorship practices. Articles with Chilean authors published in *Revista Medica de Chile* were included in the sample and thus represent research from Latin America (19).

Studies addressing plagiarism

One study addressed plagiarism (20). Articles published by Iranian researchers in international journals were compared to articles from the USA, Turkey, Australia and China. We only included data from articles published in journals from the Middle East and East Asia.

Studies addressing conflicts of interest

Five studies (11, 22, 29, 34, 40) addressed conflicts of interest. Brannstrom and colleagues (2012) included original research articles related to paediatrics published between 2007 and 2009 in low-income countries of sub-Saharan Africa and in Sweden (11). We only included data of articles representing research from sub-Saharan Africa. Klitzman and colleagues (2010) included original research articles on HIV, carried out in India, Thailand, Nigeria and Uganda and indexed in Medline (22). Romero and colleagues (2007) included research articles published in the *Revitas de Medici de Chile* between 2002 and 2005 (29), Soto Subriabre and colleagues (2016) included articles published in two medical journals from Chile between 2002 and 2015 (40), and Tisce and colleagues (2014) included original research articles published in biomedical journals indexed in Scielo Peru between 2007 and 2012 (34).

Studies addressing duplicate publication

Two studies addressed duplicate publication (28, 35), both representing research from East Asia. Qi and colleagues (2013) included all original articles on Budd-Chiari syndrome in China, indexed in PubMed, Chinese Scientific and technological Journal database and the

China National Knowledge Infrastructure database (28). Tucker and colleagues (2011) included English articles from Chinese institutions indexed in PubMed (35).

Studies addressing research misconduct in general or more than one topic

One study (23) addressed more than one topic related to research misconduct and included journal articles of medical journals from Iranian universities, published in 2011 and 2012.

- 🔴 Studies addressing authorship
- 🟢 Studies addressing plagiarism
- 🔵 Studies addressing conflicts of interest
- 🟣 Studies addressing research misconduct in general
- 🔵 Studies addressing duplicate publication

One study addressing plagiarism was conducted in the Middle East and East Asia

One study addressing conflicts of interest was conducted in Sub-Saharan Africa, South Asia and East Asia
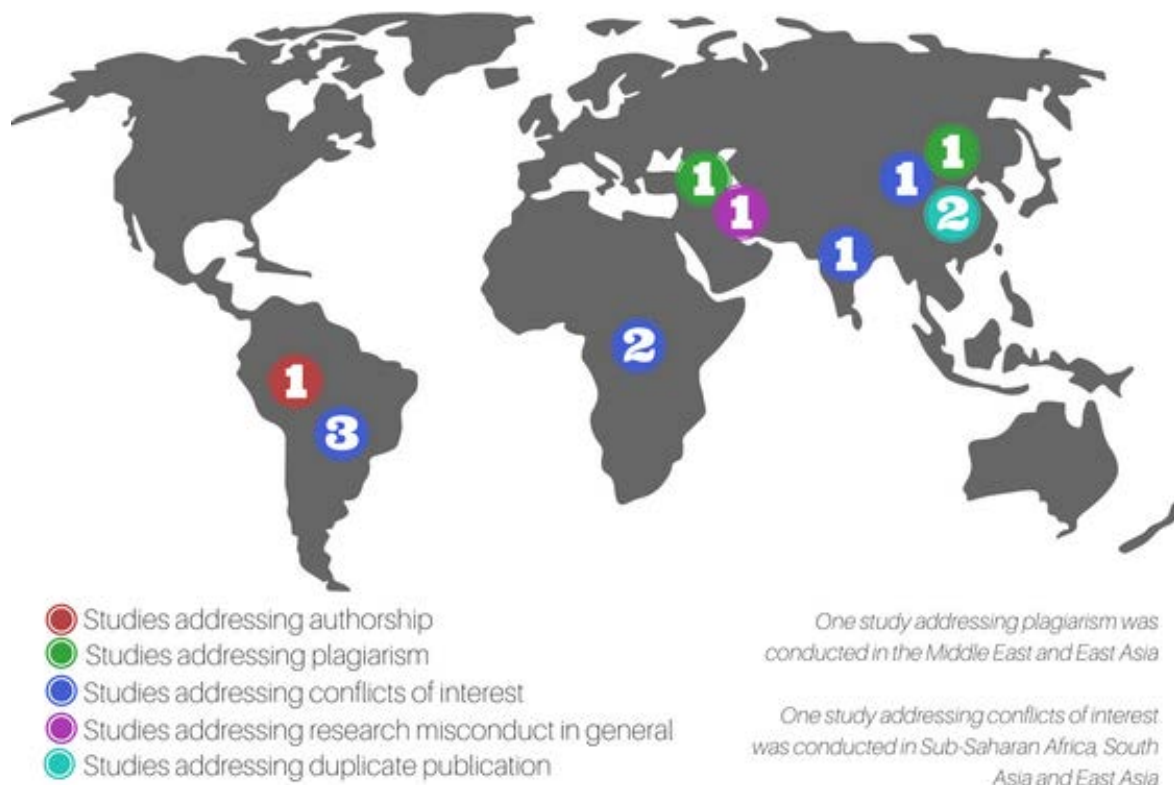
Figure 2-3 Regions where cross-sectional studies of biomedical research articles were conducted (n=10)

2.4.2.2.2. Data collection

Three studies reported using standardised data extraction forms to collect data (22, 28, 35). Two studies applied a checklist to selected articles. Jacard and colleagues (2002) applied the checklist to authors' disclosure of contributions (19). They used the criteria proposed by the International Committee of Medical Journal Editors (ICMJE) to classify reported contributions. The ICMJE criteria at the time when the study was conducted required authors to contribute to 1) the conception and design of the study, or acquisition of data, or analysis and interpretation of data; 2) drafting the article, or critically reviewing it; and 3) approving the final version of the manuscript. It was not clearly reported what items the checklist Koushan and colleagues (2014) used contained and how it was used (23). Four

studies did not report whether they used a standardised data extraction form to collect data (11, 29, 34, 40). Jamali and colleagues (2014) used Dustball text-matching software to check three to four paragraphs of the introduction or literature review section of each article for evidence of plagiarism (20).

Five studies reported that two authors were involved in data extraction (22, 28, 29, 34, 35), while the other five did not report how many authors extracted data (11, 19, 20, 23, 40).

2.4.2.2.3. Outcomes - Primary outcome: Occurrence of research misconduct

Guest authorship

Two studies assessed prevalence of guest authorship (19, 23). Jacard and colleagues (2002) assessed published statements of author contributions (19). Each author was classified as having justified authorship (meeting all three ICMJE criteria), partial authorship (meeting two of the three criteria) or unjustified authorship (meeting only one of the criteria). Koushan and colleagues (2014) examined author contributions, but did not clearly report how they measured guest authorship (23).

Ghost authorship

Koushan and colleagues (2014) also addressed ghost authorship (23), but it was not clear how this was assessed.

Plagiarism

Jamali and colleagues (2014) analysed research articles using text-matching software and reported the rate of plagiarism in terms of the number of articles with at least one completely copied sentence (20) in the introduction or the literature review section of the article.

Non-disclosure of conflicts of interest

Six studies reported on the number of research articles without declarations of conflicts of interest (11, 22, 23, 29, 34, 40).

Non-disclosure of funding sources

Four studies that assessed conflicts of interest also assessed disclosure of funding sources and reported on the number of research articles that did not disclose funding sources (11, 22, 23, 29).

Redundant publication

Three studies assessed redundant publication in research articles (23, 28, 35). Qi et al. (2013) examined "covert duplicate publications" in original research articles on Budd-Chiari Syndrome in China (28). The authors clearly defined "covert duplicate publications" with six pre-specified criteria that had to be met: 1) the first author or affiliation was the same for the primary and secondary publication, 2) at least two of four characteristics related to enrolment period, number of patients, gender proportion and age range, were the same in the two publications, 3) the aim, methods and conclusion were the same; 4) the primary and secondary publications were published in different journals or different volumes or issues of the same journal; 5) the authors did not mention a secondary publication in the article and 6) the authors did not mention that the secondary publication was approved by the editors of both journals. Tucker et al. (2011) assessed English articles from Chinese institutions for substantial or minor overlap with Chinese literature (35). Substantial overlap was defined as overlap greater than 30% similarity in any of the content reported in the introduction, methods, results or discussion section of the articles, while minor overlap was defined as less than 30% similarity in any one of the article sections. Koushan et al. (2014) reported the number of articles published in Persian and English, and the number of articles containing sections that had already been published elsewhere (23).

2.4.2.2.4. Outcomes – Secondary outcomes: Factors influencing research misconduct

None of the included cross-sectional studies of biomedical research articles addressed secondary outcomes.

Table 2-3 Summary of characteristics of included cross-sectional studies of biomedical research articles (n=10)

Study ID	Study participants	N	Country	Outcomes
Authorship				
Jacard 2002	Biomedical manuscripts from Chilean authors in Revista Medica de Chile	921	Chile	Prevalence of guest authorship
Plagiarism				
Jamali 2014	Articles published by Iranian researchers in international journals (variety of fields) compared to 50 articles from US, Turkey, Australia, China (only engineering and medicine)	177	Iran, Turkey, China	Prevalence of plagiarism
Conflicts of interest				
Brannstrom 2012	All original research articles in paediatrics published between 2007 and 2009 and indexed in Web of Science, Science Citation Index Expanded, Social Sciences Citation Index, and Arts&Humanities Citation index	34	Kenya, Malawi, Tanzania, Zambia, Uganda, Congo Dem Rep, Burkina Faso, Ethiopia, Ghana, Guinea Bissau, Madagascar/Senegal, Mali, Mozambique, Rwanda, Zimbabwe	Absence of declaration of conflicts of interest and of disclosure of funding source
Klitzman 2010	Original research articles on HIV indexed in Medline in 2007	221	India, Thailand, Nigeria, Uganda	Absence of declaration of conflicts of interest Absence of disclosure of funding source
Romero 2007	Research articles published in the "Revista Medica de Chile" between 2001 and 2005	519	Chile	Absence of declaration of conflicts of interest Absence of disclosure of funding source
Soto Subriabre 2016	Studies published in two medical journals from Chile between 2002 and 2015	596	Chile	Absence of declaration of conflicts of interest

Ticse 2014	Original research articles published in biomedical journals indexed in Scielo Peru between 2007 and 2012	672	Peru	Absence of declaration of conflict of interest
Duplicate publication				
Qi 2013	All original articles regarding Budd-Chiari syndrome in China indexed in PubMed, Chinese Scientific and Technological Journal (VIP) database, and China National Knowledge Infrastructure (CNKI) database	1914	China	Prevalence of duplicate publication
Tucker 2011	English Manuscripts from Chinese institutions indexed in PubMed	100	China	Prevalence of duplicate publication
Research misconduct in general				
Koushan 2014	Journal papers of 102 medical journals of Iranian universities published in 2011 and 2012	109	Iran	Prevalence of guest authorship, ghost authorship, data fabrication, duplicate publication, plagiarism Absence of disclosure of funding sources

2.4.2.3. *Risk of bias in included studies*

In the following section, we first report on the risk of bias in included cross-sectional studies of health researchers and then on the risk of bias in included cross-sectional studies of biomedical articles.

2.4.2.3.1. Cross-sectional studies of health researchers (n=22)

Risk of bias for each domain, as well as overall risk of bias across studies is summarised in Table 2-4. Details of risk of bias for each included study can be found in Appendix 2.5 in the Characteristics of included studies and in Appendix 2.6.

Eleven surveys were judged as having high risk of selection bias (8, 12, 14, 24-27, 31, 32, 36, 38, 39). Cross-sectional studies of health researchers generally did not use an appropriate sampling frame, while selection of participants was not done randomly or by census. Two studies were judged as having low risk of selection bias (15, 33), while the remaining nine were judged as having unclear risk of selection bias (9, 10, 13, 16-18, 21, 30, 37), mainly due to poor reporting in included studies. For non-response bias, 12 cross-sectional studies of health researchers were judged as having high risk of bias (9, 12-15, 18, 24, 30, 31, 33, 36, 38). Of these, six did not report the number of participants that were invited to participate (12, 14, 24, 31, 33, 36) and the other six (9, 13, 15, 18, 30, 38) had low response rates with no analysis of non-respondents. Six surveys were judged as having low risk of bias, as they had good response rates (8, 10, 16, 21, 27, 37). Four studies were judged as having unclear risk of bias (17, 25, 26, 32, 39).

We judged eight surveys (9, 15, 17, 30, 32, 33, 36, 38) to have high risk, 12 to have unclear risk (8, 10, 12-14, 17, 18, 21, 24, 27, 31, 39) and two to have low risk of measurement bias (25, 26, 37). Only seven cross-sectional studies of health researchers used a validated questionnaire to measure outcomes, while only five studies included an adequate definition of the reporting practice in the questionnaire.

Risk of bias due to analysis was judged as being low for nine studies (8, 10, 14, 15, 21, 24-26, 31, 36), unclear for 10 studies (12, 13, 16, 18, 27, 30, 32, 33, 37, 39) and high for the remaining three studies (9, 17, 38), which did not include the correct denominator in the results or only reported proportions.

Overall risk of bias was bias was judged to be high for twelve cross-sectional studies of health researchers (9, 12, 14, 15, 17, 24, 30-33, 36, 38), indicating that further research is very likely to have an important impact on our confidence in the estimate and is likely to change the estimate. Overall risk of bias was judged to be moderate for 10 cross-sectional studies of health researchers (8, 10, 13, 16, 18, 21, 25-27, 37, 39), indicating that further research is likely to have an important impact on our confidence in the estimate and may change the estimate. None of the included cross-sectional studies of health researchers were judged to have low risk of bias overall.

Table 2-4 Summary of risk of bias across included cross-sectional studies of health researchers (n=22)

Study ID	Selection bias	Non-response bias	Measurement bias	Bias due to analysis	Overall risk of bias
Adeleye 2012	High (red)	Low (green)	Unclear (yellow)	Low (green)	Moderate (orange)
Al-Herz 2013	Unclear (yellow)	High (red)	High (red)	High (red)	High (red)
Borracci 2011	Unclear (yellow)	Low (green)	Unclear (yellow)	High (red)	Moderate (orange)
Das 2013	High (red)	High (red)	Unclear (yellow)	Unclear (yellow)	High (red)
Das 2016	High (red)	High (red)	High (red)	Low (green)	High (red)
Dhaliwal 2006	Unclear (yellow)	High (red)	Unclear (yellow)	Unclear (yellow)	Moderate (orange)
Dhingra 2014	High (red)	High (red)	Unclear (yellow)	Low (green)	High (red)
Ghajarzadeh 2012a	Unclear (yellow)	Low (green)	Unclear (yellow)	Unclear (yellow)	Moderate (orange)
Ghajarzadeh 2012b	Unclear (yellow)	Unclear (yellow)	High (red)	High (red)	High (red)
Ghajarzadeh 2014	Low (green)	High (red)	Low (green)	Low (green)	High (red)
Gultekin 2010	Unclear (yellow)	High (red)	Unclear (yellow)	Unclear (yellow)	Moderate (orange)
Jain 2015	Unclear (yellow)	Low (green)	Low (green)	Unclear (yellow)	Moderate (orange)
Jawaid 2013	Unclear (yellow)	Low (green)	Unclear (yellow)	Low (green)	Moderate (orange)
Kurdi 2015	High (red)	High (red)	High (red)	High (red)	High (red)
Mirazazadeh 2011	High (red)	High (red)	Unclear (yellow)	Low (green)	High (red)
Okonta 2013 and 2014	High (red)	Unclear (yellow)	Low (green)	Low (green)	Moderate (orange)
Poorolajal 2012	High (red)	Low (green)	Unclear (yellow)	Unclear (yellow)	Moderate (orange)
Rathore 2015	High (red)	Unclear (yellow)	Unclear (yellow)	Unclear (yellow)	Moderate (orange)
Roussos 2011	Unclear (yellow)	High (red)	High (red)	Unclear (yellow)	High (red)
Shirazi 2010	High (red)	High (red)	Unclear (yellow)	Low (green)	High (red)
Singh 2014	High (red)	Unclear (yellow)	High (red)	Unclear (yellow)	High (red)
Tadakamadla 2013	Low (green)	High (red)	High (red)	Unclear (yellow)	High (red)

Risk of bias per domain:
High risk — red
Unclear risk — yellow
Low risk — green

Overall risk of bias:
High risk — red
Moderate risk — orange
Low risk — green

2.4.2.3.2. Cross-sectional studies of biomedical research articles (n=10)

Risk of bias for each domain, as well as overall risk of bias across studies is summarised in Table 2-5. Details of risk of bias for each included study can be found in Appendix 2.5 in the Characteristics of included studies and in Appendix 2.6.

Four studies were judged as having high risk of selection bias (19, 20, 22, 40) as eligibility criteria and sampling frames of included research articles were not adequate. Four studies were judged as having low (28, 29, 33, 34), and two studies as unclear risk of selection bias (23, 35) mainly due to poor reporting in included studies.

The risk for measurement bias was judged as being high for three studies (11, 23, 34), that did not adequately define the outcome of interest and did not collect data in a standardised way. We judged three studies to have low risk (22, 28, 29) and four studies (19, 20, 35, 40) to have unclear risk of measurement bias.

Risk of bias due to analysis was judged as being low for eight studies (19, 20, 22, 28, 29, 34, 35, 40), unclear for one study (11) and high one study (23), which did not include the correct denominator in the results or only reported proportions.

Overall risk of bias was bias was judged to be high for one cross-sectional study of biomedical research articles (23), indicating that further research is very likely to have an important impact on our confidence in the estimate and is likely to change the estimate. Overall risk of bias was judged to be moderate for seven cross-sectional studies of biomedical research articles (11, 19, 20, 22, 34, 35, 40) indicating that further research is likely to have an important impact on our confidence in the estimate and may change the estimate. Only two cross-sectional studies of biomedical research articles (28, 29) were judged as having overall low risk of bias, indicating that further research is very unlikely to change our confidence in the estimate.

Table 2-5 Summary of risk of bias across included cross-sectional studies of biomedical research articles (n=10)

Study ID	Selection bias	Non-response bias	Measurement bias	Bias due to analysis		Overall risk of bias
Brannstrom 2012	green	n/a	red	yellow		orange
Jacard 2002	red	n/a	yellow	green		orange
Jamali 2014	red	n/a	yellow	green		orange
Klitzman 2010	red	n/a	green	green		orange
Koushan 2014	yellow	n/a	red	red		red
Qi 2013	green	n/a	green	green		green
Romero 2007	green	n/a	green	green		green
Soto Subriabre 2016	red	n/a	yellow	green		orange
Ticse 2014	green	n/a	red	green		orange
Tucker 2011	yellow	n/a	yellow	green		orange

Risk of bias per domain:

High risk [red]
Unclear risk [yellow]
Low risk [green]

Overall risk of bias:

High risk [red]
Moderate risk [orange]
Low risk [green]

2.4.3. Findings of included studies

2.4.3.1. Primary outcome: Prevalence of research misconduct

Detailed tables containing data related to the prevalence of research misconduct can be found in Appendix 2.7.

2.4.3.1.1. Guest authorship

Eight cross-sectional studies of health researchers (9, 10, 14, 15, 18, 24, 30, 36) and two cross-sectional studies of biomedical research articles (19, 23) reported on the prevalence of guest authorship (Figure 2-4).

In cross-sectional studies of health researchers, the proportions of participants admitting to having inappropriately added authors (five studies; moderate to high risk of bias) ranged from 24% to 66%. For participants admitting to having inappropriately received authorship, one study (high risk of bias) reported a prevalence of 7%, while the other study (high risk of bias) reported a prevalence of 29%. For participants knowing about other people inappropriately adding authors, one study (high risk of bias) reported a prevalence of 65%. For the three cross-sectional studies of health researchers that assessed contributions of authors according to ICMJE criteria (moderate to

high risk of bias), the prevalence of unjustified authorship ranged from 33% to 56%.

For cross-sectional studies of biomedical research articles, two studies (high risk of bias) reported on the prevalence of unjustified authorship according to published contributions of authors. One study reported a prevalence of 6% and the other of 47%.
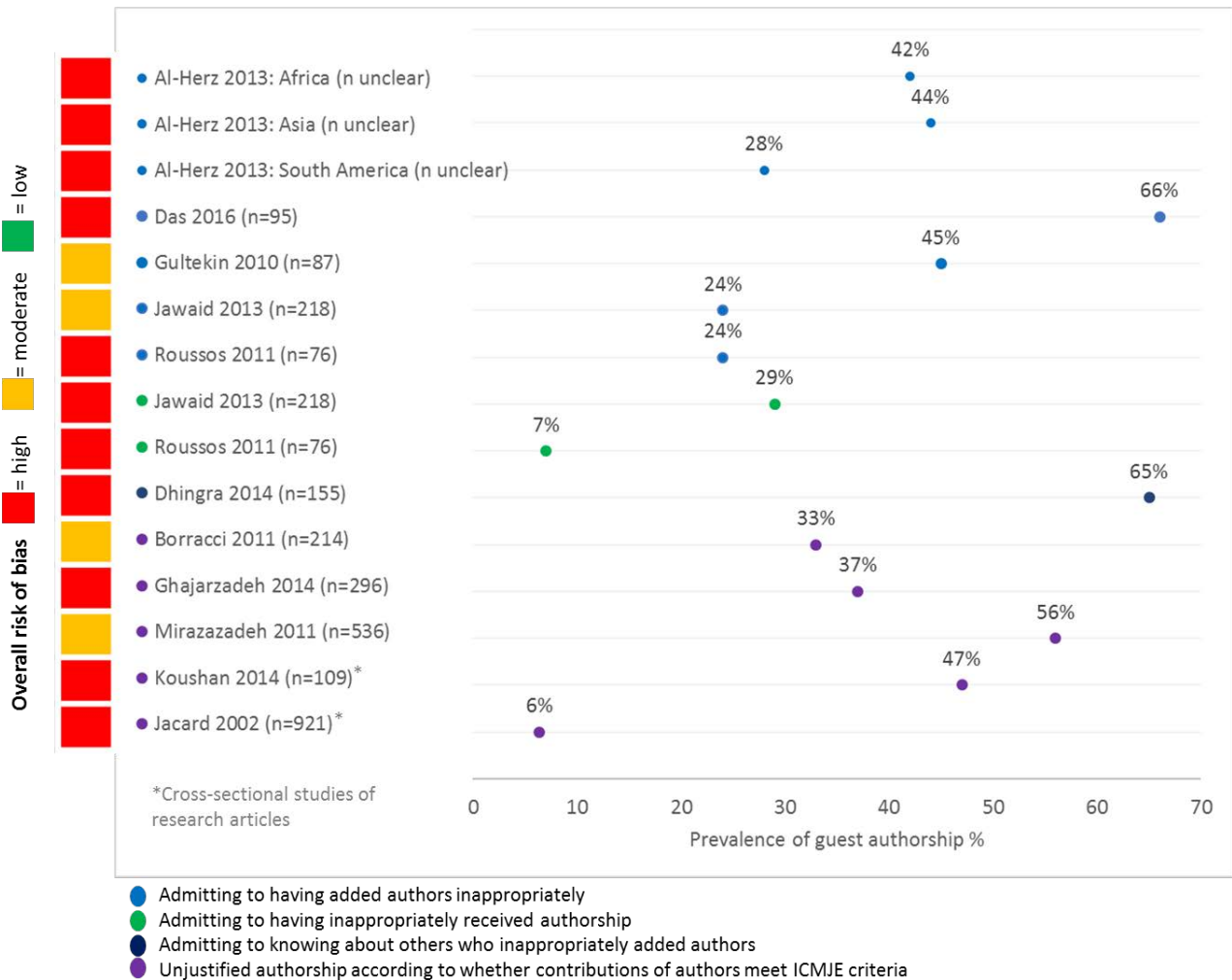
Figure 2-4 Prevalence of guest authorship

2.4.3.1.2. Ghost authorship

Three cross-sectional studies of health researchers (14, 21, 24) and one cross-sectional study of biomedical research articles (23) reported on ghost authorship (Figure 2-5).

Amongst cross-sectional studies of health researchers, one study (high risk of bias) reported that 20% of respondents admitted to having inappropriately omitted authors from the publication. For participants that knew about others who had inappropriately omitted authors, one study (high risk of bias) reported a prevalence of 34%, and for participants that were not included as authors when authorship felt deserved, one study (moderate risk of bias) reported a prevalence of 43%.

One cross-sectional study of biomedical research articles (high risk of bias) reported a prevalence of ghost authorship of 6%. However, it is not clear how ghost authorship was assessed.
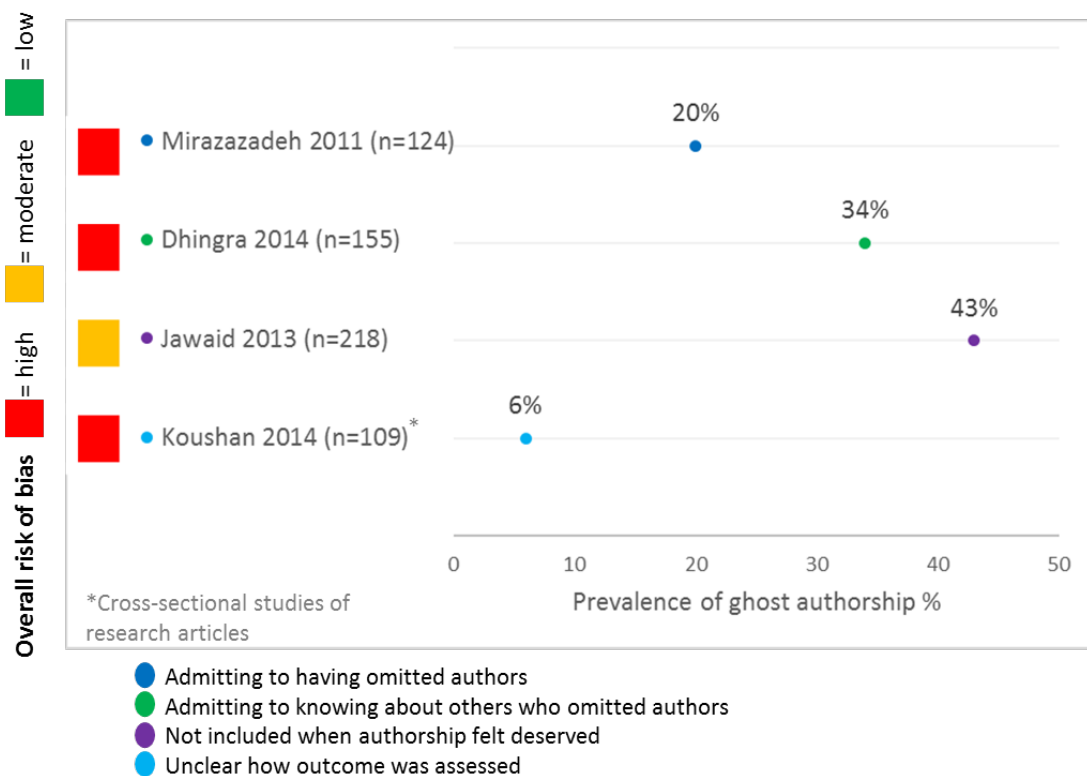
Figure 2-5 Prevalence of ghost authorship

2.4.3.1.3. Plagiarism

Seven cross-sectional studies of health researchers (8, 14, 25-27, 30-32) and one cross-sectional study of biomedical research articles (20) reported on the prevalence of plagiarism (Figure 2-6).

Amongst cross-sectional studies of health researchers, six studies (moderate to high risk of bias) reported on the proportion of participants admitting to having plagiarised. The prevalence ranged from 5% to 73%. For participants admitting to knowing about other people who had plagiarised, the prevalence ranged from 54% to 89% in three studies (moderate to high risk of bias).

One cross-sectional study of biomedical research articles (moderate risk of bias) reported on the prevalence of plagiarism. The proportion of research articles with at least one copied sentence was 39% for articles from Iran. Results were similar for articles from China and Turkey.
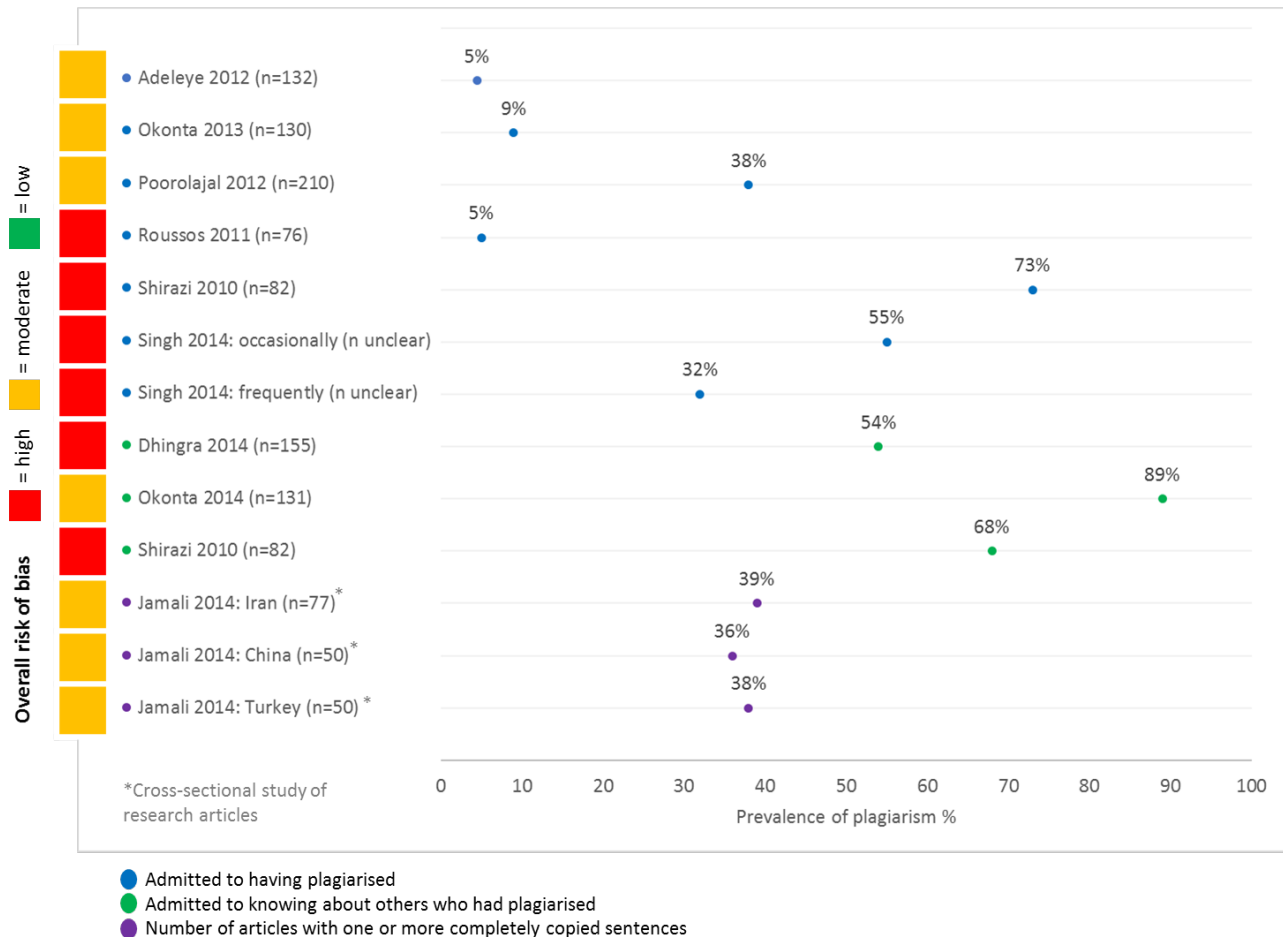
Figure 2-6 Prevalence of plagiarism

2.4.3.1.4. Non-disclosure of conflicts of interest

One cross-sectional study of health researchers (12) and six cross-sectional studies of biomedical research articles (11, 22, 23, 29, 34, 40) reported on non-disclosure of conflicts of interest (Figure 2-7).

In the survey of health researchers (high risk of bias), 98% of participants admitted to not declaring conflicts of interest in publications.

For cross-sectional studies of biomedical research articles, the prevalence of articles that did not contain disclosures of conflicts of interest ranged from 45% to 81% in six studies (low, moderate and high risk of bias).
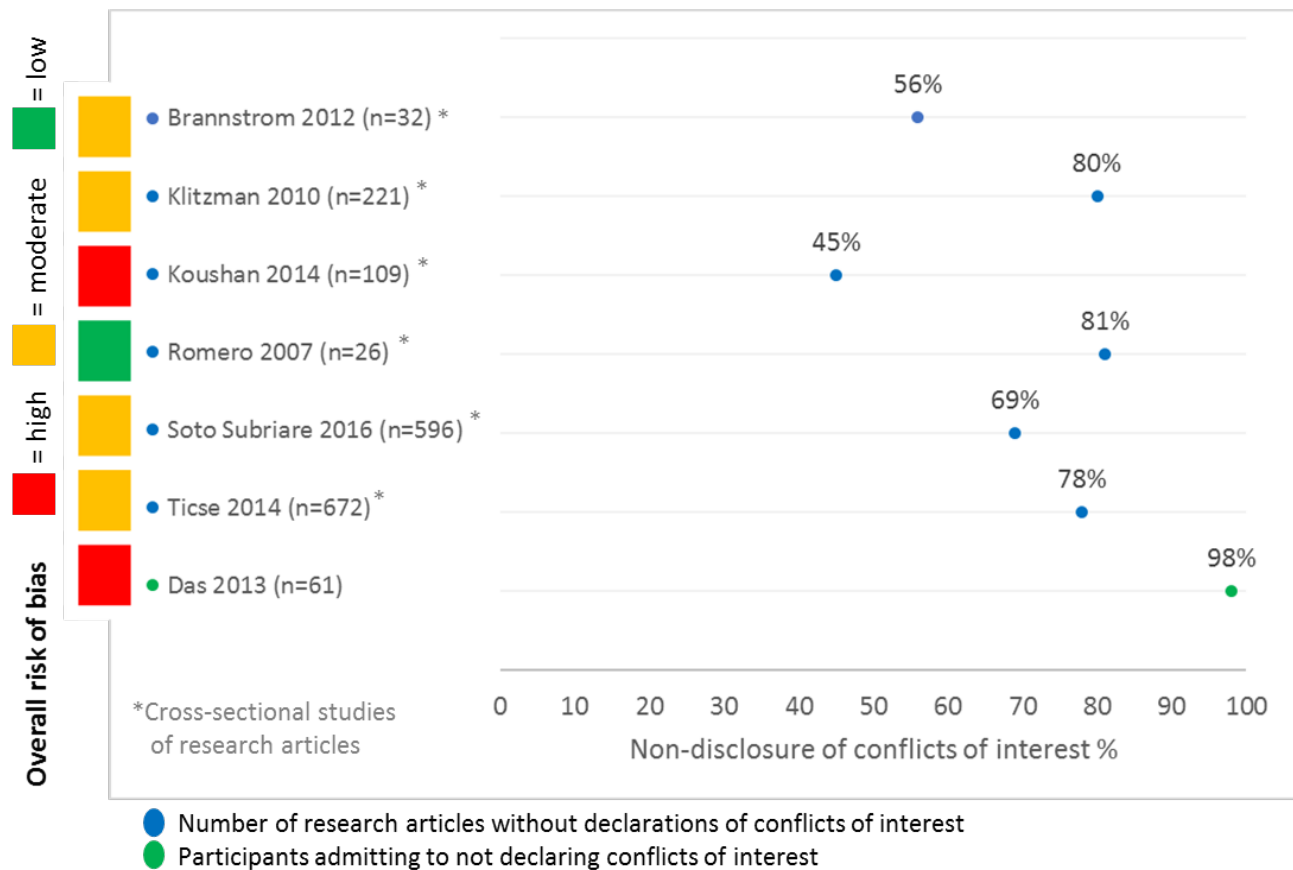
Figure 2-7 Prevalence of non-disclosure of conflicts of interest

2.4.3.1.5. Non-disclosure of funding sources

No cross-sectional studies of health researchers and four cross-sectional studies of biomedical research articles (11, 22, 23, 29) reported on non-disclosure of funding sources (Figure 2-8). The reported prevalence of articles without a disclosure of funding sources ranged from 28% to 58% (low, moderate and high risk of bias).
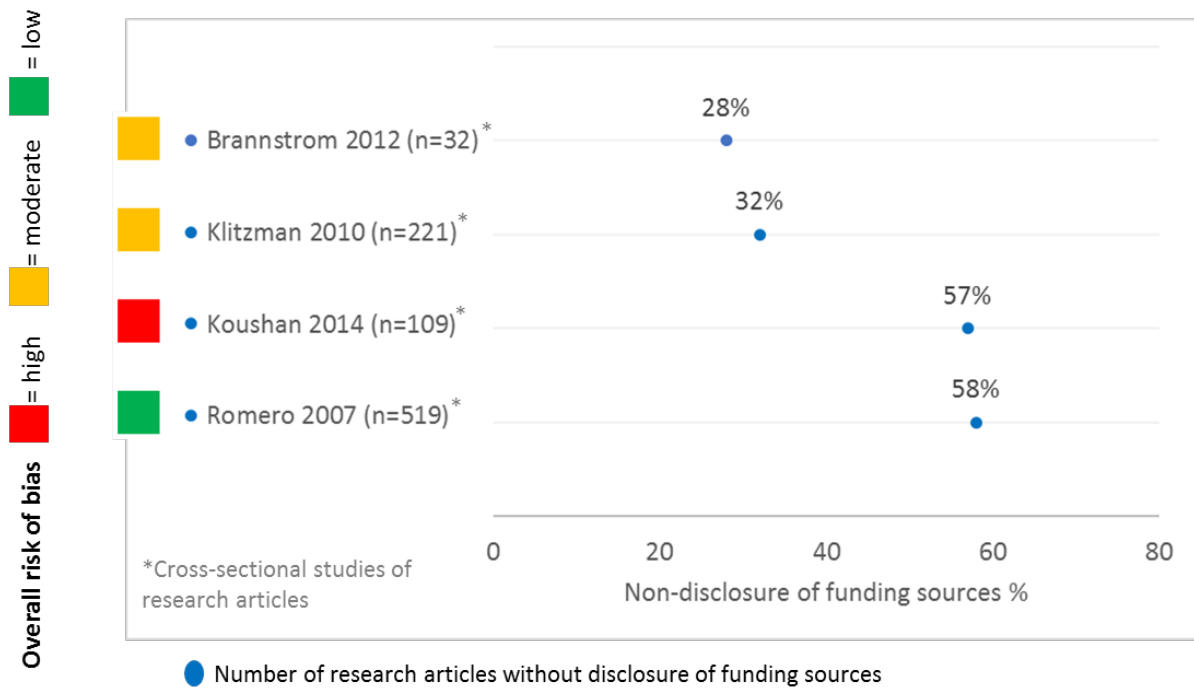
Figure 2-8 Prevalence of non-disclosure of funding sources

2.4.3.1.6. Redundant publication

Three cross-sectional studies of health researchers (8, 14, 33) and three cross-sectional studies of biomedical research articles (23, 28, 35) reported on the prevalence of redundant publication (Figure 2-9).

For cross-sectional studies of health researchers, one study (moderate risk of bias) reported that 5% of participants admitted to redundant publication; while another reported that 8% of participants admitted to having submitted similar manuscripts to more than one journal (high risk of bias). For participants knowing about others engaging in this practice, one study (high risk of bias) reported a prevalence of 21% for duplicate submissions and 33% for salami publication.

For cross-sectional studies of biomedical research articles, the prevalence of duplicate publication was similar across three studies (low, moderate and high risk of bias) and ranged from 6% to 19%.
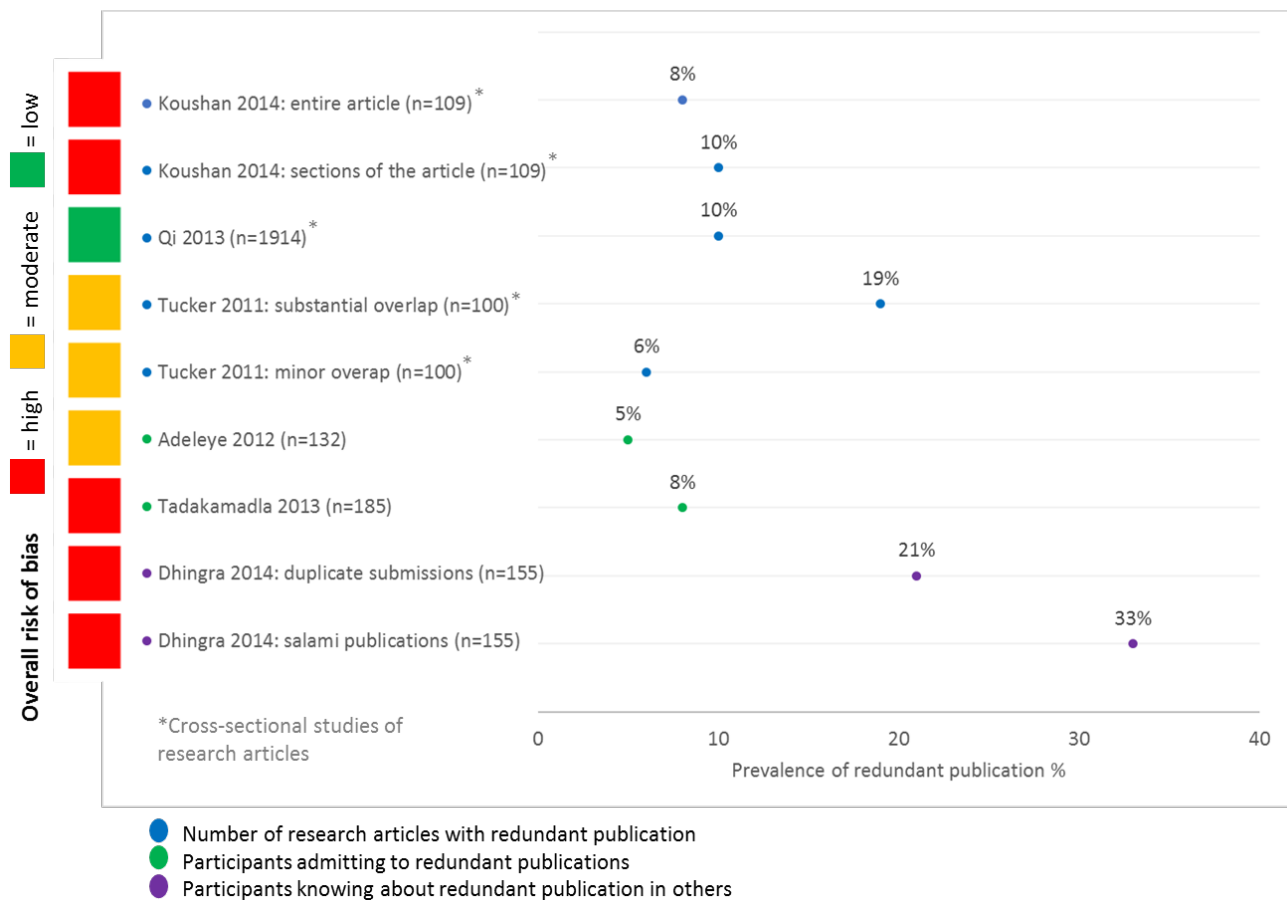
Figure 2-9 Prevalence of redundant publication

2.4.3.1.7. Data fabrication or falsification

Three cross-sectional studies of health researchers (8, 14, 25, 26) and no cross-sectional studies of biomedical research articles reported on the prevalence of data fabrication or falsification (Figure 2-10).

For participants admitting to data fabrication or falsification, one study (moderate risk of bias) reported a prevalence of 14% for data fabrication and 10% for data falsification, while another study (moderate risk of bias) reported a prevalence of 27% for data falsification. For participants knowing about others that have engaged in these practices, one study (high risk of bias) reported a prevalence of 57% for data fabrication or falsification, while another (moderate risk of bias) reported a prevalence of 91% for data falsification.
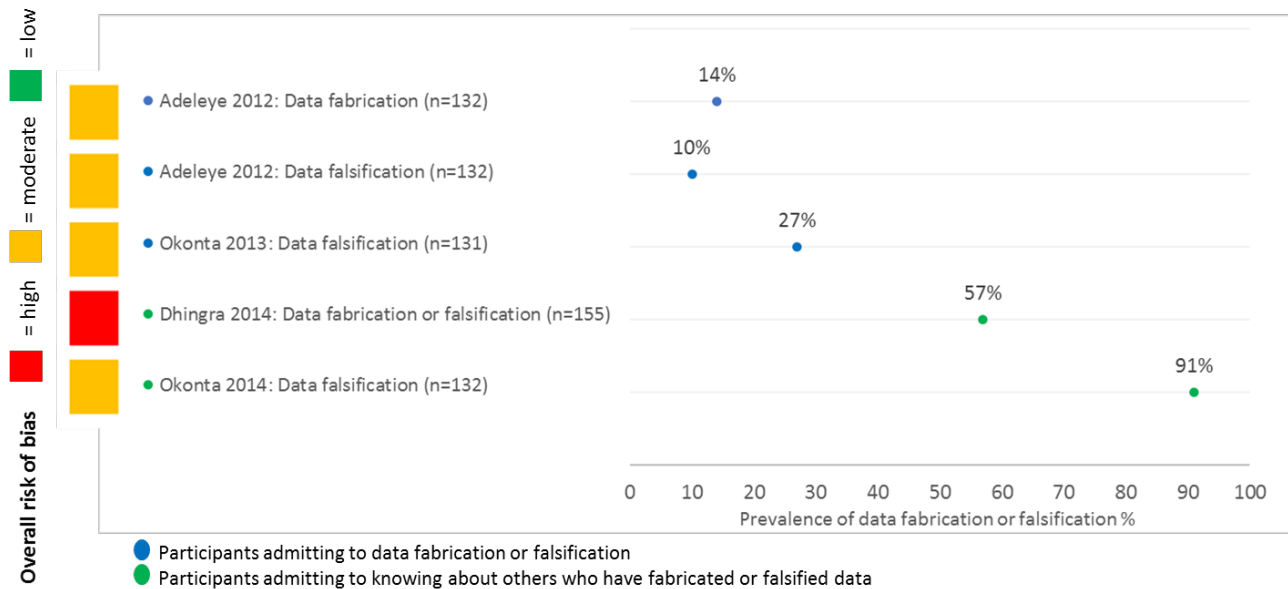
Figure 2-10 Prevalence of data fabrication or falsification

2.4.3.2. Secondary outcomes

Detailed results of secondary outcomes are presented in Appendix 2.8, while a summary is presented in the text below.

2.4.3.2.1. Knowledge of good practices

Seven studies (12, 13, 18, 21, 27, 31, 32) reported on knowledge of good practices. For authorship, one study (21) found that 65% (95%CI 54 to 76) of faculty members of an institution in the Middle East were aware of the ICMJE criteria. In three studies (13, 18, 21), half of the participants agreed that all three ICMJE criteria should be met for someone to qualify as an author.

For plagiarism, three studies reported different outcomes (27, 31, 32). One study (32) found that 83% of dental professionals from South Asia knew what plagiarism was; 62% thought it was using words of others as if they were their own, 21% thought it was using results of others as if they were their own, 8% thought it was sharing work with others and pooling ideas, while 9% thought it was getting ideas from a textbook. Poorolajal et al. (2012) reported a mean plagiarism knowledge score of 5.94 (SD 1.66) amongst researchers from the Middle East, where the maximum score was 9. Shirazi et al. (2010) found that 22% of faculty members from an institution in the Middle East understood the need for referencing, 54% understood the need to paraphrase work of others, 16% knew how to incorporate quotations in a text and 88% knew what was meant by self-plagiarism.

For conflicts of interest, one study (12) found that 18% of authors of medical journals from South Asia had heard of the term conflict of interest, while 11% knew what it meant.

2.4.3.2.2. Attitude towards research misconduct

Four studies reported on the attitude towards plagiarism using the ATP questionnaire. Two studies (16, 17) conducted in the Middle East, reported the results as mean number of correct answers and it is not clear how this links to attitude towards plagiarism. Rathore et al. (2015) reported an overall score, instead of scores per factor. They found that 52% of medical faculty members in South Asia had a high score (score of >48). Jain et al. (2015) found moderate attitude for the first factor (positive attitude towards plagiarism), with a median score of 34 for dental and 32 for medical postgraduate students in South Asia; moderate attitude for the second factor (negative attitude towards plagiarism) with a median score of 21.5 for dental and 19 for medical postgraduate students; and moderate attitude for factor 3 (subjective norms) with a median score of 29 for dental and 27.5 for medical postgraduate students.

Another study that assessed attitude towards plagiarism (27) amongst researchers in the Middle East, found a mean attitude score of 24.12 (SD 2.99), from a maximum attainable score of 27. However, it is not clear whether a high score represents a positive or negative attitude towards plagiarism.

2.4.3.2.3. Perceptions on research misconduct and factors influencing research misconduct

Two studies reported on perceptions related to authorship practices (18, 33). Gultekin et al. (2010) reported that 93% of psychiatrists from the Middle East thought that guest authorship was widespread and that it was linked to academic expectations. Tadakamadla (2013) reported that 40% of dentists from South Asia thought that supervision of a study alone merited authorship.

Kurdi et al. (2015) reported perceived reasons for plagiarism (38) amongst medical faculty in South Asia and found that 32% of participants believed it to be linked to regulations that stipulate compulsory publications, while 31% thought it was due to poor writing skills.

One study (33) reported that 86% of dentists from South Asia thought it should be mandatory to disclose conflicts of interest.

Okonta and Rossouw (2013 and 2014) reported perceptions of researchers from sub-Saharan Africa on research in general (25, 26) and found that 89% of participants (95%CI 82 to 93) were

concerned about the amount of misconduct and 97% thought that all professional education programmes should include information on research ethics. Regarding behavioural influences on research misconduct, they found that 50% of participants thought that pressure for external funding was a strong influence, 59% thought that need for recognition was a strong influence, while 53% thought that insufficient censure for misconduct was a strong influence. When asking participants to rate factors affecting research misconduct related to work environment, 81% of participants said the severity of penalties for misconduct were low or very low and 76% rated the chances of getting caught when engaging in misconduct as low or very low. In addition, 61% rated the effectiveness of their institution's rules and procedures for reducing misconduct as low or very low.

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2.6.   Differences between protocol and review

When we planned the review, we did not anticipate many studies reporting on the prevalence of research misconduct. We therefore aimed to include studies with quantitative data, qualitative data as well as case studies. During the screening process, we flagged any original study that related to research integrity. However, since we included 32 studies that reported quantitative data, we did not include one qualitative study, one study evaluating a course on research integrity and one case study in the review. These are listed in the Table of excluded studies (Appendix 2.5). We did not anticipate cross-sectional studies of research articles and did not address risk of bias of these studies in the protocol.

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Chapter 3

LMIC researchers' perceptions on reporting practices
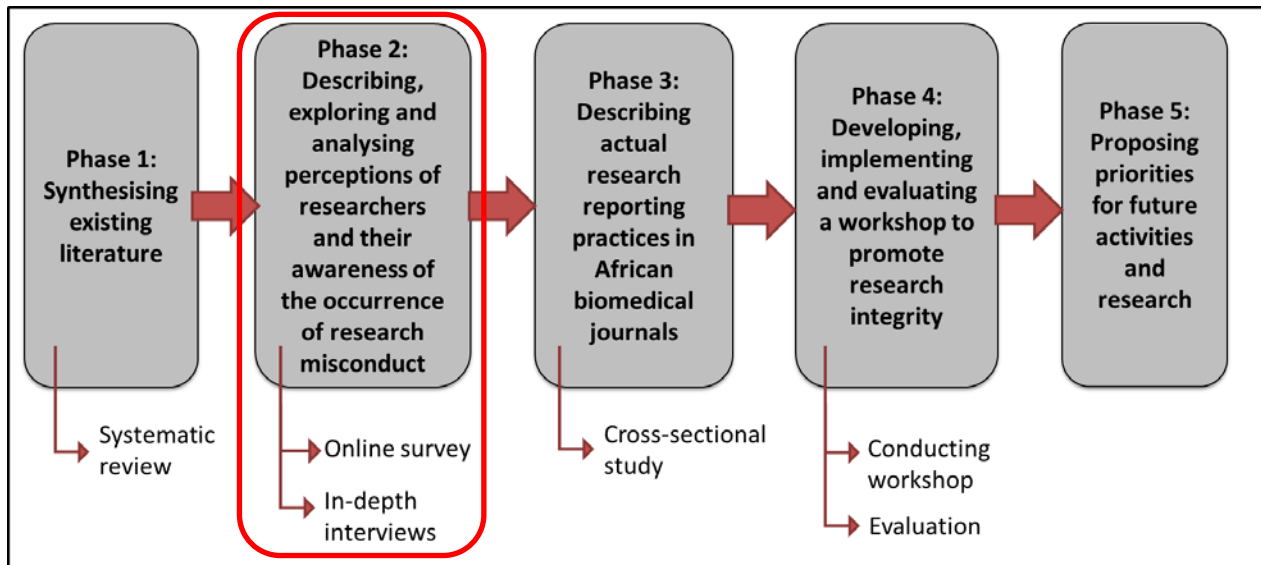
Summary

The second phase of the PhD explored LMIC researchers' views about authorship, redundant publication, plagiarism and conflicts of interest and their awareness of the occurrence of poor practices.

We conducted an online survey and follow-up interviews with Cochrane authors working in LMICs. We developed and piloted a questionnaire containing scenarios related to authorship, redundant publication, plagiarism and conflicts of interests. We asked participants whether the described practices were acceptable or not, whether they themselves or someone they knew had ever engaged in these practices, and how often these occurred at their institutions. We also interviewed willing respondents. We analysed quantitative data with SPSS and qualitative data using the framework method. The survey response rate was 34% (199/583). Respondents mostly believed that poor practices were unacceptable, however, they indicated that these occurred at their institutions. Guest authorship was the most common practice and 24% admitting to having done this in the past, while 77% stated it occurred in their institution. Respondents knew that plagiarism occurred occasionally (12%) or rarely (24%). Themes identified from interviews were: 1)

authorship rules are simple in theory, but not consistently applied; 2) academic status and power underpin behaviours; 3) institutions and culture fuel bad practices; and 4) researchers are uncertain about what conflicts of interest means, and how this may influence research.

Appendices

Appendix 3.1: List of low- and middle-income countries according to the World Bank and number of contact authors of published Cochrane reviews per country

Appendix 3.2: Questionnaire for online survey

Appendix 3.3: Interview guide

Appendix 3.4: Final list and categories of codes

Appendix 3.5: Detailed survey responses

Appendix 3.6: Comparison of quantitative survey results between regions

Appendix 3.7: Selected comments from free-text survey responses

Linked publications and presentations

Publications

Rohwer A, Young T, Wager E, Garner P. Authorship, plagiarism and conflict of interest: views and practices from low and middle income country health researchers. *BMJ Open 2017;7:e018467. doi:10.1136/bmjopen-2017-018467*

Presentations

Rohwer A, Young T, Wager E, Garner P. Integrity in reporting research: Perspectives from LMIC health researchers. 5th World Conference on Research Integrity 2017, Amsterdam, The Netherlands, 28-31 May 2017 (poster presentation)

Rohwer A, Young T, Wager E, Garner P**.** Integrity in reporting research: What do Cochrane authors from LMICs think? 24th Cochrane Colloquium, Seoul, Korea, 23-27 October 2016 (short oral presentation)

3.1.   Introduction and rationale

During phase 1 of the PhD (Chapter 2), we conducted a systematic review examining the occurrence of research misconduct among health researchers from LMICs, and the factors influencing good and poor practices. To our knowledge, this is the first comprehensive synthesis of available empirical studies on research integrity from LMICs. Of the 32 studies we included, 22 were cross-sectional studies of health researchers. In these surveys prevalence of research misconduct was measured differently, with some studies reporting the number of participants admitting to having engaged in research misconduct themselves, and some reporting the number of participants that knew about others having done so. We found high rates of self-reported guest authorship (range from 24% to 66%), plagiarism (5% to 73%), as well as data fabrication and falsification (range from 10% to 27%). Overall, these rates of self-reported misconduct were much higher than those reported in systematic reviews that included mainly studies from high-income countries. Results show that 1.97% (95%CI 0.89 to 4.45) of survey participants admitted to having fabricated or falsified data (1), 1.7% (95%CI 1.2 to 2.4) admitted to having plagiarised (2) and 29% (95% CI 24% to 35%) reported knowing of authorship problems (3).

The high rates of research misconduct found in Chapter 2 are concerning. However, all included surveys were judged to have moderate to high risk of bias, indicating that our confidence in the effect estimate is likely to change with future research (4). In addition to several study limitations, included studies were poorly reported and few studies addressed factors influencing practices.

In LMICs research outputs are increasing (both locally and with international collaborations), national policies on research integrity are lacking (5) and the pressure to perform and live up to global standards is rising. In this context, adequate systems, processes and guidelines are needed to ensure ethical behaviour, address poor research reporting practices and promote research integrity (6, 7). There is a need to better understand how researchers from LMICs perceive research misconduct, how they experience it in their research environments and which factors influence practices. This will provide a baseline that can inform further research and activities to promote research integrity.

3.2.   Objectives

To describe, explore and analyse for research reporting practices related to authorship, plagiarism, redundant publication and conflicts of interest:

- The perceptions of LMIC health researchers of acceptable and unacceptable practices

- The awareness of LMIC health researchers of occurrence of research misconduct in their institutions

3.3.   Methods

3.3.1. Study design and population

We conducted a mixed method study, comprising an online survey and follow-up, in-depth interviews. Our target population was contact authors of Cochrane systematic reviews, living in LMICs (countries defined by the World Bank (8). We purposively sampled all 607 LMIC contact authors of active Cochrane reviews (i.e. reviews that are currently published in *The Cochrane Library*), published in the May 2015 issue of *The Cochrane Library* (Appendix 3.1) and invited them via email to participate in the online survey. We conducted semi-structured interviews with selected survey participants who indicated that they would be willing to engage in follow-up conversations. We contacted participants via email and invited them to participate in telephonic/Skype interviews.

For the qualitative part of the study, we recognised that the researcher's values and morals play a part in interpreting phenomena and how knowledge is created (9, 10). The research team have diverse experience and skills, including nursing and clinical epidemiology (AR), infectious diseases (PG), publication ethics (EW) and public health (TY). They are all authors on Cochrane reviews, have editorial and training roles within Cochrane and publication ethics; two team members are based at a LMIC institution, and all members have extensive experience in working in LMIC settings. AR has formal training in qualitative interview and data analysis methods and has some experience in doing qualitative research.

3.3.2. Data collection

We developed a questionnaire comprising three sections (Appendix 3.2). The first section focused on demographic details of the respondents. In the second section, the main part of the survey, we

made use of scenarios to elicit responses on participants' understanding and occurrence of acceptable and unacceptable reporting practices. The third section contained questions related to reporting guidelines and required participants to indicate whether they were willing to participate in follow-up interviews. If participants agreed, they were asked to follow a link to a second, separate survey and provide contact details.

Developing the scenarios was an iterative process that comprised numerous discussions within the author team and two rounds of piloting. Drawing on existing cases described in the COPE database of cases, cases used in published literature and our own experiences, we created hypothetical scenarios related to guest authorship, ghost authorship, plagiarism, redundant publication and declaration of conflicts of interest. We chose these practices because we aimed to describe behaviour that is proscribed in many international guidelines, and is considered to be "less serious" than data fabrication or falsification, but more common. We also aimed to create scenarios that did not portray obvious fraud but rather described situations where lines between what is accepted and what not, would be blurred. The initial set of scenarios and accompanying questions were piloted amongst a group of five researchers not eligible for our study, but with similar characteristics as our target population and background knowledge of systematic reviews. We asked participants to complete the questionnaire and subsequently discussed each scenario as well as the accompanying questions with the group. We implemented revisions based on the feedback received and set up the survey on the online platform using Google forms. For the second round of piloting, we invited a different group of researchers to complete the online survey and discussed issues related to clarity of content as well as usability of the electronic questionnaire. The nine final case scenarios are shown in

Table 3-1. Eight scenarios portrayed situations related to irresponsible research practices, while one scenario referred to internationally recognised acknowledgement practices. After each scenario, participants were invited to answer three questions, relating to their perception of a specific practice, their respective behaviour and the occurrence thereof in their institution (Table 3-2). Questions followed a similar pattern for all scenarios. In addition, there was an opportunity to add free-text comments or clarifications after each case.

Table 3-1 Hypothetical scenarios included in the survey

Research reporting practice	Scenario
Guest authorship	A junior researcher, J, adds the head of department, D, as the last author on a research paper. D provided suggestions for direction of J's work that helped her obtain the grant, although he hasn't contributed to the actual research or the publication.
	A professor, M, who did not contribute to study design, data collection or data analysis but is an expert in the field, reviews the draft manuscript and suggests some minor changes to the English. He asks to be listed as an author on the paper.
Ghost authorship	A researcher, S, contributes to the design and does most of the data collection in a study but goes on maternity leave as it is being analysed. When she returns to her post she discovers that the research has been published by her supervisor without her name or any acknowledgement of her contributions.
Acknowledgement practices	A Master's student consults with the resident biostatistician, P, to help with data analysis on her research project. In the manuscript that she submits for publication, she lists P in the "Acknowledgement" section.
Text-recycling/redundant publication	A PhD student "copies and pastes" nearly all of the introduction from a paper that she has previously published into her next manuscript, since she is doing a series of experiments on the same topic.
Plagiarism	A researcher in Mozambique wants to submit his manuscript to a journal published in English. He finds a text book in Portuguese that explains an aspect of the background to the disease very well. He translates one paragraph into English, and puts this into his introduction without reference to the book.
	A researcher from India attends an international conference where a European research study with a novel design is presented. He submits a protocol for an identical study to the ethics committee at his home institution. He does not reference the European study.
Conflict of interests	A researcher, T, is working on a diagnostic test study. The company manufacturing the test has supplied the kits for free but did not design or fund the research. T was paid for a consultancy for the same company two years ago. In the publication of the study, he declares that he has no conflicts of interest.
	A researcher, K, writes a review for treatment guidelines of herbal remedies for children's cough. K's wife is employed by the company that manufactures one of these remedies. In the review, K declares that he has no conflicts of interest.

Table 3-2 Example of a scenario and accompanying questions

A junior researcher, J, adds the head of department, D, as the last author on a research paper. D provided suggestions for direction of J's work that helped her obtain the grant, although he hasn't contributed to the actual research or the publication.	**My view on this is:**	This is acceptable because D should be an author
		This is not best practice, but it does not really matter, as it doesn't affect the science
		This is unacceptable because D has not contributed to this paper
	Have you ever done something like this?	Yes
		No, and I am <u>not</u> aware of anybody else doing it
		No, but I <u>am</u> aware of other people doing it
	In my current department or unit, this pattern of authorship:	
	Is usual practice and happens most of the time	Happens occasionally / Happens rarely
	Never happens	Other: (please specify)
	Comments or clarifications:	

We set up the survey on Google forms and invited participants to complete the survey via email, explaining the purpose of the study and providing a link to the survey. In the email we also stated that participation in the study was completely voluntary, that the survey would take approximately 15-20 minutes, anonymity would be ensured and submission of a response was seen as informed consent. We sent two reminders, at two and four weeks after the original invitation.

We developed an interview guide (Appendix 3.3), aligned with our objectives and informed by the survey results, to guide semi-structured interviews. This ensured that we covered the same topics with each participant and allowed us to explore certain ideas in greater depth. Participants also had the opportunity to address topics that were of particular importance to them. Interviews took place between October and December 2015 and were scheduled according to the availability of the participants. One researcher (AR) conducted all the interviews. Interviews lasted 45-60 minutes and were conducted in person or via Skype/telephone. All interviews were recorded with a digital voice recorder and additional notes were taken during the interviews to provide a comprehensive data set.

3.3.2.1. Data analysis

Quantitative data was imported into Excel spread sheets for analysis with SPSS. We dichotomised categories for perception and occurrence of research misconduct. Perception was reported as "acceptable or does not really matter" or "unacceptable", while occurrence at institutions was reported as "it happens" or "it does not happen". We analysed data using descriptive statistics for each scenario, and reported results as proportions. We compared results between regions with the Chi-squared test and regarded a p-value of 0.05 or less as statistically significant. For significant results, we used logistic regression to determine between which regions the differences were present by using Sub-Saharan Africa as the reference region.

We analysed qualitative data using the framework method for analysing qualitative data (11). This method fits into the broader family of thematic analysis and comprises seven stages: Transcription, familiarisation with the interview, coding, developing a working analytical framework, applying the framework, charting the data into the framework matrix and interpreting the data. We outsourced the transcriptions of audio recordings. Interviewees' names did not appear in the transcripts. One researcher (AR) checked all the transcriptions by reading through them while listening to the audio recordings. This also facilitated familiarisation with the data. Three researchers (AR, TY, EW) independently coded one of the transcripts, using an inductive method of coding which allows the data to speak for itself. We compared and discussed our individual codes and developed a set of preliminary codes that could be applied to the other transcripts. We did not consider the set of codes to be exhaustive and continually added new codes until all transcripts were coded. One researcher (AR) coded all the subsequent transcripts using Atlas.ti software, version 7 (12). We categorised the codes (Appendix 3.4) and extracted illustrative quotations. Emerging themes were identified through discussions with the whole research team. This was an iterative process

3.3.2.2. Ethics

We contacted the Cochrane Central Executive Team to obtain their permission, as well as email addresses of the eligible authors. We also obtained ethics approval from the Stellenbosch University Health Research Ethics Committee (N14/12/158). Participation in the survey was voluntary and submitting a response was seen as informed consent. Respondents who were willing to be interviewed, signed an electronic consent form before the interview. This included consent to participate in the study, for interviews to be recorded and for results to be

disseminated in the scientific community. Anonymity for both survey and interview responses was ensured.

3.4.   Results

We sent 607 emails inviting LMIC contact authors of Cochrane reviews to participate in the survey. Of these, 24 emails could not be delivered. We received a total of 199 responses, yielding a response rate of 34% (199/583). One participant only completed the first section of the questionnaire and we therefore included 198 responses in the analysis. Most respondents were based in Latin America (26%), followed by Sub-Saharan Africa (24%), South and South-East Asia (22%) and East Asia (19%). We grouped the remaining countries together (other: 9%), as they were scattered across North Africa, the Middle East, Europe and North America. Characteristics of survey respondents varied in terms of age, years at current workplace, time spent on research, number of peer-reviewed articles and number of Cochrane reviews. Most respondents had obtained a PhD and worked at a University (Table 3-3).

We interviewed 15 researchers from Africa, Latin-America and Asia. Of these, seven were junior researchers who had not yet obtained, were in the process of obtaining, or had recently completed a PhD, and eight senior researchers who have supervised PhD students. Interviewees were generally passionate about research integrity and engaged in lively conversation about their views and experiences with poor research reporting practices.

Table 3-3 Characteristics of survey respondents

	Median (IQR)
Age	44 (38 to 52)
Years at current workplace	10 (4.75 to 19.5)
% Time spent on research	40 (20 to 60)
Year of first publication	2003 (1997 to 2008)
Number of peer-reviewed articles	20 (7 to 41)
Number of Cochrane reviews	3 (1 to 5)
	n (%)
Gender	
Female	95 (48)
Male	104 (52)
Highest qualification	
Bachelor's degree	14 (7)
Master's degree	82 (41)
PhD	103 (52)

Place of work[1]	
University	141 (66)
Other research institution	40 (19)
Hospital	24 (11)
Other	10 (5)
Regions	
Latin America	52 (26)
Sub-Saharan Africa	48 (24)
South and South-East Asia	44 (22)
East Asia	37 (19)
Other	18 (9)

3.4.1. Survey responses

We have reported a summary of the responses to the survey below (Table 3-4). For the detailed survey responses, please see Appendix 3.5.

Adding a head of department who had not contributed sufficiently to the research paper was generally seen as being acceptable by 35% of respondents. Twenty-four per cent of respondents admitted that they had done this themselves, while 57% said they had not done it themselves, but were aware of other people doing it. Most researchers (77%) were aware of this practice occurring at their institution, 13% said that it occurred most of the time, and 39% said it occurred rarely.

Similar responses were seen when an expert in the field was added to the author list even though the input was limited to language editing. While 68% of respondents thought that this practice was unacceptable, 21% admitted to having done this in the past. Seventy-one per cent of respondents indicated that this practice happened at their institution, 13% said it happened most of the time, 33% said it happened occasionally and 25% said it happened rarely.

Most respondents (67%) agreed that it was acceptable to acknowledge the biostatistician for assistance with data analysis, whereas the rest thought that it was unacceptable and that the biostatistician deserved to be added to the author list. Half of the respondents (52%) indicated that they had done this before and it seemed to be common practice at institutions – 85% said that it happened. This scenario portrayed behaviour that is recommended by guidelines, as opposed to the other scenarios, and we expected respondents to find this practice acceptable.

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[1] Multiple responses – total responses n=215

All but three respondents (99%) thought that it was unacceptable to omit an author that had contributed substantially to the research from the publication. Only 2% indicated that they had done this before, but 42% said even though they had not done this, they knew of others who had. A similar number of participants indicated that this happened at their institution (41%). However, most of these said it occurred rarely (26%).

Table 3-4 LMIC researchers' perceptions and awareness of occurrence of research reporting practices

Health research reporting practice Total n=198	Perception: Acceptable or does not really matter	Behaviour: Have done this themselves	Occurrence at institution: This happens
	n (%)	n (%)	n (%)
Authorship			
Adding the head of department who has not contributed sufficiently[1]	69 (35)	48 (24)	153 (77)
Adding an expert in the field who has not contributed sufficiently to the research	64 (32)	42 (22)	140 (71)
Acknowledging a biostatistician for assistance with data analysis	132 (67)	103 (52)	166 (84)
Omitting an author who has contributed substantially to the research	3 (2)	4 (2)	81 (41)
Redundant publication			
Text-recycling (using one's own work from a previous publication in another)	57 (29)	22 (11)	118 (60)
Plagiarism			
Translating a text without acknowledging the original source	9 (5)	4 (2)	74 (37)
Copying an idea without acknowledgement of the original source	20 (10)	5 (3)	85 (43)
Conflicts of interest			
Not declaring previous financial reimbursement from a company involved in a research project	25 (13)	5 (3)	80 (40)
Not declaring your spouse's link to a company involved in a research project	47 (24)	3 (2)	56 (28)

While 71% of respondents thought that it was unacceptable to recycle one's own texts, 11% said that they had had done this in the past and 60% indicated that this happened at their institution occasionally (25%) or rarely (26%).

Translating a text without acknowledging the original source was perceived as unacceptable by 96% of participants. Only 2% admitted to having done this in the past, but 37% indicated that this happened at their institution, mostly rarely.

Plagiarism in the form of copying an idea without acknowledging the original source was seen as unacceptable by 90% of respondents. Three per cent of respondents admitted to having done this before, but 43% indicated that this happened at their institution, mostly rarely (30%).

Not declaring previous financial reimbursement from a company involved in a research project was seen as unacceptable by 87% of respondents. Only 3% said they had not declared similar interests in the past, but 40% said that this happened at their institution, mostly rarely (24%).

Not declaring a spouse's link to a company involved in a research project was seen as unacceptable by 76% of respondents. Two per cent said that they had not declared similar interests in the past, but 28% indicated that this happened at their institution, mostly rarely (21%).

When asked about research integrity policies, 47% of respondents said that they were aware of written institutional policies, while the rest was not.

Obvious differences between countries were explored (Appendix 3.6). The most striking difference was seen for perception and occurrence of guest authorship at institutions, where results for East Asia were outliers. More than half of the respondents from East Asia (67%) thought that adding a head of department who had not contributed significantly to the paper was acceptable, whereas most respondents from other regions (between 61 and 87%) thought that this practice was unacceptable. While most respondents across regions indicated that this occurred at their institutions (67 to 83%), all respondents from East Asia (100%) indicated that this happened at their institutions.

Survey respondents commented extensively on the scenarios. Issues they alluded to were elaborated on by interviewees and taken into consideration when analysing qualitative data. A selection of comments can be found in Appendix 3.7.

3.4.2. Interviews

Findings from the interviews mirrored those of the survey and highlighted the occurrence of poor practices amongst health researchers from institutions in LMICs. Interviewees mostly addressed problems around authorship practices, which appear to be common across regions. These included adding authors who had not contributed substantially to the research, omitting authors who had contributed substantially or conflicts about the order of authors. Interviewees were also aware of cases of plagiarism, especially amongst students and junior researchers, whose first language was not English, duplicate publication in different languages, not publishing negative results and inaccurate reporting of research to the public. Some interviewees also knew about researchers who had fabricated data, manipulated data or engaged in data dredging. They were worried that misconduct was probably more prevalent than was officially acknowledged.

Four themes emerged from the qualitative analysis: 1) Authorship rules are simple in theory, but not consistently applied; 2) Academic status and power underpin behaviours; 3) Institutions and culture fuel bad practices; 4) Researchers are uncertain about what conflicts of interest means, and how this may influence research. Each theme, supported by a selection of quotes, is explained below.

3.4.2.1. *Authorship rules are simple in theory, but not consistently applied (Table 3-5)*

Interviewees generally assigned authorship based on the contributions of researchers and identified various criteria that had to be met to warrant authorship. These referred to the entire research process, from conceptualisation of the idea, to data collection, data analysis, writing the manuscript and taking responsibility for the research. Most interviewees knew about the international guidelines on authorship proposed by the International Committee of Medical Journal Editors (ICMJE) or Cochrane. Some used these in an explicit way, while others implied that their thinking on authorship was based on these guidelines. However, none of them were aware of formal institutional guidelines on authorship. While some of the interviewees applied the criteria very diligently, others thought that it was not always as straight forward as there was often *"blurring of lines"* when it came to defining contribution and input of authors. For example, intellectual input of senior authors was seen as equally important and acknowledging the support of a mentor by means of authorship was also accepted.

Throughout the interviews, it became clear that assignment of authorship was not always easy. At times, it was difficult to quantify the contributions of authors, leading to conflict within the author team – doing *"the right thing"* was challenging, especially where *"strong emotions"* were involved. In tricky situations like these, international guidelines did not help to resolve the issues. Others were clearly frustrated with the whole process, as *"it should be simple"* – authorship should only be awarded when one has contributed to the research.

Interviewees highlighted that other researchers within their institutions did not always make authorship decisions based on contributions of authors and knew of a lot of problems related to authorship. Adding authors who did not contribute substantially, or *"add my name"* as it is commonly called in one region, is a well-known and popular practice that is encountered across regions. Interviewees spoke extensively about guest authorship and told many stories where they had seen this happening. While they did not endorse this practice, it seemed as though a lot of other researchers did not think it was significant, and some were not even aware of it being problematic.

Reasons for adding authors, who had not contributed substantially, varied. These included random reasons such as a *"favour"* and loyalty towards colleagues, family and friends; as a means of payment of research assistants; to make a publication look better; out of respect for a senior researcher and as a reward for paying the publication fees. In contrast to this haphazard way of assigning authorship, other researchers had to follow *"unwritten rules"* within their department and were obliged to add their head of department, boss or supervisor to any publication, regardless whether they had contributed or not. Junior researchers in particular, expressed a lot of frustration towards this practice and found it very unfair.

Timing of adding authors to a manuscript was also seen as problematic. Interviewees spoke about senior researchers being added at the *"last minute"*, and professors deciding to take over first authorship of a paper once they realised that it would be a *"key publication"*. Interviewees felt that decisions about authorship should be made at the start of a research project, with clear terms of reference, to avoid conflict at a later stage.

Table 3-5 Supporting quotes for theme 1

Theme 1: Authorship rules are simple in theory, but not consistently applied
"If you can't present this project at a conference or in front of an audience then you can't be a co-author because you don't know what happened there or how was the data collected..." (JNR_1)
"It varies from group to group. In my group at the outset of the project it's decided what's would merit, what would constitute enough contribution to merit authorship so in my own group, not everyone who collect data automatically becomes an author. You have to have done more than that." (JNR_3)
"That's also input because it's intellectual input. Some people don't think it's input. They think that you have to actually do the work. That kind of work, extracting the data, screening, but I think it you are a senior person you don't actually have time for that… So giving the idea is also enough to be an author and then guiding the process, giving intellectual input." (JNR_7)
"Sometimes you feel what if the person is your mentor…I don't really see anything wrong even though you know that right now basically if somebody does not contribute you are not supposed to put the person's name… but you know there is this thing about somebody… that is above you and that you look up to and sometimes they will have told you that they are interested in that paper. So if you don't put their name there will be friction. It is going to be a serious issue. It happens." (JNR _6)
"Yes at the end you say, well how specific could be the rules to define an author, because every research has their own situations. For example, in a Cochrane review, significant contribution in an extraction of data, significant contribution in read the articles but for example, in a primary research on a whole, significant contribution would involve the collection of data for patients in the hospital, it is difficult. It is a very tough issue I think." (SNR_6)
"You are a very eminent professor in your discipline... but this does not automatically qualify you into authorship. You have to work. You have to do something. You have to learn. If you don't know how to do it, you have to learn how to do it, and then do it...And I believe they are, the best, good surgeons for example... this is totally different from being a scientist." (SNR_8)
"If I leave him out, it's a problem to me, but if I involve him, I do not really feel that the author deserves to be an author." (SNR_6)
"Because you know, it should be simple. I shouldn't have to worry about authorship. It should be: I contributed, great. I didn't contribute, no." (JNR_2)
"I mean I generally use the medical editors' guidelines, the requirements for authorship, but it is clearly not being followed by most people." (SNR_5)
"We have a lot of issues on what we call 'add my name'. It's very popular." (SNR_2)
"Recently I had my name put on a paper that was I was unaware of, until it was submitted, and I actually ask that it be retracted. They thought that they were doing me a favour, that that's what they are supposed to be doing." (SNR_5)

> *"So he did it out of good intent that he is helping a colleague, and what goes around, comes around. One day, I will be in need for this and he will help me, the idea of sharing and caring."* (SNR_8)

> *"I think it is not fair. If you don't work and you want to be an author. It's not fair… I think that the author should be the person involved in the work, the person who thought about the work, elaborated on the work, the person who works with the main author. And the people who really wrote the work… And not the chief of a discipline for example. He is an author just because he is the chief and I think it is unfair".* (JNR_5)

3.4.2.2.   Academic status and power underpin behaviours (Table 3-6)

Interviewees used expressive language to illustrate the *"power play"* between senior and junior researchers. Junior researchers, the *"work horses",* had to *"abide"* by the *"mandatory rules"* of their bosses in order to avoid conflict or a "*change in attitude*" towards them. They found it *"very difficult to fight senior professors"* who were described as being *"arrogant"* and *"corrupt".* This was highlighted through various examples and personal stories. In many settings, junior researchers were being forced to add head of departments, bosses, or supervisors to their publications even when they did not contribute. It also seemed rather common for professors or supervisors to take over the position of first author on a publication, which was based on a student's dissertation or junior researchers' work. Others talked about examples where professors published students' research without including them as authors and sometimes even without students knowing that their work had been published. Linked to this were examples where senior researchers had plagiarised ideas of junior researchers and published them as their own.

The desire for academic status was described as a big driver of the problems. Publications could be seen as the currency of academia, the *"bread and butter"* of researchers – more publications lead to promotions and more power. Interviewees felt that researchers often did not care about the research itself, but rather about the number of publications that had their name on it and the power that came with it. The problem with power was that *"once you got some you want more"* and academics were willing to do almost anything to be *"recognised in the scientific community",* *"associated with high-impact publications"* and ascend the institutional hierarchy. This behaviour was portrayed as not being *"in the best interest of the research…but certainly in the best interests of the researcher".*

Interviewees explained that junior researchers found it difficult to deal with the power dynamics between them and the "*big professors"*. However, they often had no choice but to tolerate this

manipulative behaviour in order to complete their degrees and advance their careers. Some interviewees who had experienced this themselves, spoke vehemently about how upset they were - telling the stories evoked strong emotions: anger, betrayal, frustration and hurt.

Junior researchers also found it difficult to stand up against senior researchers when they were aware of poor practices. Their place on the hierarchy determined whether their voice was heard or not, and they were often *"brushed off"*. Interviewees were concerned that researchers, especially those that are *"not in a position of power"* were unable to raise concerns or make anonymous remarks when they suspected misconduct.

Interviewees also told stories about senior researchers being protected and supported by their peers. In some cases, high-level academics did not have to face the consequences of misconduct. In another example, local journal editors, who were also professors at institutions, rejected junior authors' manuscripts (regardless of the quality) and rather accepted those of their peers, often without requiring revisions to the manuscript.

Table 3-6 Supporting quotes for theme 2

Theme 2: Academic status and power underpin behaviours
"The senior author, the professor, took over first authorship and he knew the paper was actually accepted in a high impact publication and it has gotten many citations. But it was not the senior author, the first author who did the work. He just came in on the last minute and said I'm going to be first author." (JNR_7)
"I believe that they are probably upset, but when you have pros and cons, you have to do this trade-off between saying that you are upset and you may be faced with an arrogant professor who said okay let's drop this postgraduate project and you lose your degree, or you just swallow your pride and swallow your right to be an author and say okay just do whatever you want, but I just want my degree." (SNR_8)
"I guess if a review was going to bring into disrepute all the ideas put forward by a big professor he might shy away from going ahead with the review because you don't want to get into any sort of conflict of ideas with the big professor" (JNR_3)
"They have their names on the publication, otherwise there is no publication. Otherwise they do not give us the degree. They are actually part of the jury." (JNR_5)
"I was frustrated. I felt betrayed. I felt cheated out of my efforts and it was more like a failed expectation." (SNR_4)
"I think largely it is a power thing. You know, once you got some you want more...and status. I think that is absolutely huge. I don't know that it is personal money, personal financial interest as much as professional and as I say, brining money for one's programme. So it does not really

matter if we fudge some of these results, but we will get more money and can do a bigger, better study next time." (SNR_5)
"The truth is that tutors want to have their names on the papers. I think the majority of professors and supervisors are not researchers really. They are not worried about the research or the progression of science. They just want to be the professor or the tutor because of the status, because of the economic factor, but they don't like it. That is the big problem here." (JNR_5)
"I have heard of people in other institutions who have lost their jobs because they have reported data fiddling." (SNR_5)

3.4.2.3. *Institutions and culture fuel bad practices (Table 3-7)*

Existing systems within institutions contributed to researchers engaging in poor practices. Interviewees believe that the *"overemphasis"* on publications needed for promotion fuels misconduct such as guest authorship and plagiarism, where it is the quantity rather than the quality of papers that matters. They told about cases where researchers submitted *"photo-shopped"* articles for promotion, or *"set up phony journals"* where they published a reworked version of an existing paper. Another example described clinicians and nurses resorting to unethical publication practices in order to meet the criteria for promotion. They fabricated data and purposively published their papers in local journals, that are known to be untrustworthy. In this setting, it was common knowledge that data from such journals should not be used for decision-making. Yet, these publications counted towards promotion. Furthermore, some interviewees suggested that researchers often published in *"local"* journals to increase the number of publications, as it was *"easier to publish in these journals"* and *"no one would notice"* if you did something wrong.

Interviewees also highlighted the lack of structures to support and promote research integrity, such as research integrity offices, clear policies on research misconduct and channels for whistleblowing. They strongly believed that offenders should be punished appropriately, as this was also a way to deter people from poor practices and raise awareness about these issues.

Institutional guidelines on good research reporting practices were lacking. Most interviewees were not aware of any guidelines, while some knew about a document but did not know how and where to access it. Institutions generally had guidelines on plagiarism as well as access to plagiarism software, but this was mainly directed towards students and not academics.

In addition to flawed systems, interviewees felt that cultures within institutions did not foster integrity. A fundamental concern was the lack of research integrity champions within institutions. Interviewees, especially senior researchers, played a big role in promoting research integrity in their respective institutions. However, they often felt like *"lone voice(s) in the wilderness"* and described awareness about research integrity amongst other researchers as being low. In some institutions, it was difficult to promote research integrity as those *"sitting on the top"* made all the decisions and calls for better guidelines and ethical practices fell on deaf ears. Indeed, leadership was seen as an essential factor in fostering a culture of research integrity. The need to create greater awareness about research integrity was highlighted: *"We have to repeat this message over and over again, so that maybe at the end of the day, one day we reach the critical mass where we can change that."*

Interviewees were worried about negative role-modelling happening at their institutions as certain behaviours and attitudes of senior researchers were alarming. They also thought that professors, once they have reached their status, no longer cared about research and mentoring of students. The lack of role-models and mentors was disconcerting. Interviewees highlighted this as an important factor that influenced poor practices. They themselves had mixed experiences of their own supervisors. The majority were very grateful to have had good supervisors that helped them to know *"what is right and wrong"*. They did acknowledge that not everybody was *"lucky"* in this regard. But some felt that they were not adequately supported by their supervisors and were very disappointed and angry about this.

Table 3-7 Selected quotes for theme 3

Theme 3: Institutions and culture fuel bad practices
"Especially before promotions and appraisal. Some people are desperate to have the requisite number of papers so they are willing to have their name on just any paper." (JNR_3)
"They have to choose a quick way to publish your paper and they also know that nobody will…use their results, especially if they publish it under general journals…" (JNR_4)
"There are lots of journals and there are lots of publications and people only care about the results and the paper is published in the top journals of one's field. For other papers published under general, they don't care about that. If you would like to find some results, find some research to help you to make a decision you will only refer to the top journals in your field and most of the case…English journals." (JNR_4)
"They should also continue to punish those who are found guilty of all of these offences because that's really where others would learn and not do them but if people can get away

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with them, I mean everyone loves to get things done faster so people will continue doing them but as long people keep getting punished and more people get away it won't stop." (JNR_3)
"There is also a lack of punishment. I don't think… in general they are less honest than other people in the world. I think it is easier to be dishonest, because there is no punishment in general. For good practices to be rewarded and there should be the opposite for bad practices." (JNR_5)
"Very clear guidelines for undergraduate students and there some guidelines for postgraduate students, but as far as I am concerned, the guidelines for the academics, the academic staff members, are poor in terms of plagiarism, in terms of research integrity." (SNR_5)
"We have to repeat this message over and over again, so that maybe at the end of the day, one day we reach the critical mass where we can change that." (SNR_8)
"I don't think we have got a guideline on that. I suppose I would have to write it if there was one." (SNR_7)
"People don't know the issue of research integrity. It's not really pushed to the point, the position it should be" (SNR_2)
"Entrenching this sort of quality assurance process here right from the department to the faculty level is key to ensuring that we don't we don't cheat so people don't get involved in misconduct and all that." (SNR_1)
"It is very hierarchical and it is kind of normal to find your place on the hierarchy and to know your place on the hierarchy, and to act in that role according to your place, and it permeates every aspect of life…. So it starts there, and it permeates right through to the department." (SNR_7)
"I suspect that people stay in their rooms and cook up data and especially the ones that are smart." (SNR_2)
"Some students have alluded to it that one of colleagues is always in the habit of 'add my name' one and then the students are the one that he is now using and putting his name. So he may be even was in other areas but if you stay here you are aware people may, that influence may also rub off on other people and how they conduct research." (SNR_2)
"If we want to be so honest we have to say that okay we cannot find anyone and the study is over without any patients. Therefore accurate research is very difficult. An accurate science is very difficult." (SNR_3)
"Not actually training but my tutor will tell me how to publish a good paper. She will tell us how to you know, how to avoid plagiarism. She will tell us how to read other papers and to avoid this thing." (JNR_4)
"It is not quite common here… because it would depend on your professor. I think he is quite far from you. Here he does not take care of your work. They just let you do the work, and put his or her name on the article and it is finished…No you have to do all the work all by yourself. I have worked for 5 years all by myself." (JNR_5)

3.4.2.4. Researchers are uncertain about what conflicts of interest means, and how this may influence research (Table 3-8)

Interviewees mainly spoke about poor authorship practices and plagiarism and rarely brought up issues around conflicts of interest on their own. When we asked them about their views, they described conflicts of interest as any relationship that could influence the research process and the outcomes of that research. Most interviewees had a clear understanding of financial conflicts of interest, but were uncertain of the extent of non-financial conflicts of interest and thought that *"it's not a black and white thing"*, but a continuum.

There were various views on dealing with conflicts of interest. Some believed that they would not be influenced – neither by pharmaceutical companies, nor by personal relationships – but would just report the evidence *"as is"*. Researchers could not refuse to work with pharmaceutical companies per se, as their expertise could help in the advancement of science, as long as they reported the results accurately. A contrasting view was that ties to pharmaceutical companies would always influence researchers on some level, even if this influence was very subtle. Key to both points of view was being transparent and declaring any links to pharmaceutical companies, as not doing so was *"unacceptable and maybe criminal"*. Some interviewees supported the idea that it was better to decline participation in a research project when there was a financial or academic conflict of interest.

There were some doubts about the validity and adequacy of declarations of conflicts of interest. Some thought that declaring conflicts of interest did not mean that the research was *"free of any kind of internal, external manipulation"*, while others believed that researchers generally declared that they did not have conflicts of interest, even if they did. Interviewees were mostly confused about declaring personal relationships with friends, family and spouses in a scientific paper. They thought that there was inadequate guidance and that all conflicts of interests should be judged according to the impact they had in a specific situation.

Interviewees were concerned about academic conflicts of interests. One example was researchers splitting their work into *"little bits"* and publishing these separately to increase their number of publications. Although this was commonly called salami slicing of publications, it could also be seen as a conflict of interest, as the main interest was professional advancement and not the research as such. Interviewees told of a few dilemmas they faced related to academic conflicts of interest. One interviewee wondered whether one should examine a thesis that was similar to one'

own work, while another questioned the practice of including clinical experts, funded in part by pharmaceutical companies, in systematic reviews. Interviewees also felt that one could not peer-review papers of colleagues without being biased.

Table 3-8 Selected quotes for theme 4

Theme 4: Researchers are uncertain about what conflicts of interest means, and how this may influence research
"When we talk about declaring conflict of interest I would rather kind of rephrase to say declaring any relevant things that other people might think can be relevant." (JNR_1)
"Collecting money often times puts the authors under some form of obligation to please the funder... Because they could directly or indirectly put pressure on the researchers to skew the findings in their favour and also it's mainly industry funded studies in the attempts to suppress results if they are not positive but if you didn't collect any money from them then you can decide whether you want to publish or not irrespective of what the industry feels" (JNR_3)
"Well, I know, you know in those publications there's only the session for you to declare if there's any conflict of interest but no, they don't, people just say no, no, no so you there's no way you can tell if the person does or does not have (Conflicts of interest)" (JNR_6)
"For instance if you've got a paper to, as a reviewer and it turns out that probably the lead author works with you or something you should actually turn down. I mean that's in my own, in my mind I think he should turn down that opportunity to read that paper because obviously we've got some quite substantial relationship with the... It doesn't have to be the lead author, maybe any other authors in on the team." (SNR_1)
"I'll make it clear that well, so long as I make it very clear that I'll be transparent about the results and I'll make sure that what's reported is what is actually what I found" (JNR_7)
"I just report the evidence as it is so not declaring that my husband works for a…company and we have potential conflict of interest, I fail to understand how that can be a conflict of interest if his work did not really affect…the findings of the review…" (JNR_7)
"People should do research, should be free to do research but they need to clearly declare them so at the time acceptable thing may be a bit too heavy in terms that they may be too heavy because looking at it you just see him saying that it's unacceptable. People who tend to shy away from, even when they have something to contribute. So for me it still goes back to grading impact or effect of conflict of interest, declare conflict of interest on the raw research output." (SNR_2)
"I think it is okay if you work in an honest way. If you say what did happen to the patients, if you say the drug really had functioned, and if you don't hide the information from the public, yes it is okay, and if you say that you are working with the pharmaceutical industry, that is okay. Then people will know that you have a conflict of interest, but I think we have to such work, but it cannot be hidden from the people." (JNR_5)

> *"I don't know if this is sufficient in the end – you can say yes, I am employed by Phizer but and then what? And then? I don't know if this is sufficient? Because in the end you are saying yes, I am defending the ideas of my employer and in the end you read the article and ask yourself, who is this that is speaking?" (SNR_6)*

> *"Well conflict of interest would be any issue that would create or considered or thought of, or might implicitly or explicitly lead to introduce bias to the process of conducting, reporting, interpreting, disseminating, advocating for the results of the research." (SNR_8)*

> *"We all actually have conflict of interest and in some ways, it starts getting a bit ridiculous because you are trying to think back to, I mean how far do you go? If a rep has given you a pen at a conference, do you then have a conflict of interest if you are dealing with their product? I am not really sure" (SNR_5)*

> *"That's transparency on behalf of conflicts of interest to clarify but because it becomes unacceptable and maybe criminal when it's not done." (SNR_2)*

3.5. Acknowledgements

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Chapter 4

Actual practices in African biomedical journals
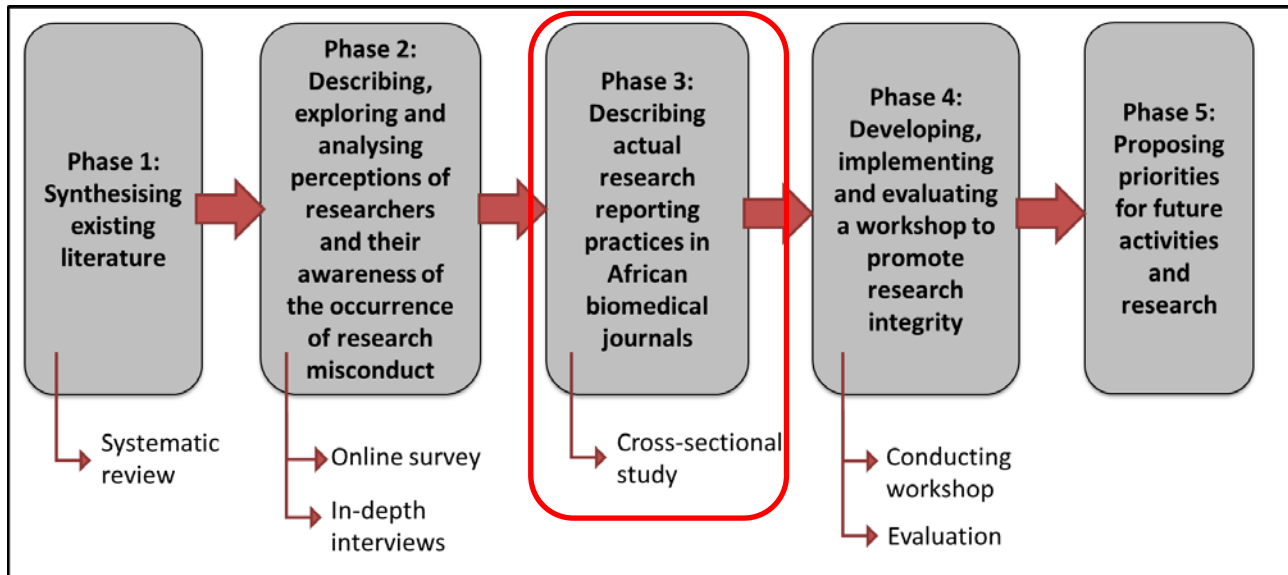
Summary

In the third phase of the PhD, we described actual reporting practices in African biomedical journals, by measuring plagiarism, analysing journal policies and author guidelines on plagiarism, conflicts of interest, disclosure of funding sources and authorship and examining author adherence to these.

All biomedical journals indexed on the Africa Journals Online database (AJOL) were sampled. Journals were eligible if the editor-in-chief and publisher were based in a LMIC, if author guidelines and policies were published in English, and if the journal published an issue in 2016. For each included journal, we randomly selected five original research articles published in 2016. Data were extracted using standardised and pre-piloted data extraction forms and analysed with SPSS. All research articles were submitted to Turnitin. Articles with an overall similarity index (OSI) of more than 10%, were examined for the extent of plagiarism, using a predefined and piloted framework.

We included 100 eligible journals. Of these, 59 had non-commercial publishers and 41 had commercial publishers. More journals with a commercial publisher had a guideline on authorship, contributorship, acknowledgement practices, conflicts of interest, funding sources and plagiarism,

compared to journals with a non-commercial publisher. Most journals with relevant guidelines were open-access journals.

We included 495 research articles, published in non-commercial (n=290) and commercial (n=205) journals. The majority of included research articles did not disclose contributions of authors, conflicts of interest and funding sources. Research articles published in commercial journals with abovementioned disclosures, were generally published in a journal with relevant guidelines. For research articles published in non-commercial journals, the proportion of articles with disclosures was well distributed between journals with and without relevant guidelines.

Of the included research articles, 358 had an OSI above 10%. Of these, 73% (95%CI 67 to 78) had evidence of any level of plagiarism, comprising one to two copied sentences in one or more sections in 26% (95%CI 22 to 31), three to six copied sentences in one or more sections in 25% (95%CI 20 to 29), and at least four linked or more than six copied sentences in 22% (95%CI 18 to 28). Articles with plagiarism were mostly published in journals without a plagiarism policy. Redundancy was less prevalent. We found overall redundancy in 15% of research articles with an OSI above 10%.

Appendices

Appendix 4.1: Data extraction forms

Appendix 4.2: Permission to use Turnitin for research

Appendix 4.3: Examples of levels of plagiarism

Appendix 4.4: Excluded journals

Appendix 4.5: Characteristics of included journals

Appendix 4.6: Additional characteristics of journals with relevant policies

Appendix 4.7: Detailed characteristics of included research articles

Appendix 4.8: Additional characteristics of research articles that disclosed author contributions, conflicts of interest and funding sources

Appendix 4.9: Adherence to guidelines

Appendix 4.10: Levels of plagiarism and redundancy per section of the article, according to publisher

Appendix 4.11: Additional characteristics of studies with any level of plagiarism

Appendix 4.12: Additional characteristics of studies with any level of redundancy

4.1. Introduction and rationale

In Phase 2 of the PhD (Chapter 3), we elicited the perceptions of Cochrane authors from LMICs on poor practices as well as their awareness of occurrence of these practices through a survey and follow-up interviews. Survey respondents thought that poor practices related to authorship, plagiarism and disclosure of conflicts of interest were common in their institutions. However, prevalence related to self-reported practice or practice observed in others, is not always accurate. While self-reported practice might be underestimated, practice observed in others might be overestimated. One way of measuring actual research reporting practices more objectively, is to examine articles published by LMIC health researchers. As research reporting practices can differ according to the requirements of journals, they need to be assessed in the context of existing journal policies and author guidelines.

Global recommendations and best practice for journals

Indeed, journals are part of the external research environment that can influence research integrity (1). Journal editors have control over what is published and are responsible for the content of their journal. According to COPE, editors "should be accountable for everything published in their journals" (2). Policies and guidelines can help to ensure that high standards, in terms of quality and integrity of published materials, are maintained. COPE's Code of Conduct and Best Practice Guidelines for Journal Editors (2), as well as the position statement on responsible research publication (3) provide recommendations on standards and best practices for journal editors that foster transparent and honest reporting of research. Furthermore, the World Association of Medical Editors (WAME) recommends that every journal should publish explicit policies related to publication ethics so that authors can easily access these (4). For the purpose of this thesis, we will focus on best practice related to explicit policies and guidelines on authorship, disclosure of conflicts of interest and funding sources, and plagiarism.

Recommendations on authorship stipulate that journals should give clear guidance on which contributions merit authorship (2-4). Probably the most well-known criteria for authorship of biomedical research are those developed by the International Committee of Medical Journal editors (ICMJE). The "Recommendations for the Conduct, Reporting, Editing and Publication of Scholarly Work in Medical Journals" was developed by and is targeted at both authors and editors. These recommendations aim to promote ethical and best practices when conducting and

reporting research and include guidelines on authorship, declaration of conflicts of interest and disclosure of funding source (5). They were first published as the "Uniform Requirements for Manuscripts Submitted to Biomedical Journals" in 1978 and are regularly updated. The latest version was published in December 2016. Although these recommendations are primarily intended for the 11-member journals, many, but not all, non-member journals follow them by choice.

For authorship, the ICMJE developed four criteria that need to be met for a person to be listed as an author. These are: "1) substantial contributions to the conception or design of the work; or the acquisition, analysis or interpretation of data for the work; and 2) drafting the work or revising it critically for important intellectual content; and 3) final approval of the version to be published; and 4) agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved". Up until 2013, the recommendations only included the first three criteria. In addition, the ICMJE strongly encourages journals to adopt a contributorship policy, where information related to the contribution of each author should be published with the paper. Authorship is not only a way of giving credit to the contributors of the work, but it also implies taking responsibility for the work. It is therefore important that researchers that have contributed to the work sufficiently are listed as authors, and those that do not merit authorship are not added as guest authors.

Recommendations on conflicts of interest specify that journals should have clear and accessible guidelines on disclosing conflicts of interest and funding sources (3, 5, 6). WAME recommends that every journal should have its own definition on conflict of interest, as well as clear explanations of financial and non-financial conflicts of interest (6). Non-financial conflicts of interest include any personal, professional relationship or intellectual beliefs that can influence professional judgement. Guidelines should require that all authors disclose any potential financial or non-financial conflicts of interest, as well as funding sources (3, 6). The ICMJE recommends that each author completes a standardised conflict of interest form when submitting their manuscript for publication (5). Indeed, poor practice relates to not disclosing conflicts of interest, rather to having them. However, conflicts of interest have the potential to influence professional judgement and authors therefore need to be transparent about them.

Recommendations on addressing plagiarism include having a clear policy related to originality of submitted work, a definition of plagiarism and a policy on handling plagiarism (3, 4, 7). COPE, in

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Section 13 of their Code of Conduct and Best Practice Guidelines, also encourages journal editors to screen submitted manuscripts for plagiarism (2). In addition, they developed flowcharts on handling plagiarism (7) and redundant publication (8) that journals can refer to in their guidelines. Plagiarism is considered research misconduct, as it involves taking credit for someone else's work.

Most well-known, high impact journals such as The Lancet, are members of COPE and have clear author guidelines on authorship, conflicts of interest and disclosure of funding sources, and editorial policies that meet international standards (9, 10). These sometimes depend on the publishers, who can have their own policies that journals are expected to follow. BioMed Central, Elsevier or Wiley are examples of commercial publishers that have standard policies that apply to all their journals. However, it is not clear whether journals from LMICs are generally published by commercial publishers (as opposed to non-commercial publishers such as institutions or associations), to what extent they follow international standards in terms of policies and guidelines on authorship, plagiarism, conflicts of interest and disclosure of funding sources and whether authors adhere to these when submitting their manuscripts.

Measuring actual reporting practices

It is difficult to accurately measure actual research reporting practices. However, the presence of statements disclosing author contributions, conflicts of interest and funding sources in published manuscripts is indicative of transparency and accountability. Indeed, this is the aim of journal policies and guidelines (3, 5).

Plagiarism is more difficult to measure, as there is no clear line between what is considered plagiarism and what not. Instead, it can be viewed on a continuum, from minor plagiarism that involves copying of short phrases to clear plagiarism, to copying of a whole paper. Besides the amount of text that is copied, one also needs to consider how it was referenced, whether it was intentional or not, as well as the originality of the copied text (7, 11). In addition, COPE suggests differentiating between plagiarism (copying of someone else's work) and redundancy (7, 8). Redundancy refers to republishing one's own work, including copying of an entire manuscript (duplicate publication), publication of parts of the results in separate papers (salami publication) and re-using of text in several publications (text-recycling) (see Table 1-1). More and more journal editors and publishers make use of text-matching software to screen submitted manuscripts for copied text (12), but software licences are expensive and some smaller journals, especially those

with non-commercial publishers, may not be able to afford them (13). However, text-matching software on its own is not a panacea for identifying and tackling plagiarism. While the software generates an overall similarity index (OSI) in form of the proportion of copied text, there is currently no consensus on a suitable cut-off point and manual review of manuscripts with high OSI's is needed to confirm findings (14). A study assessing plagiarism in manuscripts submitted to the Croatian Medical Journal (15) identified plagiarism in 11% of manuscripts, using an OSI threshold of 10%. Zhang (2010) (16) reported on the use of text-matching software in a Chinese journal and found that 23% of submitted papers contained high levels of plagiarism, however it is not clear how plagiarism was defined in terms of the OSI. As part of Phase 1 of the PhD (Chapter 2), we included one study from Pakistan that assessed plagiarism of submitted manuscripts (17) and found that 39% of papers contained plagiarised text. However, they defined plagiarism as the presence of one or more copied sentences, which does not seem adequate. We therefore aimed to develop an approach that enables consistent and transparent measurement of the extent of plagiarism in articles identified as high risk for plagiarism.

Sampling frame

This thesis aimed to understand research reporting practices in LMICs. Some Cochrane authors that we interviewed in Chapter 3 thought that LMIC researchers preferred to submit their manuscripts to *"local"* journals rather than well-known international journals, as the former were perceived to have less strict rules, making it easier to obtain publications (see 3.4.2.3 Institutions and culture fuel bad practices). We therefore sought journals where the editor-in-chief, as well as the publisher (commercial or non-commercial) were based in a LMIC, as defined by the World Bank (18), and defined journals that met these criteria as LMIC journals.

We considered various sampling frames that represented LMIC journals. We explored using the Thomson Reuters Journal Citation Report (JCR) of 2016, that lists all journals with an impact factor. As the list of journals can be filtered according to country, the JCR can be used as a sampling frame for journals (19-21). However, restricting the selection of journals to those that have an impact factor would introduce selection bias, since these journals are already considered to be of high quality (22, 23) and are more accessible than journals without an impact factor. In addition, selecting journals with an impact factor would restrict our sample size for some regions, as for example, there are only 11 African journals listed on the JCR.

The International Network for the Availability of Scientific Publications (INASP) is an international development organisation that aims to "to support individuals and institutions to produce, share and use research and knowledge". It was established by the International Council for Science in 1992 (24). One of their projects, the Journals Online project, provides partner countries with a publishing platform for online journals to "improve the accessibility and visibility of developing-country research". This affords smaller journals, such as institutional journals, that are not indexed on databases such as MEDLINE or Scopus, an opportunity to be accessed online. Compared to the JCR, this therefore seemed to be a more suitable sampling frame. The project includes five Journals Online (JOL) that are managed by INASP (Bangladesh, Latin-America, Mongolia, Nepal, and Sri Lanka) and three that are manged in-country (Africa, Philippines, Vietnam). The journals indexed on the JOLs include a wide range of disciplines and are not restricted to health research, while number of indexed journals also differ widely, from five (Mongolian JOL) to 521 journals (Africa JOL). Although we considered comparing journals across JOLs, this proved to be challenging, mainly because information on some JOLs was in languages other than English and because the number of biomedical journals differed widely across JOLs, making it difficult to compare results. We therefore decided to limit our sample to biomedical journals from Africa. Africa JOL (AJOL) is the oldest JOL and contains journals from 31 African countries, of which 179 journals are related to health science and medical research. In light of the known challenges of identifying medical journals from Africa (25, 26), we perceived AJOL as a suitable and pragmatic sampling frame for African journals.

4.2. Objectives

To describe actual research reporting practices in African biomedical journals by

- Measuring plagiarism
- Analysing policies and author guidelines related to authorship, plagiarism and conflicts of interest
- Assessing author adherence to the guidelines

4.3.   Methods

4.3.1. Study design and sample

We conducted a cross-sectional study of biomedical journals indexed on AJOL and original research articles published in these journals by using a two-step approach.

First, we sampled all biomedical journals indexed on AJOL. Journals were eligible if their current editor-in-chief was based in Africa, the publisher was based in a LMIC (18) if policies and author guidelines were available in English and if the journal published an issue in 2016. All eligible journals were selected.

Secondly, to examine adherence to journal guidelines, we selected published articles from eligible journals. Eligible articles comprised those published in 2016 as original research articles, including qualitative and quantitative primary studies, literature reviews and systematic reviews, published in English. We excluded editorials and letters. We selected a simple random sample from all eligible articles by stratifying them according to the journal in which they were published. This ensured that all journals were equally represented in the sample. For each journal, we identified all eligible research articles published in 2016 and listed them according to the date of publication. We made use of a computer-generated list of random numbers to select five articles from each journal. We selected five articles per journal, as initial scoping of journals indexed on AJOL revealed substantial variation in the number of published articles per issue, as well as the number of published issues per year.

4.3.2. Data collection

For eligible journals, we downloaded policies and instructions for authors from the journal's website. If there was a link to policies specific to the publisher on the journal's website, we followed this and downloaded PDFs of relevant policies. We extracted the following data on general properties of the journal: name of publisher, type of publisher (commercial or non-commercial), country where publisher is based, country where editor-in-chief is based, impact factor, COPE membership, number of issues published per year, scope of journal, type of access, and any other characteristics that seemed relevant. We extracted data on the presence and content of policies and guidelines on plagiarism, authorship, conflicts of interest and funding sources. One author (AR) extracted data using a pre-specified, piloted data extraction form (Appendix 4.1) and entered it into Excel. For original research articles, we downloaded the full text

(PDF) of each article. We extracted data on the number of authors, country of corresponding author and type of study. In addition, we extracted data on the presence and content of contributorship statements, declarations of conflict of interest and funding sources, and plagiarism. One author (AR) extracted data using a pre-specified, piloted data extraction sheet (Appendix 4.1) and entered it into Excel.

We examined the presence and extent of plagiarism (copying of someone else's work) and redundancy (copying of one's own work) in all included research articles (Table 1-1, Chapter 1). As a first step, we submitted the PDFs of all articles to Turnitin text-matching software. We had permission to use the software and Stellenbosch University's institutional license of for this research (Appendix 4.2). Turnitin generated a similarity report containing an OSI, expressed as percentage of matching text (27), excluding quotations and references. We considered various OSI thresholds to identify articles that contained copied text. Previous studies have used thresholds of 10% (15) or 15% (28). Hong et al. (2015) considered thresholds of 10% and 30% (29) and found that a threshold of 10% was more sensitive than a threshold of 30%. Taylor (2017) proposed that the optimal threshold when excluding references and quotations was 11.5% (14). We decided to adopt an OSI threshold of 10%, as we wanted to increase sensitivity and therefore maximise the number of articles with plagiarism correctly identified as such, and minimise the number of articles with plagiarism not identified as such. As the OSI on its own is not adequate to detect the presence and extent of plagiarism and redundancy, we manually verified all similarity reports of articles with an OSI of more than 10%. We downloaded PDFs of relevant similarity reports and carefully inspected them using the plagiarism framework (Table 4-1). As we were not able to find any existing guidance to objectively assess the extent of plagiarism, we developed a framework based on suggestions from COPE (7) and Wager (2008) (11), that propose differentiating between clear plagiarism and minor copying of someone else's and one's own text. By using the framework, we intended to consistently examine the extent of plagiarism according to the amount of copied text, firstly per section of the article and secondly across the entire article. We considered plagiarism and redundancy per section, as some sections, such as the introduction and discussion, are more prone to plagiarism than others. In addition, it can be difficult to avoid plagiarism when describing a standard method, which is why copied text in the methods section is probably not as serious as copied text in other sections (11).

We defined plagiarism and redundancy according to the number of copied sentences. These had to be substantially or completely copied. We disregarded introductions to sentences with words or phrases such as "However" or "Researchers found that…", when the rest of the sentence was clearly copied. Similarly, we ignored conjunctions if they were the only elements in a sentence that were not copied. Once we identified a copied sentence, we checked the source of the original sentence, as stated in the similarity report. If the source of the original sentence contained one or more of the authors of the article under investigation, we classified it as redundancy, whereas if the source of the original sentence contained other authors, we classified it as plagiarism.

For each section of the article, we counted the number of copied sentences and assigned one of the following scores: Level 1 for one to two copied sentences, Level 2 for three to six copied sentences and Level 3 for four or more linked sentences or more than six copied sentences (Table 4-1). Separate scores were assigned for plagiarism and redundancy. Appendix 4.3 contains examples of the levels of plagiarism according to the number of copied sentences.

Overall plagiarism in articles was categorised as no plagiarism, some overall plagiarism, moderate overall plagiarism or extensive overall plagiarism. The overall score was linked to the score we assigned to each section of the article. We defined *no plagiarism* as the absence of substantially copied sentences, or Level 1 plagiarism in the methods section; *some overall plagiarism* as one or more sections with Level 1 plagiarism or Level 2 plagiarism in the methods section; *moderate overall plagiarism* as one or more sections with Level 2 plagiarism, or Level 3 plagiarism in the methods section; and *extensive overall plagiarism* as one or more sections with Level 3 plagiarism (Table 4-1). Overall redundancy was scored in an equivalent way and separate scores were given for plagiarism and redundancy.

Table 4-1 Plagiarism framework

	Level 1	**Level 2**	**Level 3**
Abstract	up to two sentences	3 to 6 sentences	4 or more linked sentences; or more than 6 sentences
Background	up to two sentences	3 to 6 sentences	4 or more linked sentences; or more than 6 sentences
Methods	up to two sentences	3 to 6 sentences	4 or more linked sentences; or more than 6 sentences
Results	up to two sentences	3 to 6 sentences	4 or more linked sentences; or more than 6 sentences
Discussion	up to two sentences	3 to 6 sentences	4 or more linked sentences; or more than 6 sentences

Overall score	Some overall plagiarism	Moderate overall plagiarism	Extensive overall plagiarism
Definition	One or more sections with plagiarism of one to two sentences; or level 2 plagiarism in the methods section	One or more sections with plagiarism of three to six sentences; or level 3 plagiarism in the methods section	One or more sections with plagiarism of four or more linked sentences, or plagiarism of more than six sentences

Development of the framework was an iterative process that entailed numerous discussions within the research team. To pilot the framework, two members of the research team (AR and EW) independently assessed similarity reports of 10 articles and discussed results with the entire research team. Once the team had agreed on the framework, one author (AR) scored all similarity reports using the framework and another author (EW) independently scored a random selection of 10% of reports.

4.3.3. Data analysis

Data were analysed descriptively with SPSS (version 24). We reported categorical data as frequencies and proportions and continuous data as medians, means and standard deviations, or modes and ranges. As this study aimed to generate rather than test hypotheses, we did not test statistical significance between categories. For plagiarism and redundancy, we calculated 95% confidence intervals (CI), adjusted for clustering at the journal level using robust standard errors, with STATA (version 15).

4.3.4. Ethical issues

All data used in this study was available online and is thus in the public domain. To ensure anonymity of authors, we did not include information identifying individual research articles in our report. We obtained an ethics exemption from the Stellenbosch University Health Research Ethics Committee (X17/08/010). Where we detected serious plagiarism in published papers, we planned to write to the editor of the respective journal, informing him/her of our findings.

4.4.   Results

Of the 179 journals related to health science and medical research and indexed on AJOL, 100 met the eligibility criteria and were included in the study. We aimed to randomly select five original research articles published in the 2016 issue of each journal. However, three of the included journals published less than five research articles during 2016. Of these, one journal only

published two research articles, and two journals published four research articles. For these journals, we therefore included all research articles published in 2016. We included a total of 495 research articles in the study (Figure 4-1). In this section, we first report on our findings related to
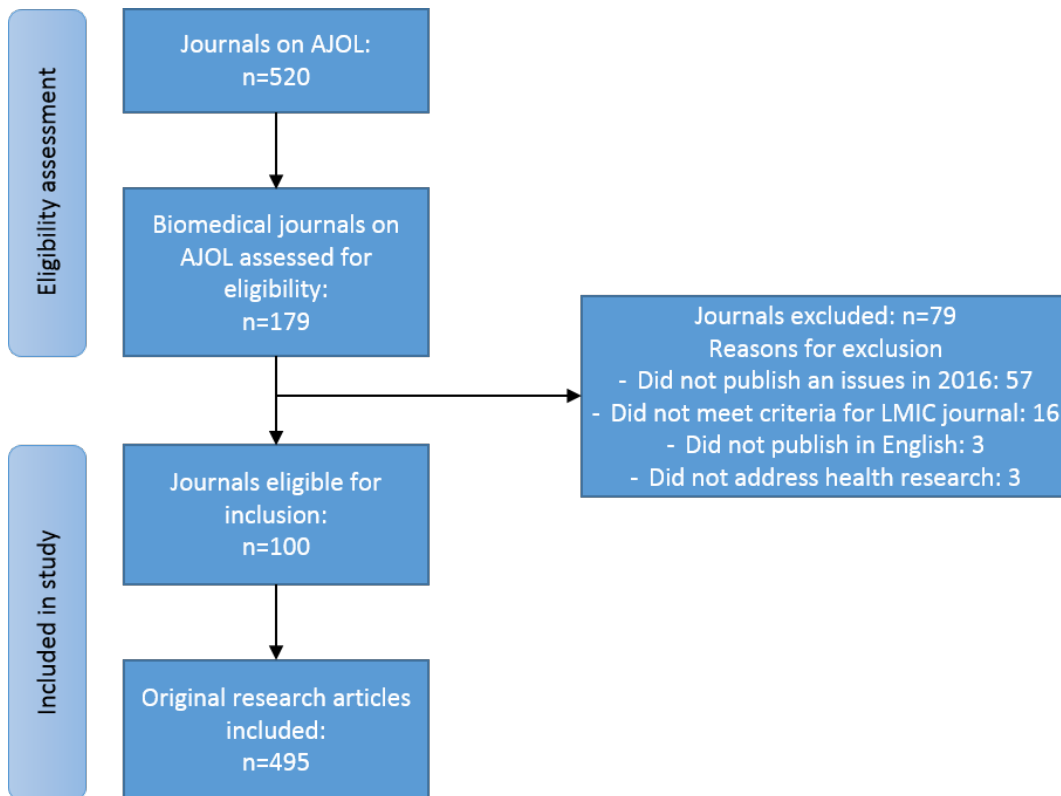
Figure 4-1 Flow-diagram of included journals and research articles

the included journals, and then on the findings related to included research articles.

4.4.1. Excluded journals

We excluded 79 journals that did not meet eligibility criteria. A list of excluded journals and reasons for exclusion are presented in Appendix 4.4. Of the excluded journals, 57 did not publish an issue in 2016, 16 did not meet the criteria for a LMIC journal because the editor in chief was not based in a LMIC (n=4), the publisher was not based in a LMIC (n=10) or both the editor-in-chief and the publisher were based in countries other than LMICs (n=2). Three journals did not publish in English, and another three did not address health research (e.g. Veterinarian Sciences).

4.4.2. Characteristics of included journals (n=100)

Characteristics of each journal are presented in Appendix 4.5. Of the included journals, 41 were published by a commercial publisher and 59 were published by a non-commercial publisher such as an institution or an association. As journal guidelines and policies can be associated with polices

and guidelines of publishers, we regarded this as the main comparison between journals and thus described included journals and research articles, as well as analysed results according to these main groups.

Table 4-2 presents a summary of the characteristics of included journals. Commercial publishers included Medknow Publications, based in India (n=19); Health & Medical Publishing group (n=6), Medpharm Publications (n=4), AOSIS Publishing (n=3) In House publications (n=2) and LAM publications limited (n=1), all based in South Africa; Bookbuilders Africa (n=1), Michael Joanna Publications (n=1), Fine Print and Manufacturers (n=1), CME ventures (n=1) and SAME ventures (n=1) based in Nigeria; and AKS publications (n=1), based in Mauritius. Editors-in-chief of these journals were based in the same country as the publisher, except those of journals published by Medknow Publications (n=19), who were all based in Nigeria. Medknow Publications and AOSIS publishing were listed as members of COPE, although only two journals published by AOSIS and none published by Medknow were specifically listed as members. The journal published by Michael Joanna publications was also listed as a member of COPE. Five of the nine journals with an impact factor had commercial publishers.

Non-commercial publishers included research institutions and associations that published their journals themselves (Appendix 4.5). Non-commercial publishers were mainly based in Nigeria (n=33) and other African countries (n=23), while three were based in South Africa. Editors-in-chief were based in the same country as the publisher, except for two journals. The publisher of one journal had regional offices across Africa and an editor-in-chief based in South Africa; while the publisher of another journal was based in Tanzania, and the editor-in-chief in Uganda. Of journals published by non-commercial publishers, eight were members of COPE and four had an impact factor. Seven journals were part of the African Journals Partnership Program (AJPP), a programme that partners African journals with mentor journals from the USA and UK (30). Mentor journals include Annals of Internal Medicine, The BMJ, the Lancet, New England Journal of Medicine, JAMA and Environmental Health Perspectives.

The majority of journals were open-access journals (n=69), more or less evenly distributed between groups. Almost half of all included journals had a general scope (n=48), 51% of journals with non-commercial publishers and 44% of journals with commercial publishers. Overall, most journals (n=85) had published their first online publication before 2010, with slightly more journals

published by commercial journals (93%) had done so compared to journals published by non-commercial publishers (80%).

Table 4-2 Summary of characteristics of included journals (n=100)

Characteristic	Non-commercial publisher (n=59)	Commercial publisher (n=41)	Total
Open access	34 (58%)	35 (51%)	69
General Scope	30 (51%)	18 (44%)	48
First online issues before 2010	47 (80%)	38 (93%)	85
Country (publisher)			
Nigeria	33 (56%)	5 (12%)	38
India	0	19 (46%)	19
South Africa	3 (5%)	16 (39%)	19
Other	23 (39%)	1 (2%)	24
Country (editor-in-chief)			
Nigeria	33 (56%)	24 (59%)	57
South Africa	4 (7%)	16 (39%)	20
Other	22 (37%)	1 (2%)	23
Impact factor	4 (7%)	5 (12%)	9
Member of AJPP	7 (12%)	0	7
Member of COPE (journal)	8 (14%)	3 (7%)	11
Member of COPE (publisher)	0	22 (54%)	22

4.4.3. Journal policies and author guidelines

We explored the presence and content of journal policies and author guidelines according to type of publisher, type of access and scope (Table 4-3). Additional characteristics of journals with relevant guidelines and policies are reported in Appendix 4.6.

Fifty-five of the included journals referred to the ICMJE in their author guidelines, 35 had a link to the ICMJE website and four had a direct link to the ICMJE recommendations (Table 4-3). More journals with a commercial publisher (78%) compared to a non-commercial publisher (39%); and with open (71%) compared to paid access (19%) referred to the ICMJE. Similarly, more journals with a link to the ICMJE website had commercial (56%) compared to non-commercial (20%) publishers; and more had open (48%) compared to paid access (6%). Similar proportions of journals that referred to ICMJE had a general (56%) and specialised (54%) scope, while more specialised journals had a link to the ICMJE website.

Table 4-3 Presence and content of journal policies and author guidelines (n=100)

	Publisher		Access		Scope		Total (n=100)
	Non-commercial publisher (n=59)	Commercial publisher (n=41)	Open access (n=69)	Paid access (n=31)	General (n=48)	Specialised (n=52)	
International Committee of Medical Journal Editors (ICMJE)							
Journal refers to ICMJE	23 (39%)	32 (78%)	49 (71%)	6 (19%)	27 (56%)	28 (54%)	55
Link to ICMJE website present	12 (20%)	23 (56%)	33 (48%)	2 (6%)	14 (29%)	21 (40%)	35
Link to ICMJE recommendations	3 (5%)	1 (2%)	3 (4%)	1 (3%)	1 (2%)	3 (6%)	4
Authorship							
Authorship guideline available	20 (34%)	32 (78%)	45 (65%)	7 (23%)	21 (44%)	31 (60%)	52
Guideline in line with new ICMJE (four) criteria	4 (7%)	0	4 (6%)	0	2 (4%)	2 (4%)	4
Guideline in line with old ICMJE (three) criteria	6 (10%)	31 (76%)	34 (49%)	3 (10%)	15 (31%)	22 (42%)	37
Contributorship policy available	19 (32%)	29 (71%)	42 (61%)	6 (19%)	21 (44%)	27 (52%)	48
Acknowledgement practices							
Information on acknowledgement practices	26 (44%)	23 (56%)	43 (62%)	6 (19%)	23 (48%)	26 (50%)	49
Conflict of interest							
Conflict of interest guideline available	27 (46%)	36 (88%)	55 (80%)	8 (26%)	27 (56%)	36 (69%)	63
Definition of conflict of interest	9 (15%)	27 (66%)	34 (49%)	2 (6%)	14 (29%)	22 (42%)	36
Information on what to declare	17 (29%)	31 (76%)	43 (62%)	5 (16%)	21 (44%)	27 (52%)	48
Sources of funding							
Guideline on disclosure of funding available	21 (36%)	31 (76%)	46 (67%)	6 (19%)	23 (48%)	29 (56%)	52
Funding statement required in publication	20 (34%)	27 (66%)	38 (55%)	9 (29%)	22 (46%)	25 (48%)	47
Plagiarism							
Plagiarism policy available	13 (22%)	13 (32%)	24 (35%)	2 (6%)	6 (13%)	20 (38%)	26
Description of what constitutes plagiarism	5 (8%)	9 (22%)	13 (19%)	1 (3%)	2 (4%)	12 (23%)	14
Reference to plagiarism software	6 (10%)	10 (24%)	14 (20%)	2 (6%)	3 (6%)	13 (25%)	16
Consequences of plagiarism described	11 (19%)	10 (24%)	20 (29%)	1 (3%)	6 (13%)	15 (29%)	21
Reference to COPE flow-diagram	2 (3%)	2 (5%)	3 (4%)	1 (3%)	0	4 (8%)	4

4.4.3.1. Authorship

Authorship guidelines generally described who qualified as an author on the submitted manuscript. Fifty-two of the included journals had a guideline on authorship. More journals with commercial (78%) compared to non-commercial publishers (34%); more journals with open (65%) compared to paid access (23%); and more specialised (60%) compared to general (44%) journals had a guideline on authorship (Table 4-3). Eight of the nine journals with impact factors, and four of the seven journals that were members of AJPP had guidelines on authorship.

Only four journals, all open-access and with a non-commercial publisher, addressed the updated ICMJE criteria, which specify four criteria that need to be met for someone to qualify as an author. Two of these journals were members of AJPP. However, 76% of journals with a commercial publisher addressed the old ICMJE criteria, that specify three criteria that need to be met for someone to qualify as an author, compared to 10% of journals with non-commercial publishers. More journals with open (49%) compared to paid access (10%); and more specialised (42%) compared to general journals (31%) addressed the old ICMJE criteria (Table 4-3). Guidelines that did not refer to the ICMJE criteria were vague and mostly stated that each author should have contributed substantially to the manuscript. Some journals limited the number of authors they allowed per paper, by explicitly stating how many authors they would accept on a manuscript.

4.4.3.2. Contributorship policy

Contributorship policies were considered independently from authorship guidelines. While authorship guidelines describe what needs to be done for someone to qualify as an author, contributorship policies require authors to explicitly state the contribution of each author in the manuscript or in the cover letter. Forty-eight included journals had a contributorship policy, of which 36 journals had a guideline on authorship and a policy on contributorship, while 12 had a contributorship policy, but no guideline on authorship.

More journals with commercial (71%) compared to non-commercial publishers (32%); more open-access (61%) compared to paid access journals (19%); and slightly more specialised (52%) compared to general (44%) journals had a policy on contributorship (Table 4-3). Seven of the nine journals with an impact factor and three of the seven journals that were members of the AJPP had a policy on contributorship.

4.4.3.3. Acknowledgement practices

Guidelines on acknowledgement practices stipulated when to acknowledge contributors and who to acknowledge. Forty-nine journals included information on acknowledgement practices in their instructions for authors. Similar proportions of journals with commercial and non-commercial publishers; and journals with specialised and general scope had information on acknowledgement practices. However, more journals with open (62%) compared to paid access (19%) included this information (Table 4-3). Four of the nine journals with an impact factor and four of the seven AJPP member journals had a guideline on acknowledgement practices.

4.4.3.4. Conflicts of interest

Guidelines on conflicts of interest informed authors whether the journal required that they declared their conflicts of interest. Sixty-three journals required authors to declare conflicts of interest. More journals with commercial (88%) compared to non-commercial publishers (46%); more journals with open (80%) compared to paid access (26%); and more specialised (69%) compared to general journals (56%) had a guideline on conflicts of interest (Table 4-3). All nine journals with an impact factor and five of the seven AJPP member journals had a guideline on conflicts of interest.

The content of the guidelines on declaring conflicts of interest differed across journals. Thirty-six journals included a definition of conflicts of interest comprising more journals with a commercial (66%) compared to a non-commercial publisher (15%); more journals with open (49%) compared to paid access (6%); and more specialised (42%) compared to general journals (29%). Forty-eight journals included information on what to declare, comprising more journals with commercial (76%) compared to non-commercial (36%) publishers; more journals with open (62%) compared to paid access (16%); and a similar proportion of specialised (52%) and general (44%) journals. Generally, existing guidelines referred only to financial conflicts of interest.

4.4.3.5. Funding sources

Guidelines on disclosure of funding sources informed authors whether they had to indicate who funded their research. Fifty-two journals had a guideline on disclosure of funding sources. More journals with a commercial (76%) compared to non-commercial publisher (36%); more journals with open (67%) compared to paid access (19%); and a similar proportion of specialised (56%) and general (48%) journals had a guideline on disclosure of funding sources (Table 4-3). Seven of the

nine journals with an impact factor and four of the seven AJPP member journals had a guideline on disclosure of funding sources.

Forty-seven journals explicitly required inclusion of a funding statement in the manuscript or in the cover letter. Distribution of these journals in terms of publisher, access and scope was similar to the distribution of journals with a guideline on disclosure of funding sources.

4.4.3.6. Plagiarism

We judged journals to have a policy on plagiarism, if they referred to plagiarism as part of their journal policies or author guidelines. Only 26 journals addressed plagiarism, comprising more journals with open (35%) compared to paid access (6%); and more specialised (38%) compared to general (13%) journals. The difference in the proportion of journals with commercial (32%) and non-commercial (22%) publishers was not as marked as was seen for other policies and guidelines (Table 4-3). Notably, none of the journals published by Medknow publications had a policy on plagiarism. Six of the nine journals with an impact factor and one of the seven AJPP member journals had a policy on plagiarism.

The way in which journals addressed plagiarism differed across journals. Fourteen journals included a description on what constituted plagiarism, comprising more journals with commercial (22%) compared to non-commercial (8%) publishers; more journals with open (19%) compared to paid access (3%); and more specialised (23%) compared to general (4%) journals. Sixteen journals said they used text-matching software to check submitted manuscripts for plagiarism, comprising more journals with commercial (24%) compared to non-commercial publishers (10%); more journals with open (20%) compared to paid access (3%); and more specialised (25%) compared to general (6%) journals. Twenty-one journals described the consequences of plagiarism, comprising more journals with open (29%) compared to paid (3%); more specialised (29%) compared to general (13%) journals; and similar proportions of journals with commercial (24%) compared to non-commercial (19%) publishers. Consequences of plagiarism included following the COPE guidelines, reporting the misconduct to institutions and/or funding agencies, retraction of the manuscript, and blacklisting of authors. Only four journals referred to the COPE flow-diagram.

4.4.4. Characteristics of included research articles (n=495)

The characteristics of included research articles are summarised in Table 4-4. As in the previous section, we categorised findings according to whether articles were published in a journal with a

commercial publisher or in a journal with a non-commercial publisher. In order to improve clarity, we will refer to the former as commercial journals and the latter as non-commercial journals. A more detailed table is presented in Appendix 4.7.

Articles had a median of three authors (min 1, max 10). Articles with five or less authors were equally distributed between commercial and non-commercial journals. Overall, half of the included articles had corresponding authors based in Nigeria. Articles published in non-commercial journals had a higher proportion of Nigerian authors (54%) compared to those published in commercial journals (45%). More articles published in commercial journals had corresponding authors from South Africa (33%) compared to those published in non-commercial journals (5%). The opposite was seen in articles with corresponding authors from other African countries, where 31% of articles published in non-commercial journals and 4% of those published in commercial journals had corresponding authors from other African countries. More articles published in commercial journals (18%) compared to those published in non-commercial journals had corresponding authors from non-African countries.

Table 4-4 Characteristics of included research articles (n=495)

Characteristic	Non-commercial journal (n=290)	Commercial journal (n=205)	Total (n=495)
Number of authors ≤5	233 (80%)	169 (82%)	402 (81%)
Country of corresponding author			
Nigeria	158 (54%)	92 (45%)	250 (51%)
South Africa	15 (5%)	68 (33%)	83 (17%)
Other African country	91 (31%)	8 (4%)	99 (20%)
Non-African country	26 (9%)	37 (18%)	63 (13%)
Type of study			
Cross-sectional study	156 (54%)	91 (44%)	247 (50%)
Retrospective study	29 (10%)	36 (18%)	65 (13%)
Case Report	21 (7%)	21 (10%)	42 (9%)
Trial	30 (10%)	6 (3%)	36 (7%)
Cohort study	8 (3%)	14 (7%)	22 (4%)
Review	12 (4%)	9 (4%)	21 (4%)
Case-control study	10 (3%)	2 (1%)	12 (2%)
Other	24 (8%)	26 (13%)	50 (10%)

More than half of the included research articles represented cross-sectional studies. Types of studies reported in included articles were generally well distributed between commercial and non-commercial journals. What stood out was that more articles published in journals with a non-commercial publisher reported on cross-sectional studies and trials, while more articles published in journals with commercial publishers reported on retrospective and cohort studies (Table 4-4).

4.4.5. Disclosure of author contributions, conflicts of interest and funding

We reported disclosure of author contributions, conflicts of interest and funding sources according to type of publisher and availability of relevant guidelines and policies in Table 4-5. Additional characteristics of articles with disclosures are presented in Appendix 4.8.

4.4.5.1. Disclosure of author contributions

Of all the included research articles, 12% (60/495) included a contributorship statement. More research articles published in non-commercial journals (15%) compared to those published in commercial journals (9%), disclosed contributions of authors.

Among articles published in commercial journals, all those that disclosed contributions (9%) were published in a journal with an authorship guideline, and 8% were published in a journal with a contributorship policy.

Among research articles published in non-commercial journals, more articles that disclosed contributions were published in a journal without an authorship guideline (11%) compared to those published in a journal with an authorship guideline (4%). However, more articles that disclosed contributions were published in a journal with a contributorship policy (9%) compared to those published in a journal without a contributorship policy (6%).

The format and content of contributorship statements differed. Reported contributions of all authors met the ICMJE criteria for 14 articles, of which 11 were published in a non-commercial journal that did not have a guideline of authorship. Thirty-nine contributorship statements provided detailed contributions but did not include all ICMJE criteria for each author. This means, that according to the ICMJE criteria, some of the listed authors would actually not qualify as authors. In seven articles, authors' contributions were reported very vaguely, so that it was not clear how each author had contributed.

Table 4-5 Disclosure of author contributions, conflicts of interest and funding sources according to publisher and availability of guidelines (n=495)

Disclosure of:	Non-commercial journal (n=290)		Commercial journal (n=205)		Total (n=495)
	Guideline/policy available		Guideline/policy available		
	Yes	No	Yes	No	
Authorship (authorship guideline)	11 (4%)	31 (11%)	18 (9%)	0	60 (12%)
Authorship (contributorship policy)	26 (9%)	16 (6%)	17 (8%)	1 (0.4%)	60 (12%)
Contributorship statement addressed all ICMJE criteria	1 (0.3%)	11 (4%)	1 (0.4%)	0	13 (3%)
Acknowledgement of other contributors	45 (16%)	59 (20%)	27 (13%)	25 (12%)	156 (32%)
Conflicts of interest	62 (21%)	39 (13%)	122 (60%)	6 (3%)	229 (46%)
Financial conflicts of interest	0	0	2 (1%)	0	2 (0.4%)
Non-financial conflicts of interest	0	0	0	0	0
No known conflicts of interest	62 (21%)	39 (13%)	120 (59%)	6 (3%)	227 (46%)
Funding sources	27 (9%)	49 (17%)	103 (50%)	14 (7%)	193 (39%)
Funding from commercial company	0	1 (0.3%)	0	1 (0.4%)	2 (0.4%)
External funding from non-commercial source	16 (6%)	29 (10%)	10 (5%)	8 (4%)	63 (13%)
No external funding	11 (4%)	20 (7%)	93 (45%)	5 (2%)	129 (26%)

4.4.5.2. Acknowledgement of other contributors

Overall, 32% of included research articles acknowledged contributors that did not qualify as authors. More articles published in non-commercial journals acknowledged other contributors (36%) compared to those published in commercial journals (25%).

Among research articles published in commercial journals that acknowledged other contributors, a similar proportion was published in a journal with a guideline (13%) compared to those published in a journal without a guideline (12%).

Among research articles published in non-commercial journals that acknowledged other contributors, more articles were published in a journal without a guideline (20%) compared to those published in a journal with a guideline (16%).

4.4.5.3. Declaration of conflicts of interest

Overall, almost half of all included articles (46%; 229/495) included declarations of conflicts of interest. More articles published in commercial journals (63%), compared to articles published in non-commercial journals (34%) included declarations of conflicts of interest.

Among research articles published in commercial journals that included declarations of conflicts of interest, more articles were published in a journal with a guideline on conflicts of interest (60%), compared to those published in a journal without a guideline (3%).

Among research articles published in non-commercial journals that included declarations of conflicts of interest, more articles were published in a journal with a guideline on conflicts of interest (21%) compared to those published in a journal without a guideline (13%).

Overall, only two articles, published in a commercial journal with a guideline on conflicts of interest declared financial conflicts of interest, while none of the included articles declared non-financial conflicts of interest. The rest of the articles declared no known conflicts of interest.

4.4.5.4. Disclosure of funding sources

Overall, 39% (193/495) of included research articles disclosed funding sources. More articles published in commercial journals (57%) disclosed funding sources, compared to those published in non-commercial journals (26%).

Among research articles published in commercial journals that declared conflicts of interest, more articles were published in a journal with a guideline on disclosure of funding sources (50%) compared to those published in a journal without a guideline (7%).

Among research articles published in non-commercial journals that declared conflicts of interest, more articles were published in a journal without a guideline on disclosure of funding sources (17%) compared to those published in a journal with a guideline on disclosure of funding sources (9%).

Only two articles disclosed having received funding from a commercial company, one published in a commercial and one published in a non-commercial journal. However, both articles were published in a journal without a guideline on disclosure of funding sources.

Thirteen per cent (63/495) of all included articles disclosed external funding from a non-commercial source (e.g. non-governmental organisation, grants, private funders). More articles published in non-commercial journals (16%) disclosed external funding from a non-commercial source compared to hose published in commercial journals (9%).

Twenty-six per cent (129/495) of all included articles disclosed that they did not receive any external funding. More articles published in commercial journals (47%) compared to those published in non-commercial journals (11%) declared no external funding.

4.4.6. Adherence to guidelines

We examined adherence to guidelines in terms of the number of research articles published in a journal with a guideline, disclosing contributions of authors, conflicts of interest and funding sources. Figure 4-2 shows adherence of articles published in commercial and non-commercial journals, and adherence across journals. Data linked to Figure 4-2 is reported in Appendix 4.9.

Overall, 11% of articles, equally spread between commercial (11%) and non-commercial journals (11%), published in a journal with an authorship guideline disclosed author contributions, while 18% of all articles published in a journal with a contributorship policy disclosed contributions. More articles published in non-commercial journals (29%) compared to commercial journal (12%) adhered to the policy. Notably, none of the research articles published in journals from Medknow Publications disclosed author contributions, even though all of the journals had a guideline on authorship and a contributorship policy.

Thirty per cent of all articles published in a journal with a guideline on acknowledgement practices acknowledged contributors other than authors. More articles published in non-commercial journals (36%) compared to commercial journals (23%) contained acknowledgements.

Overall, 58% of articles published in journals with a guideline on conflicts of interest, had declarations of conflicts of interest. More articles published in commercial journals (68%) compared to non-commercial journals (46%) adhered to the guideline. Fifty-six per cent of all articles published in journals with a guideline on funding sources, disclosed funding sources. More
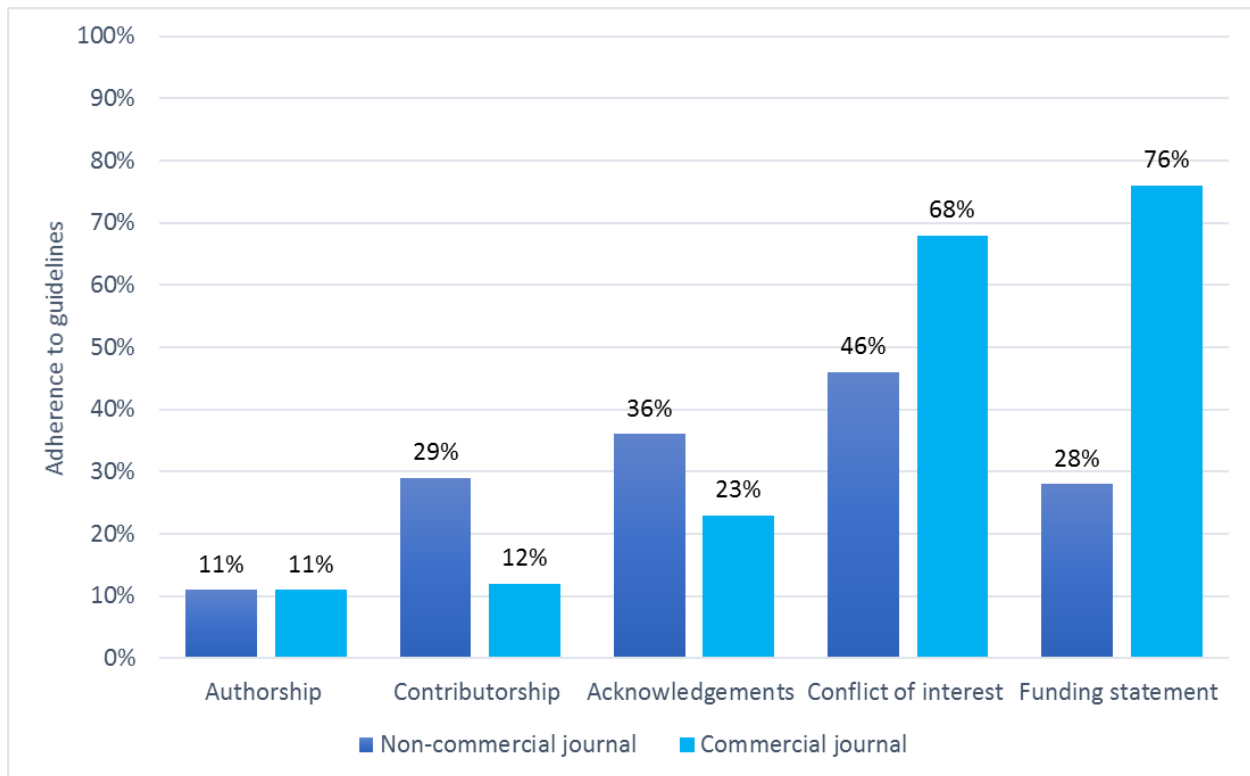
Figure 4-2 Adherence to journal policies and author guidelines

articles published in commercial journals (76%) compared to those published in non-commercial sources (28%) adhered to the guideline.

4.4.7. Plagiarism and redundancy in included articles

4.4.7.1. Overall similarity index (OSI)

The OSI's for all included research articles are depicted in Figure 4-3. Overall, 28% of all included research articles had an OSI of 10% or less. The proportions of articles with an OSI of 10% or less were almost equal for non-commercial journals (27%) and commercial journals (28%). Forty-one per cent of all included articles had an OSI between 11 and 20%, comprising 40% of articles published in non-commercial journals and 42% of articles published in commercial journals. Twenty-one per cent of all included articles had an OSI between 21 and 30%, comprising 20% of articles published in non-commercial and 23% of articles published in commercial journals. Seven per cent of included articles had an OSI between 31 and 40%, comprising more articles published in non-commercial journals (8%) compared to articles published in commercial journals (5%). Five per cent of all included articles had an OSI between 41 and 50%, comprising more articles

published in non-commercial journals (3%) compared to those published in commercial journals (1%).

Two articles (0.4%) had an OSI between 51 and 60%, while three articles (0.6%) had an OSI between 61 and 70%. All five of these articles were published in non-commercial journals.

Overall, 72% of articles (n=358) had an OSI above 10%, comprising 71% (n=147) of articles published in commercial and 73% (n=211) of articles published in non-commercial journals. Among articles published in commercial journals, more articles with an OSI above 10% were published in a journal without a plagiarism policy (49%), compared to those published in a journal with a plagiarism policy (22%). Similarly, among articles published in non-commercial journals, more articles with an OSI above 10% were published in a journal without a plagiarism policy (56%) compared to those published in a journal with a plagiarism policy (17%).
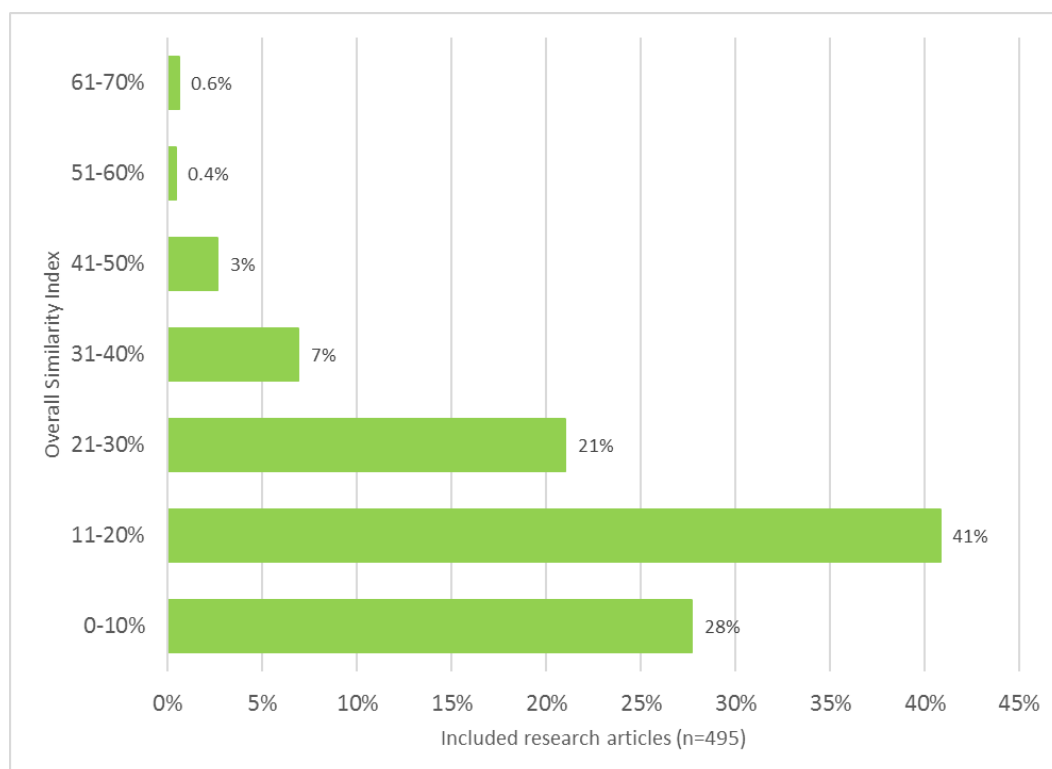
Figure 4-3 OSI's of included research articles (n=495)

4.4.7.2. Rates and extent of plagiarism and redundancy per section of article

We selected 358 articles with an OSI above 10% and then subjected them to a more intensive analysis and assessment of presence and extent of plagiarism (copying of someone else's text) and redundancy (copying of one's own text), using the plagiarism framework (Table 4-1).

Plagiarism mostly occurred in the introduction and discussion sections (Table 4-6, Figure 4-4). We found plagiarism of one to two copied sentences (Level 1) in 24%, three to six copied sentences (Level 2) in 17%, and four linked or more than six copied sentences (Level 3) in 14% of introductions of articles with an OSI above 10%. We found plagiarism of one to two copied sentences (Level 1) in 21%, three to six copied sentences (Level 2) in 17%, and four linked or more than six copied sentences (Level 3) in 12% of discussions of articles with an OSI above 10%. We did not find a difference in levels of plagiarism per section of the article between commercial and non-commercial journals (Appendix 4.10).

Redundancy mostly occurred in the methods section (Table 4-6). We found redundancy of one to two copied sentences (Level 1) in 4%, three to six copied sentences (Level 2) in 5%, and four linked or more than six copied sentences in 4% of the methods sections of articles with an OSI above
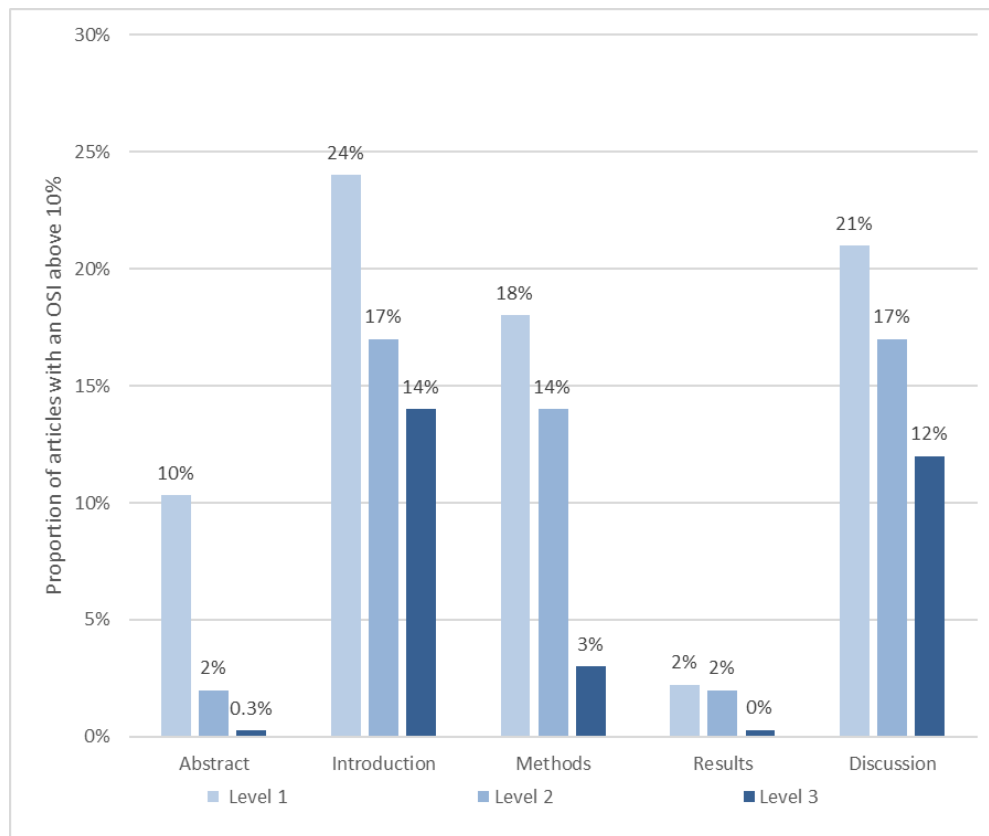
Figure 4-4 Levels of plagiarism per section in articles with an OSI above 10%

10%. We did not find a difference in levels of redundancy per section of the article between commercial and non-commercial journals (Appendix 4.10).

Table 4-6 Levels of plagiarism and redundancy per section in articles with an OSI above 10%

Total n=358	Level 1 1-2 copied sentences	Level 2 3-6 copied sentences	Level 3 4+ linked copied or 6+ copied sentences
Plagiarism			
Abstract	36 (10%)	6 (2%)	1 (0.3%)
Introduction	87 (24%)	61 (17%)	49 (14%)
Methods	63 (18%)	50 (14%)	9 (3%)
Results	8 (2%)	6 (2%)	1 (0.3%)
Discussion	74 (21%)	62 (17%)	42 (12%)
Redundancy			
Abstract	9 (3%)	5 (1%)	2 (0.6%)
Introduction	7 (2%)	4 (1%)	5 (1%)
Methods	14 (4%)	19 (5%)	16 (4%)
Results	5 (1%)	7 (2%)	1 (0.3%)
Discussion	6 (2%)	6 (2%)	1 (0.3%)

4.4.7.3. Rates and extent of overall plagiarism

The plagiarism scores assigned to each section of the article, informed the overall plagiarism scores (Table 4-1). We judged articles with an OSI above 10% with no substantially copied sentences or with one to two copied sentences in the methods section as having no plagiarism.

We found any level of plagiarism in 73% (95%CI 67 to 78) of articles with an OSI above 10% (Figure 4-5). Twenty-six per cent (95%CI 22 to 31) of articles with an OSI above 10% had one to two copied sentences in one or more sections of the article, or three to six copied sentences in the methods section (some overall plagiarism); 25% (95%CI 20 to 29) had three to six copied sentences in one or more sections of the article, or at least four linked or more than six copied sentences in the methods section (moderate overall plagiarism); and 22% (95%CI 18 to 28) had at least four linked or more than six copied sentences in one or more sections of the article (extensive overall plagiarism) (Table 4-7).
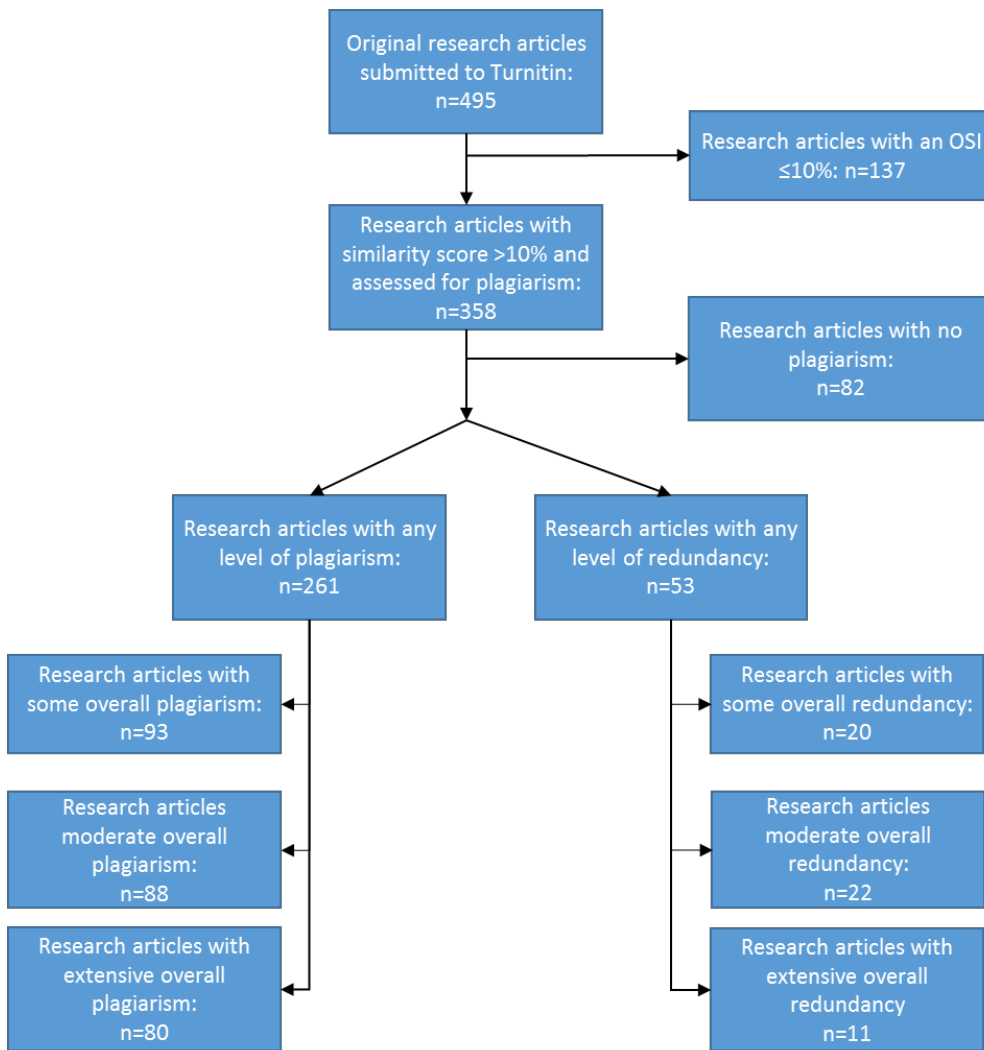
Figure 4-5 Flow diagram showing rates of plagiarism and redundancy

Table 4-7 Overall plagiarism in articles with an OSI above 10% (n=358)

Plagiarism score	Definition	n	% (95 CI)
Some overall plagiarism	One or more sections with plagiarism of one to two sentences; or level 2 plagiarism in the methods section	93	26 (22 to 31)
Moderate overall plagiarism	One or more sections with plagiarism of three to six sentences; or level 3 plagiarism in the methods section	88	25 (20 to 29)
Extensive overall plagiarism	One or more sections with plagiarism of four or more linked sentences, or plagiarism of more than six sentences	80	22 (18 to 28)

We explored the extent of plagiarism according to type of publisher and availability of a policy on plagiarism (Table 4-8). Additional characteristics of articles with any level of plagiarism are reported in Appendix 4.11.

Articles with one to two copied sentences in one or more sections, or three to six copied sentences in the methods section (some overall plagiarism), were equally distributed between articles published in non-commercial and commercial journals. However, more articles with some overall plagiarism were published in journals with no policy on plagiarism (Table 4-8). Amongst articles with three to six copied sentences in one or more sections, or at least four linked or more than six copied sentences in the methods section (moderate overall plagiarism), slightly more were published in a non-commercial journal (27%) compared to those published in commercial journals (21%). More articles with moderate overall plagiarism were published in journals with no policy on plagiarism, compared to those published in journals with a policy on plagiarism (Table 4-8). Notably, we found moderate overall plagiarism in 10 of 36 articles (28%) that reported on trials and in five of 12 articles (42%) that reported on case-control studies (Appendix 4.10). Amongst articles with at least four linked or more than six copied sentences in one or more sections of the article (extensive overall plagiarism), more were published in non-commercial journals (25%) compared to those published in commercial journals (17%). More articles with extensive overall plagiarism were published in a journal with no policy on plagiarism, compared to those published in journals with a policy on plagiarism (Table 4-8). Notably, we found extensive overall plagiarism in 10 of the 21 articles that reported on reviews (48%). Of these, eight were published in a non-commercial journal (Appendix 4.11).

Table 4-8 Overall plagiarism and redundancy according to type of publisher and availability of a plagiarism policy in articles with an OSI above 10%

| | Non-commercial journal (n=211) | | Commercial journal (n=147) | |
| | Plagiarism policy available | | Plagiarism policy available | |
	Yes	No	Yes	No
Overall plagiarism				
Some	12 (6%)	42 (20%)	11 (7%)	28 (19%)
Moderate	13 (6%)	45 (21%)	7 (5%)	23 (16%)
Extensive	12 (6%)	41 (19%)	4 (1%)	23 (16%)
Overall redundancy				
Some	4 (2%)	12 (6%)	3 (2%)	1 (1%)
Moderate	3 (1%)	10 (5%)	7 (5%)	2 (1%)
Extensive	0	10 (5%)	1 (0.6%)	0

4.4.7.4. Rates and extent of overall redundancy

As for the plagiarism scores, the redundancy scores assigned to each section of the article informed the overall redundancy scores (Table 4-1). Overall redundancy was less frequent than plagiarism. We found any level of redundancy in 15% (95%CI 11 to 20) of articles with an OSI above 10% (Figure 4-5). Six per cent (95%CI 3 to 9) of articles with an OSI above 10% had one to two copied sentences in one or more sections of the article, or three to six copied sentences in the methods section (some overall redundancy); 6% (95%CI 4 to 10) had three to six copied sentences in one or more sections of the article, or at least four linked or more than six copied sentences in the methods section (moderate overall redundancy); and 3% (95%CI 2 to 5) had at least four linked or more than six copied sentences in one or more sections of the article (extensive overall redundancy) (Table 4-9). There was no significant difference in the proportions of articles with some overall redundancy or moderate overall redundancy, in terms of type of publisher and availability of a policy on plagiarism (Table 4-8). All articles with extensive overall redundancy were published in non-commercial journals without a plagiarism policy (Table 4-8). Four of the 10 articles (40%) with extensive overall redundancy reported on trials (Appendix 4.12).

Table 4-9 Overall redundancy in articles with an OSI above 10%

Redundancy score	Definition	n	% (95 CI)
Some overall redundancy	One or more sections with redundancy of one to two sentences; or level 2 redundancy in the methods section	20	6 (3 to 9)
Moderate overall redundancy	One or more sections with redundancy of three to six sentences; or level 3 redundancy in the methods section	22	6 (4 to 10)
Extensive overall redundancy	One or more sections with redundancy of four or more linked sentences, or redundancy of more than six sentences	11	3 (2 to 5)

4.4.7.5. OSI and overall plagiarism score

We explored the relationship between OSI and extent of plagiarism. The box-and whisker plot below (Figure 4-6) shows a trend of increasing OSI and extent of plagiarism in articles with an OSI above 10%.
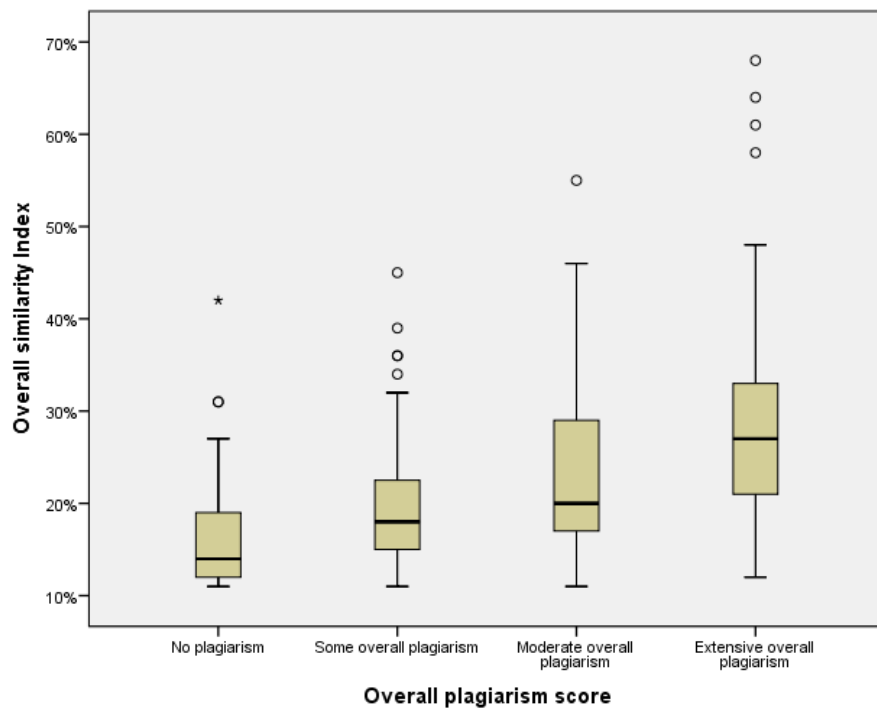
Figure 4-6 Box-and-whisker plot of OSI and overall plagiarism score

4.5.   Acknowledgements

4.6.   References

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Chapter 5

A pilot workshop on research reporting practices
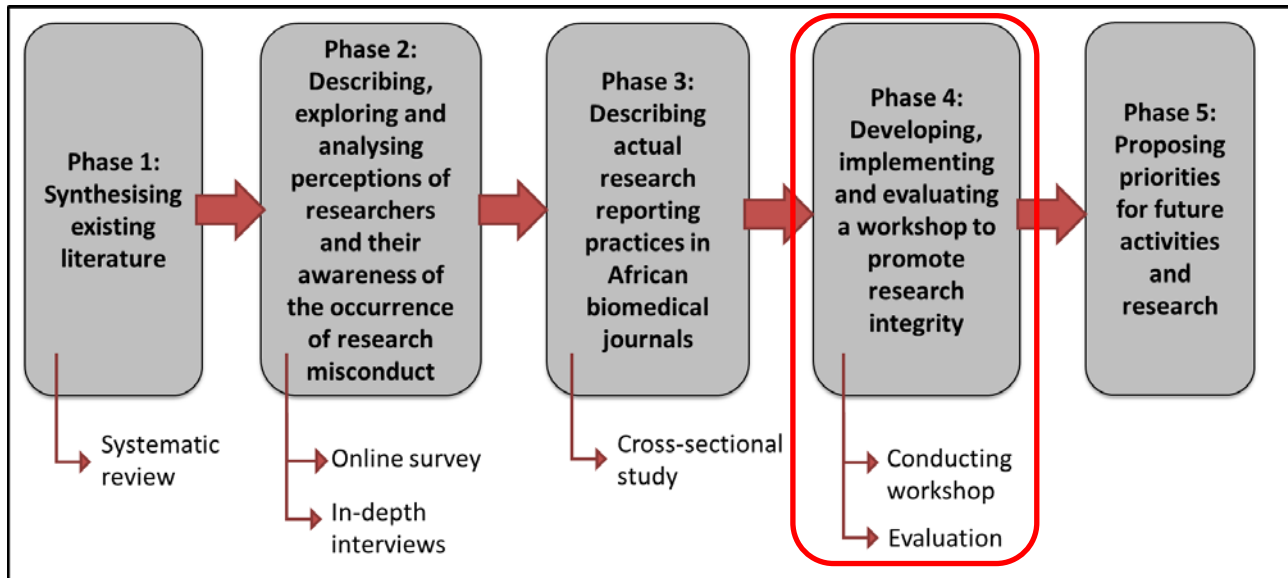
Summary

During phase four of the PhD, we developed, implemented and evaluated a workshop on research integrity. The aim of the workshop was to introduce research integrity and its importance in health research and to promote best practice in authorship attribution, conflicts of interest and avoiding plagiarism and redundant publication.

We offered the workshop to junior and senior researchers at two institutions in Malawi and Nigeria. We used a variety of interactive teaching approaches to facilitate learning. We asked participants to complete an online survey, containing scenarios on authorship, plagiarism, redundant publication and conflicts of interest, before the workshop. During the workshop, participants discussed scenarios in small groups and we presented the aggregate survey responses to the group before giving a lecture on definitions and guidelines related to the relevant practices. To evaluate the workshop, we collected data before (pre-workshop survey survey), during (workshop discussions and evaluation form) and after (post-workshop survey and reflections of facilitators) the workshop.

Both workshops were very well received. Participants felt that research integrity was an important topic area to discuss. They enjoyed the interactive nature of the workshop, the discussions and the use of examples in the form of scenarios and the feedback on the survey responses. They suggested that workshops like these should be offered regularly. Although interaction was good throughout the workshops, participants were particularly passionate about authorship issues. The scenarios on guest authorship provoked lively debates. Participants appeared enlightened when we presented the ICMJE criteria for authorship and it was noticeable that most of them did not know about their existence. Indeed, participants commented that they would be more mindful when attributing authorship.

The workshops intended to kick-start conversations on research integrity at an institutional level. There is a need for continued discussion and institutional policies and guidelines to promote good practices. Training related to research integrity should be extended and ideally included in under- and postgraduate curricula.

Appendices

Appendix 5.1: PowerPoint slides used during workshop

Appendix 5.2: Reading list

Appendix 5.3: Consent form for evaluation of research integrity workshop

Appendix 5.4: Workshop evaluation form

Appendix 5.5: Survey results (Nigeria)

Appendix 5.6: Collated participant feedback (Nigeria)

5.1.   Introduction and rationale

During Phase 4 of the PhD, we developed, implemented and evaluated a workshop designed to introduce research integrity to researchers from African institutions. In the systematic review, Chapter 2 (Phase 1) of the PhD, we found high rates of self-reported and observed undesirable behaviours related to authorship, plagiarism, redundant publication and disclosure of conflicts of interest amongst health researchers from various LMICs. In Chapter 3 (Phase 2), our own survey of Cochrane authors living in LMICs supported these findings, while the in-depth interviews shed more light on the factors influencing irresponsible practices. Inter alia, interviewees highlighted the lack of awareness of good practices, lack of mentoring, as well as negative role-modelling as big drivers of poor practices. In Chapter 4 (Phase 3), we found that few African journals had adequate journal policies and author guidelines, while those that had them, did not always implement them. In addition, we found high rates of plagiarism in a sample of research articles published in these journals. Our findings therefore highlight the need to promote responsible research reporting practices across LMICs.

In the USA, training on responsible conduct of research (RCR) has been mandated by the National Institutes of Health (NIH) since the late 1980s and has become increasingly common since then (1). What appears to be ubiquitous in the USA is lacking in LMICs. In a recent article on the status of research integrity in Brazil, Vasconcelos and colleagues (2015) explain that there are currently only few training initiatives on RCR, with the first formal course being implemented at a Brazilian institution in 2007 (2). While there are some training programmes on research ethics in Africa, these generally focus on ethics related to human and animal participants of studies and do not include topics linked to RCR or research reporting, and formal training on RCR does not exist (3-5).

Marusic and colleagues (2016) assessed the effectiveness of educational or policy interventions to promote research integrity in a systematic review. They included 33 studies that were heterogenous in terms of interventions, participants and outcome measurement and concluded that the effectiveness of training initiatives to prevent research misconduct was unclear (6). However, this does not mean that RCR education is not needed. The aim of RCR training initiatives should include increasing knowledge on good and poor practices, instilling values of honesty, accountability and responsibility and raising awareness about responsible practices rather than solely on preventing misconduct (1, 7). Indeed, training on research integrity or RCR covers a vast

number of topics. The US Office of Research Integrity (ORI) proposed nine core areas to be included during RCR education, namely 1) data acquisition, management, sharing and ownership, 2) mentor/trainee responsibilities, 3) publication practices and responsible authorship, 4) peer review, 5) collaborative science, 6) human subjects, 7) research involving animals, 8) research misconduct, and 9) conflicts of interest and commitment (8). DuBois and colleagues (2009) took this a step further and convened a panel of experts in an effort to reach consensus on the overarching goals and content of RCR teaching. They proposed nine overarching objectives to be addressed during RCR education, and unpacked each of these. In addition, they proposed specific content for each of the ORI's nine core areas, which added up to 43 main topics (7).

It is impossible to cover all the proposed topics in a single workshop on research integrity. Based on the work done in previous chapters, and considering that formal education on research integrity in Africa is lacking, we developed a workshop to introduce research integrity and promote best practices in authorship, plagiarism, redundant publication and conflicts of interest.

5.2.   Objectives

To develop, implement and evaluate a workshop on research reporting practices.

5.3.   Methods

5.3.1. Development of the workshop

We developed the workshop "Doing the right thing: A workshop on research integrity and publication ethics". It was accredited by the Liverpool School of Tropical Medicine in July 2017. A summary of the outline of the workshop is presented in Table 5-1.

5.3.1.1. Aim and learning objectives

The aim of the workshop was to introduce research integrity and its importance in health research and to promote best practice in authorship attribution, conflicts of interest and avoiding plagiarism and redundant publication. Learning objectives to achieve this goal were to discuss research integrity and how it relates to reporting research, and to find and apply current guidelines for good research reporting practice related to authorship, conflicts of interest and plagiarism.

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Table 5-1 Summary of research integrity workshop

Name of workshop	Doing the right thing: A workshop on research integrity and publication ethics
Aim	To introduce research integrity and its importance in health research and to promote best practice in authorship attribution, conflicts of interest and avoiding plagiarism.
Learning objectives	After the workshop, participants will be able to: - Discuss research integrity and how it relates to reporting their research - Find and apply current guidelines for good research reporting practice related to authorship, conflicts of interest and plagiarism
Participants	Junior and senior health researchers, who want to publish in national and international journals including Masters and PhD students as well as postdoctoral researchers
Setting	Institutions in Sub-Saharan Africa
Duration	4 hours
Teaching approach	- Interactive workshop - Using scenarios on research reporting practices as a springboard for discussions - Small group discussions
Programme	*Pre-workshop* - Complete online questionnaire *Workshop* - Why research integrity isn't just somebody else's problem - Authorship, based on questionnaire scenarios - Conflicts of interest, based on the questionnaire scenarios - Plagiarism, based on the questionnaire scenarios - Redundant publication, based on the questionnaire scenarios - How to promote integrity at individual level and group level

5.3.1.2. Setting and participants

We linked with a Research Consortium which aims to increase the use of reliable evidence related to priority health areas in LMICs and has partners in Liverpool, China, India and Sub-Saharan Africa. As buy-in from institutions is vital in implementing training, the existing collaboration presented an excellent opportunity to facilitate workshops on research integrity at sub-Saharan African institutions. Although we explored opportunities to offer workshops in other LMICs, this was not feasible as part of the PhD. However, in view of ongoing collaborations with institutions in China and India, we hope to expand the offering of the workshop to these countries in future.

The workshop was intended for junior and senior researchers, including Masters, PhD and Postdoctoral students, at a single institution. This was important, since the institutional

environment, including existing policies and guidelines, requirements for promotion and culture are all known to influence practices. We wanted to start discussions within an institution, hoping that workshop participants would continue and expand on these at an institutional level. The workshop was developed for a group of 30 to 40 researchers.

5.3.1.3. Content

In addition to a general introduction on research integrity and its importance, our workshop focused on the ORI core areas of "Publication and Responsible Authorship" and "Conflicts of Interest and Commitment" (7, 8). As part of the former, we covered authorship criteria as proposed by the International Committee of Medical Journal Editors (ICMJE) (9), guest authorship, ghost authorship, acknowledgement of contributors, text-recycling (redundant publication) and plagiarism. For each of these, we covered definitions and existing guidelines for best practice. In terms of conflicts of interest, we covered the definition and significance of conflicts of interest, financial and non-financial conflicts of interest, potential versus real conflicts and how to disclose these.

5.3.1.4. Teaching approach

We used a variety of instructional methods to facilitate learning. Our approach encouraged active engagement of participants and included individual and group activities, as well as case-based instruction, all of which have been found to be effective in the delivery of RCR education (10, 11).

The workshop was organised around the scenarios we developed as part of the survey we conducted in Phase 2 (Table 5-2). As a first step, we wanted participants to give their individual response to the scenarios and therefore asked them to complete the online survey on research reporting practices before the workshop (Chapter 3; Appendix 3.2). The survey asked participants to indicate whether the practice portrayed in the scenario was acceptable or not, whether they had engaged in this practice themselves or whether they knew someone who had, and whether it occurred at their institution.

Secondly, we asked participants to discuss the scenarios in small groups during the workshop. Small group learning encourages active participation and sharing of ideas amongst learners and thus promotes deep learning. By engaging learners in discussions and reflections, understanding of complex issues is enhanced (12-14). As the scenarios portrayed practices where the line between what is accepted and what not is blurred, and represented common practices, we believed that

they were particularly suitable for small group discussions. To maximise participation amongst group members, the intended size of the small groups was between five and eight participants, depending on the total number of participants.

Table 5-2 Scenarios used to facilitate learning

Research reporting practice	Scenario
Guest authorship	A junior researcher, J, adds the head of department, D, as the last author on a research paper. D provided suggestions for direction of J's work that helped her obtain the grant, although he hasn't contributed to the actual research or the publication.
	A professor, M, who did not contribute to study design, data collection or data analysis but is an expert in the field, reviews the draft manuscript and suggests some minor changes to the English. He asks to be listed as an author on the paper.
Ghost authorship	A researcher, S, contributes to the design and does most of the data collection in a study but goes on maternity leave as it is being analysed. When she returns to her post she discovers that the research has been published by her supervisor without her name or any acknowledgement of her contributions.
Acknowledgement practices	A Master's student consults with the resident biostatistician, P, to help with data analysis on her research project. In the manuscript that she submits for publication, she lists P in the "Acknowledgement" section.
Text-recycling/redundant publication	A PhD student "copies and pastes" nearly all of the introduction from a paper that she has previously published into her next manuscript, since she is doing a series of experiments on the same topic.
Plagiarism	A researcher in Mozambique wants to submit his manuscript to a journal published in English. He finds a text book in Portuguese that explains an aspect of the background to the disease very well. He translates one paragraph into English, and puts this into his introduction without reference to the book.
	A researcher from India attends an international conference where a European research study with a novel design is presented. He submits a protocol for an identical study to the ethics committee at his home institution. He does not reference the European study.
Conflicts of interest	A researcher, T, is working on a diagnostic test study. The company manufacturing the test has supplied the kits for free but did not design or fund the research. T was paid for a consultancy for the same company two years ago. In the publication of the study, he declares that he has no conflicts of interest.
	A researcher, K, writes a review for treatment guidelines of herbal remedies for children's cough. K's wife is employed by the company that manufactures one of these remedies. In the review, K declares that he has no conflicts of interest.

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Thirdly, we presented anonymous aggregate responses of the pre-workshop survey for each scenario. This provided an overview of participants' views on acceptability of the practice and gave an indication of whether it was a problem in the institution. In addition, we presented the results of the survey we conducted amongst Cochrane authors across LMICs (Chapter 3; Table 3-4).

After discussion of each scenario, relevant definitions and guidelines were presented in lecture format (Appendix 5.1). We deliberately presented the didactic content after discussions of each scenario, so that we would not influence participants' perceptions.

We handed a printed copy of a reading list (Appendix 5.2) to each participant. This contained links to useful websites, such as the Committee of Publication Ethics (COPE) as well as references to existing guidelines, such as the ICMJE recommendations (9).

5.3.2. Evaluation of the workshop

5.3.2.1. Study design and participants

We used quantitative and qualitative methods to evaluate the workshop. Our approach was based on Kirkpatrick's four levels of evaluation: The first level, *reaction*, measures participant satisfaction with the training; the second level, *learning*, measures change in attitude or perceptions (level 2a), knowledge and skills (level 2b); the third level, *behaviour*, measures change in behaviour because of the training; and the fourth level, *results*, measures the impact of the training in the organisation (15-17). We evaluated satisfaction with training (level 1), change in perceptions of research reporting practices (level 2a) and intention to change behaviour (level 3). All workshop participants were invited to take part in the evaluation.
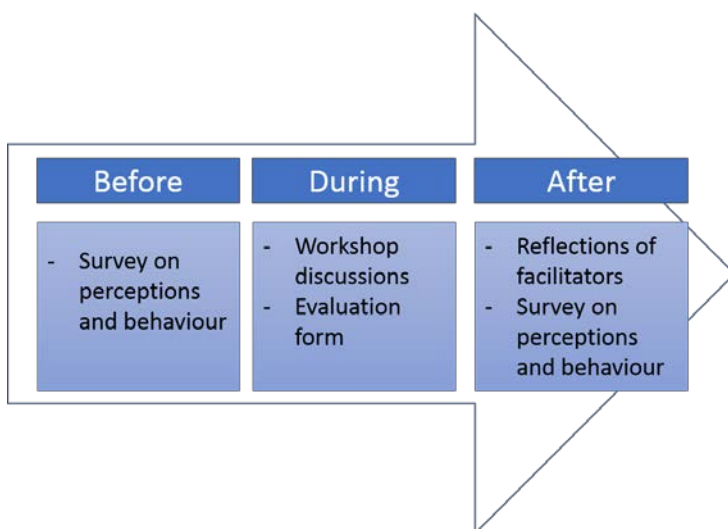
Figure 5-1 Data collection process

5.3.2.2. Data collection

We collected data before, during and after the workshop (Figure 5-1).

5.3.2.2.1. Pre- and post-workshop survey

To assess baseline perceptions and behaviour related to research reporting practices, we asked participants to complete an online survey before the workshop. We used the same scenarios and linked questionnaire developed in Phase 2 (Appendix 3.2). Development of the survey has been described in detail in Chapter 3. We asked participants whether specific practices, related to authorship practices, plagiarism, redundant publication and conflicts of interest were acceptable or not, whether they themselves or someone they knew had engaged in this behaviour in the past, and whether it occurred at their institution.

The link to the pre-workshop survey was emailed to the participants a few days before the workshop. Email addresses of participants were obtained from institutions that hosted the workshop. The email contained information about the evaluation and pointed out that participation was voluntary and that anonymity was ensured. We requested that participants sign an electronic consent form before starting the survey (Appendix 5.3). The survey was set up on Google and participants were able to complete it via mobile devices as well as personal laptops. Although participants were encouraged to complete the survey prior to the workshop, we also allowed time to complete it at the start of the workshop. The results of the pre-workshop survey were used as a springboard for discussions during the workshop.

Six weeks after the workshop, we sent another email with the link to the post-workshop survey. The post-workshop survey contained the same scenarios as the pre-workshop survey, but only asked about perceptions. In addition, the survey asked participants whether they had done anything differently since the workshop in terms of authorship practices, redundant publication, conflicts of interest and plagiarism, and to briefly explain what they had done. We sent two reminders, each one week apart.

5.3.2.2.2. Workshop discussions

We planned to record discussions during the workshop with a digital voice recorder. However, after a trial run, we decided that this was not possible due to numerous background noises from ventilators and generators and generally bad acoustic in the venue. Instead, we took detailed notes during the discussions.

5.3.2.2.3. Evaluation form

At the end of the workshop, we asked participants to complete an evaluation form (Appendix 5.4). The form comprised Likert-scale and open-ended questions on participants' satisfaction with the workshop. Participants were also requested to indicate what they would change based on the new knowledge gained. Anonymity was ensured and completing the form was considered informed consent.

5.3.2.2.4. Reflection of facilitators

After the workshops, facilitators reflected on their experience of the workshop. We thought about and discussed our experiences of the training such as what worked well, what did not work well, and how the workshop could be improved. One author (AR) took notes of the discussions and compiled a written reflection.

5.3.2.3. Data analysis

Quantitative data from the survey and the evaluation forms were collated in an Excel spreadsheet and further analysed with SPSS. We analysed data using descriptive statistics and reported on proportions and frequencies for dichotomous and categorical data (e.g. Likert scale scores). We narratively summarised data from discussions, evaluation forms and reflections.

5.3.2.4. Ethical considerations

Before the workshop, we informed participants that we were piloting the workshop and that we wanted to make use of the data linked to the survey, discussions and evaluation forms and asked them to sign an electronic consent form before the workshop. We clarified that we would not mention any names of institutions in any of the reports. We obtained ethical clearance from the Stellenbosch University Health Research Ethics committee (N14/12/158) as well as from the ethics committee of the institution in Nigeria. General reflections are also included from a workshop run in Malawi, but ethical clearance was not obtained in time to use individual participant data from this session.

5.4. Results

5.4.1. Implementation of workshop

5.4.1.1. Setting and participants

We facilitated the workshop at two institutions in sub-Saharan Africa. The first workshop was held in Malawi, as part of a 3-day publications workshop offered to graduate students in June 2017. Seventeen participants attended the workshop. They were mostly junior researchers and included interns (pre-master's level), Master's and PhD students as well as postdocs and members from the clinical research support staff. Although the invitation to attend the workshop was widely circulated in the institution, only one senior researcher, who was overseeing the graduate students, attended.

The second workshop was offered in Nigeria in July 2017. Forty-four participants attended the workshop. They were mostly senior researchers and included the deans of the four faculties, the provost, various heads of department and professors. Participants were from a variety of disciplines including paediatrics, dentistry, orthopaedics, basic life sciences, and internal medicine.

5.4.1.2. Delivery of the workshops

Both workshops were co-facilitated by Anke Rohwer and Elizabeth Wager and lasted four hours. After a short round of introductions, the workshops commenced with a short lecture to introduce research integrity (Appendix 5.1). We then divided participants into seven groups, according to their seating arrangements. Each group was handed one of the scenarios from the survey for the small-group discussions. The following questions guided the discussions: 1) Why does this matter? 2) Why do researchers engage in this practice? 3) What can we do differently? Each group was asked to write down the key points that emerged from the discussions on a flip-chart, to feed back to the bigger group.

The second part of the workshop consisted of four sessions on plagiarism, redundant publication, conflicts of interest and authorship. Each session started with presentation of the relevant scenario/s. We asked one member of the respective small group to give feedback on the most important points that emerged during the discussion, in terms of the three questions that were asked. Thereafter, participants from the bigger group also had an opportunity to comment on the scenario and we allowed time for discussions. We then presented aggregate results from the pre-workshop survey on perception, behaviour and occurrence of each practice. In addition to

presenting the group's own responses, we also presented responses from the survey of Cochrane authors (Chapter 3). Each session was concluded with a short lecture on the respective practices, which covered definitions as well as available guidelines (e.g. ICMJE criteria) for each topic. Each participant received a list with important websites and guidelines related to publication ethics and research integrity (Appendix 5.2).

5.4.2. Perceptions on research reporting practices

Twenty-one participants from Nigeria (48%) responded to the pre-workshop survey, while 17 participants (39%) responded to the post-workshop survey. Results are summarised in Appendix 5.5 and will be discussed below for each scenario.

Adding the head of department who has not contributed sufficiently

Results of the pre-workshop survey showed that 38% of workshop participants (8/21) thought that adding a head of department, who had not contributed sufficiently was acceptable or did not matter, 14% (3/21) admitted to having done this themselves, while 71% (15/21) indicated that this practice occurred at their institution. Indeed, this scenario provoked a lively debate amongst workshop participants. Some participants believed that giving direction for research was a very important aspect of a publication, as it *"culminate(d) in a tangible result"* and thus *"should be accepted as a relevant reason for inclusion as an author".* They emphasised that junior researchers thought of this practice as *"standing on the shoulders of giants"* and that adding the head of department as an author was a way of showing respect. Others believed that it depended on the quality and extent of the input, and that the head of department should have rather been acknowledged in this scenario. Participants explained that this practice was quite common in their institution for various reasons. Heads of department wanted to increase their number of publications for promotion purposes, while junior researchers wanted to "*enter into the limelight"* and thought that the paper would "*attract the attention of a wider crowd*" if the head of department was an author. One participant cautioned against this practice and rightfully said that authorship was about *"taking responsibility for what is out there, not just taking credit for what was done".* After the workshop, 41% (7/17) of participants that responded to the survey thought that adding a head of department who had not contributed sufficiently was acceptable or did not matter. One respondent commented that authorship was deserved, as the head of department contributed to the research being funded.

Adding an expert in the field who has not contributed sufficiently to the research

Of the workshop participants who completed the pre-workshop survey, 33% (7/21) thought that it was acceptable to add an expert in the field who had not contributed substantially to the research as an author. Similarly, 33% (7/21) admitted to having done this in the past, while 62% (13/21) indicated that it happened in their institution. As with the other scenario on guest authorship, workshop participants engaged in a passionate discussion around this topic. It was evident that this happened regularly in their institution. In addition to the reasons listed above, participants thought that ignorance and respect for senior researchers played a significant role. The notion of *"publish or perish"* was brought up by several participants, who viewed this as the main driver of guest authorship. One participant cautioned against guest authorship and emphasised that there was also *"publish AND perish"* when things went wrong. Participants thought that awareness raising was needed on what constituted authorship, and that institutional guidelines were important. They proposed that training on research reporting practices should be *"embedded"* in health science curricula. After the workshop, 88% (15/17) of participants that responded to the survey thought that adding an expert who has not contributed sufficiently to the work was unacceptable.

Acknowledging a biostatistician for assistance with data analysis

This scenario portrayed a practice that was in line with international guidelines and was deliberately included as an example of acceptable practice. Most respondents to the pre-workshop survey (86%; 18/21) agreed that acknowledging a biostatistician for having consulted on a research project was acceptable. However, only 57% (12/21) indicated that they themselves had done this, while 71% (15/21) said that it happened at their institution. Interestingly, workshop participants did not consider the extent of the contribution of the biostatistician, but the fact that s/he might have been paid, as the main reason for not including her/him as an author. Most respondents thought that the statistician did not merit authorship because s/he was paid and "*has already received his reward in full"*. One participant even thought that *"once he has been paid, he forfeits his right to authorship".* Some participants thought that data analysis is a substantial part of a manuscript and that the biostatistician deserved more than an acknowledgement. After the workshop, 94% (16/17) of participants that responded to the survey agreed that this practice was acceptable.

Omitting an author who has contributed substantially to the research

All respondents to the pre-workshop survey thought that omitting an author who had contributed substantially was unacceptable. None of the respondents admitted to having done this themselves, but 43% (9/21) indicated that it happened at their institution. Workshop participants were in agreement that this practice was unacceptable. Ghost authorship was considered a more serious offense than guest authorship by some, with one participant thinking it *"should be considered academic fraud".* However, researchers, especially junior researchers, did not question this behaviour, but had to "*do [their] work and shut up".* Others thought that it was *"a matter of culture"* within the institution and that it *"discourage(d) participation in joint research".* Participants also discussed ways that authorship disputes could be avoided. One suggestion was that the research team "*should agree what contribution will constitute authorship"* at the beginning of the project. After the workshop, 94% (16/17) of participants that responded to the survey thought that it was unacceptable to omit authors that had contributed substantially to the work. One respondent thought that it did not really matter, as it did not affect the science.

Text-recycling (using one's own work from a previous publication in another)

Re-using one's own work from previous publications was seen as unacceptable by most participants who completed the survey, only one (5%) said that it was acceptable or did not matter. None of the survey respondents admitted to having done this in the past, but 29% (6/21) indicated that it happened in their institution. Some particpants thought that, as this was a case of copy and paste of a large amount of text, it constituted plagiarism. In the small group that discussed this scenario, *"everybody agreed, this is self-plagiarism".* Perceived reasons for engaging in this practice included ignorance, "*intellectual laziness"* and lack of time. Pressure to publish for promotion was brought up as well, as researchers seemingly wanted to take short cuts to get their manuscript published in a certain time frame. Lack of resources, especially in terms of institutional access to journals and databases was seen as a barrier to originality. Access to text-matching software would help to promote good practices, as it could be used to teach students about plagiarism and redundant publication. Workshop participants believed that improved supervision and mentorship was vital to prevent poor practices like this. After the workshop, most participants (88%) that responded to the post-workshop survey thought that text-recycling was unacceptable.

Translating a text without acknowledging the original source

Fourteen per cent of survey respondents (3/21) thought that translating a text without acknowledging the original source was acceptable. None of them admitted to having done this before, but 29% (6/21) indicated that it happened in their institution. Although most workshop participants believed that this was a form of plagiarism, some thought that since the original text was in a textbook, there was no need to reference it. *"That's general knowledge. I don't think you need to reference that."* When we probed this, it emerged that participants did not think that text in a textbook, regardless of the language, constituted original research and that one only needed to reference text from original research published in journal articles. The need for clear guidelines on referencing and paraphrasing, and understanding concepts around plagiarism was identified. After the workshop, all participants that responded to the survey thought that this practice was unacceptable.

Copying an idea without acknowledgement of the original source

All survey respondents, except one, thought that copying an idea without acknowledgement of the original source was unacceptable. None of them admitted to having done this themselves, but four (19%) indicated that it happened at their institution. Workshop participants thought that this was a case of plagiarism and that it *"discourages originality".* However, they believed that this mainly happened due to *"ignorance of the crime".* As in the previous discussions on plagiarism, the need for training and institutional guidelines was highlighted. In addition, participants suggested that the *"establishment of regulatory bodies to check the standards of researchers"* could help promote good practices. After the workshop, all participants that responded to the survey thought that copying an idea without acknowledging the original source was unacceptable.

Not declaring previous financial reimbursement from a company involved in a research project

Most survey respondents thought it was unacceptable not to declare previous reimbursement from a company involved in a research project, but 14% (3/21) thought it was acceptable or did not matter. While none of them admitted to having done this themselves, two participants (10%) indicated that it happened in their institution. Workshop participants believed that the researcher in the scenario had a *"warm relationship with the company"* and that one could therefore not rule out that the results would be biased. This was seen as a clear conflict of interest. Participants also discussed the sponsorship of the test kits in the scenario and thought that this was problematic.

They perceived the cost of research to be an important barrier and proposed that researchers should do more collaborative studies and apply for grants so that they were not dependent on sponsorship from companies. Some participants were concerned that readers would not believe that a study was well conducted if authors declared that they had conflicts of interest. Researchers in general, but senior researchers in particular, should be knowledgeable about conflicts of interest, but as one participant pointed out, *"unfortunately, not all are".* After the workshop, all participants that responded to the survey thought that it was unacceptable not to declare previous links to a company involved in the research.

Not declaring your spouse's link to a company involved in a research project

Of the participants that competed the survey, 24% (5/21) indicated that not declaring your spouse's link to a company involved in a research project was acceptable or did not matter. None of them admitted to having done this in the past, but three (14%) said that it happened at their institution. Even though some participants acknowledged that there was a conflict of interest, most seemed to be confused about why this mattered. They did not see how the spouse's link to the company could have influenced a study. One participant thought that this would benefit the review, since the researcher might have *"watched the action of the remedy on his own child".* We acknowledge that this is a difficult scenario and that respondents might take it very literally, rather than referring to non-disclosure of indirect conflicts of interest. Workshop participants believed that ignorance about the meaning of conflict of interest was the main reason for researchers not declaring these. After the workshop, 88% (15/17) of participants that responded to the survey thought that it was unacceptable not to declare a spouse's link to a company involved in the research.

5.4.3. Participants' satisfaction with workshop

Of the 44 participants who attended the workshop, 29 (66%) completed the evaluation form. The individual feedback was collated (Appendix 5.6) and is summarised below.

Overall, we received very positive feedback. Participants indicated that they found the presentations very good (20; 69%), good (6; 21%) or moderate (2; 7%). All participants thought the content was either useful (4; 14%) or very useful (25; 86%). Participants thought that the workshop was well organised, that the presentations were clear, precise and to the point, and appreciated good time management. They felt that it was an important topic area to discuss. In

particular, they liked the content on authorship practices and redundant publication. Participants enjoyed the interactive nature of the workshop and found the discussions stimulating. They also liked the use of examples in the form of scenarios and the feedback on the survey responses. Participants thought that the workshop should be offered on a regular basis and that junior researchers and postgraduate students should also attend it. They also suggested to have more hands-on exercises, such as reviewing existing articles. Participants indicated that institutional guidelines were needed to improve reporting practices. Selected comments are presented in Table 5-3.

Table 5-3 Selected comments on participant's satisfaction with the workshop

What participants liked about the workshop
• "The group discussion and feedback that generated interesting perspectives on issues raised."
• "This has opened my mind on research integrity especially in relation to authorship…"
• "The way the presentation was done especially with use of specific scenarios"
• "Used adult learning techniques"
• "Very good timing of each session. There is enough forum for group interaction and discussion."
What participants thought could improve the learning
• "More focused group discussion. Session should be extended to 2 days."
• "Constant training and mentoring of researchers. Provision of institutional guidelines. Make RI a common-place discussion topic to improve research."
• "Should have wider presentation particularly to young researchers. Should also target senior researchers to understand their responsibilities. Institution should be advised to monitor research. They should be equipped."

5.4.4. Perceived learning and intention to change behaviour

Workshop participants who completed the evaluation form indicated that they learned a great deal (16; 55%), quite a deal (12; 41%) or a moderate amount (1; 3%). When asked whether there was anything that they would do differently, based on what they had learned, most participants said that they would be more careful when assigning authorship. In particular, they mentioned not adding authors who did not merit authorship as well as not omitting authors who did merit authorship. Some participants also commented that they would avoid redundant publication and salami slicing, as they now understood these concepts better. Speaking more generally, participants said they would try to be more transparent in the reporting of research findings and

adhere to existing guidelines. In addition, they said that they would share what they had learned with colleagues and create more awareness around research integrity. Participants felt that institutions should play a role in supporting researchers and promoting good practices. Selected comments are presented in Table 5-4.

Table 5-4 Selected comments on participants' intention to change behaviour

What participants will do differently based on what they learned
• "Certainly pay more attention to trainee project supervision. Not be part of any publication I cannot take responsibility for."
• "I will not accept gift authorship. I will not allow anyone without significant contribution to be listed as an author."
• "I now know that I should only acknowledge a superior who only made a minor review to the manuscript."
• "I will be more careful with authorship attribution, especially denying credit to any qualified author."
• "That for every publication or start-off of any research, there should be a deliberate and conscious plan laid out for research conduct and publication."
• "I will endeavour to be transparent in the reporting of research findings."

As part of the post-workshop survey, we asked participants whether they had done anything differently since the workshop. Sixty-five per cent (11/17) of respondents indicated that they had changed their behaviour related to authorship. Respondents reported that they had used the ICMJE criteria to support their decisions on authorship and their advice to others; had educated junior researchers and students in their department on good authorship practices; only added authors that had contributed sufficiently to the work to manuscripts and appropriately acknowledged contributors that did not merit authorship; and did not request authorship when they had not contributed sufficiently.

For redundant publication, only two respondents (12%) indicated that they had changed their behaviour. One respondent reported that s/he had "*dropped some papers that were similar*" from the list of publications that was submitted for promotion, while another said that s/he no longer "*sliced"* data, but reported it as a whole.

For conflicts of interest, three respondents (18%) indicated that they had changed their behaviour, in terms of recognising and declaring relevant conflicts of interest.

For plagiarism, 59% (10/17) of respondents indicated that they had done something differently. Respondents reported that they ensured correct referencing of the work of others; used quotes where necessary; educated and advised junior researchers and students on avoiding plagiarism; and used text-matching software to detect plagiarism.

5.4.5. Reflections of facilitators

We were pleased by the positive response to both workshops. It was evident that participants perceived research integrity to be an important topic. In Malawi, participants were mainly junior researchers with little exposure to publications, while participants in Nigeria were mostly senior researchers, heads of department and deans. However, in both workshops, participants recognised poor practices and they equally appeared enlightened when we shared guidelines on authorship and explained conflicts of interest and redundant publication in more detail. The workshop thus appealed to both junior and senior researchers, although a mix of researchers at various levels, as well as postgraduate students would be ideal. Senior researchers should ensure that junior researchers know about relevant publication and reporting guidelines before embarking on their first publication. Yet, many junior researchers are required follow instructions from their senior colleagues and are afraid to stand up to their supervisors. Discussing research integrity in terms of international standards and guidelines with both junior and senior researchers should encourage more transparent conversations on best practices. Indeed, participants in Malawi proposed that senior researchers should have attended the workshop, while those in Nigeria thought that junior researchers and postgraduate students should have attended. Notably, senior researchers in Malawi were invited to participate, but none of them committed to attending the workshop. We experienced the opposite in Nigeria, where academics with very senior positions such as the provost, the deans and heads of departments, cleared their schedules to attend the workshop. It was important to deliver the workshop to researchers from the same institution (as opposed to inviting researchers from other institutions to join), so that participants were on the same page and specific problems at the institution could be addressed.

Using the scenarios to kick-start discussions on reporting practices proved to work very well for both audiences. Scenarios enabled participants to have a common understanding of the issues, which participants could mostly relate to. Indeed, participants in both countries commented on their usefulness, while junior researchers in Malawi would have liked more examples. Asking participants to read the scenarios by completing the survey on research reporting practices before

the workshop was beneficial. Presenting the aggregate responses of the workshop participants and comparing them to responses of the survey done with Cochrane authors (Chapter 3) proved an excellent method of stimulating discussion. Survey responses of workshop participants in both countries were broadly similar to those of Cochrane authors. This seemed to reassure participants. However, the size of the group needs to be considered when presenting responses of workshop participants, as it might be possible to identify individuals when the group is small (less than 10 participants).

Small group discussions allowed participants to discuss scenarios in more detail and share individual experiences. It also afforded everyone an opportunity to take part in the discussions, as some people do not like to voice an opinion in the big group. Small group discussions were lively. Participants appeared to enjoy them and reported this on the evaluation form.

Although interaction was good throughout the workshop, participants were particularly passionate about authorship issues. The scenarios on guest authorship provoked a dynamic debate and an interesting discussion in both settings. This was not unexpected, as Cochrane authors also spoke extensively about authorship problems they encountered in their institutions (Chapter 3). It was striking that perceptions on guest and ghost authorship were very similar between workshop participants and Cochrane authors. Workshop participants appeared delighted when we presented the ICMJE criteria for authorship and it was noticeable that most of them did not know of their existence before the session. However, they seemed relieved that there were rules that they could follow to avoid future conflicts and to help in discussions around authorship. However, results from the post-workshop survey showed that 41% (7/17) of participants still believed that adding a head of department to a manuscript was acceptable or did not matter. Even though this result was surprising, it highlights that authorship is not straightforward and suggests that knowing what constitutes best practice is not the only factor that plays a role when making decisions about authorship.

Overall, we felt that both workshops were a success. However, there are some aspects that need to be considered for future workshops. Although we sent the link to the survey before the workshop, very few participants in Nigeria had completed the survey before the session. We therefore had to allow time at the beginning of the workshop for participants to complete it. This is not ideal, since evaluating the results and preparing graphs for presentation then needs to happen during the first part of the workshop. Asking hosts at the local institution to send out the

survey before the workshop might yield a better response rate. In Malawi, our workshop was embedded in a 3-day workshop on scientific publications. We could therefore personally ask participants to complete the survey the day before the workshop which yielded a response rate close to 100%.

We used the same scenarios that we developed as part of the survey in Chapter 3. Although these worked very well, one could consider adding to them for future workshops. The scenarios on conflict of interest both refer to financial conflicts, a direct and an indirect one. Adding a scenario on non-financial conflicts of interest could help clarify the confusion around this topic. In addition, the scenarios in their current format portray practices where the line between what is acceptable and what not, is blurred. Adding some scenarios that portray practices that are obviously wrong could be beneficial to explain various types of poor practices, especially for less experienced researchers.

On the logistic front, buy-in from institutions is essential for the workshop to be a success. This is difficult to plan and influence, and making use of existing collaborations proved vital. As research misconduct is a sensitive topic and research integrity is poorly understood, one needs to emphasise that the aim of the workshop is not to point fingers and criticise, but to improve knowledge of best practices and promote responsible conduct of research.

Evaluating the long-term effects of a workshop such as ours is difficult. We measured learners' reaction to learning immediately after the workshop. Overall, participants enjoyed the workshop and reported that they found it very useful. We sent a link to the post-workshop survey six weeks after the workshop, to measure change in perception and to ask participants whether they had done anything differently in terms of research reporting practices, since the workshop. Seventeen (39%) workshop participants responded to the post-workshop survey. Of these, 65% had changed their behaviour in terms of authorship, 59% in terms of plagiarism, 18% in terms of conflicts of interest and 12% in terms of redundant publication. Although these results are promising, self-reported behaviour change is not a reliable measure of actual change in behaviour. Ideally, one would want to measure change in individual researcher's practices and how this translates to change in institutional practice in the long term.

In both institutions, participants recognised the need for ongoing discussions on research integrity. Junior researchers in Malawi suggested that a "safe space" to share and discuss their challenges

would be useful. In Nigeria, a small working group was established to start working on an institutional publication policy to guide research reporting. Our workshop aimed to introduce research integrity and certain reporting practices. However, there is much more to be done. In addition to having more awareness-raising workshops like ours, education on the responsible conduct of research should be embedded in under- and post-graduate health programmes and should be the topic of continued discussions within an institution.

5.5.   Acknowledgements

5.6.   References

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Chapter 6

Discussion

6.1.   Introduction

Research integrity is fundamental to any discipline, in any setting. In LMICs, efforts to promote research integrity are limited, and policies as well as training initiatives are lacking (1-4). Furthermore, there is very little research on research integrity, hindering insight into the magnitude and scope of problems (5). Understanding the *status quo* is important to tailor initiatives that promote research integrity in LMICs and to inform future research.

Research misconduct includes a wide spectrum of poor practices and is not limited to serious crimes such as data fabrication and falsification. Poor research reporting practices such as guest and ghost authorship or not declaring conflicts of interest are just as important, more relevant on a day-to-day basis and more common compared to data fabrication and falsification (6-8).

This thesis therefore aimed to understand perceived and actual research reporting practices, in particular those related to authorship, plagiarism, redundant publication and conflicts of interest amongst health researchers from LMICs. We achieved this through quantitative and qualitative research conducted in four phases (Figure 6-1).
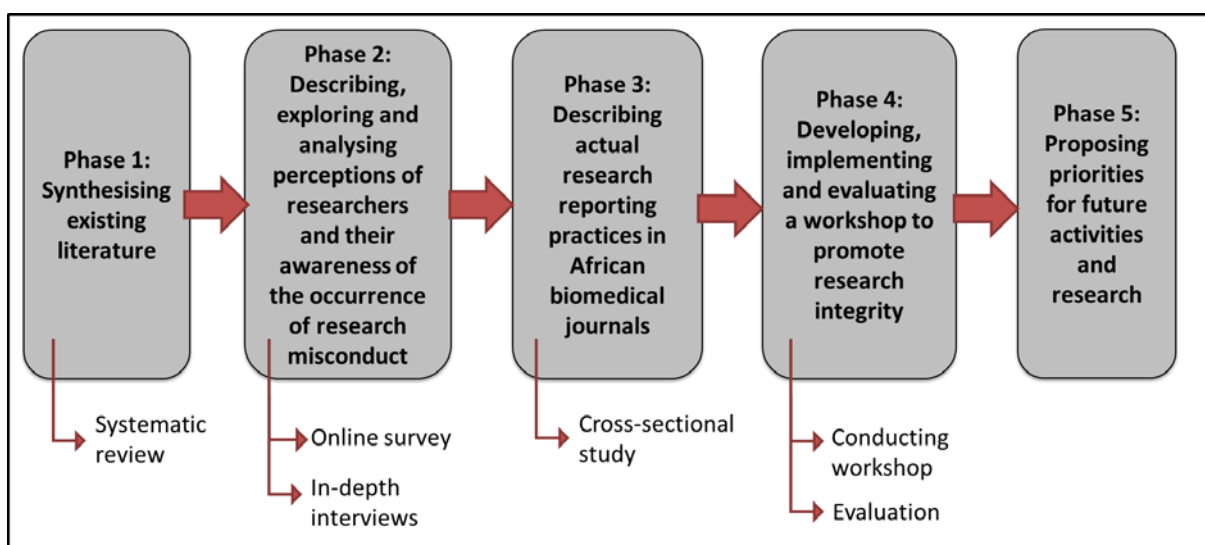
Figure 6-1 Phases of research

In Phase 1 we summarised existing literature from LMICs on the prevalence of and factors influencing research misconduct amongst health researchers (Chapter 2). In Phase 2 we conducted an online survey amongst Cochrane authors living in LMICs to examine perceptions and occurrence of practices related to authorship, plagiarism, redundant publication and conflicts of interest. Survey respondents volunteered to participate in follow-up, in-depth interviews, through which we gained more insight into problems they experienced (Chapter 3). In Phase 3 we analysed and described actual practices in African biomedical journals indexed on AJOL. We measured the rate and extent of plagiarism, by screening articles with text-matching software, and assessing articles with an overall similarity index (OSI) above 10% with a proposed plagiarism framework. Furthermore, we analysed journal policies and author guidelines related to authorship, plagiarism, conflicts of interest and funding sources and examined disclosure of contributions of authors, conflicts of interest and funding sources in a random sample of research articles published in these journals (Chapter 4). In Phase 4, we developed, implemented and evaluated a workshop that aimed to introduce research integrity and best practice related to authorship, plagiarism, redundant publication and conflicts of interest (Chapter 5).

This chapter discusses the findings of the first four phases of the thesis in an integrated way, while phase five will be addressed in the concluding chapter.

6.2.   Contribution to new knowledge

This PhD contributed to the existing knowledge in a number of ways.

The systematic review is the first comprehensive summary of existing studies on the prevalence of and factors influencing research misconduct in health researchers from LMICs. Although the findings indicate that rates of various types of misconduct are high, included studies were mostly of poor quality. Only two of the 32 included studies were conducted in Africa and few explored perceptions on and factors influencing research integrity.

We conducted an online survey of Cochrane authors living in LMICs. We developed hypothetical scenarios to elicit responses on acceptability and occurrence of poor practices. The findings highlight that although respondents thought the practices were unacceptable, they do occur. This is the first survey to show that guest authorship is an important problem across LMICs.

We conducted follow-up, in depth interviews with survey respondents. To our knowledge, this is the first qualitative study of participants across LMICs that explores health researchers' experiences with poor practices. Interviews provided rich data and our findings indicate that the need for publications for promotion and the desire for academic status and power are the main factors that influence research integrity and that organisational culture and institutional systems enable research misconduct. Our findings also show that there is poor understanding of conflicts of interest.

We measured actual rates of plagiarism in African biomedical journal articles. In addition to screening manuscripts with Turnitin text-matching software, we developed a plagiarism framework to objectively evaluate the presence and extent of plagiarism in terms of number of copied sentences. This is the first study to explore plagiarism in articles published in African biomedical journals. Furthermore, we are not aware of other, similar tools that can be used to determine the presence of plagiarism in a consistent and objective manner. We found very high rates of plagiarism in the sample of articles.

We analysed African biomedical journal policies and author guidelines. Not only is this the first study to explore this, but it is also unique in that it also examined adherence to these guidelines in research articles published in these journals. Our findings show that policies and guidelines on research reporting practices are inadequate, especially those of non-commercial journals. In addition, existing guidelines are poorly implemented across journals, as shown in the analysis of research articles.

We developed, implemented and evaluated a half-day workshop to introduce research integrity and best practices related to authorship, plagiarism, redundant publication and conflicts of interest in two African countries. We are not aware of similar workshops currently being offered in Sub-Saharan Africa. Our workshop therefore played a key role in raising awareness about research integrity at African institutions. We envisage expanding the offering of this workshop, as awareness raising and training are vital in the promotion of research integrity.

6.3.   Summary of thesis findings

We present findings on perceived and actual practices related to authorship, plagiarism, redundant publication, conflicts of interest and general impressions related to research integrity among health researchers from LMICs.

6.3.1. Authorship practices

Authorship emerged as an important topic across phases of the PhD. Poor practice related to authorship included guest authorship (adding authors that did not contribute substantially to the work) and ghost authorship (omitting authors that contributed substantially to the work).

6.3.1.1. *Prevalence of guest authorship*

Findings related to guest authorship were consistent across Phases 1 to 4. Guest authorship was assessed in terms of self-reported practice or practice observed in others, and in terms of mapping author contributions in manuscripts to the authorship criteria put forward by the International Committee of Medical Journal Editors (ICMJE).

We found high rates of guest authorship in terms of self-reported practice or practice observed in others in Phase 1, Phase 2 and Phase 4 of the PhD. In the systematic review (Phase 1) four cross-sectional studies, two with moderate and two with high risk of bias, reported on the proportion of health researchers admitting to having added authors inappropriately, ranging from 24% to 66%. Two studies with high risk of bias reported on the proportion of health researchers admitting to having inappropriately received authorship, ranging from 7% to 29%. One study with high risk of bias found that 65% of health researchers admitted to knowing about others who had inappropriately added authors. However, due to the study limitations, further research is very likely to have an important impact on our confidence in the results and may change the results.

We included two scenarios related to guest authorship in the survey of Cochrane authors living in LMICs (Phase 2) and the pre-workshop survey amongst workshop participants in Nigeria (Phase 4). The first scenario portrayed the practice of adding a head of department who had not contributed substantially to the research. Although Cochrane authors from LMICs (Phase 2) thought that this was unacceptable, 35% of respondents thought that is was acceptable. Twenty-four per cent admitted to having done this in the past and 77% indicated that this happened at their institution. Similarly, 38% of workshop participants (Phase 4) thought that this practice was acceptable, 14% admitted to having done this themselves and 71% indicated that it happened at their institution.

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The second scenario on guest authorship portrayed the practice of adding an expert in the field whose only contribution was minor language editing. As with the previous scenario, 33% of Cochrane authors that responded to the survey (Phase 2) thought this was acceptable, 21% admitted to having done this in the past and 71% indicated that it occurred at their institution. Similarly, 33% of workshop participants (Phase 4) thought this practice was acceptable or did not matter, 33% admitted to having done this in the past and 62% indicated that it happened at their institution.

We also found high rates of guest authorship in terms of unjustified authorship according to ICMJE criteria in Phase 1 and 3 of the PhD. In the systematic review (Phase 1) three cross-sectional studies of health researchers, two with moderate and one with high risk of bias and two cross-sectional studies of biomedical research articles, both with high risk of bias, reported on unjustified authorship according to whether author contributions met the ICMJE criteria, ranging from 6% to 56%. The analysis of research articles published in African biomedical journals (Phase 3) found that only 12% (60/495) of research articles disclosed contributions of authors. Of these, contributorship statements of only 13 articles addressed all the ICMJE criteria for each listed author. This can be translated into the presence of unjustified authorship in 78% of research articles with contributorship statements.

6.3.1.2. *Prevalence of ghost authorship*

Findings related to ghost authorship were also consistent across phases 1, 2 and 4. As with guest authorship, reported rates of ghost authorship were assessed in terms of self-reported behaviour or behaviour observed in others. Self-reported rates of ghost authorship were much lower than those reported for guest authorship. However, rates of observed behaviour in others were high, although not as high as those reported for guest authorship.

In the systematic review (Phase 1), one study with high risk of bias reported that 20% of health researchers admitted to having omitted authors in the past, while another study with high risk of bias reported that 34% of health researchers admitted to knowing about others who had done this. One study with moderate risk of bias, found that 43% of participants were not included as an author when they felt that authorship was deserved. However, due to the study limitations, further research is very likely to have an important impact on our confidence in the results and may change the results.

We included one scenario on ghost authorship in the survey of Cochrane authors (Phase 2) and the pre-workshop survey of workshop participants from Nigeria (Phase 4). Almost all (99%) Cochrane authors that responded to the survey (Phase 2) thought that this practice was unacceptable. While only 2% admitted to having done this in the past, 41% said that this happened at their institution. Workshop participants in Nigeria (Phase 4) had similar responses. All participants thought that this practice was unacceptable and none of them admitted to having done this in the past. However, 43% indicated that it occurred in their institution.

6.3.1.3. Factors influencing authorship practices

Authorship was a prominent topic of conversation during Phase 2 and 4 of the PhD. Cochrane authors from LMICs participating in interviews thought that guest authorship was widespread, while the scenarios on authorship provoked lively debates among workshop participants. Factors influencing poor practices were related to the researcher, the internal and the external research environment (Figure 1-1, Chapter 1).

Factors related to the researcher

We found that lack of knowledge of existing guidelines on authorship, such as the criteria set out by the ICMJE, also contributed to poor practices. Three cross-sectional studies of health researchers included in the systematic review (Phase 1) reported on knowledge of authorship criteria. One study with moderate risk of bias found that 65% of participants were aware of the ICMJE criteria, while three studies, all with moderate risk of bias, found that only half of the survey participants through that all ICMJE criteria had to be met for someone to qualify as an author.

During the interviews with Cochrane authors (Phase 2) it emerged that the ICMJE criteria were not widely known or used in LMIC institutions. This became evident during the workshops we conducted (Phase 4), when, after lively debates about authorship, workshop participants were visibly enlightened when we presented the ICMJE criteria for authorship. Some even seemed relieved that rules did exist, as it would help them manage future conflicts about authorship.

Factors related to the internal research environment

Interviewees in Phase 2 as well as workshop participants in Phase 4 shared many examples of researchers being added to manuscripts even though they did not contribute to the work. The emphasis on the number of publications for promotions was seen as the main driver of poor

practices related to authorship, as promotion came with academic status and clout. According to participants, junior researchers added senior researchers out of respect, to make their paper look better, due to lack of knowledge of guidelines on authorship, or because it was mandatory in their specific department. Senior researchers added authors as a favour to their colleagues, family and friends, to reward someone for having paid the publication fees, or because they were told to do so by their superiors. In some cases, senior authors took over first authorship of their students' work, or in extreme cases, published students' work without adding their names to the manuscript.

Indeed, Cochrane authors participating in interviews (Phase 2) and workshop participants from Nigeria and Malawi (Phase 4) alluded to the existence of a tension between junior and senior researchers. Junior researchers were often afraid to stand up to their seniors and depended on their approval to advance their careers. During the interviews, junior researchers were very emotional when they recounted instances where they had been treated unfairly – this mainly related to cases where they had done the work but were left off the author list. Workshop participant also recounted personal experiences of being omitted from publications. Indeed, a lot of participants thought that ghost authorship was worse than guest authorship, and was it even labelled as "academic fraud" by a workshop participant in Nigeria.

Factors related to the external research environment

African biomedical journals did not have adequate authorship guidelines in Phase 3. Fifty-two per cent of eligible journals indexed on AJOL had a guideline on authorship, which described who qualified as an author, while 48% had a contributorship policy, that required authors to disclose author contributions in the manuscript. Most of the journals with commercial publishers had a guideline on authorship (78%) and contributorship (71%), while few journals with non-commercial publishers had a guideline on authorship (34%) or contributorship (32%). However, of the 52 journals with a guideline on authorship, guidelines of only four journals were in line with the new ICMJE criteria, specifying four criteria that need to be met for authorship, which were put forward in 2013. In addition, we found that existing journal guidelines were poorly implemented. Of the included research articles published in eligible journals, only 12% disclosed contributions of authors. Of these, most articles were published in non-commercial journals without a guideline on authorship. Regarding articles published in a journal with a contirbutorship policy, most articles

that disclosed author contributions were published in a non-commercial journal with a policy on contributorship.

6.3.2. Plagiarism

Plagiarism was addressed in Phases 1 to 4. Although researchers reported that plagiarism did not occur that often, we found very high rates of plagiarism in articles published in African biomedical journals.

6.3.2.1. Prevalence of plagiarism

The prevalence of plagiarism was assessed in terms of self-reported practice, practice observed in others and evidence of copied text in manuscripts.

The systematic review (Phase 1) included five cross-sectional studies of health researchers, three with moderate and one with high risk of bias, that reported on the proportion of health researchers admitting to plagiarism, ranging from 5% to 73%. Studies reporting on the proportion of health researchers admitting to knowing about others who had plagiarised (3 studies, moderate to high risk of bias), generally reported higher rates of plagiarism, ranging from 54% to 89%. . However, due to the study limitations, further research is very likely to have an important impact on our confidence in the results and may change the results

We found lower rates of self-reported and observed plagiarism amongst Cochrane authors from LMICs (Phase 2) and Nigerian workshop participants (Phase 4). The survey included two scenarios on plagiarism. The first related to translating a text without acknowledging the original source. Amongst Cochrane authors that responded to the survey (Phase 2), 96% thought that this practice was unacceptable, 3% admitted to having done this in the past and 43% indicated that this happened in their institution. Similarly, 86% of workshop participants from Nigeria (Phase 4) thought that this practice was unacceptable, none of them admitted to having done this before and 29% said that it happened in their institution.

The second scenario on plagiarism related to copying of an idea without acknowledging the original source. Amongst Cochrane authors from LMICs (Phase 2), 90% thought that this practice was unacceptable, 3% admitted to having done this before and 43% indicated that it happened at their institution. Amongst workshop participants from Nigeria (Phase 4), 95% thought that this practice was unacceptable, none of them admitted to having done this before and 19% indicated that it happened at their institution.

Examining manuscripts for plagiarism is a more objective way of measuring the prevalence of plagiarism. One study included in the systematic review (Phase 1), used Dustball text-matching software to assess plagiarism in the introduction of manuscripts from Iran, Turkey and China. They found that 39% of manuscripts from Iran had evidence of plagiarism, with similar results for manuscripts from Turkey and China. However, the authors defined plagiarism as the presence of one completely copied sentence, which seems inadequate.

We measured actual rates of plagiarism in a random sample of research articles published in African biomedical journals indexed on AJOL (Phase 4). We used Turnitin text-matching software to screen articles for plagiarism and assessed all articles with an overall similarity index (OSI) above 10% with the plagiarism framework we developed. We defined plagiarism in each section of the article according to the number of copied sentences. The plagiarism score in each section informed the overall plagiarism score. We found evidence of plagiarism in 73% (95%CI 67 to 78) of articles with an OSI above 10%. Of these, 26% (95%CI 67 to 78) had one to two copied sentences in one or more sections or three to six copied sentences in the methods section (some overall plagiarism), 25% (95%CI 20 to 29) had three to six copied sentences in one or more sections or at least four linked or more than six copied sentences in the methods section (moderate overall plagiarism), and 22% (95%CI 18 to 28) had at least four linked or more than six copied sentences in one or more sections (extensive overall plagiarism). A similar proportion of articles with some overall plagiarism were published in non-commercial and commercial journals. More articles published in non-commercial journals had evidence of moderate and extensive overall plagiarism compared to articles published in commercial journals. Notably, we found extensive overall plagiarism in almost half of the included articles that reported on reviews. From all the included study designs, this finding stood out, even though only 21 of the 495 articles were reviews.

6.3.2.2. Factors influencing plagiarism

Factors influencing plagiarism were related to the researcher, the internal and the external research environment (Figure 1-1, Chapter 1).

Factors related to the researcher and the internal research environment

We found that lack of knowledge and awareness was an important factor that influenced poor practice related to plagiarism. The systematic review (Phase 1) included three cross-sectional studies of health researchers that reported on knowledge on plagiarism. Each study measured

different aspects of knowledge related to plagiarism and it was difficult to make an overall conclusion. In addition, four cross-sectional studies of health researchers assessed attitude towards plagiarism, using the validated Attitude towards Plagiarism (ATP) questionnaire. However, only one study correctly analysed responses according to the intentions of the questionnaire (9, 10) and found a moderate attitude towards plagiarism amongst medical and dental postgraduate students, meaning that they neither approved nor disapproved of plagiarism.

Although interviewees in Phase 2 knew about serious cases of plagiarism at their institutions, they alluded to the general lack of awareness about plagiarism. Workshop participants reiterated this and explained that researchers were generally not aware about what constituted plagiarism and thus ignorantly engaged in poor practices. Most institutions did not have access to text-matching software, which is a useful tool for postgraduate students and researchers in general, to learn about plagiarism. In addition, most institutions did not have policies on plagiarism, while those that did mostly referred to academic cheating amongst students and did not apply to researchers publishing their work in journals.

We found that only 26% of African biomedical journals indexed on AJOL had a plagiarism policy (Phase 3), while only about half of these included a definition of plagiarism and roughly two-thirds made a reference to plagiarism software. More journals with commercial publishers compared to journals with non-commercial publishers had plagiarism policies. We found that fewer articles published in journals with policies on plagiarism had evidence of plagiarism, compared to those published in journals without plagiarism policies. This suggests that plagiarism policies do have a positive effect in terms of promoting good practices.

6.3.3. Redundant publication

Redundant publication is an overarching term used to describe re-using of one's own text in publications, including republishing of an entire paper (duplicate publication), publishing parts of the results in separate papers (salami slicing) and re-using large amounts of text in different publications (text-recycling). Although the systematic review (Phase 1) included studies that reported on all of these, Phases 2 to 4 only assessed practices related to text-recycling.

6.3.3.1. Prevalence of redundant publication

Redundancy was assessed in terms of self-reported practice, practice observed in others or in terms of evidence of redundancy in published articles.

The systematic review (Phase 1) included two cross-sectional studies of health researchers that reported on redundancy. One study with moderate risk of bias reported that 5% of health researchers admitted to redundant publication. Another study with high risk of bias found that 21% of health researchers knew about duplicate publication, and 33% knew about salami publication in others. However, due to the study limitations, further research is very likely to have an important impact on our confidence in the results and may change the results.

We found similar rates of self-reported redundancy and observed redundancy in others in Phase 2 and 4. These were based on a scenario on text-recycling that was included in the survey of Cochrane authors (Phase 2) and the pre-workshop survey of Nigerian workshop participants (Phase 4). Amongst Cochrane authors that responded to the survey, 71% thought that this practice was unacceptable, 2% admitted to having done this in the past and 60% indicated that it occurred in their institution. Among Nigerian workshop participants, 95% thought that this was unacceptable, none of them admitted to having done this in the past, and 29% indicated that it happened at their institution.

Three cross-sectional studies of biomedical articles included in the systematic review (Phase 1) assessed published articles for redundancy. One study with high risk of bias found duplicate publication in 8% of articles and redundancy of sections of an article in 10%. Another study with moderate risk of bias found substantial overlap in 19% of articles and minor overlap in 6%, while one study with low risk of bias reported covert duplicate publication in 10% of Chinese articles on Budd-Chiari syndrome.

We found evidence of redundancy in 15% of included research articles of African biomedical journals with an OSI above 10% (Phase 3). We used the same definitions as for plagiarism to classify overall redundancy in articles. We found *some overall redundancy* in 6% of articles, most of which were published in non-commercial journals, *moderate overall redundancy* in 6% of articles, evenly distributed between commercial and non-commercial journals, and *extensive overall redundancy* in 3% of articles, all of which were published in non-commercial journals.

6.3.3.2. *Factors influencing redundancy*

As most participants thought of redundancy as being self-plagiarism, and therefore a subset of plagiarism, redundancy was rarely addressed out of the context of plagiarism.

However, Cochrane authors participating in the interviews (Phase 2) as well as workshop participants (Phase 4) thought that some researchers engaged in this practice to increase their number of publications that they required for promotion.

6.3.4. Conflicts of interest

Our findings related to conflicts of interest indicate that these are poorly understood by many health researchers from LMICs. In Phases 1 to 4, conflicts of interest were assessed according to whether they were declared or not. Indeed, poor practice does not relate to the existence of conflicts of interest, but rather to whether researchers are transparent about them.

6.3.4.1. *Prevalence of non-disclosure of conflicts of interest*

Non-disclosure of conflicts of interest was assessed in terms of self-reported practice, practice observed in others and the absence of declarations of conflicts of interest in published articles.

One cross-sectional study of health researchers, with high risk of bias, included in the systematic review (Phase 1) reported that 98% of health researchers admitted to not having declared conflicts of interest in the past. However, due to the study limitations, further research is very likely to have an important impact on our confidence in the results and may change the results.

We found much lower rates of non-disclosure of conflicts of interest in terms of self-reported practice and practice observed in others, amongst Cochrane authors from LMICs (Phase 2) and Nigerian workshop participants (Phase 4). These related to two scenarios on conflicts of interest in the survey. Both scenarios portrayed cases of non-disclosure of financial conflicts of interest, one in terms of non-disclosure of direct financial conflicts of interest and one in terms of non-disclosure of indirect financial conflicts of interest. Not declaring previous financial reimbursements from a company involved in a research project (direct financial conflict of interest) was regarded as unacceptable by 87% of Cochrane authors responding to the survey (Phase 2), 3% said they had no declared relevant financial conflicts of interest in the past, while 40% indicated that this happened at their institution. Amongst workshop participants (Phase 4), 86% thought it was unacceptable, none of them admitted to having done this in the past, while 10% indicated that it occurred at their institution.

Not declaring a spouse's link to a company involved in a research project (indirect financial conflict of interest) was seen as unacceptable by 76% of Cochrane authors that responded to the survey (Phase2), 2% said that they had not declared similar conflicts of interest in the past, while 28%

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indicated that it occurred in their institution. Similarly, 76% of workshop participants from Nigeria (Phase 4) thought this practice was unacceptable, none of them admitted to having done this in the past, and 14% indicated that it happened at their institution.

The systematic review included six cross-sectional studies of biomedical research articles, four with moderate, one with high and one with low risk of bias, that assessed the absence of declarations of conflicts of interest. The proportion of articles without declarations of conflicts of interest ranged from 45% to 81%.

We found similar high rates of absence of disclosures of conflicts of interest in the analysis of research articles published in African biomedical journals indexed on AJOL (Phase 3). Of all included articles, 56% did not declare conflicts of interest, while most articles that did declare conflicts of interest, were published in commercial journals with a guideline on conflicts of interest. Interestingly, of the 229 articles that declared conflicts of interest, only two declared financial conflicts of interest, none declared non-financial conflicts of interest and the rest declared no known conflicts of interest.

6.3.4.2. *Factors influencing disclosure of conflicts of interest*

Factors influencing poor practices were related to the researcher and the external research environment (Figure 1-1, Chapter 1).

Factors related to the researcher

Lack of understanding of conflicts of interest in terms of what they are and when to declare them, emerged as an important theme during interviews with Cochrane authors (Phase 2) and during workshops (Phase 4). While they generally understood the potential bias that could result from direct financial conflicts of interest such as reimbursement from a company, they appeared confused about the scenario on an indirect financial conflict of interest. Most workshop participants did not understand why this mattered, as the spouse did not have any influence in the work of the researcher. Similarly, some interviewees thought that they did not have to declare conflicts of interest if they did not perceive them to influence their research. Non-financial conflicts of interest were equally poorly understood. There was uncertainty to what extent researchers had to declare their personal and work-related relationships. Interviewees and workshop participants highlighted that non-disclosure of conflicts of interests was most likely

related to researchers' poor understanding of the concept and the implications thereof. They also identified the lack of adequate guidelines that could promote transparency.

Factors related to the external research environment

In our analysis of author guidelines of African biomedical journals indexed on AJOL (Phase 3), we found that 63% of journals required authors to declare conflicts of interest. However, only 36% of journals included a definition of conflicts of interest, while 48% included information on what had to be declared. Most of these journals only referred to financial conflicts of interest. Implementation of guidelines on conflicts of interest appeared to differ between commercial and non-commercial journals. Of research articles published in commercial journals, 60% with declarations of conflicts of interest were published in journals with a guideline, while 3% with declarations of conflicts of interest were published in a journal without a guideline. Of research articles published in non-commercial journals, 21% with declarations of conflicts of interest were published in a journal with a guideline, while 13% with declarations of conflicts of interest were published in a journal without a guideline. Notably, of all included articles that declared conflicts of interest (n=229), only two declared financial conflicts of interest, none declared non-financial conflicts of interest and the rest declared no known conflicts of interest. It is hard to believe that authors of 227 research articles had no financial or non-financial conflicts of interest. However, in light of the insight gained during Phase 2 and 4, the results can be regarded as adding to the notion that conflicts of interest are poorly understood among health researchers from LMICs.

6.3.5. Findings related to research integrity in general

This section presents findings from the various phases of the research that relate to research integrity and research misconduct in general, and practices that were not covered in the previous sections. Reflections of the PhD candidate in terms of insight gained throughout the phases of the PhD are integrated into this section.

A recurring theme of the PhD was the prominent role publications played in a researcher's career. Researchers need a certain amount of publications in order to be promoted to the next level of the institutional hierarchy, which comes with more power and more status. Therefore, in order to gain power, academic status and recognition, researchers need to have their names on as many publications as possible. This desire to become king of the academic jungle appears to be pronounced to such an extent where the research *per se* is no longer what matters. However, the

researchers are not the only ones to blame, but also the systems within which they operate. Institutions set the requirements for promotion and emphasise quantity of publications instead of quality and impact. This drives seemingly harmless misconduct such as guest authorship, ghost authorship and redundant publication, but also more serious forms of misconduct such as plagiarism, data fabrication and falsification.

Although the two latter practices were not the focus of the PhD, interviewees in Phase 2 did mention that they were concerned about these practices happening at their institution. The systematic review (Phase1) reported rates of data fabrication and falsification that were alarmingly high. However, results need to be interpreted with caution due to the limitations of included studies. One study with moderate risk of bias reported that 14% of health researchers admitted to having fabricated data, and 10% admitted to having falsified data. Another study with moderate risk of bias reported that 27% of health researchers admitted to having falsified data themselves and 91% admitted to knowing of others who had done this. One study with high risk of bias reported that 57% of participants admitted to knowing about others who had fabricated or falsified data.

While it appeared that the desire for power and status was driving poor practices mostly in senior researchers, reasons for junior researchers engaging in poor practices appeared to be different. This notion first came to light during the interviews with Cochrane authors in Phase 2, while the workshop in Malawi, where participants were predominantly junior researchers, shed some more light on the experiences of junior researchers. Some simply did not know what constituted best practice and therefore unknowingly engaged in poor practices such as guest authorship, text-recycling and copying of text. Others knew what best practices were, but had to follow the rules of their superiors (which often related to poor practices), and did not have the courage to stand up to them. Although they were very frustrated with these practices, postgraduate students, in particular, depended on their supervisors to obtain their degrees and hence felt that they had no choice other than to comply with the rules. Not only is this practice unfair towards junior researchers, but it also exposes them to negative role-modelling.

Indeed, a lot of Cochrane authors that we interviewed expressed concern about the lack of positive and the existence of negative role-modelling in their institutions. This appeared to be entrenched in the organizational culture of the institutions rather than linked to individuals. Although interviewees, especially those that represented senior researchers, often played an

important role in the promotion of research integrity, their efforts were often not supported by other researchers and faculty management. During the interviews, it frequently seemed as if interviewees were grateful that they had an opportunity to share their experiences and frustration with someone.

We were surprised that senior researchers in Malawi were not interested in attending the workshop on research integrity (Phase 4). One of the participants explained that it might be due to the fact that they did not really see the significance thereof and hence did not prioritise it as an activity they wanted to join. In contrast, workshop participants in Nigeria were mostly very senior researchers and included the provost, the deans of the faculties and heads of department. They thought that research integrity was an important topic and had therefore cleared their schedules for that day. Clearly, researchers in Nigeria had been sensitised to the topic, whereas awareness thereof was lacking in Malawi.

The Cochrane authors we interviewed also emphasised the need for increased awareness raising in terms of research integrity, as a necessary first step to improving practice. The workshop we developed during Phase 4, aimed to do exactly that – introduce the concept of research integrity and best practices regarding authorship practices, plagiarism, redundant publication and conflicts of interest. The workshop was very well received in both Malawi and Nigeria. Workshop participants suggested that there should be more training initiatives like this for all levels of researchers and that more comprehensive training should become mandatory for all students.

Although awareness raising and training are important in promoting good practices, interviewees (Phase 2) also suggested that institutional guidelines and policies, channels for whistle blowing and punishments for offenders were needed. Most interviewees reported that their institution did not have a dedicated research integrity officer and that guidelines were not available. Indeed, it emerged that the institutions, representing the internal research environment, played a key role in the promotion of research integrity. As described above, this includes structural as well as cultural aspects.

As part of the external research environment, we explored whether African journals indexed on AJOL promote best practices in research reporting (Phase 3), by analysing their policies and author guidelines related to authorship, plagiarism, conflicts of interest and funding sources. Although journals only represent one aspect of the external environment, we had two reasons for focusing

on journals instead of other aspects of the external research environment. Firstly, the pressure to publish for promotion drives poor practices. As manuscripts are generally published in scientific journals, journals and their editors have an important role as gatekeepers of good and poor research. Secondly, interviewees in Phase 2 suggested that many researchers from LMICs prefer to publish their research in "local" journals, as their requirements are not as strict as those of international journals. It was therefore not only easier to have a manuscript published in these "local" journals, but researchers could also get away with poor practices. Our findings indicate that there is a lack of adequate guidelines and policies especially amongst journals published by non-commercial publishers such as institutions and associations. Implementation of guidelines where they do exist is also poorer amongst non-commercial journals compared to commercial journals. There therefore seems to be a lack of transparency when it comes to journals managed and published by institutions or associations. What was surprising, was that more than half of the non-commercial journals were based in Nigeria. Even more surprising was the fact that most of these journals were not open-access journals. During the workshop in Nigeria (Phase 4), we learned that even researchers in Nigeria had to pay to access the articles published in these journals. However, even though the restricted access limits the number of readers of these articles, new institutional journals keep appearing. One of these journals was just launched when we visited the Nigerian institution. More research is needed to uncover the reasoning behind this practice, but in light of the findings of the other phases of the PhD, we cannot rule out the possibility that some of the non-commercial journals are created as a vehicle to enable and fast-track publications.

6.3.6. New insights into why researchers engage in poor practices

The findings, as described in the previous section, generated new insights into the reasons for engaging in poor practices. These can be mapped to our conceptual framework on research integrity (Figure 1-1, Chapter 1), which depicts the researcher and his/her internal and external research environment in a rather linear relationship. However, our findings highlight that the research system is much more complex than depicted in Figure 1-1.

The following insights added to our understanding of the complexity of the research system, in particular as it relates to the internal research environment: Firstly, researchers' motivations to conduct research and their career paths play a bigger role than their individual values and principles. This is linked to research culture. Secondly, it is difficult to separate researchers from their internal research environment, meaning that they are embedded in the institution and its

organisational culture, systems and structures. Thirdly, it is the intricate interaction of the researcher, organisational culture and institutional systems that influences poor practices, and it is difficult to tease out individual factors. These interactions are non-linear, have feedback loops and are therefore highly complex.

Based on these insights, we adapted the original conceptual framework (Figure 1-1, Chapter 1). The modified framework, depicted in Figure 6-2, aims to highlight this complexity of the internal research environment. In this framework, research and organisational culture play a prominent role. Researchers, their motivations and relationships interact within this culture. Institutional systems and structures are important – their absence can enable poor practice, while their presence can promote integrity. Institutional journals are included as part of institutional systems and structures, as journals managed and published by an institution can be seen as part of the internal, as opposed to the external research environment. This modified framework focuses on the internal environment and needs to be further developed in terms of the external environment.
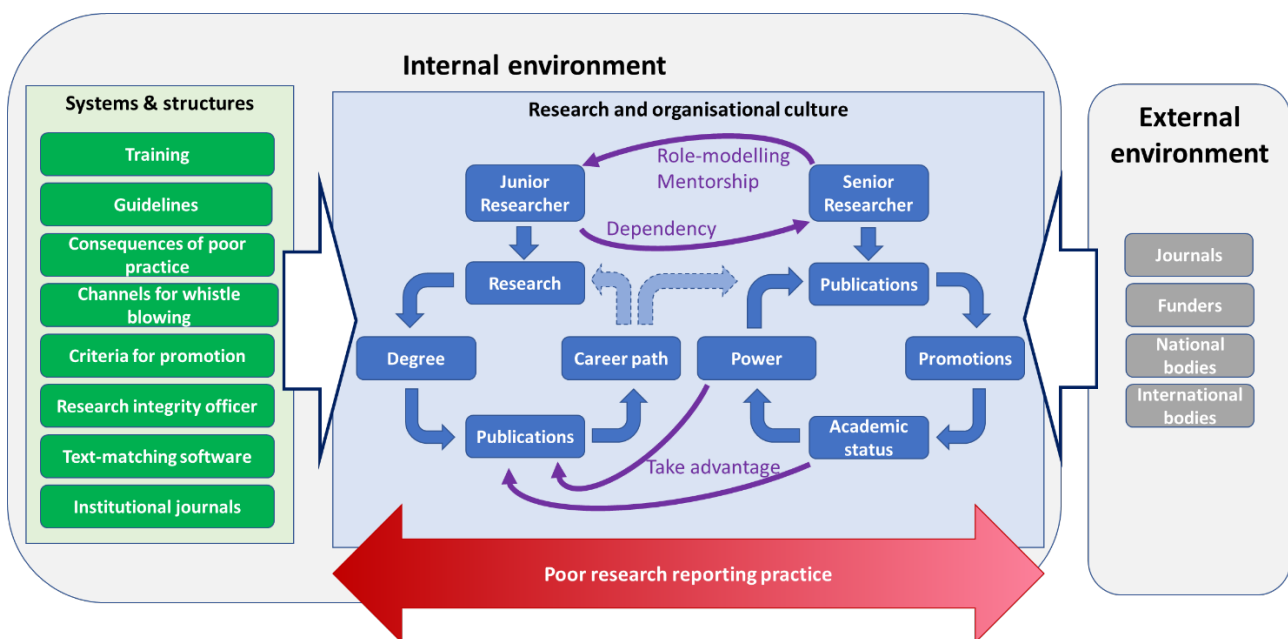
Figure 6-2 Modified conceptual framework on research integrity

6.4. Comparison with findings of existing research

This section compares the findings of Phases 1 to 4 to other existing studies on research integrity. As findings from existing studies from LMICs were summarised in Phase 1, we have already

discussed and compared these to our findings from Phase 2-4 in the previous section. This section therefore primarily compares our findings to studies from high-income countries.

Our findings of self-reported rates of guest and ghost authorship in Phase 1 and 2 compare well to other studies. However, our findings on observed guest and ghost authorship are much higher than reported in the current literature. Marusic and colleagues (2011) conducted a systematic review on authorship practices across disciplines. They reported a pooled estimate of 29% (95%CI 24 to 35) of researchers reporting misuse of authorship in self or others from any discipline (11). The meta-analysis included three studies from LMICs, of which we also included the one from India in our review (12). The pooled estimate for studies conducted outside of the USA or UK (France, India, Bangladesh and South Africa) was 55% (95%CI 45 to 64) and thus much higher than the overall estimate. In a more recent study, Pupovac and colleagues assessed self-reported and observed research misconduct amongst Croatian scientists. They found that 25% of 237 survey respondents admitted to having added authors in the past, while 52% admitted to having observed this in others. In addition, 1% of respondents admitted to having omitted authors, but 29% indicated that they had observed this in others (13).

In 1996, Flanagin and colleagues assessed guest authorship in six peer-reviewed journals, including Annals of Internal Medicine, JAMA and the New England Journal of Medicine, by evaluating reported contributions of authors according to the ICMJE criteria. They found that 19% of 809 included articles included authors that did not meet criteria for authorship and that 11% of 93 articles had omitted authors (14). In a subsequent study, Mowatt and colleagues (2002) found that 39% of 577 Cochrane reviews included guest authors, while 9% had evidence of ghost authors (15). In 2008, Flanagin and colleagues repeated their study to assess guest authorship in six medical journals with high impact factors (16). They found that 17.6% of articles (95%CI 14.6 to 21%) included authors that did not meet the criteria for authorship, which is a similar to the result in 1996. However, they found that 7.9% of articles (95%CI 6.0 to 10.3) had omitted authors, representing a significant decline in ghost authorship from 1996.

We found high rates of plagiarism in Phase 1, 2 and 3. Rates for participants admitting to having plagiarised themselves were, on average, lower than those for participants knowing about others who had plagiarised. A systematic review by Pupovac and Fanelli (2014) also found this difference in rates of plagiarism in self and in others. They reported a pooled estimate of 1.7% (95%CI 1.2 to 2.4) for participants admitting to having plagiarised themselves and 30% (95% CI 17 to 46) for

participants knowing about others who had done so. In the recent survey amongst Croatian scientists, Pupovac and colleagues (2017) reported that 4% of survey respondents admitted to plagiarism, 30% admitted to having observed plagiarism in others (13). These rates of plagiarism are much lower than those we found in the systematic review (Phase 1), while those reported by Cochrane authors (Phase 2) were similar.

Only one of the included studies in the systematic review (Phase 1) objectively measured plagiarism by making use of text-matching software (17). They found that 39% of included articles from Iran contained one completely copied sentence. And reported similar results for Turkey and China. A study assessing plagiarism in manuscripts submitted to the Croatian Medical Journal (18) defined plagiarism as a text-matching similarity score of more than 10% in a section of the manuscript. They identified plagiarism in 11% (85/754) of manuscripts, of which 8% (63/754) were classified as plagiarism of others, while 3% (22/754) as self-plagiarism. Zhang (2010) used text-matching software to screen manuscripts submitted to a Chinese journal for plagiarism (19) and found that 23% contained high levels of plagiarism. However, is it not clear how plagiarism was defined. When determining plagiarism in a random sample of articles published in African biomedical journals (Phase 3), we found that 73% had an OSI above 10%, and when manually reviewing these articles, found that 72% had evidence of any level of plagiarism, while 15% had evidence of any level of redundancy. These rates of plagiarism are much higher compared to other existing studies.

We found high rates of non-disclosure of conflicts of interest and funding sources in Phase 1 and 3. In contrast to our results, a recent survey on disclosure of conflicts of interest in published systematic reviews (20) found that only 3% of the 200 included systematic reviews did not disclose conflicts of interest, while 22% did not disclose funding sources. This could be due to the fact that the systematic reviews were published in journals with explicit policies on disclosure of conflicts of interest and funding sources.

Few studies included in the systematic review (Phase 1) reported on data fabrication or data falsification. However, the reported rates of data fabrication and data falsification are much higher than those reported in a systematic review by Fanelli (2009), who reported a pooled estimate of 1.97% (95%CI 0.96 to 4.45) for self-reported fabrication or falsification and 14.12% (95%CI 9.91 to 19.72) for participants knowing about others who did this (21). Fanelli did not include any studies from LMICs. Pupovac and colleagues (2017) found that 9% of survey respondents in Croatia

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admitted to data falsification and 4% to data fabrication, while 29% admitted to having observed data falsification and 19% to having observed data fabrication (13).

Our findings show that the desire for power and academic status, as well as institutional systems and academic culture greatly influence research integrity. These findings are in line with other international publications (22-24) and suggest that certain factors driving research misconduct are similar across low, middle and high-income countries. Of particular concern is the lack of mentors and role-models for junior researchers. A systematic review on mentoring in academic medicine found that mentorship had a positive effect on research career development, productivity and success (25). Anderson and colleagues (2007), in a survey of over 7500 biomedical and social science researchers, found that ethics mentoring, personal mentoring and research mentoring were more beneficial than training in decreasing poor practices amongst junior researchers (26). Fanelli et al. (2015) also argue that mentoring has an important role in preventing misconduct and promoting research integrity (23).

The impact of financial conflicts of interest on study results and reported conclusions is well recognised (27, 28). More recently, the importance of considering non-financial conflicts of interest has been highlighted (29-31). We found that non-financial conflicts of interest were vaguely understood and that participants were reluctant to report them. A recent study found that authors of systematic reviews reported non-financial conflicts of interests less frequently than financial conflicts of interests (20). Cochrane authors in Phase 2 and workshop participants in Phase 4 felt that there was inadequate guidance on declaring financial and non-financial conflicts of interest and that a universal framework would be helpful. This need for standardised methods of reporting conflicts of interest has been recognised (20, 30, 32, 33) and some approaches proposed (20, 30, 32). However, a universal system has not been realised and the onus is on journals to provide clear policies and guidelines on the transparent reporting of conflicts of interests.

In Phase 3, we found that 63% of journals had a guideline on conflicts of interest. However, only 36% included a definition of conflict of interest, while 48% included information on what to declare. Other studies reported a much higher proportion of journals with a guideline on conflicts of interest. Shawwa and colleagues (2016) found that 116 of the 117 core clinical journals had policies on conflicts of interest. However, non-financial conflicts of interest were poorly defined within these policies (34). Blum and colleagues (2009) examined guidelines on conflicts of interest

among the top 10% of medical journals, according to impact factor. They found that 89% of 256 included journals had a guideline, while 77% provided definitions (35). Probst and colleagues (2015) reported that disclosure of conflicts of interest was mandatory in 88% of 64 journals related to general or abdominal surgery with an impact factor, while 78% provided definitions of conflicts of interest.

6.5.   Strengths and limitations of the PhD

The research conducted within the realms of the PhD aimed to understand the perceptions and experiences of LMIC health researchers of research integrity. It therefore covered a wide range of aspects to describe the status quo, as opposed to analysing a specific aspect in great depth, to propose a way forward in terms of promoting research integrity through future activities and research. The use of quantitative and qualitative research provided a rich data set.

This PhD focused on research integrity when reporting research and mainly considered authorship practices, plagiarism, redundant publication and conflicts of interest. While poor practices related to authorship, redundant publication and conflicts of interest are generally labelled as questionable research practices, plagiarism is one of the three practices that form part of the widely used definition of research misconduct that includes data fabrication, data falsification and plagiarism (FFP). However, since plagiarism can take many forms that are not all necessarily as severe as copying of an entire article, we included it in our research. We specifically chose these so-called questionable research practices for a number of reasons. Firstly, they represent practices where the line between what is acceptable and what not is not always clear and instead can be viewed on a continuum from acceptable to unacceptable practice. Secondly, they represent practices where guidelines on best practice exist, but are often not followed. Thirdly, prior studies have identified questionable research practices such as these, as being more common and relevant to the every-day lives of researchers compared to FFP (6, 8). Indeed, when we spoke to LMIC researchers in Phase 2 and 4, they mostly talked about authorship practices, plagiarism and conflicts of interest. However, where reports of other practices, such as data fabrication and falsification emerged, we included them in our findings. In addition, some of the perceptions and experiences relate to research integrity in general and are not limited to authorship practices, plagiarism, redundant publication and conflicts of interest.

The first phase of the study aimed to take stock of existing research on research integrity in LMICs, through a systematic review. We aimed to identify all relevant studies by conducting a thorough and systematic search in various databases, including databases that focus on research from LMICs, such as Africa Wide and LILACS. However, we did not search any Chinese database, due to time and resource availability and realise that we thus could have missed relevant studies. In addition, we did not search conference abstracts and thus might have missed unpublished studies. We contacted experts in the field in an attempt to address these limitations. Not only did this systematic review enable us to summarise existing studies, but it also highlighted the gaps in the evidence.

In Phase 2, we purposively sampled LMIC contact authors of Cochrane reviews to participate in the survey. We acknowledge that Cochrane authors may be a biased sample of participants and not necessarily representative of other LMIC health researchers, as they are part of a network with very high ethical standards. Using this sampling frame might therefore limit generalisability of the results. However, using this specific sample also has advantages. Firstly, using a sample from an existing, international network provides access to the target population, ensures a spread of participants from various LMICs and a certain degree of homogeneity amongst participants. In addition, Cochrane authors are inclined to be more aware of poor practices than other researchers, since they have been exposed to high standards within Cochrane. They are well placed not only to pick up various types of research misconduct, but to understand what this entails (36). Survey respondents were well spread across different regions and included junior as well as senior researchers. The interviews supplemented the survey with rich data that allowed better understanding of researchers' experiences. Interviewees, especially senior researchers, appeared to be avid promoters of research integrity at their institutions. We acknowledge that they might have volunteered to participate because they were frustrated with the system they worked in, or because they were upset about injustice that they had experienced themselves. But interviewees also shared many examples about what they had perceived in other researchers, and these were generally consistent. However, generalisability of the results is limited.

We included a number of documented strategies in an attempt to maximise our response rate for the survey of Cochrane authors (Phase 2), as a low response rate is a well-documented disadvantage and challenge of online surveys (37, 38). We pushed the survey out to participants in individual and personalised emails, emphasising the value of participants' knowledge and

understanding of health research reporting practices, ensuring anonymity of responses and inviting them to engage in further discussions. Two rounds of piloting of the questionnaire ensured that the scenarios were understandable and not too long, that the accompanying questions were coherent, and that the format of the survey was user-friendly. In addition, we sent two reminders to all participants (37-39). Despite our efforts, we only obtained a response rate of 34% for the survey. We were unable to contact non-respondents to obtain demographic information and reasons for not responding as anonymity of participants did not allow us to distinguish between respondents and non-respondents. We thus cannot rule out the possibility that non-respondents had different views from respondents (37, 40). Only 28 (14%) survey respondents indicated that they were willing to participate in follow-up interviews. While we invited all of those to participate in follow-up interviews via email, only 15 respondents were available to be interviewed at the time. Although this is a small and self-selected sample, participants were very aware of what was happening at their institution and generally addressed the same problems.

There are several caveats that need to be taken into consideration when interpreting the prevalence results of surveys on research misconduct, as they address a very sensitive topic. Therefore, when interpreting the results of the systematic review (Phase 1), the survey of Cochrane authors (Phase 2), and the pre-workshop survey of Nigerian workshop participants (Phase 4), one has to be mindful that researchers might not be telling the truth all the time, especially if they have concerns about confidentiality. It is almost impossible to eliminate social desirability bias, which refers to the tendency of survey participants to answer questions about their own values and behaviours in a way that is socially acceptable (41, 42). Although we tried to reduce this bias by having an anonymous, self-administered, online survey (Phase 2 and 4), rates of self-reported misconduct might be underestimated (43). Rates of reported misconduct in others might be overestimated, as participants from the same institution might refer to the same acts of misconduct. Others have described that reported rates of misconduct in others might also be underestimated, as researchers tend to protect their colleagues and the reputation of their institution (21). In addition, terminology used might play a role in how survey participants interpret various practices. Most of the surveys included in the systematic review in Phase 1 did not adequately define the practices in their questionnaires, which leaves interpretation thereof up to the participants' understanding and personal experiences.

We used hypothetical scenarios to portray certain irresponsible research reporting practices in our survey. Our intention was to describe practices where the line between what is considered good or bad practice was blurred, but that still had fairly clear answers. We included one scenario, on the practice of acknowledging a biostatistician for advice, as opposed to adding him/her to the list of authors, which we considered to be normal practice. To elicit honest views from respondents and to create a neutral starting point, we did not include any words referring to "negative" behaviour in the survey heading, text, scenarios or the email invitation, i.e. we did not include the terms irresponsible practices, research misconduct, research integrity, guest authorship, ghost authorship, redundant publication or plagiarism in the survey. Describing these practices in short scenarios, rather than naming the practices involved, aimed to standardise understanding of the practices across participants, increasing the validity of responses. However, using scenarios also limited our findings to the particular practice that was described. In terms of guest authorship, our scenarios only referred to cases where a head of department and an expert in the field were added to the manuscript, without having made substantial contributions to the work. In terms of ghost authorship, our scenario portrayed a case of a female researcher going on maternity leave and thus being omitted from the manuscript, even though she had done most of the work. We only considered the practice of text-recycling in terms of redundant publication. Our scenarios on plagiarism only refer to translation of texts and copying of an idea without referencing the original source, and not to copying of text. The latter is probably a more well-known understanding of plagiarism. Both our scenarios on conflicts of interest portrayed cases of financial conflicts of interest, one related to a direct and one related to an indirect conflict of interest. We did not include scenarios on non-financial conflicts of interest. Our scenarios therefore did not cover all aspects of poor practices. To overcome this limitation, we asked participants to answer questions in terms of practices "like these".

We used the same scenarios developed for the survey of Cochrane authors in Phase 2, to facilitate learning in the workshops conducted in Malawi and Nigeria (Phase 4). We asked workshop participants to complete the survey before the workshop, hence giving them an opportunity to think about the scenarios individually. During the workshops, we asked participants to discuss scenarios in small groups before presenting them with the aggregate survey responses and presented the didactic content related to the practice portrayed in the scenario after the discussions. Using the scenarios as a springboard for discussions worked very well and participants

indicated that they found the scenarios very useful. Indeed, case-based instruction has been shown to be an effective teaching and learning strategy for research integrity (44, 45).

We measured actual rates and extent of plagiarism in research articles included in Phase 3 of the PhD. Text-matching software is widely used to screen manuscripts for plagiarism, yielding an overall similarity index (OSI) in terms of the proportion of copied text; and a report highlighting the copied text and identifying the original sources. However, the OSI on its own is an unreliable measure of plagiarism and there is no consensus of an acceptable threshold. Manual review of similarity reports of manuscripts with plagiarism is thus necessary. As this is a relatively subjective task, we developed a plagiarism framework that aimed to overcome this by assessing plagiarism in terms of the number of copied sentences. We screened all articles for plagiarism using Turnitin text-matching software, but only manually reviewed those with an OSI above 10%. Although we did not aim to measure correlation between extent of plagiarism, as we defined it in our framework, and OSI, we did find a trend in increasing OSI and extent of plagiarism. The PhD candidate reviewed all articles, while a random sample of 10% of articles with an OSI above 10% were checked by another author (EW). While our scores for overall plagiarism were mostly consistent, they differed for three of the 36 articles. We found that variations depended on how we scored borderline cases in terms of what was considered a completely copied sentence. The framework therefore may lack precision in terms of interrater reliability and test-retest reliability and needs further testing. However, we found that the framework was still a useful tool that facilitated assessment across articles and represented the extent of plagiarism well.

Our framework is limited in that is only measures plagiarism in terms of number of copied sentences, although it does take into account where in the article the copied text was found. We considered plagiarism in the methods section to be less severe that plagiarism in other sections of the articles, as it is sometime difficult to avoid repeating standard methods. It does however, not consider other aspects of plagiarism, such as how the text was referenced and whether plagiarism was intentional or not (46), which are important aspects to consider when making judgements about plagiarism. It is also limited to plagiarism of text and does not take into account plagiarism of data or images.

In Phase 3 of the PhD, we examined policies and author guidelines of African biomedical journals indexed on AJOL. As we were mainly interested in what interviewees in Phase 2 called "local" journals, we specifically wanted to examine smaller and non-mainstream journals based in LMICs.

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We considered various sampling frames, but few met the requirements. We chose AJOL to sample journals, as it hosts over 500 journals, including 179 biomedical journals, from over 30 African countries. In light of the known challenges in identifying African biomedical journals (47, 48), we thus considered AJOL to be a comprehensive and pragmatic sampling frame, although it does not represent all African biomedical journals.

As part of Phase 3, in addition to analysing journal policies and author guidelines, we examined actual reporting practices in research articles. For each included journal, we randomly selected five research articles published in 2016. Initial scoping revealed that the number of published articles per year varied considerably between journals. We therefore considered five research articles per journal to yield a large enough sample for our analysis that would represent all included journals. We acknowledge that other sampling techniques, such as stratified random sampling with proportional allocation per journal could also have been used. However, as the aim of this phase was to generate rather than test hypotheses, we considered our sample adequate to allow us to describe findings across journals.

We evaluated the workshops offered in Malawi and Nigeria to improve future offerings. We based our approach on Kirkpatrick's four levels of evaluation, where the first level measures participant satisfaction with learning (reaction), the second level (learning) measures change in attitude or perceptions (level 2a), knowledge and skills (level 2b), the third measures change in behaviour (behaviour), and the fourth (results) measures the impact of the training on the organisation (49, 50). Although we aimed to evaluate the workshop in terms of the first three levels, it proved challenging to measure post-workshop perceptions and behaviours, as very few participants responded to the post-workshop survey. Furthermore, self-reported intention to change behaviour is not a reliable measure of actual behaviour. Ideally, actual change in practices related to authorship, plagiarism, redundant publication and conflicts of interest, as well as the impact of the training on the institution, should be evaluated in the long term. Measuring change in behaviour and results of any training is challenging, and particularly so for training on research integrity. Our workshop aimed to introduce concepts and guidelines. Assessing learners' satisfaction with the learning is therefore apt and should not be disregarded, as it is an important first step in evaluating training initiatives (51).

Lastly, although the PhD considered all LMICs in Phase 1 and 2, we focused on the African region during Phase 3 and 4 for pragmatic reasons. While some findings apply to LMICs in general, we need to take into account that others will mainly apply to the African region.

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Chapter 7

Implications for future activities and research to promote research integrity
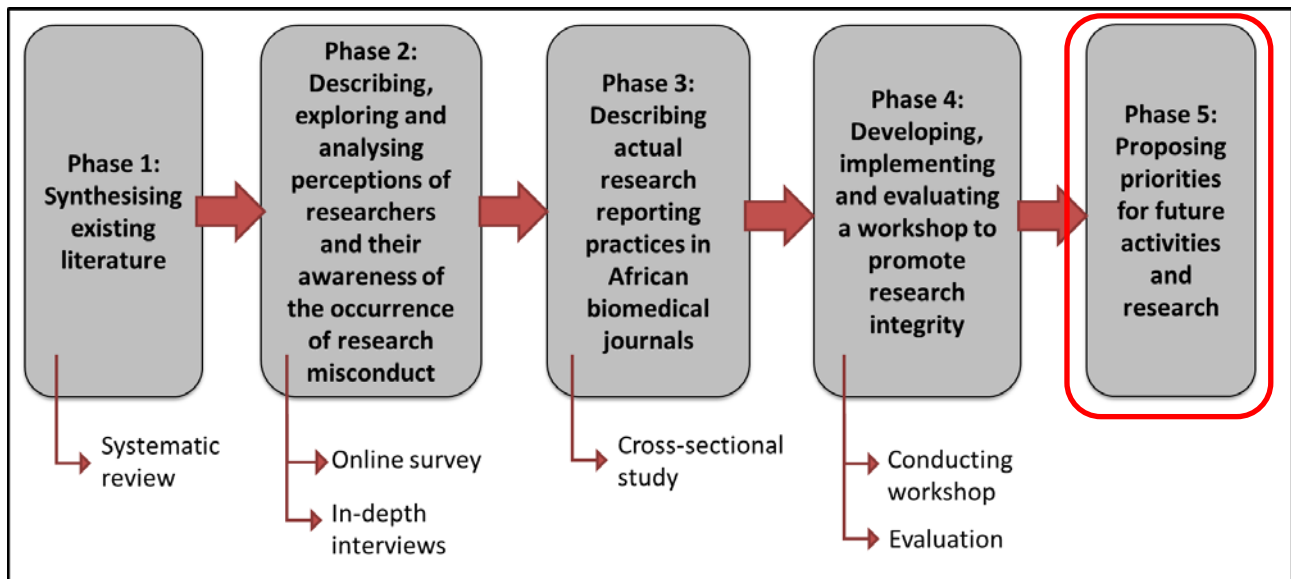
In this chapter, we present the conclusions of the PhD. We also propose priorities for future activities to promote research integrity in LMICs as well as priorities for future research on research integrity in LMICs.

7.1.   Conclusions

This thesis addressed the gap in existing evidence on research integrity in LMICs. It adds to the understanding of perceived and actual research reporting practices related to authorship, plagiarism, redundant publication and conflicts of interest.

The main conclusions of the research conducted are as follows:

- Researchers across LMICs report that poor reporting practices are common. They are mostly concerned about widespread guest authorship.
- Actual rates of plagiarism, in terms of number of copied sentences, in African biomedical articles are very high.

- Conflicts of interest are poorly understood and not declared.
- The desire for academic status and power, research and organisational culture, and institutional systems linked to promotions, are the main drivers of poor practices in LMICs.

7.2. Priorities for future activities to promote research integrity

As portrayed in the modified conceptual framework (Figure 6-2), research integrity is part of a complex research system. There is no 'magic bullet' that will enable good and prevent poor research reporting practices. On the contrary, efforts to promote research integrity should be multi-faceted and targeted at various stake-holders, the internal as well as the external research environment.

7.2.1. Priorities for institutions

Below, we propose future activities that should be prioritised to promote research integrity in LMIC institutions. These need to be tailored to the specific institutions in various countries.

Continued awareness raising

Sensitising researchers to research integrity is vital. This should not be a top-down approach, but needs to involve junior and senior researchers, as well as postgraduate students within an institution. It should entail continued conversations within a research team, that extend to the departmental and institutional level. Institutional workshops to introduce research integrity are an excellent way to kick-start these conversations.

Research integrity champions

Importantly, efforts to promote research integrity should be driven from within the institution. There is thus a need to identify champions to drive the promotion of research integrity. These research integrity champions should comprise junior and senior researchers, that are actively involved in research and knowledgeable about best practices. They should be role-models and promote best practices informally, as part of their every-day work, as opposed to having a formal role as a research integrity officer.

Training of researchers

There is a need to develop and implement formal training programmes on responsible conduct and reporting of research. These can comprise short-courses as well as modules embedded in

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post-graduate programmes and should cover various aspects related to research integrity. Face-to-face training initiatives are a great way to stimulate discussion between researchers from an institution.

Mentorship programmes

Formal training on its own is not sufficient for instilling values and principles. Researchers need role-models and mentors that reinforce these in a more implicit way. Mentorship programmes, proactively pairing senior and junior researchers, can facilitate this.

Institutional guidelines and policies

There is a need for clear institutional policies and guidelines on research integrity. These should specifically focus on research integrity when reporting research, and be distinct to policies on the ethical conduct of research. As a starting point, institutions should consider developing a publication policy that addresses issues around authorship, plagiarism, redundant publication, conflicts of interest in terms of outlining best practices. Additional policies should address misconduct in terms of consequences and punishment.

These policies need to be actively promoted and implemented. It is vital that researchers know about the existence of and are able to access the policies. Policies can be promoted through research integrity champions and marketing strategies such as posters and visible links on websites.

Criteria for promotion

Institutions should revisit their requirements for promotion to emphasise the quality and impact of publications rather than purely considering the quantity. There is room to add innovative criteria that promote good publication practices, for example criteria linked to mentorship of junior authors. However, this not only requires a shift in institutional expectations, but also a shift in global rating systems of academics, which is beyond the scope of this thesis.

Institutional resources to support research integrity

Institutions can further promote research integrity with various structural support systems. However, these require financial resources that might currently not be available at LMIC institutions. This includes appointing a research integrity officer, whose primary role involves

overseeing all matters related to research integrity, including handling of complaints about potential misconduct. Linked to the research integrity officer is the need to create channels for whistle blowers to lodge complaints in an anonymous way. This is essential to identify offenders but also to discourage researchers from engaging in poor practices, out of fear for being identified.

Acquiring an institutional licence for text-matching software such as Turnitin, could provide all students and researchers with access to this tool. In addition to checking assignments and manuscripts for plagiarism, it can be used to teach students and researchers about plagiarism and paraphrasing.

7.2.2. Priorities for journals

Journals play a key role in promoting good reporting practices as part of the external research environment. Below, we propose priorities for LMIC journals.

Explicit policies and author guidelines

LMIC journals should aim to meet global expectations and follow best practices with regards to their policies and guidelines on reporting practices to encourage transparent reporting. In addition, journal editors should ensure that policies and guidelines are implemented and adhered to.

Use of text-matching software

LMIC journals should acquire text-matching software to detect plagiarism in submitted manuscripts. Not only will this help to verify originality of submitted work, but it also has the potential to deter poor practices. As licences for text-matching software are expensive, non-commercial journals should explore opportunities to liaise with institutions to make best use of available resources.

7.3. Priorities for future research on research integrity

This thesis provided a baseline of current research reporting practices amongst LMIC health researchers and identified a number of questions that remain to be answered. In this section, we outline priorities for future research activities on research integrity in LMICs, linked to the researcher and the internal research environment, and the external research environment. To gain

in-depth insight, future research should focus on health researchers from the same institution or country, or comprise of a sample large enough to make comparisons between different countries.

7.3.1. Research priorities linked to the researcher and the internal research environment

Our findings suggest that research and organisational culture play a more prominent role in the research system than institutional systems and structures. There is thus a need to better understand research culture at LMIC institutions as well as the influence of research culture on research integrity. Factors that need to be considered include those at the level of the researcher and the research team, the department, the faculty and institution.

There is a need to better understand health researchers' perceptions on research itself, including motivations to conduct research, career paths and personal aspirations, which links to research culture. Understanding how researchers perceive and value research could also shed some light on reasons for engaging in poor practices.

Linked to research culture is the environment of junior researchers, which includes their relationships with senior researchers and supervisors, the properties and practices of their role-models and mentors, as well as opportunities to participate in research projects. There is a need to identify the essential components of a nourishing research environment that instils values and principles of honesty, accountability, fairness, trust and openness in junior researchers.

Future research should also focus on identifying effective interventions to promote research integrity at the various levels of institutions. These include rigorous evaluations of education on responsible conduct of research and the impact of institutional guidelines and policies on research integrity. In addition, there is a need for researchers to come up with innovative ways of promoting research integrity, that researchers will not regard as policing strategies.

In addition, there is a need to understand publication practices of LMIC researchers in more detail. This includes exploring which journals LMIC researchers choose to submit their research to; the reasons for choosing these journals; whether they prefer to publish in national or international journals; and susceptibility to predatory journals.

7.3.2. External research environment

This thesis only explored a small part of the external research environment in terms of policies and guidelines of African biomedical journals. More research needs to be conducted to examine the

difference between non-commercial and commercial journals in terms of following best practices in research reporting. This includes examining the reasons behind the suggested difference in the existence and implementation of guidelines and policies. Gaining insight into how editors of non-commercial journals perceive and understand research integrity will be an important first step. Furthermore, guidelines and policies on authorship, plagiarism, conflicts of interest and funding sources of journals from other LMICs need to be examined and compared to our findings of African biomedical journals.

We developed a framework to measure the extent of plagiarism. Further testing of this tool is needed to determine reliability and validity.

We found that Cochrane authors based in LMICs, had an important role in promoting research integrity at their institutions, as they were exposed to the high ethical standards of Cochrane. Future research should thus examine the role of research networks, including national, regional and international networks, in the promotion of research integrity at an institutional level.

Appendix

Table of Contents

Appendix 1

Appendix 1.1: List of low-and middle-income countries as defined by the World Bank[1]

Low-income countries	Lower middle-income countries	Upper middle-income countries
Afghanistan	Armenia	Albania
Bangladesh	Bhutan	Algeria
Benin	Bolivia	American Samoa
Burkina Faso	Cabo Verde	Angola
Burundi	Cameroon	Argentina
Cambodia	Congo, Rep.	Azerbaijan
Central African Republic	Côte d'Ivoire	Belarus
Chad	Djibouti	Belize
Comoros	Egypt, Arab Rep.	Bosnia and Herzegovina
Congo, Dem. Rep.	El Salvador	Botswana
Eritrea	Georgia	Brazil
Ethiopia	Ghana	Bulgaria
Gambia, The	Guatemala	China
Guinea	Guyana	Colombia
Guinea-Bissau	Honduras	Costa Rica
Haiti	India	Cuba
Kenya	Indonesia	Dominica
Korea, Dem. Rep.	Kiribati	Dominican Republic
Liberia	Kosovo	Ecuador
Madagascar	Kyrgyz Republic	Fiji
Malawi	Lao PDR	Gabon
Mali	Lesotho	Grenada
Mozambique	Mauritania	Hungary
Myanmar	Micronesia, Fed. Sts.	Iran, Islamic Rep.
Nepal	Moldova	Iraq
Niger	Mongolia	Jamaica
Rwanda	Morocco	Jordan
Sierra Leone	Nicaragua	Kazakhstan
Somalia	Nigeria	Lebanon
Tajikistan	Pakistan	Libya
Tanzania	Papua New Guinea	Macedonia, FYR
Togo	Paraguay	Malaysia
Uganda	Philippines	Maldives
Zimbabwe	Samoa	Marshall Islands
	São Tomé and Principe	Mauritius
	Senegal	Mexico
	Solomon Islands	Montenegro
	South Sudan	Namibia
	Sri Lanka	Palau
	Sudan	Panama
	Swaziland	Peru
	Syrian Arab Republic	Romania
	Timor-Leste	Serbia
	Ukraine	Seychelles
	Uzbekistan	South Africa

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[1] siteresources.**worldbank**.org/DATASTATISTICS/Resources/CLASS.XLS

	Vanuatu	St. Lucia
	Vietnam	St. Vincent and the Grenadines
	West Bank and Gaza	Suriname
	Yemen, Rep.	Thailand
	Zambia	Tonga
		Tunisia
		Turkey
		Turkmenistan
		Tuvalu
		Venezuela, RB

Appendix 1.2: Protocol for the thesis as approved by the Health Research Ethics Committee (HREC) at Stellenbsoch Univeristy

Aim and objectives

To analyse LMIC researchers' perceptions and experiences of good research reporting practices related to plagiarism, conflict of interest and authorship.

Objectives are:

1. To describe and analyse for key research reporting integrity indicators (including conflict of interest, plagiarism and authorship criteria) the perception of LMIC researchers to:
   - Acceptable and unacceptable practices
   - Whether unacceptable practices are common in their institution
2. To explore researchers' views on research integrity, in particular, the drivers, and the size of the problems
3. To pilot and evaluate a workshop on research reporting practices in terms of
   - Participant satisfaction with the workshop
   - Change in perceptions on authorship, plagiarism and conflicts of interest
   - Change in behaviour related to authorship, plagiarism and conflicts of interest
   - Factors that need to be considered to improve future workshops
4. To propose priorities, further research and developments to promote research integrity in LMICs

Methods

Our project will have four steps. First, we will conduct an online survey of researchers (step 1), followed by in-depth interviews with selected survey participants (step 2). Thereafter, we will develop, implement and evaluate a workshop on research integrity (step 3). Lastly, we will combine the results to inform further research and developments to promote research integrity in LMICs (Step 4).

Step 1: Online survey

Study design
We will conduct a cross-sectional survey.

Study population and sample

Our target population will be authors of a Cochrane systematic review, living in LMICs. Cochrane systematic reviews are "systematic reviews of primary research in human health care and health policy, and are internationally recognised as the highest standard in evidence-based health care" (https://www.cochrane.org/cochrane-reviews). All Cochrane reviews are published in *The Cochrane Library*, which is updated on a daily basis and currently contains over 8700 systematic reviews (www.thecochranelibrary.com).

 All 884 contact authors, living in LMICs, of active Cochrane reviews (i.e. reviews that are currently published in *The Cochrane Library*), published in the August 2014 issue of *The Cochrane Library* will be invited to participate in the online survey (Annex 1 - List of low- and middle-income countries according to the World Bank and number of contact Cochrane authors in these countries). We will categorise the authors according to regions (Latin America, Northern Africa, Sub-Saharan Africa, India and China) and are aiming to obtain a response rate of 85%.

We acknowledge that Cochrane authors may be a biased sample of participants as they are inclined to be more aware of poor practices than other researchers, although this also has advantages. Firstly, through examining the totality of evidence from primary studies of a specific area, they are well placed not only to pick up various types of research misconduct, but to understand what this entails.[2] Due to this enhanced understanding of the topic, we anticipate that Cochrane authors will be in a good position to paint a rather accurate picture of what is happening at their institutions. Secondly, using the Cochrane network will ensure a higher response rate and allow a more accurate calculation of denominators than using other populations for the survey, since low response rates are a well-recognised problem of this type of method.[3]

As the Cochrane Collaboration has formal procedures for surveys, we are currently in dialogue with the Central Executive Team to obtain their permission, as well as email addresses of the eligible authors, who we will subsequently invite to participate.

Data collection

Development of questionnaire

The questionnaire will comprise three sections (see Annex 2). The first section will focus on demographic details of the participants; the second will explore the understanding of acceptable and unacceptable research reporting practices and the third section will address questions related to training and institutional policies. In addition, we will ask participants whether they would be willing to participate in an interview on this topic. If they agree, they will be required to complete a separate form with their contact details, which will not be linked to their survey responses.

We will make use of case scenarios to elicit responses from researchers on their understanding of acceptable and unacceptable practices. We have created the scenarios by looking at existing cases in published articles and the COPE and identifying those that are relevant to our study. We will pilot the questionnaire firstly by discussing it with a group of researchers not eligible to be included in our

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[2] Vlassov V, Groves T. The role of Cochrane Review authors in exposing research misconduct [editorial]. Cochrane Database of Systematic Reviews. 2010:ED000015.

[3] Nulty DD. The adequacy of response rates to online and paper surveys: what can be done? Assessment & Evaluation in Higher Education. 2008;33(3):301-14.

study population, but with background knowledge of systematic reviews. We will then revise the questionnaire accordingly and send the online version to ten consenting participants in order to clarify content and interface. We will then refine and finalise it.

Administration of questionnaire

We will set up the survey on an online platform, using Google forms. We will invite participants to complete the survey by sending them an email, explaining the purpose of the study and providing a link to the survey (Annex 3). We will send one reminder to complete the survey, two weeks after the original invitation.

Data analysis

Data of completed questionnaires will be automatically extracted and collated into a table by Google. We will import these results into Excel and use STATA for further analyses. For dichotomous and ordinal categorical data, we will report the frequencies of each category and for ordinal categorical data we will also report the medians and interquartile ranges.

We will stratify results by regions (Latin America, Northern Africa, Sub-Saharan Africa, India and China) and compare the differences between countries with appropriate statistical tests. We will compare the difference between proportions with the Chi-squared test and the difference in medians with the Kruskal-Wallis test. We will regard a p-value of 0.05 or less as statistically significant. If we find a significant result for the overall Kruskal-Wallis test, we will perform an adjusted Dunnett's multiple comparison test, to determine between which categories the differences were present.

The results of the analysis will help us identify areas to be explored in more depth in the second step of our study.

Ethical considerations

Participants will be informed about the purpose of the study. Participation in the survey will be completely voluntary and anonymity will be ensured. Completing the online survey will be seen as informed consent. Details of participants will only be required if they agree to participate in subsequent interviews. This will be voluntary and details of participants will not be linked to survey responses.

Step 2: In-depth interviews

Study design

We will conduct a qualitative study situated in an interpretivist paradigm, recognising that the researcher's values and morals play a key role in interpretation of phenomena, that knowledge is created through dialogue and that all phenomena occur at a specific time point, in a specific context.

Study population and sample

For the first set of interviews, we will conduct interviews with individual survey participants. All survey participants that expressed willingness to participate in follow-up interviews will be invited to participate in telephonic interviews (Step 1).

Data collection

For the first set of interviews, we will invite selected survey participants via email. We will conduct individual, semi-structured interviews, focusing on issues emerging from the online survey (Step 1) via Skype or telephone.

We have compiled a draft interview guide (Annex 4) which will be revised and adapted once we have analysed the responses of the online survey. Using the interview guide will ensure that the same content is covered with all participants. Participants will be informed about the purpose of the interview and will be asked to sign informed consent for participation and for recording of the interviews (Appendix 4) before we will commence with the interviews. For telephonic and Skype interviews, this will be done electronically by sending them the consent form (Annex 5) via email and asking them to submit their signature electronically. Participation will be voluntary and we will ensure confidentiality and anonymity.

We will record all interviews with a digital voice recorder. Additional notes will be taken during the interviews to capture key issues. Names of interviewees will not appear on the transcriptions. Recordings and transcriptions will be stored in a password protected file to which only the PI will have access to. These will be destroyed 12 months after the interviews. The audio recordings will not be released to any persons not involved in this study. If researchers consent to participate in the study, but do not consent for the interview to be recorded, we will ask permission to take notes instead.

Data management and analysis

We will transcribe recorded interviews. No names will appear in the transcriptions. One author (AR) will read through the transcripts while listening to the recorded interview in order to check the transcripts and will develop a preliminary code book. The other authors will read a selection of the transcripts to verify and add to the code book. All authors will discuss and agree on the final code book. All transcripts will be coded by the lead author (AR) with ATLAS.ti software. All extracted quotes will be checked independently by another author. We will do thematic content analysis by identifying emerging themes, discussing these amongst the author team and collating information in an iterative manner.[4]

Ethical considerations

Participants will be informed about the purpose of the study. Participation in the interviews will be completely voluntary and anonymity will be ensured, as no names will appear in the transcripts. We will actively anonymise all qualitative data obtained through interviews with health researchers to prevent identification of institutions. We will not mention names of institutions in any of the reports. Interviewees will sign an informed consent (paper-based or electronic copy) before commencement of the interviews.

All interviews will be strictly confidential. Should individual cases of misconduct come to light, we will counsel and advise participants to use appropriate channels to report such misconduct. We will ensure that we are familiar with the relevant policies and procedures at each institution prior to the interviews.

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[4] Braun V, Clarke V. Using thematic analysis in psychology. Qualitative Research in Psychology. 2006;3(2):77-101.

Step 3: Evaluation of a workshop on research integrity

Research integrity workshop

We will pilot the workshop in two institutions in sub-Saharan Africa. Table 2 provides an outline of the workshop.

Table 2: Research integrity workshop

Name of workshop	Doing the right thing: A workshop on research integrity and publication ethics
Aim	To introduce research integrity and its importance in health research and to promote best practice in authorship attribution, conflicts of interest and avoiding plagiarism.
Learning objectives	After the workshop, participants will be able to: - Discuss research integrity and how it relates to reporting their research - Find and apply current guidelines for good research reporting practice related to authorship, conflicts of interest and plagiarism
Participants	Junior and senior health researchers, who want to publish in national and international journals including Masters and PhD students as well as postdoctoral researchers
Setting	Two institutions in Sub-Saharan Africa
Teaching approach	- Interactive workshop - Using scenarios on research reporting practices as a springboard for discussions - Small group discussions - Hands-on demonstration on accessing international guidelines and policies on research reporting practices such as the recommendations by the International Committee of Medical Journal Editors (ICMJE) (20)
Programme	*Pre-workshop* - Complete online questionnaire *Workshop* - Why research integrity isn't just somebody else's problem - Authorship, based on questionnaire scenarios - Conflicts of interest, based on the questionnaire scenarios - Plagiarism, based on the questionnaire scenarios - How to promote integrity at individual level and group level

Evaluation of the workshop

Study design and participants

We will use quantitative and qualitative methods to evaluate the workshop. Our approach will be based on Kirkpatrick's four levels of evaluation: The first level, *reaction*, measures participant satisfaction with the training; the second level, *learning*, measures change in attitude or perceptions (level 2a), knowledge and skills (level 2b); the third level, *behaviour*, measures change in behaviour because of the training; and the fourth level, *results*, measures the impact of the training in the

organisation.[5,6,7] We will evaluate satisfaction with training (level 1), change in perceptions of research reporting practices (level 2a) and change in behaviour (level 3). All workshop participants will be invited to take part in the evaluation.

Data collection

We will collect data before, during and after the workshop (Figure 1).

Figure 1: Data collection process
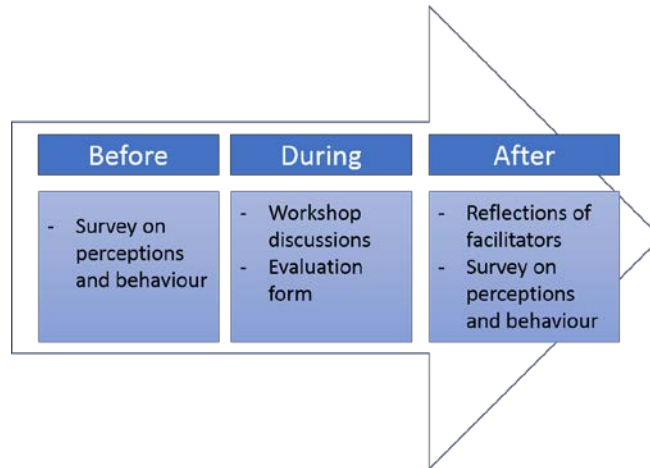
Pre- and post workshop survey

To assess change in perceptions and behaviour, we will ask participants to complete an online survey before and after the workshop. We will adapt the questionnaire developed for the survey in Step 1 (Annex 2) to measure perceptions and behaviour before and after the workshop. We will ask participants whether specific scenarios, related to authorship practices, plagiarism, redundant publication and conflicts of interest are acceptable or not. In addition, we will include questions on behaviour related to current reporting practices before the workshop, and change in behaviour related to reporting practices after the workshop.

The link to the pre-workshop survey will be emailed to the participants one week before the workshop. Email addresses of participants will be obtained from institutions that host the workshop. The email will contain information about the evaluation and point out that participation is voluntary and that anonymity will be ensured. We will request that participants sign an electronic consent form (Annex 6) before starting the survey. The survey will be set up on Google and participants will be able to complete it via mobile devices as well as personal laptops. Although participants will be encouraged to complete the survey prior to the workshop, we will also allow time to complete it at the start of the workshop, if necessary. The results of the pre-workshop survey will also be used as a springboard for discussions during the workshop.

Four weeks after the workshop, we will send the link to the post-workshop survey via email. We will send two reminders, each one week apart.

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[5] Kirkpatrick DL, Kirkpatrick JD. Evaluating Training Programs: The Four Levels. 3rd Edition ed. San Fransisco: Berrett-Koehler Publishers; 2006.

[6] Kirkpatrick DL. Seven keys to unlock the four levels of evaluation. Performance Improvement. 2006;45(7):5-8.

[7] Barr H FD, Hammick M, Koppel I, Reeves S. . Evaluations of INterprofessional Education: A United Kingdom Review for Health and Social Care. London; 2000.

Workshop discussions

We will record all discussions during the workshop with a digital voice recorder. To supplement recordings we will take notes of discussions during the workshop. This will be included on the electronic consent form (Annex 6) and participants will be required to submit their consent before the start of the workshop. Names of participants will not appear on the transcriptions. Recordings and transcriptions will be stored in a password protected file to which only the PI will have access to. These will be destroyed 12 months after the workshop. The audio recordings will not be released to any persons not involved in this study.

Evaluation form

At the end of the workshop, we will ask participants to complete an evaulation form (Annex 7). The form comprises Likert-scale and open-ended questions and will be competed for each session. Anonymity will be ensured and completing the form will be seen as informed consent.

Reflection of facilitators

After the workshop, facilitators will reflect on the workshop. We will think about and discuss our experiences of the training such as what worked well, what did not work well, and how the workshop can be improved. One author (AR) will takes notes of the discussions and compile a written reflection.

Data analysis

Quantitative data from the survey and the evaluation forms will be collated in an Excel spreadsheet and further analysed with SPSS. We will analyse data using descriptive statistics and will report on proportions and frequencies for dichotomous data and medians and interquartile ranges for categorical data (e.g. Likert scale scores).

We will analyse qualitative data through thematic content analysis. We will transcribe recordings of discussions. No names will appear in the transcriptions. One author (AR) will check the transcriptions by reading through them while listening to the audio. This will also enable familiarisation with the content. One author (AR) will code all transcriptions. Codes will be checked by another author. Emerging themes will be identified through an iterative process of discussions with the entire research team.

Ethical considerations

Before the workshop, we will inform participants that we are piloting the workshop and would like to make use of the data linked to the survey, discussions and evaluation forms and will ask them to sign an electronic consent form (Annex 6). Participation will be completely voluntary and anonymous. We will not mention names of institutions in any of the reports. We will obtain additional permission and ethics clearance (if needed) from host institutions before the workshop.

Step 4: Proposing priorities for further activities

We will combine the results obtained from the survey (Step 1) and the case studies of different institutions including the qualitative interviews (Step 2) and the evaluation of a research integrity workshop (Step 3). This will enable us to propose priorities for further activities related to research and capacity development to promote research integrity in LMICs, which we will share with Effective Health Care Research Consortium partners and other participating institutions.

Project management

Timeline

	December 2014	January 2015	February 2015	March 2015	April 2015	May 2015	June 2015	July 2015	August 2015	September 2015	October 2015	November 2015	December 2015	January 2016	February 2016	March 2016	April 2016	May 2016	June 2016	July 2016	August 2016
Protocol development and submission for ethics approval	■																				
Complete piloting of questionnaire		■																			
Administration of survey			■	■																	
Data analysis of survey and reporting					■	■															
Conduct qualitative interviews								■	■												
Data analysis of interviews and reporting										■	■	■	■	■	■	■	■	■			
Data collection for document analysis								■	■												
Data analysis of institutional policies and reporting										■	■	■	■	■	■	■	■	■			
Collating all results and proposing further activities																			■	■	■

Budget

This study will be funded by the Effective Health Care research Consortium (EHCRC).

Item	Amount (Rand)
Researcher Time	408 000
Transcription (R300/interview)	9 000
Stationery	1 500
Small equipment – digital recorder, external hard drive	Provided by CEBHC
Communication – telephone, internet	5 000
Translations	20 000
Case study visits (flights, accommodation and subsistence to China, India and an African country)	140 000*
Total	583 500

*Already budgeted for

Annex 1: List of low- and middle-income countries according to the World Bank
(siteresources.**worldbank**.org/DATASTATISTICS/Resources/CLASS.XLS)

Country		No of contact authors from active reviews in the Cochrane Library, Issue 8, 2014
Afghanistan	Low income	0
Bangladesh	Low income	1
Benin	Low income	0
Burkina Faso	Low income	0
Burundi	Low income	0

Cambodia	Low income	1
Central African Republic	Low income	0
Chad	Low income	0
Comoros	Low income	0
Congo, Dem. Rep.	Low income	0
Eritrea	Low income	0
Ethiopia	Low income	1
Gambia, The	Low income	4
Guinea	Low income	0
Guinea-Bissau	Low income	0
Haiti	Low income	0
Kenya	Low income	7
Korea, Dem. Rep.	Low income	0
Liberia	Low income	0
Madagascar	Low income	0
Malawi	Low income	4
Mali	Low income	0
Mozambique	Low income	0
Myanmar	Low income	0
Nepal	Low income	0
Niger	Low income	0
Rwanda	Low income	0
Sierra Leone	Low income	0
Somalia	Low income	0
Tajikistan	Low income	0
Tanzania	Low income	2
Togo	Low income	0
Uganda	Low income	9
Zimbabwe	Low income	0
Armenia	Lower middle income	0
Bhutan	Lower middle income	0
Bolivia	Lower middle income	1
Cabo Verde	Lower middle income	0
Cameroon	Lower middle income	3
Congo, Rep.	Lower middle income	0
Côte d'Ivoire	Lower middle income	0
Djibouti	Lower middle income	0
Egypt, Arab Rep.	Lower middle income	18
El Salvador	Lower middle income	0
Georgia	Lower middle income	0
Ghana	Lower middle income	2
Guatemala	Lower middle income	0
Guyana	Lower middle income	0
Honduras	Lower middle income	0
India	Lower middle income	70
Indonesia	Lower middle income	3
Kiribati	Lower middle income	0
Kosovo	Lower middle income	0
Kyrgyz Republic	Lower middle income	0
Lao PDR	Lower middle income	0
Lesotho	Lower middle income	0
Mauritania	Lower middle income	0
Micronesia, Fed. Sts.	Lower middle income	0
Moldova	Lower middle income	0
Mongolia	Lower middle income	0
Morocco	Lower middle income	0
Nicaragua	Lower middle income	0
Nigeria	Lower middle income	37
Pakistan	Lower middle income	7

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Papua New Guinea	Lower middle income	0
Paraguay	Lower middle income	0
Philippines	Lower middle income	13
Samoa	Lower middle income	0
São Tomé and Principe	Lower middle income	0
Senegal	Lower middle income	0
Solomon Islands	Lower middle income	0
South Sudan	Lower middle income	0
Sri Lanka	Lower middle income	1
Sudan	Lower middle income	0
Swaziland	Lower middle income	0
Syrian Arab Republic	Lower middle income	9
Timor-Leste	Lower middle income	0
Ukraine	Lower middle income	0
Uzbekistan	Lower middle income	0
Vanuatu	Lower middle income	0
Vietnam	Lower middle income	0
West Bank and Gaza	Lower middle income	0
Yemen, Rep.	Lower middle income	0
Zambia	Lower middle income	0
Albania	Upper middle income	0
Algeria	Upper middle income	0
American Samoa	Upper middle income	0
Angola	Upper middle income	0
Argentina	Upper middle income	21
Azerbaijan	Upper middle income	0
Belarus	Upper middle income	0
Belize	Upper middle income	0
Bosnia and Herzegovina	Upper middle income	0
Botswana	Upper middle income	0
Brazil	Upper middle income	121
Bulgaria	Upper middle income	0
China	Upper middle income	277
Colombia	Upper middle income	0
Costa Rica	Upper middle income	4
Cuba	Upper middle income	1
Dominica	Upper middle income	0
Dominican Republic	Upper middle income	0
Ecuador	Upper middle income	1
Fiji	Upper middle income	0
Gabon	Upper middle income	0
Grenada	Upper middle income	0
Hungary	Upper middle income	2
Iran, Islamic Rep.	Upper middle income	12
Iraq	Upper middle income	0
Jamaica	Upper middle income	5
Jordan	Upper middle income	3
Kazakhstan	Upper middle income	0
Lebanon	Upper middle income	7
Libya	Upper middle income	0
Macedonia, FYR	Upper middle income	0
Malaysia	Upper middle income	25
Maldives	Upper middle income	0
Marshall Islands	Upper middle income	0
Mauritius	Upper middle income	0
Mexico	Upper middle income	9
Montenegro	Upper middle income	0
Namibia	Upper middle income	0
Palau	Upper middle income	0

Panama	Upper middle income	0
Peru	Upper middle income	4
Romania	Upper middle income	2
Serbia	Upper middle income	10
Seychelles	Upper middle income	0
South Africa	Upper middle income	103
St. Lucia	Upper middle income	0
St. Vincent and the Grenadines	Upper middle income	0
Suriname	Upper middle income	0
Thailand	Upper middle income	61
Tonga	Upper middle income	0
Tunisia	Upper middle income	0
Turkey	Upper middle income	1
Turkmenistan	Upper middle income	0
Tuvalu	Upper middle income	0
Venezuela, RB	Upper middle income	22

Annex 2: Questionnaire on acceptable and unacceptable practices in reporting research

Study on research reporting practices

Section A: Please answer the following questions:

1. Which country are you currently working in?

2. Where do you currently work?
    a. University
    b. Other research institution
    c. Other (please specify)

3. How long have you been working here? (months and years)

4. What is your highest qualification?
    a. Bachelor's degree
    b. Master's degree
    c. PhD

5. On average, how much of your time (%) do you spend on research?

6. How many peer reviewed research articles have you been an author on?

7. What was the year of your first publication?

8. How many Cochrane reviews are you an author on?

9. What is your first language?

10. What is your gender?
    a. Male
    b. Female

11. What is your age?

<u>Section B: Please read the following scenarios and answer the questions that follow:</u>

1. A junior researcher, J, adds the head of department, D, as the last author on a research paper. D provided suggestions for direction of J's work that helped her obtain the grant, although he hasn't contributed to the actual research or the publication.

My view on this is:

- This is acceptable because D should be an author
- This is not best practice, but it does not really matter, as it doesn't affect the science
- This is unacceptable because D has not contributed to this paper

Have you ever done something like this?

- Yes
- No, and I am <u>not</u> aware of anybody else doing it
- No, but I <u>am</u> aware of other people doing it

In my current department or unit, this pattern of authorship

- Is usual practice and happens most of the time
- Happens occasionally
- Happens rarely
- Never happens
- Other: (please specify)

Comments or clarifications:

2. A professor, M, who did not contribute to study design, data collection or data analysis but is an expert in the field, reviews the draft manuscript and suggests some minor changes to the English. He asks to be listed as an author on the paper.

My view on this is:

- This is acceptable because M should be an author
- This is not best practice, but it does not really matter, as it doesn't affect the science
- This is unacceptable because M has not sufficiently contributed to this paper

Have you ever done something like this?

- Yes
- No, and I am <u>not</u> aware of anybody else doing it
- No, but I <u>am</u> aware of other people doing it

In my current department or unit, this pattern of authorship

- Is usual practice and happens most of the time
- Happens occasionally
- Happens rarely
- Never happens

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- Other: (please specify)

Comments or clarifications:

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3. A Master's student consults with the resident biostatistician, P, to help with data analysis on her research project. In the manuscript that she submits for publication, she lists P in the "Acknowledgement" section.

My view on this:

- This is acceptable because P should be acknowledged in this way
- This is not best practice, but it does not really matter, as it doesn't affect the science
- This is unacceptable because P has made substantial contributions to the work

Have you ever done something like this?

- Yes
- No, and I am <u>not</u> aware of anybody else doing it
- No, but I <u>am</u> aware of other people doing it

In my current department or unit, this pattern of authorship

- Is usual practice and happens most of the time
- Happens occasionally
- Happens rarely
- Never happens
- Other: (please specify)

Comments or clarifications:

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4. A PhD student "copies and pastes" nearly all of the introduction from a paper that she has previously published into her next manuscript, since she is doing a series of experiments on the same topic.

My view on this is:

- This is acceptable because it is her own work
- This is not allowed by journals but it does not really matter, as it doesn't affect the science
- This is unacceptable behaviour

Have you ever done something like this?

- Yes
- No, and I am <u>not</u> aware of anybody else doing it
- No, but I <u>am</u> aware of other people doing it

In my current department such text-recycling

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- Is usual practice and happens most of the time
- Happens occasionally
- Happens rarely
- Never happens
- Other: (please specify)

Comments or clarifications:

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5. A researcher in Mozambique wants to submit his manuscript to a journal published in English. He finds a text book in Portuguese that explains an aspect of the background to the disease very well. He translates one paragraph into English, and puts this into his introduction without reference to the book.

My view on this is:

- This is acceptable because the text has been translated
- This is not best practice, but it does not really matter, as it doesn't affect the science
- This is unacceptable behaviour

Have you ever done something like this?

- Yes
- No, and I am <u>not</u> aware of anybody else doing it
- No, but I <u>am</u> aware of other people doing it

In my current department or unit, such use of other people's material:

- Is usual practice and happens most of the time
- Happens occasionally
- Happens rarely
- Never happens
- Other: (please specify)

Comments and clarifications:

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6. A researcher, T, is working on a diagnostic test study. The company manufacturing the test has supplied the kits for free but did not design or fund the research. T was paid for a consultancy for the same company two years ago. In the publication of the study, he declares that he has no conflicts of interest.

My view on this is:

- This is acceptable because T does not have a conflict of interest
- This is not best practice, but it does not really matter, as it doesn't affect the science
- This is unacceptable because T should disclose this consultancy

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Have you ever done something like this?

- Yes
- No, and I am <u>not</u> aware of anybody else doing it
- No, but I <u>am</u> aware of other people doing it

In my current department or unit, this behaviour happens:

- Is usual practice and happens most of the time
- Happens occasionally
- Happens rarely
- Never happens
- Other: (please specify)

Comments or Clarifications:

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7. A researcher, K, writes a review for treatment guidelines of herbal remedies for children's cough. K's wife is employed by the company that manufactures one of these remedies. In the review, K declares that he has no conflicts of interest.

My view on this is:

- This is acceptable because K does not have a conflict of interest
- This is not best practice, but it does not really matter, as it doesn't affect the science
- This is unacceptable because K should disclose his wife's link to the company

Have you ever done something like this?

- Yes
- No, and I am <u>not</u> aware of anybody else doing it
- No, but I <u>am</u> aware of other people doing it

In my current department or unit, this behaviour happens:

- Is usual practice and happens most of the time
- Happens occasionally
- Happens rarely
- Never happens
- Other: (please specify)

Comments or clarifications:

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8. A researcher, S, contributes to the design and does most of the data collection in a study but goes on maternity leave as it is being analysed. When she returns to her post she

discovers that the research has been published by her supervisor without her name or any acknowledgement of her contributions.

My view on this is:

- This is acceptable because S did not contribute to the publication
- This is not best practice, but it does not really matter, as it doesn't affect the science
- This is unacceptable because S should have been invited to contribute to the publication

Have you ever done something like this?

- Yes
- No, and I am not aware of anybody else doing it
- No, but I am aware of other people doing it

In my current department or unit, this type of practice (leaving out a junior author who has made substantial contributions) happens:

- Is usual practice and happens most of the time
- Happens occasionally
- Happens rarely
- Never happens
- Other: (please specify)

    Comments or clarifications:

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9. A researcher from India attends an international conference where a European research study with a novel design is presented. He submits a protocol for an identical study to the ethics committee at his home institution. He does not reference the European study.

My view on this:

- This is acceptable
- This is not best practice, but it does not really matter, as it doesn't affect the science
- This is unacceptable because the original idea should be acknowledged

Have you ever done something like this?

- Yes
- No, and I am not aware of anybody else doing it
- No, but I am aware of other people doing it

In my current department or unit, this behaviour happens:

- Is usual practice and happens most of the time
- Happens occasionally
- Happens rarely
- Never happens
- Other: (please specify)

Comments or clarifications:

_____

Section C: Please answer the following questions:

1. Are you aware of any written institutional policies that cover the situations described in our scenarios?
   a. Yes
   b. No

2. Would you be interested in participating in an interview via Skype or telephone to discuss research reporting practices further?
   a. Yes
   b. No

3. Would you be interested in receiving feedback on this study?
   a. Yes
   b. No

Thank you for participating in the survey.

Annex 3: Email to participants of online survey

Dear Cochrane author,

We are currently conducting a study to understand researchers' understanding and experiences with research reporting practices in low-and middle-income countries (LMICs). As part of this study, we are conducting a survey amongst contact authors of published Cochrane reivews, living in LMICs.

As you are the contact author of a published Cochrane reivew, we would like to invite you to participate in the online survey.

Please note that your anonymity will be ensured and that participation is entirely voluntary. Completion of the survey will be considered informed consent. The survey will take approximately 20 minutes to complete.

We are planning to publish the results of this survey and will let you know once the results of the survey are available.

Please follow the link to complete the survey:

(link to Google survey)

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Thank you in advance for your time!

Kind regards,

Anke Rohwer (on behalf of the research team)

Annex 4: Interview guide for semi-structured interviews

Hi *(Name)*

Thanks so much for agreeing to talk to me about research reporting today. I just want to check – have you read the information sheet? Is there anything that is unclear? As noted in the sheet, I will record our conversation – are you fine with that? Please note that all reporting is anonymous and you will not be identified in any way, and you are free to stop the interview at any time.

Another thing I want to mention is that we invited you to complete the survey because you are an author on a Cochrane review, but I would like you to think about any research publication – not just Cochrane reviews – during our conversation.

Let's start then. You work at the *(institution as provided by participant)*, right? What is your job there?

Let's talk about the survey that you completed a few weeks ago. What did you think about the situations we gave, did any seem familiar? What do you remember?

Some of the scenarios were about being an author on a paper. Have you come across any issues here yourself? What happened?

- *Prompts depending on answer:*
    - What about omitting an author that has contributed sufficiently to the research paper?
    - What about adding an author that has not made a big enough contribution to the research paper?
- Have you experienced something like this?
- How do you decide on authorship at your institution?
- Are there any guidelines about authorship at your institution? Are these being followed?

Some of the scenarios were about people copying other peoples work, often called plagiarism.

What do you think about this? What do you understand by it? What do you think are the main problems with plagiarism?

- *Prompts depending on answer:*
    - What about translating a text into another language?
    - What about copying a text from another paper?
    - What about using someone else's idea?
- Do you have guidelines on plagiarism at your institution?

There were also scenarios about conflict of interest. How do you understand conflict of interest? Why do you think this is a problem?

- *Prompts depending on answer:*
    - What about being paid by a drug company for a consultation not related to the research project?
    - What about conflicts of interest that do not involve money?
- How do you deal with these competing interests at your institution and how are they reported in a paper?

What about other problems that we did not address in the survey, like making-up or manipulating data - Are you aware of any other poor practices happening at your institution?

Why do you think people engage in this bad practice?

What do you think can be done to prevent this behaviour?

Any other comments or questions?

Annex 5: Informed consent for qualitative interviews

PARTICIPANT INFORMATION LEAFLET

TITLE OF THE RESEARCH PROJECT: Research integrity in reporting research: Documenting understanding and perceptions around plagiarism, conflict of interest and authorship criteria in low- and middle income countries

REFERENCE NUMBER:

PRINCIPAL INVESTIGATOR: Ms Anke Rohwer

ADDRESS: Centre for Evidence-based Health Care, Faculty of Medicine and Health Sciences, Stellenbosch University, Francie van Zijl drive, 7500 Parow, Cape Town, South Africa

CONTACT NUMBER: +27-21-9389886

Dear Colleague,

My name is Anke Rohwer and I am a researcher at the Centre for Evidence-based Health Care, Stellenbosch University, South Africa. I would like to invite you to participate in a research project that aims to investigate perceptions and experiences of good research reporting practices related to plagiarism, conflict of interest and authorship, amongst researchers in low- and middle-income countries.

Please take some time to read the information presented here, which will explain the details of this project and contact me if you require further explanation or clarification of any aspect of the study. Also, your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the **Health Research Ethics Committee (HREC) at Stellenbosch University** and will be conducted according to accepted and applicable National and International

ethical guidelines and principles, including those of the international Declaration of Helsinki October 2008.

You will be asked to participate in an individual, oral interview. During this interview an interviewer will ask you about your experiences with and understanding of good and bad research reporting practices at your institution, including issues such as conflict of interest, plagiarism and authorship. You will also be asked about existing policies related to these issues. The interview will take about 60 minutes, either face-to-face in a private room or via telephone or Skype, at a time that is convenient to you.

With your permission we would like to audio tape the interview. This ensures that valuable information from this interview is not missed. The information on the tape will be transcribed for analysis purposes. Your name will NOT appear on the transcription. The research team of this project will do the analysis of the interviews. If you do not want to be audio recorded, you can still participate in the interview, and the PI will take notes of important points that you make.

Your audio recording will not be released to any persons or entities other than the research team of this study, based at the Centre for Evidence-based Health Care at the Faculty of Medicine and Health Sciences, Stellenbosch University. The audio recording and typed transcription of the interview will be stored in a password protected computer file to which only the PI of this study will have access and will be destroyed within 12 months of your interview. The anonymous scientific data – in which no individuals will be named or identified – resulting from the study may be presented at meetings within the Faculty of Medicine and Health Sciences, used for PhD theses and published in national or international journals, for dissemination purposes.

If you are willing to participate in this study please sign the attached Declaration of Consent and hand it back to the interviewer. Alternatively, you can send it back to the principal investigator via email prior to the scheduled interview.

Yours sincerely

Ms Anke Rohwer

Principal Investigator

Declaration by participant

By signing below, I ……………………………………………………………………….. agree to take part in a research study entitled **Research integrity in reporting research: Documenting understanding and perceptions around plagiarism, conflict of interest and authorship criteria in low- and middle income countries.**

I declare that:

- I have read the attached information leaflet and it is written in a language with which I am fluent and comfortable.

- I have had a chance to ask questions and all my questions have been adequately answered.

- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.

- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.

- I may be asked to leave the study before it has finished, if the researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at (*place*) ....….......…………. On (*date*) ………….……….. 2015.

……………………………………………………………………………………….

Signature of participant

Annex 6: Informed consent for evaluation of research integrity workshop

PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

TITLE OF THE RESEARCH PROJECT: Research integrity in reporting research: Documenting understanding and perceptions around plagiarism, conflict of interest and authorship criteria in low- and middle income countries

REFERENCE NUMBER:

PRINCIPAL INVESTIGATOR: Ms Anke Rohwer

ADDRESS: Centre for Evidence-based Health Care, Faculty of Medicine and Health Sciences, Stellenbosch University, Francie van Zijl drive, 7500 Parow, Cape Town, South Africa

CONTACT NUMBER: +27-21-938 9886

Dear Colleague,

My name is Anke Rohwer and I am a researcher at the Centre for Evidence-based Health Care, Stellenbosch University, South Africa. As you are participating in a research integrity workshop, I would like to invite you to take part in the evaluation of this workshop in order improve it for future offerings. The evaluation is part of a bigger research project that aims to investigate perceptions and experiences of good research reporting practices related to plagiarism, conflict of interest and authorship, amongst researchers in low- and middle-income countries.

Please take some time to read the information presented here, which will explain the details of this project. Please ask the workshop facilitators any questions about any part of this evaluation that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you

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negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the **Health Research Ethics Committee at Stellenbosch University** and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

What is this research study all about?

We are conducting a formal evaluation of the research integrity workshop in order to improve future workshops. We would therefore like to know whether you are satisfied with the workshop and how you experienced it; what you learned and whether you will do anything linked to research reporting practices differently based on what you have learned in the workshop.

Why have you been invited to participate?

You have been invited to take part in the evaluation, as you are a participant of the workshop. You can help us to improve further workshops in order to promote research integrity in low- and middle income countries.

What will your responsibilities be?

You will be invited to complete an online survey before the workshop as well as after the workshop. We will ask you about your views on research reporting practices and about your research reporting practices. We will also ask you to complete an evaluation form after the workshop, where you can indicate your satisfaction with each session during the workshop and can tell us what you liked and what you did not like.

The workshop will be interactive and we anticipate a lot of discussions. You can decide whether or not you want to participate in the discussions. With your permission, we will record all discussions with a digital voice recorder. In addition, one of the facilitators will take written notes.

Will you benefit from taking part in this research?

The research will help us to improve the workshop so that we can actively promote research integrity across Sub-Saharan Africa.

Are there in risks involved in your taking part in this research?

We do not anticipate any risks. Responses from the survey and the evaluation will be anonymous. We will record the discussion with a digital audio recorder and take notes during the discussions. The audio recording will not be released to any persons or entities other than the research team of this study, based at the Centre for Evidence-based Health Care at the Faculty of Medicine and Health Sciences, Stellenbosch University. The audio recording and typed transcription of the discussions will be stored in a password protected computer file to which only the PI of this study will have access and will be destroyed within 12 months of the workshop.

If you do not agree to take part, what alternatives do you have?

You can still participate in the workshop even if you do not want to take part in the evaluation. There will be no implications.

Will you be paid to take part in this study and are there any costs involved?

No, you will not be paid to take part in the study and there will be no costs involved for you, if you do take part.

Is there anything else that you should know or do?

You can contact the Health Research Ethics Committee at 021-938 9207 if you have any concerns or complaints that have not been adequately addressed. The anonymous scientific data – in which no individuals will be named or identified – resulting from the study may be presented at meetings within the Faculty of Medicine and Health Sciences, used for PhD theses and published in national or international journals, for dissemination purposes.

You will receive a copy of this information and consent form for your own records via email.

Declaration by participant

By signing below, I ……………………………….…………. agree to take part in a research study entitled **Research integrity in reporting research: Documenting understanding and perceptions around plagiarism, conflict of interest and authorship criteria in low- and middle income countries (Evaluation of research integrity workshop)**

I declare that:

- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.

- I have had a chance to ask questions and all my questions have been adequately answered.

- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.

- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.

- I may be asked to leave the study before it has finished, if the study doctor or researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at (*place*) ....…......…………………. on (*date*) ………….…………. 2017.

Signature of participant

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Annex 7: Evaluation form (per session)

Session X					
The presentation was	Very good	Good	Moderate	Slightly poor	Poor
The content was	Very Useful	Useful	Moderately useful	Slightly useful	Not useful
I learnt	A great deal	Quite a deal	A moderate amount	Only a little	Almost nothing
Additional commentary					
Please list three things that you liked most about this session:					
Please list three things that would improve the usefulness of the session or that would help your learning:					

Appendix 2

Appendix 2.1: Protocol of systematic review

2.1.1 Study objectives

1. To estimate the prevalence of research misconduct in reporting research amongst health researchers in low-and middle income countries (LMICs)
2. To describe the factors associated with research integrity and good research reporting practices in LMICs
3. To map the literature related to research integrity in LMICs and identify gaps

2.1.2 Methods

Criteria for considering inclusion of studies

Types of participants:
- Health researchers in LMICs (as defined by the World Bank – Appendix 1)

Types of studies:
- Studies relating to research reporting practices, namely data fabrication, data falsification, plagiarism, conflict of interest, authorship practices, acknowledgement practices, salami publication, duplicate publication, delayed publication and accurate reporting of results
- Published and unpublished reports containing
  - Quantitative data on the occurrence of and the factors associated with research misconduct in a specific population (e.g. surveys)
  - Qualitative data on research integrity and good research reporting practices
  - A case study of research misconduct
- We will exclude studies that:
  - Investigate research integrity when planning, conducting and reviewing research
  - Investigate academic integrity (e.g. student cheating)

Types of outcome measures:
- Occurrence of research misconduct, related to data fabrication, data falsification, plagiarism, conflict of interest, authorship practices, acknowledgement practices, salami publication, duplicate publication, delayed publication, and inaccurate reporting of results
- Factors associated with research integrity and good research reporting practices related to:
  - Attitudes and behaviours of individuals
  - Organisational structure (e.g. institutional policies)
  - Organisational processes (e.g. leadership, supervision, role-models)
  - Organisational culture
  - Broader research environment (e.g. funding agencies, journals)

Search methods for identifying studies

Electronic searches
We will search MEDLINE via PubMed, Scopus, CINHAL, ERIC, PsychInfo, Web of Science, LILACS and Africa-Wide. The search strings will contain a combination of text words and MeSH terms of the

terms "research integrity" and "low-and middle-income countries". The search strategy for searching MEDLINE via PubMed is detailed in Appendix 2. Search strategies for the other databases will be based on this, but adapted and revised appropriately for each database. We will not have restrictions based on language or publication status.

Searching other resources

We will contact experts in the field to find out whether they are aware of any unpublished studies and check reference lists of included studies for potentially eligible studies. We will specifically contact experts in China and India to enquire about relevant studies that might not have been identified in the literature search.

Study selection, data collection and analysis

Selection of studies

Two authors will independently screen titles and abstracts of search outputs to identify potentially relevant studies. Full texts of potentially relevant studies will be retrieved and will be screened independently for eligibility by two authors. Discrepancies will be resolved through discussion or consultation with another author. We will list reasons for excluding studies.

Data extraction and management

In the first step of the review, all eligible studies will be used to create a descriptive map of the literature on research misconduct in LMICs. This will describe the type of research activity or issues addressed and will not focus on the findings of these studies. Two authors will independently extract data using a pre-piloted data extraction form. We will extract data on the aim of the study, country of origin, setting (e.g. urban vs. rural, organisational setting), research methods, participants, specific contexts, policies and practices addressed, and any other important information on the study.

From the descriptive map, we will identify studies that assessed occurrence of and factors associated with research misconduct. For these studies, two authors will independently extract more detailed information using a pre-piloted data extraction form. We will extract data on the study population, study design, study methods, outcomes and results.

Discrepancies will be resolved through discussions amongst the author team. We will contact authors of studies in case of missing data.

Assessment of risk of bias

We will perform risk of bias assessment on surveys and qualitative studies assessing occurrence of and factors associated with research misconduct. For surveys, we will use the tool by Hoy et al[8] (Table 2) and for qualitative studies, we will use the CASP tool (Table 3).

Table 2: Critical appraisal tool for surveys

External validity
1. Was the study's target population a close representation of the national population in relation to relevant variables?

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[8] Hoy D, Brooks P, Woolf A, Blyth F, March L, Bain C, et al. Assessing risk of bias in prevalence studies: modification of an existing tool and evidence of interrater agreement. J Clin Epidemiol. 2012;65(9):934-9.

2.	Was the sampling frame a true or close representation of the target population?
3.	Was some form of random selection used to select the sample, OR was a census undertaken?
4.	Was the likelihood of nonresponse bias minimal?
Internal validity	
5.	Were data collected directly from the subjects (as opposed to a proxy)?
6.	Was an acceptable case definition used in the study?
7.	Was the study instrument that measured the parameter of interest shown to have validity and reliability?
8.	Was the same mode of data collection used for all subjects?
9.	Was the length of the shortest prevalence period for the parameter of interest appropriate?
10.	Were the numerator(s) and denominator(s) for the parameter of interest appropriate?

Table 3: CASP tool for qualitative research

Appraisal questions	Yes	Can't tell	No
1. Was there a clear statement of the aims of the research?			
2. Is a qualitative method appropriate?			
3. Was the research design appropriate to address the aims of the research?			
4. Was the recruitment strategy appropriate to the aims of the research?			
5. Was the data collected in a way that addressed the research issue?			
6. Has the relationship between researcher and participants been adequately considered?			
7. Have ethical issues been taken into consideration?			
8. Was the data analysis sufficiently rigorous?			
9. Is there a clear statement of findings?			
10. How valuable is the research?			

Data synthesis

For the descriptive map of all studies, we will make use of tables to present our results in meaningful categories. In addition, we will narratively summarise the key findings.

For studies on the occurrence of and factors associated with research misconduct, we anticipate high levels of heterogeneity related to outcome measurement and study methodology. We will therefore not pool results in a meta-analysis, but rather report on the results of each outcome narratively.

Appendix 2.2: Search strategies

2.2.1 PubMed search strategy

Search	Query
#1	Search guest authorship Field: Title/Abstract
#2	Search ghost authorship Field: Title/Abstract
#3	Search gift authorship Field: Title/Abstract
#4	Search "author* contribution" [Title/Abstract] Field: Title/Abstract
#5	Search "conflicting interest" Field: Title/Abstract
#6	Search "data fabrication" Field: Title/Abstract
#7	Search publication retraction Field: Title/Abstract
#8	Search data fabrication Field: Title/Abstract
#9	Search "competing interest" Field: Title/Abstract
#10	Search "conflict of interest" Field: Title/Abstract
#11	Search plagiarism Field: Title/Abstract
#12	Search ("Plagiarism"[Mesh]) OR "Conflict of Interest"[Mesh] Field: Title/Abstract
#13	Search "research fraud" Field: Title/Abstract
#14	Search scientific fraud Field: Title/Abstract
#15	Search "scientific fraud"[Title/Abstract] Field: Title/Abstract
#16	Search publication misconduct Field: Title/Abstract
#17	Search scientific misconduct Field: Title/Abstract
#18	Search "Scientific Misconduct"[Mesh] Field: Title/Abstract
#19	Search research misconduct Field: Title/Abstract
#20	Search research integrity Field: Title/Abstract
#21	Search (((scientific dishonesty[Title/Abstract]) OR irresponsible research practice[Title/Abstract]) OR questionable research practice[Title/Abstract]) OR publication* ethic*[Title/Abstract] Field: Title/Abstract
#22	Search ("Retraction of Publication as Topic"[Mesh]) OR "Duplicate Publication as Topic"[Mesh] Field: Title/Abstract
#23	Search duplicate publication Field: Title/Abstract
#24	Search authorship[MeSH Terms] Field: Title/Abstract
#25	Search authorship Field: Title/Abstract
#26	Search "Developing Countries"[Mesh] OR "developing countries" [tiab] OR "developing country" [tiab] OR "low income" [tiab] OR "middle income" [tiab] OR "low-and middle-income" [tiab] OR "low and middle income" [tiab] Field: Title/Abstract
#27	Search Albania*[Tiab] OR Algeria*[Tiab] OR "American Samoa"[Tiab] OR Antigua*[Tiab] OR Barbuda*[Tiab] OR Argentin*[Tiab] OR Azerbaijan*[Tiab] OR Belarus*[Tiab] OR Bosnia*[Tiab] OR Herzegovin*[Tiab] OR Botswana[Tiab] OR Motswana[Tiab] OR Batswana[Tiab] OR Brazil*[Tiab] OR Bulgaria*[Tiab] OR Chile*[Tiab] OR Colombia*[Tiab] OR "Costa Rica" [Tiab] OR Cuba*[Tiab] OR Dominica*[Tiab] OR "Dominican Republic"[Tiab] OR Fiji*[Tiab] OR Gabon*[Tiab] OR Grenad*[Tiab] OR Iran*[Tiab] OR Jamaica*[Tiab] OR Kazakhstan*[Tiab] OR Leban*[Tiab] OR Libya*[Tiab] OR Lithuania*[Tiab] OR Macedonia*[Tiab] OR Malaysia*[Tiab] OR Mauriti*[Tiab] OR Mayotte[Tiab] OR Mahoran[Tiab] OR Mexic*[Tiab] OR Montenegr*[Tiab] OR Namibia*[Tiab] OR Palau*[Tiab] OR Panama*[Tiab] OR Peru*[Tiab] OR Romania*[Tiab] OR Russia*[Tiab] OR Serbia*[Tiab] OR Seychell*[Tiab] OR "South Africa" [Tiab] OR "St Lucia" [Tiab] OR Suriname*[Tiab] OR Turk*[Tiab] OR Uruguay*[Tiab] OR Venezuela*[Tiab] OR Angola*[Tiab] OR Armenia*[Tiab] OR Belize*[Tiab] OR Bhutan*[Tiab] OR Bolivia*[Tiab] OR Cameroon*[Tiab] OR "Cape Verd*" [Tiab] OR China [Tiab] OR Chinese[Tiab] OR "Cote d'Ivoire" [Tiab] OR Ivorian[Tiab] OR

	Djibouti[Tiab] OR Ecuador*[Tiab] OR Egypt*[Tiab] OR "El Salvador"[Tiab] OR Salvadoran[Tiab] OR Guatemala*[Tiab] OR Guyana[Tiab] OR Guyanese[Tiab] OR Hondura*[Tiab] OR India*[Tiab] OR Indonesia*[Tiab] OR Iraq*[Tiab] OR Jordan*[Tiab] OR Kiribati[Tiab] OR Kosov*[Tiab] OR Lesotho[Tiab] OR Mosotho[Tiab] OR Basotho[Tiab] OR Maldiv*[Tiab] OR "Marshall Islands"[Tiab] OR Marshallese[Tiab] OR Micronesia*[Tiab] OR Moldova*[Tiab] OR Mongolia*[Tiab] OR Morocc*[Tiab] OR Nicaragua*[Tiab] OR Nigeria*[Tiab] OR Pakistan*[Tiab] OR "Papua New Guinea*" [Tiab] OR Paraguay*[Tiab] OR Philippines[Tiab] OR Filipino[Tiab] OR Samoa*[Tiab] OR Senegal*[Tiab] OR Sri Lanka*[Tiab] OR Sudan*[Tiab] OR Swaziland[Tiab] OR Swazi[Tiab] OR "Syrian Arab Republic"[Tiab] OR Syria*[Tiab] OR Thailand [Tiab] OR Thai [Tiab] OR TimOR-Leste[Tiab] OR "East Timorese"[Tiab] OR Tonga*[Tiab] OR Tunisia*[Tiab] OR Turkmen*[Tiab] OR Tuvalu*[Tiab] OR Ukrain*[Tiab] OR Uzbekistan*[Tiab] OR Uzbek[Tiab] OR Vanuatu[Tiab] OR Ni-Vanuatu [Tiab] OR Vietnam*[Tiab] OR Afghan*[Tiab] OR Bangladesh* [Tiab] OR Benin* [Tiab] OR Burkina Faso [Tiab] OR Burkinabé [Tiab] OR Burundi*[Tiab] OR Cambodia*[Tiab] OR "Central African Republic" [Tiab] OR Chad* [Tiab] OR Comoros[Tiab] OR Comorian*[Tiab] OR Congo*[Tiab] OR Eritrea*[Tiab] OR Ethiopia* [Tiab] OR Gambia*[Tiab] OR Ghana*[Tiab] OR Guinea-Bissau*[Tiab] OR Haiti*[Tiab] OR Kenya* [Tiab] OR "Kyrgyz Republic" [Tiab] OR Kyrgyzstani [Tiab] OR Lao*[Tiab] OR Liberia*[Tiab] OR Madagascar [Tiab] OR Malagasy [Tiab] OR Malawi*[Tiab] OR Mali*[Tiab] OR Mauritania*[Tiab] OR Mozambique [Tiab] OR Mozambican[Tiab] OR Myanmar*[Tiab] OR Burma[Tiab] OR Burmese[Tiab] OR Nepal*[Tiab] OR Niger*[Tiab] OR Rwanda*[Tiab] OR Sierra Leone*[Tiab] OR "Solomon Islands" [Tiab] OR "Solomon Islanders"[Tiab] OR Somali*[Tiab] OR Tajikistan*[Tiab] OR Tanzania*[Tiab] OR Togo*[Tiab] OR Uganda*[Tiab] OR Zambia*[Tiab] OR Zimbabwe*[Tiab] OR "Africa"[Mesh] OR Africa*[tiab] OR "Asia"[Mesh] OR Asia* [tiab] OR "South America"[Mesh] OR "South America*"[tiab] OR "Latin America"[Mesh] OR "Latin America*"[tiab] OR "Europe, Eastern"[Mesh] OR "Central America"[Mesh] OR "Central America*"[tiab] OR "Caribbean Region"[Mesh] OR "Caribbean"[tiab] Field: Title/Abstract
#28	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 Field: Title/Abstract
#29	#26 OR #27 Field: Title/Abstract
#30	#28 AND #29

2.2.2 Web of Science search strategy

Search	Query
#1	**TOPIC:** (Albania* OR Algeria* OR "American Samoa" OR Antigua* OR Barbuda* OR Argentin* OR Azerbaijan* OR Belarus* OR Bosnia* OR Herzegovin* OR Botswana OR Motswana OR Batswana OR Brazil* OR Bulgaria* OR Chile* OR Colombia* OR "Costa Rica" OR Cuba* OR Dominica* OR "Dominican Republic" OR Fiji* OR Gabon* OR Grenad* OR Iran* OR Jamaica* OR Kazakhstan* OR Leban* OR Libya* OR Lithuania* OR Macedonia* OR Malaysia* OR Mauriti* OR Mayotte OR Mahoran OR Mexic* OR Montenegr* OR Namibia* OR Palau* OR Panama* OR Peru* OR Romania* OR Russia* OR Serbia* OR Seychell* OR "South Africa" OR "St Lucia" OR Suriname* OR Turk* OR Uruguay* OR Venezuela* OR Angola* OR Armenia* OR Belize* OR Bhutan* OR Bolivia* OR Cameroon* OR "Cape Verd*" OR China OR Chinese OR "Cote d'Ivoire" OR Ivorian OR Djibouti OR Ecuador* OR Egypt* OR "El Salvador" OR Salvadoran OR Guatemala* OR Guyana OR Guyanese OR Hondura* OR India* OR Indonesia* OR Iraq* OR Jordan* OR Kiribati OR Kosov* OR Lesotho OR Mosotho OR Basotho OR Maldiv* OR "Marshall Islands" OR Marshallese OR Micronesia* OR Moldova* OR Mongolia* OR Morocc* OR Nicaragua* OR Nigeria* OR Pakistan* OR "Papua New Guinea*" OR Paraguay* OR Philippines OR Filipino OR Samoa* OR Senegal* OR Sri Lanka* OR Sudan* OR Swaziland

	OR Swazi OR "Syrian Arab Republic" OR Syria* OR Thailand OR Thai OR Timor-Leste OR "East Timorese" OR Tonga* OR Tunisia* OR Turkmen* OR Tuvalu* OR Ukrain* OR Uzbekistan* OR Uzbek OR Vanuatu OR Ni-Vanuatu OR Vietnam* OR Afghan* OR Bangladesh* OR Benin* OR Burkina Faso OR Burkinabé OR Burundi* OR Cambodia* OR "Central African Republic" OR Chad* OR Comoros OR Comorian* OR Congo* OR Eritrea* OR Ethiopia* OR Gambia* OR Ghana* OR Guinea-Bissau* OR Haiti* OR Kenya* OR "Kyrgyz Republic" OR Kyrgyzstani OR Lao* OR Liberia* OR Madagascar OR Malagasy OR Malawi* OR Mali* OR Mauritania* OR Mozambique OR Mozambican OR Myanmar* OR Burma OR Burmese OR Nepal* OR Niger* OR Rwanda* OR Sierra Leone* OR "Solomon Islands" OR "Solomon Islanders" OR Somali* OR Tajikistan* OR Tanzania* OR Togo* OR Uganda* OR Zambia* OR Zimbabwe* OR "Africa" OR "Asia" OR "South America*" OR "Latin America*" OR "Central America" OR "Caribbean") Indexes=SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH Timespan=All years
#2	**TOPIC:** ("scientific misconduct") Indexes=SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH Timespan=All years
#3	**TOPIC:** ("research misconduct") *OR* **TOPIC:** ("research integrity") *OR* **TOPIC:** ("scientific dishonesty") *OR* **TOPIC:** ("publication ethics") *OR* **TOPIC:** ("publication retraction") *OR* **TOPIC:** ("duplicate publication") Indexes=SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH Timespan=All years
#4	**TOPIC:** (authorship) *OR* **TOPIC:** ("author contribution") *OR* **TOPIC:** ("scientific fraud*") *OR* **TOPIC:** ("research fraud*") *OR* **TOPIC:** (plagiarism) *OR* **TOPIC:** ("conflict of interest") *OR* **TOPIC:** ("competing interest") *OR* **TOPIC:** ("data fabrication") *OR* **TOPIC:** ("data falsification") Indexes=SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH Timespan=All years
#5	**TOPIC:** ("developing countr*") *OR* **TOPIC:** ("low income") *OR* **TOPIC:** ("middle income") *OR* **TOPIC:** ("low and middle income") *OR* **TOPIC:** (LMIC) Indexes=SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH Timespan=All years
#6	#5 OR #1 Indexes=SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH Timespan=All years
#7	#4 OR #3 OR #2 Indexes=SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH Timespan=All years
#8	#7 AND #6 Indexes=SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH Timespan=All years

2.2.3 EBSCOHost (Africa-wide, Cinahl, PsycInfo, ERIC) search strategy

Search	Query
S1	TI (Albania* OR Algeria* OR "American Samoa" OR Antigua* OR Barbuda* OR Argentin* OR Azerbaijan* OR Belarus* OR Bosnia* OR Herzegovin* OR Botswana OR Motswana OR Batswana OR Brazil* OR Bulgaria* OR Chile* OR Colombia* OR "Costa Rica" OR Cuba* OR Dominica* OR "Dominican Republic" OR Fiji* OR Gabon* OR Grenad* OR Iran* OR Jamaica* OR Kazakhstan* OR Leban* OR Libya* OR Lithuania* OR Macedonia* OR Malaysia* OR Mauriti* OR Mayotte OR Mahoran OR Mexic* OR Montenegr* OR Namibia* OR Palau* OR Panama* OR Peru* OR Romania* OR Russia* OR Serbia* OR Seychell* OR "South Africa" OR "St Lucia" OR Suriname* OR Turk* OR Uruguay* OR Venezuela* OR Angola* OR Armenia* OR Belize* OR Bhutan* OR Bolivia* OR Cameroon* OR "Cape Verd*" OR China OR Chinese OR "Cote d'Ivoire" OR Ivorian OR Djibouti OR Ecuador* OR Egypt* OR "El Salvador" OR Salvadoran OR Guatemala* OR Guyana OR Guyanese OR Hondura* OR India* OR Indonesia* OR Iraq* OR Jordan* OR Kiribati OR

	Kosov* OR Lesotho OR Mosotho OR Basotho OR Maldiv* OR "Marshall Islands" OR Marshallese OR Micronesia* OR Moldova* OR Mongolia* OR Morocc* OR Nicaragua* OR Nigeria* OR Pakistan* OR "Papua New Guinea*" OR Paraguay* OR Philippines OR Filipino OR Samoa* OR Senegal* OR Sri Lanka* OR Sudan* OR Swaziland OR Swazi OR "Syrian Arab Republic" OR Syria* OR Thailand OR Thai OR Timor-Leste OR "East Timorese" OR Tonga* OR Tunisia* OR Turkmen* OR Tuvalu* OR Ukrain* OR Uzbekistan* OR Uzbek OR Vanuatu OR Ni-Vanuatu OR Vietnam* OR Afghan* OR Bangladesh* OR Benin* OR Burkina Faso OR Burkinabé OR Burundi* OR Cambodia* OR "Central African Republic" OR Chad* OR Comoros OR Comorian* OR Congo* OR Eritrea* OR Ethiopia* OR Gambia* OR Ghana* OR Guinea-Bissau* OR Haiti* OR Kenya* OR "Kyrgyz Republic" OR Kyrgyzstani OR Lao* OR Liberia* OR Madagascar OR Malagasy OR Malawi* OR Mali* OR Mauritania* OR Mozambique OR Mozambican OR Myanmar* OR Burma OR Burmese OR Nepal* OR Niger* OR Rwanda* OR Sierra Leone* OR "Solomon Islands" OR "Solomon Islanders" OR Somali* OR Tajikistan* OR Tanzania* OR Togo* OR Uganda* OR Zambia* OR Zimbabwe* OR "Africa" OR "Asia" OR "South America*" OR "Latin America*" OR "Central America" OR "Caribbean") OR AB (Albania* OR Algeria* OR "American Samoa" OR Antigua* OR Barbuda* OR Argentin* OR Azerbaijan* OR Belarus* OR Bosnia* OR Herzegovin* OR Botswana OR Motswana OR Batswana OR Brazil* OR Bulgaria* OR Chile* OR Colombia* OR "Costa Rica" OR Cuba* OR Dominica* OR "Dominican Republic" OR Fiji* OR Gabon* OR Grenad* OR Iran* OR Jamaica* OR Kazakhstan* OR Leban* OR Libya* OR Lithuania* OR Macedonia* OR Malaysia* OR Mauriti* OR Mayotte OR Mahoran OR Mexic* OR Montenegr* OR Namibia* OR Palau* OR Panama* OR Peru* OR Romania* OR Russia* OR Serbia* OR Seychell* OR "South Africa" OR "St Lucia" OR Suriname* OR Turk* OR Uruguay* OR Venezuela* OR Angola* OR Armenia* OR Belize* OR Bhutan* OR Bolivia* OR Cameroon* OR "Cape Verd*" OR China OR Chinese OR "Cote d'Ivoire" OR Ivorian OR Djibouti OR Ecuador* OR Egypt* OR "El Salvador" OR Salvadoran OR Guatemala* OR Guyana OR Guyanese OR Hondura* OR India* OR Indonesia* OR Iraq* OR Jordan* OR Kiribati OR Kosov* OR Lesotho OR Mosotho OR Basotho OR Maldiv* OR "Marshall Islands" OR Marshallese OR Micronesia* OR Moldova* OR Mongolia* OR Morocc* OR Nicaragua* OR Nigeria* OR Pakistan* OR "Papua New Guinea*" OR Paraguay* OR Philippines OR Filipino OR Samoa* OR Senegal* OR Sri Lanka* OR Sudan* OR Swaziland OR Swazi OR "Syrian Arab Republic" OR Syria* OR Thailand OR Thai OR Timor-Leste OR "East Timorese" OR Tonga* OR Tunisia* OR Turkmen* OR Tuvalu* OR Ukrain* OR Uzbekistan* OR Uzbek OR Vanuatu OR Ni-Vanuatu OR Vietnam* OR Afghan* OR Bangladesh* OR Benin* OR Burkina Faso OR Burkinabé OR Burundi* OR Cambodia* OR "Central African Republic" OR Chad* OR Comoros OR Comorian* OR Congo* OR Eritrea* OR Ethiopia* OR Gambia* OR Ghana* OR Guinea-Bissau* OR Haiti* OR Kenya* OR "Kyrgyz Republic" OR Kyrgyzstani OR Lao* OR Liberia* OR Madagascar OR Malagasy OR Malawi* OR Mali* OR Mauritania* OR Mozambique OR Mozambican OR Myanmar* OR Burma OR Burmese OR Nepal* OR Niger* OR Rwanda* OR Sierra Leone* OR "Solomon Islands" OR "Solomon Islanders" OR Somali* OR Tajikistan* OR Tanzania* OR Togo* OR Uganda* OR Zambia* OR Zimbabwe* OR "Africa" OR "Asia" OR "South America*" OR "Latin America*" OR "Central America" OR "Caribbean")
S2	TI "developing countr*" OR AB developing countr*"
S3	TI ("low and middle income countr*") OR AB ("low and middle income countr*")
S4	TI LMIC OR AB LMIC
S5	S1 OR S2 OR S3 OR S4
S6	AB (authorship OR "author contribution" OR "scientific fraud*" OR "research fraud*" OR plagiarism OR "conflict of interest" OR "competing interest" OR "data fabrication" OR "data falsification") OR TI (authorship OR "author contribution" OR "scientific fraud*"

	OR "research fraud*" OR plagiarism OR "conflict of interest" OR "competing interest" OR "data fabrication" OR "data falsification")
S7	TI ("research misconduct" OR "research integrity" OR "scientific dishonesty" OR "publication ethics" OR "publication retraction" OR "duplicate publication") OR AB ("research misconduct" OR "research integrity" OR "scientific dishonesty" OR "publication ethics" OR "publication retraction" OR "duplicate publication")
S8	S6 OR S7
S9	S5 AND S8

2.2.4 LILACS search strategy

Search on : "research misconduct" OR "research integrity" OR "scientific dishonesty" OR "publication ethics" OR "publication retraction" OR "duplicate publication" [Title words] or "research misconduct" OR "research integrity" OR "scientific dishonesty" OR "publication ethics" OR "publication retraction" OR "duplicate publication" [Abstract words] or authorship OR "author contribution" OR "scientific fraud" OR "research fraud" OR plagiarism OR "conflict of interest" OR "competing interest" OR "data fabrication" OR "data falsification" [Title words] OR authorship OR "author contribution" OR "scientific fraud" OR "research fraud" OR plagiarism OR "conflict of interest" OR "competing interest" OR "data fabrication" OR "data falsification"[Abstract words]

2.2.5 Scopus search strategy

History Search Terms (((TITLE (albania* OR algeria* OR "American Samoa" OR antigua* OR barbuda* OR argentin* OR azerbaijan* OR belarus* OR bosnia* OR herzegovin* OR botswana OR motswana OR batswana OR brazil* OR bulgaria* OR chile* OR colombia* OR "Costa Rica" OR cuba* OR dominica* OR ") OR ABS(Albania* OR Algeria* OR " american samoa " OR Antigua* OR Barbuda* OR Argentin* OR Azerbaijan* OR Belarus* OR Bosnia* OR Herzegovin* OR Botswana OR Motswana OR Batswana OR Brazil* OR Bulgaria* OR Chile* OR Colombia* OR " costa rica " OR Cuba* OR Dominica* OR ") OR TITLE ("developing countr*" OR "low and middle income countr*" OR lmic) OR ABS ("developing countr*" OR "low and middle income countr*" OR lmic))) OR ((TITLE ("Dominican Republic" OR fiji* OR gabon* OR grenad* OR iran* OR jamaica* OR kazakhstan* OR leban* OR libya* OR lithuania* OR macedonia* OR malaysia* OR mauriti* OR mayotte OR mahoran OR mexic* OR montenegr* OR namibia* OR palau* OR panama* OR peru*) OR ABS ("Dominican Republic" OR fiji* OR gabon* OR grenad* OR iran* OR jamaica* OR kazakhstan* OR leban* OR libya* OR lithuania* OR macedonia* OR malaysia* OR mauriti* OR mayotte OR mahoran OR mexic* OR montenegr* OR namibia* OR palau* OR panama* OR peru*) OR TITLE (romania* OR russia* OR serbia* OR seychell* OR "South Africa" OR "St Lucia" OR suriname* OR turk* OR uruguay* OR venezuela* OR angola*) OR ABS (romania* OR russia* OR serbia* OR seychell* OR "South Africa" OR "St Lucia" OR suriname* OR turk* OR uruguay* OR venezuela* OR angola*))) OR ((TITLE (armenia* OR belize* OR bhutan* OR bolivia* OR cameroon* OR "Cape Verd*" OR china OR chinese OR "Cote d'Ivoire" OR ivorian OR djibouti OR ecuador*) OR ABS (armenia* OR belize* OR bhutan* OR bolivia* OR cameroon* OR "Cape Verd*" OR china OR chinese OR "Cote d'Ivoire" OR ivorian OR djibouti OR ecuador*) OR TITLE (egypt* OR "El Salvador" OR salvadoran OR guatemala* OR guyana OR guyanese OR hondura* OR india* OR indonesia* OR iraq* OR jordan* OR kiribati OR kosov* OR lesotho) OR ABS (egypt* OR "El Salvador" OR salvadoran OR guatemala* OR guyana OR guyanese OR hondura* OR india* OR indonesia* OR iraq* OR jordan* OR kiribati OR kosov* OR lesotho) OR TITLE (mosotho OR basotho OR maldiv* OR "Marshall Islands" OR

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marshallese OR micronesia* OR moldova* OR mongolia* OR morocc* OR nicaragua* OR nigeria* OR pakistan* OR "Papua New Guinea*" OR paraguay*) OR ABS (mosotho OR basotho OR maldiv* OR "Marshall Islands" OR marshallese OR micronesia* OR moldova* OR mongolia* OR morocc* OR nicaragua* OR nigeria* OR pakistan* OR "Papua New Guinea*" OR paraguay*))) OR ((TITLE (philippines OR filipino OR samoa* OR senegal* OR sri lanka* OR sudan* OR swaziland OR swazi OR "Syrian Arab Republic" OR syria* OR thailand OR thai OR timor-leste OR "East Timorese" OR tonga* OR tunisia*) OR ABS (philippines OR filipino OR samoa* OR senegal* OR sri lanka* OR sudan* OR swaziland OR swazi OR "Syrian Arab Republic" OR syria* OR thailand OR thai OR timor-leste OR "East Timorese" OR tonga* OR tunisia*) OR TITLE (turkmen* OR tuvalu* OR ukrain* OR uzbekistan* OR uzbek OR vanuatu OR ni-vanuatu OR vietnam* OR afghan* OR bangladesh* OR benin* OR burkina faso OR burkinabé OR burundi* OR cambodia* OR "Central African Republic" OR chad*) OR ABS (turkmen* OR tuvalu* OR ukrain* OR uzbekistan* OR uzbek OR vanuatu OR ni-vanuatu OR vietnam* OR afghan* OR bangladesh* OR benin* OR burkina faso OR burkinabé OR burundi* OR cambodia* OR "Central African Republic" OR chad*) OR TITLE (comoros OR comorian* OR congo* OR eritrea* OR ethiopia* OR gambia* OR ghana* OR guinea-bissau* OR haiti* OR kenya* OR "Kyrgyz Republic" OR kyrgyzstani OR lao* OR liberia* OR madagascar OR malagasy OR malawi* OR mali* OR mauritania*) OR ABS (comoros OR comorian* OR congo* OR eritrea* OR ethiopia* OR gambia* OR ghana* OR guinea-bissau* OR haiti* OR kenya* OR "Kyrgyz Republic" OR kyrgyzstani OR lao* OR liberia* OR madagascar OR malagasy OR malawi* OR mali* OR mauritania*))) OR ((TITLE (mozambique OR mozambican OR myanmar* OR burma OR burmese OR nepal* OR niger* OR rwanda* OR sierra leone* OR "Solomon Islands" OR "Solomon Islanders" OR somali* OR tajikistan* OR tanzania*) OR ABS (mozambique OR mozambican OR myanmar* OR burma OR burmese OR nepal* OR niger* OR rwanda* OR sierra leone* OR "Solomon Islands" OR "Solomon Islanders" OR somali* OR tajikistan* OR tanzania*) OR TITLE (togo* OR uganda* OR zambia* OR zimbabwe* OR "Africa" OR "Asia" OR "South America*" OR "Latin America*" OR "Central America" OR "Caribbean") OR ABS (togo* OR uganda* OR zambia* OR zimbabwe* OR "Africa" OR "Asia" OR "South America*" OR "Latin America*" OR "Central America" OR "Caribbean")))) AND ((TITLE ("research misconduct" OR "research integrity" OR "scientific dishonesty" OR "publication ethics" OR "publication retraction" OR "duplicate publication") OR ABS ("research misconduct" OR "research integrity" OR "scientific dishonesty" OR "publication ethics" OR "publication retraction" OR "duplicate publication") OR TITLE (authorship OR "author contribution" OR "scientific fraud*" OR "research fraud*" OR plagiarism OR "conflict of interest" OR "competing interest" OR "data fabrication" OR "data falsification") OR ABS (authorship OR "author contribution" OR "scientific fraud*" OR "research fraud*" OR plagiarism OR "conflict of interest" OR "competing interest" OR "data fabrication" OR "data falsification")))

2.2.6 EMBASE search strategy

Search	Query
1	(Albania* or Algeria* or "American Samoa" or Antigua* or Barbuda* or Argentin* or Azerbaijan* or Belarus* or Bosnia* or Herzegovin* or Botswana or Motswana or Batswana or Brazil* or Bulgaria* or Chile* or Colombia* or "Costa Rica" or Cuba* or Dominica* or "Dominican Republic" or Fiji* or Gabon* or Grenad* or Iran* or Jamaica* or Kazakhstan* or Leban* or Libya* or Lithuania* or Macedonia* or Malaysia* or Mauriti* or Mayotte or Mahoran or Mexic* or Montenegr* or Namibia* or Palau* or Panama* or Peru* or Romania* or Russia* or Serbia* or Seychell* or "South Africa" or "St Lucia" or Suriname* or Turk* or Uruguay*).mp. [mp=title, abstract, heading word,

	drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]
2	(Venezuela* or Angola* or Armenia* or Belize* or Bhutan* or Bolivia* or Cameroon* or "Cape Verd*" or China or Chinese or "Cote d'Ivoire" or Ivorian or Djibouti or Ecuador* or Egypt* or "El Salvador" or Salvadoran or Guatemala* or Guyana or Guyanese or Hondura* or India* or Indonesia* or Iraq* or Jordan* or Kiribati or Kosov* or Lesotho or Mosotho or Basotho or Maldiv* or "Marshall Islands" or Marshallese or Micronesia* or Moldova* or Mongolia*).mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]
3	(Morocc* or Nicaragua* or Nigeria* or Pakistan* or "Papua New Guinea*" or Paraguay* or Philippines or Filipino or Samoa* or Senegal* or Sri Lanka* or Sudan* or Swaziland or Swazi or "Syrian Arab Republic" or Syria* or Thailand or Thai or Timor-Leste or "East Timorese" or Tonga*).mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]
4	(Tunisia* or Turkmen* or Tuvalu* or Ukrain* or Uzbekistan* or Uzbek or Vanuatu or Ni-Vanuatu or Vietnam* or Afghan* or Bangladesh* or Benin* or Burkina Faso or Burkinab* or Burundi* or Cambodia* or "Central African Republic" or Chad* or Comoros or Comorian* or Congo* or Eritrea* or Ethiopia* or Gambia* or Ghana* or Guinea-Bissau*).mp.
5	(Haiti* or Kenya* or "Kyrgyz Republic" or Kyrgyzstani or Lao* or Liberia* or Madagascar or Malagasy or Malawi* or Mali* or Mauritania* or Mozambique or Mozambican or Myanmar* or Burma or Burmese or Nepal* or Niger* or Rwanda* or Sierra Leone* or "Solomon Islands" or "Solomon Islanders" or Somali* or Tajikistan* or Tanzania* or Togo* or Uganda* or Zambia* or Zimbabwe* or "Africa" or "Asia" or "South America*" or "Latin America*" or "Central America" or "Caribbean").mp.
6	developing countries.mp. or developing country/
7	(low and middle income countries).mp.
8	LMIC.mp.
9	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8
10	scientific misconduct.mp. or scientific misconduct/
11	research misconduct.mp.
12	research integrity.mp. or research ethics/
13	scientific dishonest*.mp.
14	questionable research practice.mp.
15	publication ethics.mp.
16	publication retraction.mp
17	duplicate publication.mp.
18	authorship.mp
19	author contribution.mp.
20	scientific fraud.mp
21	research fraud.mp.
22	plagiarism.mp.
23	conflict of interest.mp. or "conflict of interest"/ (
24	competing interest*.mp.
25	data falsification.mp.
26	data fabrication.mp.
27	publication misconduct.mp.
28	10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27
29	9 and 28

Appendix 2.3: Data extraction form

Study ID	
Aim of study	
Country of respondents	
Setting where study was conducted	
When was the study conducted?	
Participants	
Number of participants invited	
Number of participants responding n (%)	
Number used for analysis	
Sample size calculation	
Topic	
Study design	
Data collection tool	
Type of questions	
Distribution of questionnaires	
Data collection period	
Outcomes:	
Results	

Risk of bias	Judgement	Justification
Was the study's target population a close representation of the national population in relation to relevant variables?		
Was the sampling frame a true or close representation of the target population?		
Was some form of random selection used to select the sample, OR was a census undertaken?		
Was the likelihood of nonresponse bias minimal?		
Were data collected directly from the subjects (as opposed to a proxy)?		
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?		
Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)		
Was the study instrument that measured the parameter of interest shown to have validity and reliability?		
Was the same mode of data collection used for all subjects?		
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?		
Overall risk of bias		

Appendix 2.4: Table of excluded studies

Study ID	Reason for exclusion
Abu Talib 2013	Participants from a variety of disciplines, results not stratified for health researchers
Adiningrum 2015	Participants not eligible – focus is on academic misconduct and student cheating.
Ahmadi 2014	Academic misconduct. Participants not health researchers
Almeida 1998	Topic not relevant: Exploring views on criteria for authorship
Amin 2012	Study design not eligible: this is a review
Amos 2014	Topic not relevant: retractions
Anyanwu 2010	Not empirical research
Arda 2011	Study design not eligible: Evaluation of a course
Badea-Voiculescu 2013	Academic integrity
Berhidi 2010	Topic not eligible: this paper investigates journal guidelines, not research misconduct
Beute 2008	Academic misconduct
Bi 2011 (Chinese)	Academic misconduct
Boerma 1997	Not empirical research
Bosch 2009	No research paper
Broga 2014	Topic not eligible: this paper investigates journal guidelines, not research misconduct
Campbell 2013	Not empirical research
Chinamasa 2013	Participants not eligible: not health researchers
Clowes 2013	Participants not health researchers, topic not irresponsible research reporting practices
De 2010	Not empirical research
Deolia 2014	Topic not eligible: Research ethics not publication ethics
Ehrich 2016	Participants not health researchers. Academic misconduct
Eisenberg 2014	Countries not relevant. 11% of participants were from Asia. Emailed author to clarify: Of the participants from Asia, 5 were from China, 1 from Hong-Kong, and 1 from India. the rest from Japan and Korea which are not LMICs
Elzubeir 2003	Academic integrity
Etemadi 2004	Participants not eligible: journal editors, not researchers (11% of editors had authorship in the same field)
Farrokhi 2009	Not empirical research
Felaefel 2016	Participants not limited to health researchers, results not stratified according to disciplines
Ganatra 1996	Not empirical research
Grieger 2005	Study design not eligible: Literature review
Grieger 2007	Topic not relevant: looking at e-commerce of scientific papers
Gupta 2007	Topic not relevant: not research misconduct
Hadji 2016	Participants not only health researchers. Results not stratified according to disciplines
Harrita 2016	Topic not research misconduct
Heidari 2012	Topic not eligible: journal policies on declaring conflicts of interest
Hvistendahl 2013	Not empirical research
Jaramillo 2008	Study design not eligible: Paper is a practice guideline
Jawad 2013	Not empirical research
Jawaid 2008	Not empirical research
Jawaid 2011	Topic not eligible: evaluation of a workshop
Jaykaran 2011	Topic not eligible: examines instructions to authors
Jia 1997	Not empirical research

Jordan 2013	This is a review/discussion paper that reports on the results of 2 surveys conducted in Hong Kong but this is not a LMIC
Kali 2015	Topic not eligible: Looks at number of retractions (without reasons)
Kanyane 2006	Topic not eligible: Not health-related
Kerbauy 2005	Topic not eligible: Only considers number of authors, not research misconduct
Kirac 2011	Not empirical research
Kirac 2012	Case study – not empirical research
Larson 2013	Not empirical research
Le 2015	Participants not eligible: journals all from high-income countries
Li 2013	Participants not eligible: Not only related to health sciences and very difficult to tease out results for health sciences.
Looi 2015	Survey of journal editors, looking at any misconduct over the past 5 years – denominator not clear. Not limited to LMICs
Louw 1999	Topic not relevant: Focus is on student-supervisor relationship
Macfarlane 2014	Study design not eligible: Review Topic: Academic integrity
Macfarlane 2015	Participants not eligible: Not health researchers
Malafaia 2011	Topic not eligible: Relates to ethics clearance, informed consent etc.
Mathur 2013	Topic not eligible: Instructions to authors, not research misconduct
Mazonde 2007	Study design not eligible: not empirical research
Momen 2009	Study design not eligible: Review
Moten 2014	Study design not eligible: Review
Muula 2008	Not empirical research
Peh 2007	Not empirical research
Peh 2008	Not empirical research
Raman 1998	Not empirical research
Ramzan 2012	Academic integrity
Rathod 2010	Not empirical research
Reyes 2007	Not empirical research
Riasati 2013	Participants not eligible: Not health researchers
Rojas-Revoredo 2007	Academic research
Rossouw 2014	Not empirical research
Sabir 2015	Not empirical research
Sahu 2000	Not empirical research
Salamat 2013	Topic not eligible: Looks at instructions to authors, not misconduct
Saldana-Gastulo 2010	Academic integrity
Samad 2009	Topic not eligible: Study assesses instructions to authors in Pakistani journals
Santos 2013	Topic not eligible: paper looks at instructions to authors
Satanarayana 2010a	Not empirical research
Satanarayana 2010b	Not empirical research
Sathyanarayana Rao 2014	Not empirical research
Shahghasemi 2015	Academic integrity
Smith 2014	Not empirical research
Stretton 2012	Topic not eligible: Looking at retractions
Tavares-Neto 2009	Topic not eligible: instructions to authors and not research misconduct
Tharyan 2011	Not empirical research
Vasconcelos 2009	Not empirical study
Verma 2015	Topic not eligible: not misconduct
Wu 2011	Not empirical research
Zachariah 2013	Not empirical research

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Zeng 2013	Not empirical research
Zhang 2010 (a)	Not empirical research but linked to Zhang 2010 b
Zhang 2010 (b)	Includes a variety of disciplines, not able to extract results related to health research

Appendix 2.5: Characteristics of included studies

2.5.1 Cross-sectional studies of health researchers

Adeleye 2012

Aim of study	"to measure the prevalence of research wrongdoing and its associated factors among health researchers in Nigeria"
Country of respondents	Nigeria
Setting where study was conducted	3 medical and dental schools located in two adjacent states in Southern Nigeria (names not disclosed to maintain confidentiality)
When was the study conducted?	Jan-Feb 2009
Participants	Medical and dental researchers: Lecturers and consultants/attendants in the institutions Eligibility criteria: all researchers in institutions
Number of participants invited	167
Number of participants responding n (%)	132 (79)
Number used for analysis	132 (79)
Sample size calculation	yes
Topic	Research misconduct - Fabrication - Falsification - Plagiarism - Inadequate record keeping - Using inappropriate research design
Study design	Cross-sectional survey
Data collection tool	Questionnaire with section on participant characteristics, followed by a list of wrongdoings. Respondents had to identify the ones they had ever committed. List was adapted from Martinson et al (2005) and the Council of Science Editors' definition of research misconduct (2008). Respondents were also required to identify perceived barriers and criteria for ethical research in a list from Nigeria's National Code of Health Research Ethics
Type of questions	Yes/No questions
Distribution of questionnaires	not clearly described
Data collection period	Jan-Feb 2009
Outcomes:	1. Prevalence of research misconduct 2. Factors associated with research misconduct

Risk of bias	Judgement	Justification
Was the study's target population a close representation of the national population in relation to relevant variables?	no	lecturers, consultants/attendants of 3 medical and dental schools in the South of Nigeria - not necessarily representative of all health researchers in Nigeria
Was the sampling frame a true or close representation of the target population?	no	Sampling frame not clearly described. "Each institution provided approved access to their staff"
Was some form of random selection used to select the sample, OR was a census undertaken?	no	No random sample was taken. Not reported how participants were chosen
Was the likelihood of nonresponse bias minimal?	yes	Reasons for not responding not given, but response rate high: 79%
Were data collected directly from the subjects (as opposed to a proxy)?	yes	not explicitly stated but assumed. Questionnaire was self-administered
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	no	Research misconduct defined (ORI definition). Individual practices not defined

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Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	no	No definitions of "wrongdoings" in questionnaire
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	yes	Questions adapted from Martinson 2005 and Council of Science Editors definition of research misconduct. Not explicitly stated that these were validated questionnaires
Was the same mode of data collection used for all subjects?	yes	Same questionnaire used for all participants
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	yes	Denominator was the total number of respondents.
Overall risk of bias	moderate risk	

Al-Herz 2012

Aim of study	"to determine the frequency of honorary authorship in biomedical publications and to identify the factors that lead to its existence"
Country of respondents	Categorised according to continents: North America, South America, Europe, Asia, Africa, Australia
Setting where study was conducted	Various
When was the study conducted?	n/a
Participants	Corresponding authors of articles published in biomedical journals indexed in PubMed were invited. Inclusion criteria: articles published within 12 months of contact that included at least 2 authors
Number of participants invited	7909
Number of participants responding n (%)	1246 (15.75)
Number used for analysis	Author contacted for number of participants per continent
Sample size calculation	no
Topic	Honorary authorship: "inappropriately adding authors to the authorship list"
Study design	Survey
Data collection tool	10-item electronic survey (available online): 1. In which of the following journals was your last publication? 2. What is your gender? 3. Professional level at time of writing your publication? 4. What war your affiliation at time of study? 5. In which continent(s) participating medical centre(s) in the published study is/are located? 6. What was the type of published paper? 7. How many authors in the paper? 8. Did any of the authors included in the article did not deserve credit for authorship? 9. if yes, for which of the following reasons? (Complimentary; secondary gain to get paper accepted; avoid work/personal conflict with doctor; other) 10. If you have added authors who do not deserve credit for authorship, how many names would you remove from the list now if you had the chance?
Type of questions	Mixed: yes/no, MCQ, open-ended
Distribution of questionnaires	digital survey was sent (presumably via email but not explicitly stated)
Data collection period	not reported
Outcomes:	1. Frequency of honorary authorship 2. Factors associated with honorary authorship

Notes	Author contacted on 13.6.2016: - Number of respondents per continent - Absolute values (numerator and denominator) of number of authors reporting unjust authorship - Absolute values for the reasons for adding honorary authors - If possible, a breakdown of these reasons per continent (as we are only including results for LMICs)
Risk of bias	**Judgement**	**Justification**
Was the study's target population a close representation of the national population in relation to relevant variables?	yes	Target population: Authors of biomedical publications around the world
Was the sampling frame a true or close representation of the target population?	yes	Corresponding authors of articles published during the preceding 12 months in biomedical journals indexed in PubMed were invited. Limited to one database, but good representation of target population
Was some form of random selection used to select the sample, OR was a census undertaken?	no	Stratified sampling: "to cover journals with different levels of importance, they were divided into five groups based on their impact factor and the journals within each group were selected randomly". Not clear whether all corresponding authors of all articles published in these journals were invited.
Was the likelihood of nonresponse bias minimal?	no	Response rate was 15.75%. No analysis comparing non-responders to responders
Were data collected directly from the subjects (as opposed to a proxy)?	yes	Digital survey was sent to participants who completed it
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	no	Honorary authorship defined as "inappropriately adding authors to the authorship list". But they do not say what the appropriate criteria are
Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	no	In the questionnaire, participants were asked whether any of the authors on the paper "do not deserve credit" - this is open to individual interpretation of when someone would deserve credit
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	no	The authors compiled their own questionnaire and did not report whether it was validated or piloted.
Was the same mode of data collection used for all subjects?	yes	Same questionnaire used for all participants
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	no	Absolute values (numerator/denominator) not reported for outcomes. Only % reported
Overall risk of bias	high risk	

Borracci 2012

Aim of study	"in order to know the criteria used by authors to justify their inclusion as such in the articles published in the Argentine Journal of cardiology and compare these results with those reported in international journals"
Country of respondents	Argentina
Setting where study was conducted	n/a
When was the study conducted?	01/04/2011
Participants	Authors who had published original articles, brief communications, and case reports in the Argentine Journal of Cardiology during 2010
Number of participants invited	43 articles/corresponding authors (total of 281 authors and co-authors)
Number of participants responding n (%)	32 (74.4%) 214 (76.25)
Number used for analysis	214 (total number of authors)
Sample size calculation	no

Topic	Criteria for authorship (Unjustified authorship)
Study design	Survey
Data collection tool	Authors were emailed and asked to indicate the criteria used to incorporate the co-authors in the publication. They were sent a grid with all the co-authors and had to indicate one or more of the following criteria: 1. Contribution to the conception and design, or acquisition, analysis and interpretation of data 2. Writing of the article or critical revision for its intellectual aspects 3. Final approval of the full version 4. Data collection 5. Statistical analysis 6. Acquisition of funds or means for research 7. Achievement of diagnostic or therapeutic procedures 8. General supervision of the work team
Type of questions	MCQs
Distribution of questionnaires	per email
Data collection period	not reported
Outcomes:	1. Number of justified/partially justified and unjustified authors

Risk of bias	Judgement	Justification
Was the study's target population a close representation of the national population in relation to relevant variables?	no	Target population: Authors of articles in the Argentine Journal of Cardiology (not representative of all researchers in Argentina)
Was the sampling frame a true or close representation of the target population?	no	Sampling frame: Authors of original papers, brief communications and case reports published in one year (2010) Not representative of all authors (journal started in 1934)
Was some form of random selection used to select the sample, OR was a census undertaken?	yes	All authors of original papers, brief communications and case reports that were published in 2010 were invited to participate.
Was the likelihood of nonresponse bias minimal?	yes	Response rate was 74.4%
Were data collected directly from the subjects (as opposed to a proxy)?	unclear	Unclear - the numerator in the analysis was the total number of authors and co-authors. The corresponding author had to indicate the involvement of each co-author.
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	yes	Referred to ICMJE criteria for authorship. Also explained these criteria
Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	yes	Respondents had to indicate the nature of the involvement for each co-author. Nature of involvement was well described. The respondents were not made aware of the requirements for authorship according to ICMJE.
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	no	No report of validation or piloting of the survey instrument
Was the same mode of data collection used for all subjects?	yes	Same questionnaire sent to all participants
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	yes	Numerator was the total number of authors on papers published in 2010 (as opposed to the corresponding author)
Overall risk of bias	moderate risk	

Das 2013

Aim of study	"to assess… awareness of the 'conflict of interest' issue in medical research and publication among the editorial staff, peer reviewers and authors of Indian medical journals"
Country of respondents	India
Setting where study was conducted	n/a
When was the study conducted?	March 2011 to December 2012
Participants	Authors, peer reviewers and editorial board members of Indian journals
Number of participants invited	Journals: n=15 Authors n=61 Peer reviewers: n=56 Editorial board members: n=35
Number of participants responding n (%)	Journals: n=15 Authors n=61 Peer reviewers: n=56 Editorial board members: n=36
Number used for analysis	Journals: n=15 Authors n=61 Peer reviewers: n=56 Editorial board members: n=37
Sample size calculation	no
Topic	Conflict of interest
Study design	Survey/interview
Data collection tool	Questionnaire for authors: 1. Do authors notice "COI statement" in "Instruction to Author" section of journal? 2. Does author heard of "COI"? 3. Does author has any idea about "COI" meaning? 4. Does author provide his/her "COI" (who knows about COI)? 5. Does editor asks "COI" declaration from the authors after acceptance of article (if not provided)?
Type of questions	Yes/No
Distribution of questionnaires	Not clearly reported. Mentioned questionnaire and telephonic interviews
Data collection period	Not reported
Outcomes:	Authors' awareness and understanding of Conflict of Interest
Notes	Only results related to authors used. This is a very poorly written paper.

Risk of bias	Judgement	Justification
Was the study's target population a close representation of the national population in relation to relevant variables?	no	Target population: Authors, medical journal editorial board members and peer reviewers from Indian journals. Not representative of all Indian authors/researchers
Was the sampling frame a true or close representation of the target population?	no	Not reported how they selected the 15 journals. Not clearly reported how the authors were selected.
Was some form of random selection used to select the sample, OR was a census undertaken?	no	Not reported how they selected the 15 journals. Not clearly reported how the authors were selected.
Was the likelihood of nonresponse bias minimal?	no	Not reported how many authors were invited to participate and how many responded
Were data collected directly from the subjects (as opposed to a proxy)?	unclear	Not sure how data was collected - via telephonic interviews or paper-based questionnaires
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	unclear	COI defined as: "A conflict of interest exists when an individual's professional or ethical obligations might be compromised by self-interest" Not comprehensive

Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	unclear	Not applicable - objective was to determine awareness and understanding of COI
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	no	No report of validation or piloting
Was the same mode of data collection used for all subjects?	unclear	Not sure which methods were used to collect data - not reported
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	unclear	Not well reported
Overall risk of bias	high risk	

Das 2016

Aim of study	"to assess knowledge and understanding on authorship concept in research publicationamong medical faculty members and pharmacy faculty members engaged in postgraduate teaching, research and guidance"
Country of respondents	India
Setting where study was conducted	not clearly described. Medical and pharmacy faculty from different parts of India
When was the study conducted?	June 2013 to December 2013
Participants	faculty members including: Professors, associate professors, readers and professors who were actively engaged in research and publicaton
Number of participants invited	not reported
Number of participants responding n (%)	95
Number used for analysis	stratefied for medical faculty: 54 and pharmacy faculty: 41
Sample size calculation	no
Topic	Authorship
Study design	Survey
Data collection tool	Questionnaire and interview aimed at assessing "knowledge and understanding on the concept of authorship issues for ethical publication" Questionnaire containing 13 questions
Type of questions	Yes/no questions. For some respondents had to specify
Distribution of questionnaires	Not clear - some participants were interviewed telephonically
Data collection period	Between June and December 2013
Outcomes:	Prevalence of guest authorship
Risk of bias	**Judgement**	**Justification**
Was the study's target population a close representation of the national population in relation to relevant variables?	yes	Medical and Pharmacy Faculty from India - participants from all over India were included although not mentioned explicitly where participants came from
Was the sampling frame a true or close representation of the target population?	no	not reported how sampling was done
Was some form of random selection used to select the sample, OR was a census undertaken?	no	not reported how participants were selected
Was the likelihood of nonresponse bias minimal?	no	not reported how many participants were invited
Were data collected directly from the subjects (as opposed to a proxy)?	yes	Faculty members requested to complete questionnaire
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	no	authorship not defined (ICMJE mentioned, but criteria for authorship not mentioned) guest authorship/ghost authorship not defined
Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	yes	Terms Guest/gift authorship not mentioned in questionnaire. Rather, description of the term

Was the study instrument that measured the parameter of interest shown to have validity and reliability?	no	Questionnare was "prepared by us and modified by Committee on Publication ethics (COPE), United Kingdom" Not sure what this means, no description of piloting questionnaire
Was the same mode of data collection used for all subjects?	no	some were interviewed and others had to complete the questionnaire
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	yes	numerator and denominators appropriate
Overall risk of bias	high risk	

Dhaliwal 2006

Aim of study	"We explored: a) awareness of authorship criteria in an academic medical center in India, b) the extent of conflict concerning ownership of data, gift authorship, and other issues in the research environment, and c) their interrelationship"
Country of respondents	India
Setting where study was conducted	University College of Medical Sciences in Delhi
When was the study conducted?	Mar-06
Participants	Faculty members
Number of participants invited	118
Number of participants responding n (%)	77/118 (65%)
Number used for analysis	77
Sample size calculation	No
Topic	Authorship
Study design	Survey
Data collection tool	Questionnaire based on ICMJE criteria for authorship (awareness of authorship criteria). Questions on conflict based on experience and anecdotal reports
Type of questions	For awareness of authorship criteria, respondents had to indicate whether certain criteria would entitle a person to authorship, acknowledgement, or neither of the two. For questions on authorship conflict, authors had to answer yes/no questions
Distribution of questionnaires	Faculty was approached in person - self-administered questionnaire Not mentioned whether it was paper-based or electronic. But assumed paper-based
Data collection period	Mar-06
Outcomes:	1. Extent of awareness of criteria for authorship 2. Extent of conflict relating to authorship issues 3. interrelationship between 1. and 2.

Risk of bias	Judgement	Justification
Was the study's target population a close representation of the national population in relation to relevant variables?	unclear	Not clear who the target population was. Could be faculty members in India?
Was the sampling frame a true or close representation of the target population?	no	Only faculty from one university included.
Was some form of random selection used to select the sample, OR was a census undertaken?	yes	All faculty members were invited to participate in the survey
Was the likelihood of nonresponse bias minimal?	no	Response rate 65%. No data on non-respondents
Were data collected directly from the subjects (as opposed to a proxy)?	yes	"Each faculty member was approached in person and invited to complete a self-administered survey"
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	yes	ICMJE document referenced and criteria specified clearly

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Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	unclear	respondents were asked to indicate which criteria were necessary for authorship to assess their awareness before assessing rate of conflicts
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	unclear	Not sure how questionnaire was piloted. "Since a pre-validated questionnaire could not be found in the literature, we designed and pretested ours prior to administration".
Was the same mode of data collection used for all subjects?	yes	each faculty was approached in person and completed the questionnaire
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	unclear	For reasons for conflict, authors used the number of respondents who reported reasons (21/77) rather than the number of authors who indicated that they had experienced conflict (30/77)
Overall risk of bias	moderate risk	

Dhingra 2014

Aim of study	"to assess the prevalence of misconduct as observed by young medical professionals"
Country of respondents	India
Setting where study was conducted	Hospitals in India - 4 in Delhi, 3 in southern India, 2 in central India
When was the study conducted?	August 2012 to March 2013
Participants	Young medical professionals: Inclusion criteria: Having completed post-graduation within the last ten years, having at least 5 publications in peer-reviewed journals
Number of participants invited	Unclear. Calculated sample size was 200 - each of the 9 institutions were sent 20 questionnaires (which =180). But coordinators at the centres also photocopied the questionnaires.
Number of participants responding n (%)	192 cannot calculate response rate
Number used for analysis	155 (27 responses excluded as participants did not meet inclusion criteria, 10 questionnaires were incomplete or illegible)
Sample size calculation	yes. But they based their sample size calculation on the results of the systematic review by Fanelli 2009, which only looked at data fabrication and falsification. In addition, the authors reference Fanelli as reporting a prevalence of publication misconduct of 50% (95% CI 35.7 to 72%). This is incorrect. The reported prevalence of misconduct related to fabrication and falsification is much lower. In addition, they calculated their sample for a randomly selected sample and not for cluster sampling. They do mention this in the discussion section.
Topic	Authorship
Study design	Survey
Data collection tool	Not well described: "detailed discussions on publication misconduct were held with a few senior faculty members of medical colleges, having experience in the field of biomedical publishing. Based on these discussions, a structured questionnaire was prepared to elicit responses on publication misconduct..." Questions were related to the existence and frequency of: - ghost authorship - gift authorship - falsification or fabrication of data - Plagiarism - Salami-slicing
Type of questions	Not described. Questionnaire not available
Distribution of questionnaires	Coordinators at the 9 (10?) study cites received questionnaires per mail. The coordinators then distributed questionnaires and sent them back via mail.
Data collection period	August 2012 to March 2013

Outcomes:	Occurrence of misconduct
	Sample size calculation not valid Incorrectly referencing values

Risk of bias	Judgement	Justification
Was the study's target population a close representation of the national population in relation to relevant variables?	yes	Study looked at young medical professionals in India and included 9 institutions spread across the country
Was the sampling frame a true or close representation of the target population?	no	Institutions were selected based on the availability of a local coordinator. All local coordinators were personally known to at least one of the study authors. The coordinators distributed the questionnaire to "acquaintances" in institution. "No pre-decided scheme was used for selecting participants, except for a direction to include personnel from different medical specialties"
Was some form of random selection used to select the sample, OR was a census undertaken?	no	A biased sample was selected to participate: "The questionnaires for each centre were mailed to the coordinators, who subsequently approached acquaintances among their colleagues for participation in the study"
Was the likelihood of nonresponse bias minimal?	no	Cannot calculate response rate, as it is not clear how many participants were invited to participate.
Were data collected directly from the subjects (as opposed to a proxy)?	yes	Participants completed questionnaire
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	yes	Clear definition of research misconduct and the various types of misconduct in the background section. With references
Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	unclear	Questionnaire not available. No definitions in table of results
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	unclear	Questionnaire was "pre-tested on 10 medical researchers and modified where necessary". Unclear whether this was sufficient
Was the same mode of data collection used for all subjects?	yes	Participants completed paper-based questionnaire
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	yes	Denominator was 155 - the number of respondents that met inclusion criteria and submitted complete responses
Overall risk of bias	moderate risk	

Ghajarzadeh 2012a

Aim of study	"assessed the attitude of the students of Tehran University of medical Sciences towards plagiarism"
Country of respondents	Iran
Setting where study was conducted	Tehran University of Medical Sciences
When was the study conducted?	August-October 2011
Participants	Medical students: Clerkship (3rd to 6th year of medical curriculum); Internship (7th and 8th year of curriculum) and Residency
Number of participants invited	230
Number of participants responding n %)	198 (86%)
Number used for analysis	unclear
Sample size calculation	no

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Topic	Plagiarism
Study design	Survey
Data collection tool	Attitude towards Plagiarism (ATP) questionnaire: - Mavrinac M, Brumini G, Bili c-Zulle L, et al. Construction and validation of attitudes toward plagiarism questionnaire. Croat Med J 2010;51:195e200. - original questonnaire consists of 29 questions: 12 items representing positive attitude towards plagiarism, 7 items representing negative attitude and 10 items showing subjective norms ("respondents' normative beliefs about plagiarism and their perceptions of its prevalence in the academic and scientific community") - questionnaire was translated into Persian, with 25 questions (the validity of the translated version was tested in Ghajarzadeh 2012a) - Answers presented on a 5-point Likert scale from strongly disagree (1) to strongly agree (5)
Type of questions	Likert scale
Distribution of questionnaires	not reported
Data collection period	August-October 2011
Outcomes:	Attitude towards plagiarism
Notes	Author contacted 21.06.2016: - Did you collect data on whether participants had published a paper before? - Is it possible to send me the data in the original format? i.e. Individual Likert-scale ratings for each question - The original ATP questionnaire contains 29 questions, but the translated version only contains 25. Could you please clarify this? - Was this a paper-based questionnaire? How did you invite participants?

Risk of bias	Judgement	Justification
Was the study's target population a close representation of the national population in relation to relevant variables?	no	target population medical students in Iran, but participants were from one medical university in Iran
Was the sampling frame a true or close representation of the target population?	unclear	not reported what the sampling frame was - whether all medical students registered at the insitution? Undergraduate or postgraduate?
Was some form of random selection used to select the sample, OR was a census undertaken?	unclear	stratefied random sampling - although not clear how many participants were sampled from each strata
Was the likelihood of nonresponse bias minimal?	yes	Response rate: 86%
Were data collected directly from the subjects (as opposed to a proxy)?	yes	medical students submitted responses
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	yes	definition in introduction
Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	unclear	questionnaire not attached
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	yes	The Attitude towards Plagiarism questionnaire (validated questionnaire) was translated into Persian and piloted among 20 participants.
Was the same mode of data collection used for all subjects?	unclear	not clear how data was collected - online/paper based questionnaire?
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	unclear	results presented in an unusual way - mean number of false answers, but questionnaire contains Likert scale type questions
Overall risk of bias	moderate risk	

Ghajarzadeh 2012b

Aim of study	"to assess the attitude towards plagiarism in medical faculty members of Tehran University of medical Sciences"
Country of respondents	Iran
Setting where study was conducted	Tehran University of Medical Sciences
When was the study conducted?	November 2011-March 2012
Participants	Medical Faculty members
Number of participants invited	120
Number of participants responding n (%)	87 (73%)
Number used for analysis	unclear
Sample size calculation	no
Topic	Plagiarism
Study design	Survey
Data collection tool	Attitude towards Plagiarism (ATP) questionnaire: - Mavrinac M, Brumini G, Bili c-Zulle L, et al. Construction and validation of attitudes toward plagiarism questionnaire. Croat Med J 2010;51:195e200. - original questonnaire consists of 29 questions: 12 items representing positive attitude towards plagiarism, 7 items representing negative attitude and 10 items showing subjective norms ("respondents' normative beliefs about plagiarism and their perceptions of its prevalence in the academic and scientific community") - questionnaire was translated into Persian, with 25 questions (the validity of the translated version was tested in Ghajarzadeh 2012a) - Answers presented on a 5-point Likert scale from strongly disagree (1) to strongly agree (5)
Type of questions	Likert scale
Distribution of questionnaires	email/face-to-face
Data collection period	November 2011-March 2012
Outcomes:	Attitude towards plagiarism
Notes	Author contacted on 21.6.2016 - Is it possible to send me the data in the original format? i.e. Individual Likert-scale ratings for each question - The original ATP questionnaire contains 29 questions, but the translated version only contains 25. Could you please clarify this?

Risk of bias	Judgement	Justification
Was the study's target population a close representation of the national population in relation to relevant variables?	no	Medical Faculty members of one instituion not necessarily representative of all medical researchers in Iran
Was the sampling frame a true or close representation of the target population?	unclear	Not clear what the sampling frame was. Assumed to be a list of all medical faculty members, but this is not explicitly stated - are these permanent faculty members/full time/or any?
Was some form of random selection used to select the sample, OR was a census undertaken?	yes	120 faculty members were randomly selected
Was the likelihood of nonresponse bias minimal?	unclear	Response rate: 73% but no anlaysis of non-responders
Were data collected directly from the subjects (as opposed to a proxy)?	unclear	Not explicitly stated, but assumed
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	yes	Clear definition of plagiarism in introduction

Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	no	Not reported what the questions entail
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	yes	validated questionnaire on Attitude towards Plagiarism was used
Was the same mode of data collection used for all subjects?	no	Some participants were approached via emial and some contacted face-to-face. Not clear whether questionnaire was also available in both formats
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	no	results presented in an unusual way - mean number of false answers. Questions are Likert-scale type
Overall risk of bias	High risk	

Ghajarzadeh 2014

Aim of study	"to determine whether Iranian researchers fulfill the ICMJE criteria"
Country of respondents	Iran
Setting where study was conducted	n/a
When was the study conducted?	not reported
Participants	Authors of original articles with at least 2 authors, pubished in AIM (an English language quarterly Iranian medical journal) between january 2005 and October 2007. Authors had to be Iranian
Number of participants invited	128 corresponding authors (total of 576 author names)
Number of participants responding n (%)	63/128 (49%)
Number used for analysis	296 (total number of authors included in the byline of articles)
Sample size calculation	no
Topic	Guest authorship
Study design	Survey
Data collection tool	Not cleary described - a "structured questionnaire" - each corresponding author had to determine the contribution of authors on byline bu indicating on a scale from 0-100 their contribution according to: - Study conception - study design - Proposal writing - proposal editing - literature review - data gathering - management of data gathering - data analysis - interpretation of results - identifying coworkers - funding - project management - manuscript description - manuscript editing Corresponding authors also had to indicate whether they had read the ICMJE criteria, who was responsible for listing the authors, whether the paper was part of a student's thesis, and whether the student was part of the authors
Type of questions	Questionnaire not available Yes/No; rating on a scale from 0-100%
Distribution of questionnaires	via email
Data collection period	not reported
Outcomes:	Number of guest authors
Risk of bias	**Judegement**	**Justification**

Was the study's target population a close representation of the national population in relation to relevant variables?	yes	Authors of original articles published in one of the oldest Iranian medical journals, from 2005-2007. Representative of Iranian researchers
Was the sampling frame a true or close representation of the target population?	yes	Corresponding authors of original articles published in AIM
Was some form of random selection used to select the sample, OR was a census undertaken?	yes	Corresponding authors of all original articles published in AIM between 2005 and 2007 were invited to participate
Was the likelihood of nonresponse bias minimal?	no	Response rate was 49% and no data on non-respondents
Were data collected directly from the subjects (as opposed to a proxy)?	unclear	Corresponding author indicated contributorship for all authors on byline
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	yes	Definition of guest authorship and listing of ICMJE criteria in article
Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	unclear	Questionnaire contained criteria for authorship and coresponding authors had to indicate contribution of each author
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	no	Not reported whether questionnaire was piloted
Was the same mode of data collection used for all subjects?	no	Participants were invited to participate in study via email and questionnaire was sent via email. If they did not respond, they called the authors and as a last resort sent the questionnaire via mail. Not reported how many questionnaires were sent via mail
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	yes	Denominator was 296 - the total number of authors
Overall risk of bias	moderate risk	

Gultekin 2010

Aim of study	"to assess knowledge, views, and behaviour of Psychiatrists on authorship, to determine the authorship problems experienced, and to evaluate their views on which contributions to research merit authorships and their perceptions about gift authorship and strategies for preventing it"
Country of respondents	Turkey
Setting where study was conducted	Turkish Psychiatry association mailing list
When was the study conducted?	18 June to 15 August 2008
Participants	academic psychiatrists and psychiatry specialists
Number of participants invited	Unclear. 239 academic staff invited (60 responded). The denominator for the other 27 unkonwn
Number of participants responding n (%)	87 – unclear what denominator is
Number used for analysis	87
Sample size calculation	No. All Psychiatrists that were members in 2008 were approached
Topic	Authorship
Study design	Survey
Data collection tool	Questionnaire with 36 questions
Type of questions	Yes/no
Distribution of questionnaires	Via email
Data collection period	18 June to 15 August 2008
Outcomes:	Perceptions about authorship Awareness of criteria for authorship Experienced problems with authorship
Risk of bias	Judgement	Justification

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Was the study's target population a close representation of the national population in relation to relevant variables?	No	The study population is a selected specialist population registeres in a national professional organisation
Was the sampling frame a true or close representation of the target population?	Yes	The target population is specialist academic psychiatrists. The sampling frame was the Turikish Psychiatry association mailing list
Was some form of random selection used to select the sample, OR was a census undertaken?	Unclear	The mailing list of the Turikish Psychiatry association was used. It is not clear whether the mailing list has only academic or all psychiatrists
Was the likelihood of nonresponse bias minimal?	No	It seems that 60/239 academic staff participated. Denominator for other Psychiatrists not reported
Were data collected directly from the subjects (as opposed to a proxy)?	Yes	The questionnaire was sent electronically by emails
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	No	No definition
Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	Unclear	
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	Unclear	This was not reported
Was the same mode of data collection used for all subjects?	Yes	All via electronic survey
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	Unclear	The denominator is 87. But It is stated that 60/239 academic personnel took part. Not clear where the other 27 came from.
Overall risk of bias	**Moderate**	

Jain 2015

Aim of study	"to assess the attitude towards plagiarism of PGs of medical and dental fraternity of Bhopal and to address this gap in the literature by investigating dishonest nehaviours of students in a research program"
Country of respondents	India
Setting where study was conducted	medical and dental institutions in Bhopal
When was the study conducted?	January to March 2014
Participants	Medical and dental postgraduate students
Number of participants invited	200
Number of participants responding n (%)	164 (82%) (medical: 80%, dental 84%)
Number used for analysis	unlcear - 36 incomplete questionnaires were excluded from the study. Should be 128, but not reported anywhere
Sample size calculation	Post-hoc calculation
Topic	Plagiarism
Study design	Survey
Data collection tool	Attitude towards Plagiarism tool - consisting of 29 questions, with three different factors: Factor I consists of 12 statements representing positive attitude towards plagiarism, Factor II consists of 7 statements related to negative attitude toward plagiarism and Factor III consists of 10 statements showing subjective norms toward plagiarism
Type of questions	5-point Likert-scale questions. From 1 (strongly agree to 5 strongly disagree)
Distribution of questionnaires	paper-based questionnaires distributed
Data collection period	January to March 2014
Outcomes:	Plagiarism attitude

Risk of bias	Judgement	Justification
Was the study's target population a close representation of the national population in relation to relevant variables?	yes	Medical and dental postgraduate students from various institutions in Bophal sampled
Was the sampling frame a true or close representation of the target population?	unclear	investigators obtained a list of medical and dental institutions offering postgraduate programmes in Bophal from the Medical Council of India and the Dental Council of India. But not clear whether names of participants were also obtained from the list
Was some form of random selection used to select the sample, OR was a census undertaken?	unclear	They report that "questionnaires were distributed randomly". But not sure whether random sample was taken from all eligible participants. It sounds more like convenience sampling
Was the likelihood of nonresponse bias minimal?	yes	response rate: 82%
Were data collected directly from the subjects (as opposed to a proxy)?	yes	paper-based questionnaires distributed to participants. The completed questionnaires were collected from the participants.
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	yes	plagiarism adequately defined in introduction
Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	unclear	Not clear whether plagiarism was defined in questionnaire. Dome questions in the ATP tool do not use the term, but others do
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	yes	ATP is a validated questionnaire
Was the same mode of data collection used for all subjects?	yes	paper-based questionnaires distributed
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	unclear	not clear which denominator was used, as 26 questionnaires were excluded from the analysis. Number analysed not reported
Overall risk of bias	moderate	

Jawaid 2013

Aim of study	"to assess the knowledge and ascertain views of researchers on ICMJE criteria for authorship, their current practice of choosing authors of scientific papers, viewson gift authorship and experience of authorship problems"
Country of respondents	Pakistan
Setting where study was conducted	Data was collected during research writing workshops/seminars at various medical Universities (Dow University of Health Sciences - Karachi, Baqai Medical University - Karachi, Liaquat University of Medical Sciences - Hyderabad, Avicenna Medical College - Lahore, King Edward Medical University - Lahore)
When was the study conducted?	January 2011 to July 2011
Participants	Faculty members (Senior registrars and Profs)
Number of participants invited	256 (information obtained from corresponding author)
Number of participants responding n (%)	230 (90%) but only 218 (85%) used for analysis due to "writing issues" (information obtained from corresponding author)
Number used for analysis	218
Sample size calculation	No
Topic	Authorship
Study design	Survey
Data collection tool	Not well described. Questions in results section on - Knowledge of ICMJE criteria of authorship - Attitude about the ICMJE criteria of authorship - Criteria which alone contribution merits authoship - Current trend of co-authorship and order of authorship - Perception of any problems with authorship
Type of questions	Yes/no
Distribution of questionnaires	Not well described. Self-administered questionnaire ar writing workshop/seminar
Data collection period	January 2011 to July 2011

Outcomes:	1. Awareness and use of ICMJE criteria for authorship 2. Awareness as to which contributions to research merit authorship 3. Perceptions about gift authorship
Notes	Author contacted on 15.06.2016: - How many researchers attended the writing workshops/seminars? - Were all researchers that attended the workshops invited to participate in the survey? If not, how many were invited? - Was the survey paper-based? - Table 6: Does "assigned inappropriate co-authorship" refer to how authorship was decided (table 5)?
	Author response: - How many researchers attended the writing workshops/seminars? Around 256 attended the writing workshop / seminar - Were all researchers that attended the workshops invited to participate in the survey? If not, how many were invited? All are invited and we received 230 questionnaires but due to writing issues / incomplete data we analyzed 218 responses - Was the survey paper-based? Yes, its paper based - Table 6: Does "assigned inappropriate co-authorship" refer to how authorship was decided (table 5)? Both tables are separate, not linked to one another

Risk of bias	Judgement	Justification
Was the study's target population a close representation of the national population in relation to relevant variables?	unclear	Faculty members of various medical universities across Pakistan were included. But only those that attended a writing workshop and it is not clear whether these participants are respresentative of all researchers in Pakistan
Was the sampling frame a true or close representation of the target population?	unclear	Not clearly reported. Participants attended writing workshops/seminars
Was some form of random selection used to select the sample, OR was a census undertaken?	yes	All participants that attended writing workshops were invited to participate (information obtained from corresponding author)
Was the likelihood of nonresponse bias minimal?	yes	Response rate 90% - but only 85% used for analysis due to legibility issues (information obtained from corresponding author)
Were data collected directly from the subjects (as opposed to a proxy)?	yes	it was a self-administered questionnaire and was completed by researchers participating in a writing workshop/seminar
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	unclear	Reference to ICMJE but no explanation of criteria for contribution and no explicit definitions of ghost authorship and gift authorship
Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	unclear	Some questions on ICMJE and criteria. Gift and ghost authorship only described, terms not used. But some of the descriptions are unclear.
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	no	The authors developed their own questionnaire and there is no reference to piloting or testing it prior to data collection
Was the same mode of data collection used for all subjects?	yes	"self-administered questionnaire" ; paper-based (information obtained from corresponding author)
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	yes	Denominator was 218 - number of legible responses
Overall risk of bias	moderate risk	

Kurdi 2015

Aim of study	"to explore…views, attitude and practice related to various issues on 'publicatons'"
Country of respondents	India

Setting where study was conducted	various - at a conference and in various medical faculties all over India
When was the study conducted?	November 2014-January 2015
Participants	medical faculty members (predominantly anaesthesiologists), and medical consultants in a non-teaching hospital, senior residents in medical colleges
Number of participants invited	18270
Number of participants responding n (%)	600 (3.2%)
Number used for analysis	not explicilty reported - only % reported assumed: 584 (26 responses were incomplete and not considered for analysis)
Sample size calculation	There is a sample size calculation based on the results of the pilot study - required smaple size: 588
Topic	Publication practices in general - for our review one question is relevant: Why do you think people plagiarise?
Study design	Survey
Data collection tool	Questionnaire consisting of 22 questions, mostly yes/no, some open ended. Divided into 4 parts (Table 1)
Type of questions	Mostly yes/no and a few open ended questions
Distribution of questionnaires	printed copies distributed at a conference, and electronic version disctributed via email
Data collection period	November 2014-January 2015
Outcomes:	Reasons for plagiarism (only question relevant to our review)

Risk of bias	Judgement	Justification
Was the study's target population a close representation of the national population in relation to relevant variables?	yes	survey distributed widely to medical faculty members across India
Was the sampling frame a true or close representation of the target population?	no	not reported which sampling frame was used
Was some form of random selection used to select the sample, OR was a census undertaken?	no	not reported
Was the likelihood of nonresponse bias minimal?	no	response rate 3.2%
Were data collected directly from the subjects (as opposed to a proxy)?	yes	Questionnaires sent to participants "by name" (electronic versions)
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	no	Plagiarism the only reporting practice that was addressed, but not mentioned in introduction
Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	no	Plagiarism not defined in questionnaire
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	unclear	questionnaire piloted in one department before distribution - not well described
Was the same mode of data collection used for all subjects?	no	some questionnaires were distributed at a conference in printed (paper-based) format. Others were invited to complete an online survey
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	no	only % reported. Not sure what the number of responses analysed was
Overall risk of bias	high	

Mirzazadeh 2011

Aim of study	"to enquire the prevalence of ghost and honorary authors and its determinant factors as regards bio-medical journals of Iran"
Country of respondents	Iran
Setting where study was conducted	Medical Universities in Iran
When was the study conducted?	2009-2010

Participants	1. Local research committee members, students in research committees, academic staff in the public health schools Inclusion criteria: At least one publised paper of which they were the corresponding authors. 2. Corresponding authors of original papers of two issues of the Iranian Journal of Public Health, Journal of Kerman University of Medical Sciences, Kerman University Medical Journal
Number of participants invited	not reported
Number of participants responding n (%)	124 articles with a total of 536 authors
Number used for analysis	total number of authors: 536
Sample size calculation	No
Topic	Authorship
Study design	Survey
Data collection tool	Standard data collection form (Available in appendix) - Respondents had to indicate the contribution of each author to the paper by completing a matrix of yes/no questions. Components were: Idea, Research Question, Study Design/proposal writing, data collection, analysis, data interpretation, Literature review, article writing, editing the pre-final version, executive management, final proof, other activities. - They had to indicate whether there was anybody that participated in the study but was not listed as an author using the same components
Type of questions	Matrix with yes/no questions
Distribution of questionnaires	electronically as well as hard copies
Data collection period	2009-2010
Outcomes:	1. Prevalence of (according to the ICMJE criteria): - guest authorship - ghost authorship 2. Determinant factors
Notes	Author contacted on 16.6.2016: - How did you select participants from medical universities? - How many participants from universities were invited to participate and how many corresponding authors from original articles were contacted? - Did you pilot your data collection tool?
	Author response: 1. we approached the local research committee members, students in the research committees, and the academic staffs in the public health schools. Also we reviewed the most recent issues of two Iranian medical journals and approached to the corresponding authors' of published original papers. 2. Unfortunately I do not remember 3. Yes, we did. We did pilot our data collection tool.

Risk of bias	Judgement	Justification
Was the study's target population a close representation of the national population in relation to relevant variables?	yes	Iranian academics/researchers Participants were from 3 medical universities with at least on published paper (corresponding author) and corresponding authors of 3 Iranian medical journals
Was the sampling frame a true or close representation of the target population?	no	Not clear how they sampled participants from the universities. All corresponding authors of original articles published in the recent 2 issues of 3 journals were contacted
Was some form of random selection used to select the sample, OR was a census undertaken?	no	Not clearly described how participants were sampled from the universities
Was the likelihood of nonresponse bias minimal?	no	Number of participants invited to participate not reported
Were data collected directly from the subjects (as opposed to a proxy)?	unclear	The corresponding author had to indicate the contribution of all authors on the article. They did duplicate data collection from another author that had been invloved in the paper (suggested by corresponding author) and the agreement was only 50%

Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	yes	ICMJE definition and criteria explicitly stated in background. Guest and ghost authorship also defined
Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	yes	Components of a research project/publication were listed and respondents had to indicate how each author contributed to the paper. They also had to indicate whether there was anybody that contributed to the paper but was not listed as an author (ghost authorship) using the same matrix
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	no	Authors developed a standardised questionnaire, but did not report whether it was pre-tested. Agreement between corresponding authors and 2nd author was only 50%
Was the same mode of data collection used for all subjects?	no	Respondents completed electronic or paper-based questionnaires.
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	yes	for the total number of authors, 536 was used as denominator. For total number of articles, 124 was used.
Overall risk of bias	high risk	

Okonta 2013 (study results published in two papers – Okonta 2013 and Okonta 2014)

Aim of study	"documenting the prevalence of self-reported scientific misconduct among a group of researchers in Nigeria. Factors associated with specific acts of scientific misconduct were examined and behavioural influences on scientific misconduct determined" "we report on the attitudes, perceptions and factors related to the work environment perceived to be associated with research misconduct in Nigeria"
Country of respondents	Nigeria
Setting where study was conducted	at a scientific conference
When was the study conducted?	2010
Participants	Researchers (clinicians and academics) of a medical specialty attending a scientific conference
Number of participants invited	150
Number of participants responding n (%)	133 (89%)
Number used for analysis	133 For questions on specific types of misconduct, the number of responses per question was used as the denominator
Sample size calculation	Yes
Topic	Scientific misconduct (general) including Plagiarism, Falsification of data, protocol violations, selective dropping of data from outlier cases, disagreements about authorship, pressure from study sponsor
Study design	Survey
Data collection tool	"A self-administered validated questionnaire adapted from the Scientific Misconduct Questionnaire-Revised (SMQ-R) by adding questions that elicited self-reporting of scientific misconduct" The adapted SMQ-R questionnaire contained the following 50 items (from Okonta 2014): 1. Demographic and research experience (Q1-7) 2. Research and ethical climate at the work environment (Q8-13) 3. Perceived prevalence of scientific misconduct in the wokplace (Q14-23) 4. Attitude and beliefs about scientific misconduct (Q24-38) 5. Behvioural influences on scientific misconduct (Q29-42) 6. Personal involvemment in scientific misconduct (Q43-50)
Type of questions	yes/no Likert scale for frequency of misconduct: Never, seldom, occasionally, frequently

Distribution of questionnaires	paper-based questionnaires distributed at conference and returned by dropping them into a sealed box
Data collection period	During conference 2010
Outcomes:	- Self-reported prevalence of research misconduct (personal involvement) - Behavioural influences on scientific misconduct - Perceived prevalence of research misconduct in the workplace - Attitudes and beliefs about scientific misconduct - Rating of work environment factors that affect scientific misconduct
Notes	Both papers report on the same survey Okonta 2013 reports on: Personal involvement in scientific misconduct and behavioural influences on scientific misconduct Okonta 2014 reports on: Research and ethical climate at the work environment, perceived prevalence of scientific misconduct in the workplace, Attiture and beliefs about scientific misconduct

Risk of bias	Judgement	Justification
Was the study's target population a close representation of the national population in relation to relevant variables?	no	Researchers from Nigeria attending a scientific conference. Medical conference of specific discipline/field/speciality which is not representative of all medical researchers in Nigeria
Was the sampling frame a true or close representation of the target population?	no	Researchers attending the conference were sampled. But not described how participants were sampled - convenient sample
Was some form of random selection used to select the sample, OR was a census undertaken?	no	Convenient sample of researchers attending the conference
Was the likelihood of nonresponse bias minimal?	unclear	response rate was 133/150 (88.7%), but participants were a convenient sample (Volunteered to participate?)
Were data collected directly from the subjects (as opposed to a proxy)?	yes	Respondents completed the questionnaire themselves
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	yes	Various definitions for research misconduct in background. Operational definition of scientific misconduct in study described. No definitions for specific types of research misconduct
Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	yes	Operational definition for scientific misconduct in questionnaire. Types of research misconduct not specifically defined, but some described.
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	yes	They used a validated questionnaire (SMQ-R)although they added questions on personal involvement in scientific misconduct
Was the same mode of data collection used for all subjects?	yes	paper-based questionnaires distributed at conference and returned by dropping them into a sealed box
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	yes	Denominator was overall number of responses, frequency categories were dichotomised into "ever having committed misconduct" and "never having committed misconduct"
Overall risk of bias	moderate risk	

Poorolajal 2012

Aim of study	"to develop a standard questionnaire for plagiarism in order to assess knowledge, attitude and practice of the researchers working in academic and research institutions"
Country of respondents	Iran
Setting where study was conducted	Hamadan University of Medical Sciences, Hamadan Province, Iran
When was the study conducted?	June to October 2011
Participants	Faculty members, experts and students
Number of participants invited	406 (calculated from response rate)

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Number of participants responding n (%)	390	
Number used for analysis	210 for prevlaence of plagiarism (number of respondents who had participated in at least one research project or published ar least one paper) 390 for questions on knowledge and attitude	
Sample size calculation	Yes: Pilot study estimated a prevalence of plagiarism of 40%, with significance level 0.05 and error level 0.05 - sample size =369 But for the plagiarism prevalence, authors only included those participants who had previously published a paper (210) which is less than the calculated sample size	
Topic	Plagiarism	
Study design	survey	
Data collection tool	The questionnaire was developed based on literature and contained four sections: 1. general characteristics such as gender, academic rank or education level 2. Nine questions related to knowledge of plagiarism including 3 yes/no questions and 6 four-choice questions, with a total score of btw 0-9 3. Nine three-choice questions (agree/no idea/disagree) related to attitude toward plagiarism with a total score between 9 and 27 4. Eight questions related to practice of committing plagiarism, with a total score between 0 and 8. A panel of experts evaluated the validity of the questionnaire. Reliability was tested by ocnducting a pilot study with 30 participants, after which the questionnaire was revised and piloted a second time with 30 participants	
Type of questions	Mixed: yes/no, Likert scale	
Distribution of questionnaires	Not described	
Data collection period	June to October 2011	
Outcomes:	Knowledge, attitude and practice of plagiarism	
Risk of bias	Judgement	Justification
Was the study's target population a close representation of the national population in relation to relevant variables?	no	Target population were researchers and academics from one Iranian University. Not necessarily representative of all researchers in Iran
Was the sampling frame a true or close representation of the target population?	no	Not sure what the sampling frame was. Stratefied random sampling was done, strata composed of six colleges: Medicine, dentistry, Health, Nursing & Midwifery, Paramedicine, 4 vice-chancellors' domains (treatment services, health services, education, research & technology) Not sure whether random selection was done from a list of all staff members??
Was some form of random selection used to select the sample, OR was a census undertaken?	yes	Stratified random sampling was done.
Was the likelihood of nonresponse bias minimal?	yes	Reported response rate was 96%
Were data collected directly from the subjects (as opposed to a proxy)?	yes	Participants completed questionnaire (not explicitly stated but assumed)
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	yes	Plagiarism adequately defined in background section
Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	unclear	Not described. Questionnaire not available - referred to Appendix 1, but no Appendix present
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	yes	A panel of experts evaluated the validity of the questionnaire. Reliability was tested by ocnducting a pilot study with 30 participants, after which the questionnaire was revised and piloted a second time with 30 participants
Was the same mode of data collection used for all subjects?	unclear	Mode of data collection not described

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Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	unclear	for prevalence of plagiarism, only those respondents who had published a paper were included.
Overall risk of bias	moderate risk	

Rathore 2015

Aim of study	"to explore the attitudes of Pakistani medical students and faculty towards plagiarism; to explore the association between formal training in researchethics, medical writing and attitudes towards plagiarism"
Country of respondents	Pakistan
Setting where study was conducted	three private and four public medical colleges in Lahore and Rawalpindi
When was the study conducted?	August 2013-january 2014
Participants	medical students and medical faculty members (only faculty members considered for the reivew)
Number of participants invited	130 faculty members
Number of participants responding n (%)	95 (73%)
Number used for analysis	not clear - 93 forms (form both medical students and faculty were discarded due to incomplete or missing data)
Sample size calculation	convenience sampling technique - smaple size calculated but not stated how this was done and what calculated smaple size was
Topic	Plagiarism
Study design	Survey
Data collection tool	Questionnaire divided in three sections 1) demographics 2) questions on participants' interests and formal training in research methodology, research ethics and involvement in medical writing 3) Attitude towards Plagiarism questionnaire (previously validated in Croatia) adapted to Pakistani acadeeminc environment: 4 items removed, modified from 5-point to 3-point likert scale (agree, neutral and disagree). ATP questionnaire was not translated from English
Type of questions	3-point Likert-scale (agree, neutral, disagree)
Distribution of questionnaires	"personally distributed"
Data collection period	August 2013-january 2014
Outcomes:	attitude towards plagiarism

Risk of bias	Judgement	Justification
Was the study's target population a close representation of the national population in relation to relevant variables?	yes	Medical faculty from 3 private and 4 public medical colleges - seems to be representative of Pakistani medical faculty
Was the sampling frame a true or close representation of the target population?	no	not reported how sampling was done
Was some form of random selection used to select the sample, OR was a census undertaken?	no	convenience sampling - not described in more detail
Was the likelihood of nonresponse bias minimal?	unclear	response rate 73%. No analysis of non-responders
Were data collected directly from the subjects (as opposed to a proxy)?	yes	questionnaires were distributed amongst medical students and faculty
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	yes	Plagiarism clearly defined in introduction
Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	unclear	only questions related to ATP are reported. "plagiarism" without defining
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	yes	Validated questionnaire (ATP) used and adapted to Pakistani environment

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Was the same mode of data collection used for all subjects?	unclear	not sure whether questionnaire was paper-based or electronic.
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	unclear	93 reponses were discarded due to incomplete or missing data. Not sure whether these were included in the response rate and denominator or not…
Overall risk of bias	moderate	

Roussos 2011

Aim of study	"to learn the current state of affairs in the following areas: ethical training, knowledge of rules and regulations and the extent of ethical misconduct"
Country of respondents	Argentina (44%), Brazil (25%), Chile (21%), Uruguay (9%)
Setting where study was conducted	online
When was the study conducted?	not reported
Participants	Psychotherapy researchers - members of the Latin American Chapter of the Society for Psychotherapy Research
Number of participants invited	114
Number of participants responding n (%)	76 (67%)
Number used for analysis	not reported - only % reported
Sample size calculation	No
Topic	Research misconduct
Study design	Survey
Data collection tool	Online survey that included 44 questions, mainly MCQs and Likert-scale, plus a few open questions
Type of questions	Mixed - yes/no, MCQs and open-ended
Distribution of questionnaires	email
Data collection period	not reported
Outcomes:	Prevalence of research misconduct: - Guest authorship - Plagiarism

Risk of bias	Judgement	Justification
Was the study's target population a close representation of the national population in relation to relevant variables?	yes	Target population: Psychotherapy researchers - members of the Latin American Chapter of the Society for Psychotherapy Research. Probably representative of psychology researchers in Latin America
Was the sampling frame a true or close representation of the target population?	unclear	Assumed that the sampling frame was a list of all psychotherapy researchers members of the SPR, which has 1271 members of which 185 are from Latin-America
Was some form of random selection used to select the sample, OR was a census undertaken?	no	114 researchers from 185 researchers from Latin America were invited. Not reported how the 114 were selected.
Was the likelihood of nonresponse bias minimal?	no	response rate was 67%. No data on non-responders
Were data collected directly from the subjects (as opposed to a proxy)?	yes	Online survey was sent to participants
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	no	No definition of research misconduct in paper
Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	unclear	Not reported. But in the results, the practices are described rather than naming the practice e.g. plagiarism was described as: Using others' words or ideas without obtaining permission or giving due credit
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	no	Not reported whether the questionaire was pre-tested
Was the same mode of data collection used for all subjects?	yes	Online survey sent to participants

Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	unclear	Results only given as %
Overall risk of bias	high risk	

Shirazi 2010

Aim of study	"to gain a better understanding about plagiarism in the local context and to explore perceptions about various stakeholders on the issue"
Country of respondents	Pakistan
Setting where study was conducted	Private and government medical colleges in Karachi, Pakistan
When was the study conducted?	May to September 2008
Participants	4th year medical students and medical faculty members (mix of junior and senior, various disciplines: basic biomedical sciences, internal medicine, general surgery, urology, obstetrics and gynaecology, peadiatrics, neurology)
Number of participants invited	not reported
Number of participants responding n (%)	Faculty members: 82
Number used for analysis	82
Sample size calculation	No - convenient sample
Topic	Plagiarism
Study design	Survey
Data collection tool	A questionnaire comprising 19 detailed questions. In this paper, only questions 1-5 are addressed. Responses were assessed against a pre-specified correct response key. Questionnaire developed by study authors.
Type of questions	Mix of MCQs, yes/no and open-ended questios
Distribution of questionnaires	Questions were read out and participants required to write down the answer
Data collection period	May to September 2008
Outcomes:	1. Knowledge 2. Attitude (Self-reported prevalence of plagiarism)
Notes	Data extracted for Faculty members, not medical students. Outcome "Attitude" refers to self-perceived prevalence of plagiarism.

Risk of bias	Judgement	Justification
Was the study's target population a close representation of the national population in relation to relevant variables?	no	Target population were 4th year medical students and faculty members of 2 private and 1 government medical colleges in Karachi. Not necessarily representative of all Pakistani researchers
Was the sampling frame a true or close representation of the target population?	no	No sampling frame - convenient sample of faculty members that attended multidisciplinary academic meetings.
Was some form of random selection used to select the sample, OR was a census undertaken?	no	convenient sample
Was the likelihood of nonresponse bias minimal?	no	Not reported how many participants were invited
Were data collected directly from the subjects (as opposed to a proxy)?	yes	Each respondent wrote down answers to the questions that were read out aloud
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	yes	Plagiarism defined in introduction
Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	no	Plagiarism not defined in questionnaire
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	unclear	Not reported how questionnaire was developed. Paper presented as "pilot study"

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Was the same mode of data collection used for all subjects?	yes	Questions were read out and participants required to write down the answer
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	yes	Total number of respondents used as denominator
Overall risk of bias	moderate risk	

Singh 2014

Aim of study	"to explore the knowledge and attitude of dental professionals toward plagiarism" (abstract)
Country of respondents	India
Setting where study was conducted	not reported
When was the study conducted?	not reported
Participants	dental professionals
Number of participants invited	Unclear - "5000 dental professionals were randomly included" Not clear whether 5000 were invited or whether 5000 responded
Number of participants responding n (%)	Unclear - "5000 dental professionals were randomly included" Not clear whether 5000 were invited or whether 5000 responded
Number used for analysis	Unclear - only % reported
Sample size calculation	no
Topic	Plagiarism
Study design	Survey
Data collection tool	Questionnaire comprising 14 questions that was developed by the study authors after reviewing the literature. Questionnaire was piloted twice: 1. Among 50 participants 2. After having revised it, another 30 participants piloted it Only 9 of the 14 questions in Table 1
Type of questions	Mix of yes/no, MCQs, Likert scale
Distribution of questionnaires	either via email or sending printed copies.
Data collection period	4 months
Outcomes:	1. Knowledge 2. Attitude (+ self-reported prevalence)
Notes	Study not well reported. Author contacted on 21.06.2016: - How did you select dental professionals that were invited to participate in the survey? - It is not clear whether you invited 5000 dental professionals or whether 5000 responded. Could you please clarify the number of participants invited and the number of responses obtained.

Risk of bias	Judgement	Justification
Was the study's target population a close representation of the national population in relation to relevant variables?	unclear	Target population only described as: Dental professionals from India
Was the sampling frame a true or close representation of the target population?	unclear	Sampling frame not reported
Was some form of random selection used to select the sample, OR was a census undertaken?	no	reported that 5000 dental professionals were "randomly included". Not clear whether this refers to random sampling
Was the likelihood of nonresponse bias minimal?	unclear	Not clear whether 5000 were invited or whether 5000 responses were obtained.
Were data collected directly from the subjects (as opposed to a proxy)?	unclear	Only reported that questionnaire was sent via email or mail. Unclear
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	yes	Definition of plagiarism in background - adequate

Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	unclear	No clear definition of plagiarism in questionnaire. For the question on self-reported prevalence, plagiarism is described
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	yes	Questionnaire comprising 14 questions that was developed by the study authors after reviewing the literature. Questionnaire was piloted twice: 1. Among 50 participants 2. After having revised it, another 30 participants piloted it Only 9 of the 14 quest
Was the same mode of data collection used for all subjects?	no	questionnaire was sent either via email (not clear whether this was a link or an attachement) or printed copies were sent
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	unclear	only % given
Overall risk of bias	high risk	

Tadakamadla 2013

Aim of study	"to assess the knowledge and attitudes of oral physicians towards publications ethics"
Country of respondents	India
Setting where study was conducted	n/a
When was the study conducted?	Not reported
Participants	All the dentists (student members and faculty members) registered with the Indian Academy of oral medicine and Radiology (IAOMR)
Number of participants invited	Not reported
Number of participants responding n (%)	185
Number used for analysis	Not reported - only % reported
Sample size calculation	no
Topic	Publication ethics (authorship, plagiarism, conflicts of interest, selective reporting.)
Study design	Survey
Data collection tool	"A close-ended 11 item questionnaire"
Type of questions	"Close-ended" questions
Distribution of questionnaires	via email
Data collection period	
Outcomes:	1. Knowledge 2. Attitudes
Notes	Study presented as letter to editor. Author contacted on 21.06.2016 to request more comprehensive report on study.

Risk of bias	Judgement	Justification
Was the study's target population a close representation of the national population in relation to relevant variables?	yes	dentists in India - all dentists registered with the Academy of Oral Medicine and Radiology
Was the sampling frame a true or close representation of the target population?	unclear	All dentists registered with the Academy of Oral Medicine and Radiology were emailed. But not clear whether the Academy provideed the list of members and their contact details?
Was some form of random selection used to select the sample, OR was a census undertaken?	yes	All dentists registered with the Academy were invited
Was the likelihood of nonresponse bias minimal?	no	not reported how many participants were invited. Only number of respondents reported
Were data collected directly from the subjects (as opposed to a proxy)?	yes	Questionnaire emailed to participants
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	no	no definitions of terms
Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	no	questions in questionnaire not reported

Was the study instrument that measured the parameter of interest shown to have validity and reliability?	no	not reported
Was the same mode of data collection used for all subjects?	unclear	not explicitly stated
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	unclear	numerator not reported (only %). Denominator not explicitly reported but assumed to be 185 (if all responses were included in the analysis)
Overall risk of bias	high risk	

2.5.2 Cross-sectional studies of research articles

Brannstrom 2012

Aim of study	"to carry out a cross-cultural comparative review regarding publishing ethics vuz confilcts of interest in conjunction with authorships/co-authorships with reference to original articles in paediatrics"
Journals	Articles stored within the electronic literature databases Web of Science, Science Citation Index Expanded, Social Sciences Citation Index, and Arts&Humanities Citation index, published between 1 January 2007 to 7 October 2009
Selection criteria	a) at least one indexed article during th eselected publishing period b) all languages, c) obtained by searching (pediatric*) as the topic d) refined by the subject 'pediatrics' as indexed by the specific databases, e) corresponding author or at least one co-author from the two selected and contrasting regions/economies, i.e. 1) all low-income economies in Sub-Saharan Africa and 2) a high-income evonomy in the western world, namely Sweden.
How were papers selected?	Papers that met all the inclusion criteria
Number of papers eligible	?6752 (not clearly described)
Number of papers selected	Sweden: n=72 (not relevant for this paper) Sub-Saharan Africa: n=34
Country of authors of selected papers	Kenya, Malawi, Tanzania, Zambia, Uganda, Congo Dem Rep, Burkina Faso, Ethiopia, Ghana, Guinea Bissau, Madagascar/Senegal, Mali, Mozambique, Rwanda, Zimbabwe
Number used for analysis	34
Topic	Funding sources, Conflicts of interest (relevant for this review)
Study design	Cross-sectional study of journal articles
Outcomes:	Financial support declared Conflicts of interest declared
Outcome measurement	Proportion of papers with declarations
Definition of outcome	Not defined
Risk of bias	Judgement	Justification
Eliibility criteria of papers clear and does this link to the question?	yes	Eligibility of papers well defined: a) at least one indexed article during th eselected publishing period b) all languages, c) obtained by searching (pediatric*) as the topic d) refined by the subject 'pediatrics' as indexed by the specific databases, e) corresponding author or at least one co-author from the two selected and contrasting regions/economies, i.e. 1) all low-income economies in Sub-Saharan Africa and 2) a high-income evonomy in the western world, namely Sweden. Appropriate for research question
Was the sampling frame adequate and representative of the targeted papers?	yes	Sampling frame adequate - Databases searched included: Web of Science, Science Citation index Expanded, Social Sciences Citation index and Arts&Humanities Citation Index, covering 3 years of publication
Was some form of random selection used to select the sample, OR was a census undertaken?	yes	not clearly described, but assumend that all papers that met inclusion criteria were selected
Were papers excluded for a good reason? Are there any papers that were excluded from the analysis without any reason?	unclear	study selection process not clearly described. 6752 articles were indexed in paediatrics. 169 did not have a country code. They included 72 articles from Sweden and 34 articles from sub-Saharan Africa

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Were data collected directly from the papers?	yes	Each article was examined for statements related to funding sources and conflict of interest
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	No	There is no definition of conflicts of interest
How did authors define the outcome of interest?	no	No explanation of what they viewed as statements related to conflicts of interest
Was data collection done rigorously? How was outcome of interest measured? Was it done by 2 authors independently?	no	For conflict of interest, they only looked at the beginning and the end of the paper. If these were addressed somewhere else in the article, the statements might have been missed. Also not described who collected data and whether this was verified by a second person
Was the same mode of data collection used for all subjects? Was there a standardised data extraction form?	unclear	not clearly described how data was collected and extracted
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	unclear	no proportions given, only absolute numbers. Table 2 is a little confusing
Overall risk of bias	Moderate risk	

Jacard 2002

Aim of study	"to evaluate temporal trends in the number of authors per article in Rev Med Chile and authors' compliance with the International Committee of Medical Journal Editors (ICMJE) criteria of authorship
Journals	Revista Medica de Chile
Selection criteria	Manuscripts published in 2000
How were papers selected?	All research articles, clinic/case reports, and a section of articles classified as "other" (which included review articles, public health papers, AND health/medical education papers) published in the Revista Médica de Chile in the year 2000.
Number of papers eligible	216
Number of papers selected	216
Country of authors of selected papers	Chile
Number used for analysis	While there were 1024 authors in the 216 papers analysed, authors only had full information from 921 if them (90% of the total)
Topic	Guest authorship
Study design	Survey applying a contribution checklist to the contribution statements provided by authors of eligible articles published in 2000 (the 216 eligible papers).
Outcomes:	Justified authorship Partial authorship Unjustified authorship
Outcome measurement	proportion of unjustified authorship/justified authorship/partial authorship
Definition of outcome	**Justified authorship:** self-declared contributions to 1) conception and design of the study, or acquisition of data, or analysis and interpretation of data 2) drafting the article, or critically reviewing it and 3) approving the final version **Partial authorship:** when only 2 of the 3 criteria are met **Unjustified authorship:** when authors only participated in data collection, or in diagnostic/therapeutic procedures, or in the statistical analysis or in combinations lacking the main descriptors required for justified authorship

Risk of bias	Judgement	Justification
Eliibility criteria of papers clear and does this link to the question?	Yes	They selected all original papers and excluded letters to the editor, editorials, and the like.

Was the sampling frame adequate and representative of the targeted papers?	Yes	They selected papers had to be published in 2000 because that is the year when contribution statements became a requirement for publication.
Was some form of random selection used to select the sample, OR was a census undertaken?	Yes	All papers that met eligibility criteria (no sampling)
Were papers excluded for a good reason? Are there any papers that were excluded from the analysis without any reason?	No	Papers excluded from the analysis did not have a properly completed contribution statements – these should have been part of the analysis
Were data collected directly from the papers?	Yes	
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	Yes	Authors clearly defined the criteria for justified authorship
How did authors define the outcome of interest?	Yes	A list of related descriptors is provided in the introduction. There are also detailed criteria provided in the methods
Was data collection done rigorously? How was outcome of interest measured? Was it done by 2 authors independently?	Unclear	Not reported
Was the same mode of data collection used for all subjects? Was there a standardised data extraction form?	Unclear	Not reported
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	Yes	
Overall risk of bias	**Moderate**	

Jamali 2014

Aim of study	"to randomly analyze Iranian scientific articles in all subject categories in 2010 to assess the level of plagiarism. In addition for a comparison between countries, we selected four: the United States and Australia (for high rate and stable production of knowledge), China (for rapid growth in all fields of science) and Turkey (as scientific competitors of Iran in the region) to investigate plagiarism in some fields"	
Journals	International journals	
Selection criteria	1. 1% of all scientific papers of Iranian authors published in international journals up to 2010 2. 50 papers of four other countries to compare with Iranian authors	
How were papers selected?	1. random selection (? Poorly reported) 2. judgemental sampling (?)	
Number of papers eligible	29 494 articles	
Number of papers selected	1. 364 (all fields) - 77 medicine and health 2. 400	
Country of authors of selected papers	1. Iran 2. US, Australia, China, Turkey	
Number used for analysis	?	
Topic	Plagiarism	
Outcomes:	Rate of plagiarism in each field	
Outcome measurement	Plagiarism detector software (Dustball software) Three or four paragraphs of the introduction or lterature review sections of each article were checked	
Definition of outcome	Articles with at least one completely copied sentence	
Risk of bias	Judgement	Justification

Eliibility criteria of papers clear and does this link to the question?	Yes	"Iranian scientific articles in all subject categories in 2010" compared to scientific article from the USA, Australia, China and Turkey
Was the sampling frame adequate and representative of the targeted papers?	no	papers came from "international journals". Not described how these were identified, which databases were searched etc. Also not clear whether "Iranian authors" means that there was one Iranian author, that all authors were Iranian , or that the contact author was Iranian?
Was some form of random selection used to select the sample, OR was a census undertaken?	no	1% of eligible papers were included according to "judgemental sampling" . This does not seem to be a random process. 50 articles of the other countries were also selected using "judgemental sampling"
Were papers excluded for a good reason? Are there any papers that were excluded from the analysis without any reason?	unclear	not sure how the papers that were not included differed from the rest. As there was no random sampling, there might be a difference between articles selected and those not selected
Were data collected directly from the papers?	Yes	All selected papers were analysed
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	yes	Plagiarism defined in introduction as "deliberate approapriation of others' ideas and statements without proper referencing"
How did authors define the outcome of interest?	yes	"Articles with at least one completely copied sentence were categroized as plagiarized articles".
Was data collection done rigorously? How was outcome of interest measured? Was it done by 2 authors independently?	no	Dustball software was used to determine whether there was plagiarism. However, only 3 or 4 paragraphs from the literature review was checked. Not described who did this and whether there were 2 authors involved in checking the papers
Was the same mode of data collection used for all subjects? Was there a standardised data extraction form?	yes	No reason to believe that this was not the case
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	yes	numerator was number of plagiarised articles and denominator was the number of articles checked.
Overall risk of bias	moderate	

Klitzman 2010

Aim of study	"to explore…how oftenhow often articles reporting on research conducted in four developing world countries disclosed funding sources and COI and what factors are associated with such disclosures"
Journals	All papers published in Medline in 2007
Selection criteria	inclusion criteria 1) research concerned HIV 2) research was sponsored by a developed country but was carried out in India, Thailand, Nigeria and Uganda, 3) papers with human subjects 4) published in English 5) avaiable online through university medical library 6) original research articles (no systematic reviews)
How were papers selected?	Not specified in detail. Medline search conducted
Number of papers eligible	221
Number of papers selected	221
Country of authors of selected papers	Uganda, Thailand, Nigeria, India
Number used for analysis	221
Topic	Conflict of interest, funding source
Outcomes:	Primary outcome: Mention of funding source or Conflict of interest
Outcome measurement	Proportions
Definition of outcome	Whether the article mentioned or did not mention the presence or absence of a funding source or COI

Risk of bias	Judgement	Justification
Eliibility criteria of papers clear and does this link to the question?	no	Although eligibility of papers was clearly described - original research articles of studies on humans, that concerned HIV and were conducted in Thailand, Nigeria, Uganda and India, one of the criteria was that the research was sponsored by a developed country - but, disclosure of funding sources was one of the outcomes. Not sure this is representative of all the HIV studies conducted in these countries. This is also not part of the question
Was the sampling frame adequate and representative of the targeted papers?	no	Only Medline was searched. Is research conducted in Thailand, Nigeria, Uganda and India likely to be published in journals that are not indexed in Medline?
Was some form of random selection used to select the sample, OR was a census undertaken?	yes	all articles that were eligible were included
Were papers excluded for a good reason? Are there any papers that were excluded from the analysis without any reason?	unclear	Not reported how search was conducted - search terms? 590 papers were identified and of these, 221 met the inclusion criteria. Reasons for excluding papers not described
Were data collected directly from the papers?	yes	eligible articles were coded
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	yes	Conflicts of interest defined clearly in introduction
How did authors define the outcome of interest?	yes	primary outcome: mention of funding source or COI: whether the article mentioned or did not mention the presence or absence of a funding source or a COI respectively"
Was data collection done rigorously? How was outcome of interest measured? Was it done by 2 authors independently?	yes	Rigorous process of collecting data: 2 research assistants independently coded papers, first 10 papers served as pilot of code book. Disagreements were discussed until consensu reached
Was the same mode of data collection used for all subjects? Was there a standardised data extraction form?	yes	"All articles were then recoded using the final codebook"
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	yes	numerator was the number of papers that did not disclose funding/COI and denominator was the number of eligible papers
Overall risk of bias	moderate	

Koushan 2014

Aim of study	"to investigate the degree to which medical journals and authors adhere to ethical guidelines in publication"
Journals	102 medical journals of Iranian universities published in 2011 and 2012
Selection criteria	Journals published in Persian (English and Arabic journals were excluded) during 2011 and 2012 (but these dates do not correspond with when the study was conducted (2010-2011) Research articles were selected from these journals (no details specified)
How were papers selected?	random selection
Number of papers eligible	?
Number of papers selected	109
Country of authors of selected papers	Iran
Number used for analysis	109
Topic	Research misconduct (authorship, conflicts of interest, duplicate publication)
Study design	Cross-sectional study of journal papers and survey of corresponding authors

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Outcomes:	Not declaring conflicts of interest Not disclosing financial support Gift authorship Ghost authorship Salami publication Duplicate publication in another language	
Outcome measurement	Frequencies and percentages	
Definition of outcome	Not defined	
Risk of bias	Judgement	Justification
Eliibility criteria of papers clear and does this link to the question?	unclear	research articles published in medical journals of Iranian universities - not specified what type of articles were included
Was the sampling frame adequate and representative of the targeted papers?	unclear	Journals published in Persian were included, but not described where the list of journals came from and whether this is a comprehensive list
Was some form of random selection used to select the sample, OR was a census undertaken?	yes	109 papers were randomy selected from eligible journals
Were papers excluded for a good reason? Are there any papers that were excluded from the analysis without any reason?	unclear	not sure how many papers were eligible and whether ow authors reandomly selected papers
Were data collected directly from the papers?	unclear	Not clearly described what was collected from papers and what from coresponding authors
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	yes	All terms clearly defined in introduction
How did authors define the outcome of interest?	no	not reported how they defined misconduct when examining the papers
Was data collection done rigorously? How was outcome of interest measured? Was it done by 2 authors independently?	no	They developed a checklist that they applied to selected papers. They also contacted corresponding authors "to complete the checklist". Not sure wheter all corresponding authors were contacted or only when information was missing? Not clear what information corresponding authors provided. Not reported how they measured outcomes
Was the same mode of data collection used for all subjects? Was there a standardised data extraction form?	no	not clear whether all coresponding authors were contacted
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	no	only % reported, no absolute numbers
Overall risk of bias	high	

Qi 2013

Aim of study	"to evaluate the prevalence of covert duplicate pulications among these articles and to compare them across publication dates, institutional grades, and academic levels of journals" (articles on Budd-Chiari Syndrome in China)
Journals	Searched PubMed, Chinese Scientific and Technological Journal (VIP) database, and China National Knowledge Infrastructure (CNKI) database
Selection criteria	Articles were eligible if they were original research articles in which Chinese patients with Budd-Chiari Syndrome were studied All papers were screened for eligibility
How were papers selected?	Systematic approach - search, screening of all papers. Papers inlcuded if they met all six criteria for "covert duplicate publication"
Number of papers eligible	3005 papers identified through search, 2296 papers screened, 1914 papers included
Number of papers selected	

Country of authors of selected papers	China	
Number used for analysis	?	
Topic	Duplicate publication	
Outcomes:	Presence of covert duplicate publication	
Outcome measurement	Prevalence of duplicate publications	
Definition of outcome	Covert duplicate publication: If all of the following 6 criteria were met: 1. The first author or affiliation is the same btw primary and secondary publications 2. At least 2 of 4 characteristics (enrollment period, number of patients, gender proportion and age range) are the same between primary and secondary publications. 3. Aim, method, and conclusion are the same 4. Primary and secondary publications are published in different journals or different volumes or issues of one journal 5. Authors do not state that secondary publication has been published in whole or in part 6. Authors do not state that secondary publication has been approved by the editors of both journals.	
Risk of bias	Judgement	Justification
Eliibility criteria of papers clear and does this link to the question?	yes	Original articles in which Chinese patients with BCS were studied were included – links to question
Was the sampling frame adequate and representative of the targeted papers?	yes	Searched PubMed, Chinese Scientific and Technological Journal database and the China National Knowledge Infrastructure database
Was some form of random selection used to select the sample, OR was a census undertaken?	yes	All papers identified through the search that met eligibility were included
Were papers excluded for a good reason? Are there any papers that were excluded from the analysis without any reason?	yes	All eligible papers included in analysis. Reasons for excluding papers stated and valid
Were data collected directly from the papers?	yes	Data collected from papers
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	yes	"Duplicate publication is characterised by similar hypotheses, data and conclusions from the same research team being published in 2 or more journals"
How did authors define the outcome of interest?	yes	Clear definition of covert duplicate publication used to classify papers– table 2
Was data collection done rigorously? How was outcome of interest measured? Was it done by 2 authors independently?	yes	Screening and selection process well described. Two authors independently made judgements about duplicate publication by applying definition.
Was the same mode of data collection used for all subjects? Was there a standardised data extraction form?	yes	Data was extracted from all papers and judgements made
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	yes	Numerator was the number of duplicate articles, and the denominator was the total number of articles that met eligibility criteria
Overall risk of bias	low	

Romero 2007

Aim of study	"to determine the financial sources of research articles published in the Revista Medica de Chile during a 5-year period"
Journals	Revista Medica de Chile
Selection criteria	all articles classified as "research articles" published between 2001 and 2005. Eligible studies included descriptive or observational studies, case and control studies, cohort studies, experimental studies, and reviews.
How were papers selected?	
Number of papers eligible	519

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Number of papers selected	519
Country of authors of selected papers	Chile
Number used for analysis	519
Topic	Funding source and conflicts of interest
Outcomes:	Disclosure of funding source Disclosure of conflicts of interes
Outcome measurement	Proportion of studies that reported funding sources or conflicts of interest.
Definition of outcome	Funding was defined as: 1) No explicit funding (no related data reported), 2) internal funding (funding from the agency to which authors are affiliated), 3) FONDECYT (a specific Chilean government funding body), and 4) other (external institutions, which could be national, international, for- or non-for-profit, or the pharmaceutical industry)

Risk of bias	Judgement	Justification
Eliibility criteria of papers clear and does this link to the question?	Yes	Eligibility criteria are clearly described. Eligible studies included descriptive or observational studies, case and control studies, cohort studies, experimental studies, and reviews.
Was the sampling frame adequate and representative of the targeted papers?	Yes	Authors selected all papers published between 2001 and 2005,)
Was some form of random selection used to select the sample, OR was a census undertaken?	Yes	All papers that met eligibility criteria (no sampling
Were papers excluded for a good reason? Are there any papers that were excluded from the analysis without any reason?	Yes	No papers were excluded from the analysis
Were data collected directly from the papers?	Yes	It is the only way this study could have been conducted
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	Yes	Authors clearly defined the criteria for funding
How did authors define the outcome of interest?	Yes	A list of related descriptors is provided in the methods
Was data collection done rigorously? How was outcome of interest measured? Was it done by 2 authors independently?	Yes	Two authors collected study data
Was the same mode of data collection used for all subjects? Was there a standardised data extraction form?	Unclear	Not reported whether a data extraction form was used
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	Yes	
Overall risk of bias	Low risk	

Soto-Subriabre 2016

Aim of study	"to analyse the presence of declarations of conflicts of interest in studies published in the Revista Chilena de Ortopedia y Traumatologia and Revista Chilena de Neurocirugia between 2002 and 2015"
Journals	Revista Chilena de Ortopedia y Traumatologia and Revista Chilena de Neurocirugia
Selection criteria	None provided besides that the articles had to be published in the two eligible journals between 2002 and 2015.
How were papers selected?	all papers published between 2002 and 2015
Number of papers eligible	**596**
Number of papers selected	596
Country of authors of selected papers	Chile
Number used for analysis	596
Topic	Conflicts of interest

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Outcomes:	Presence of declaration of conflicts of interest	
Outcome measurement	Proportion of articles with a declaration of conflicts of interest	
Definition of outcome	Proportion of articles with conflicts of interest related to funding, partnerships with the industry, commercial patents, membership in editorial committee, others.	
Risk of bias	**Judgement**	**Justification**
Eliibility criteria of papers clear and does this link to the question?	No	Eligibility criteria not described
Was the sampling frame adequate and representative of the targeted papers?	Unclear	Authors selected papers published between 2002 (two years before the publication of studies on the relationship between physicians and conflicts of interest) and 2015 (right before the date when the study was conducted). But not sure whether these were representative of the target papers since no description of eligibility
Was some form of random selection used to select the sample, OR was a census undertaken?	Unclear	All papers that met eligibility criteria (no sampling) – not sure what eligibility criteria are
Were papers excluded for a good reason? Are there any papers that were excluded from the analysis without any reason?	Unclear	No papers were excluded from the analysis, but not sure whether all eligible papers were included – not sure what eligibility criteria were
Were data collected directly from the papers?	Yes	It is the only way this study could have been conducted
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	Yes	Authors clearly defined the criteria for conflicts of interest declaration in Table 1
How did authors define the outcome of interest?	Yes	Table 1 provide a clear definition of good reporting practice.
Was data collection done rigorously? How was outcome of interest measured? Was it done by 2 authors independently?	Unclear	Not reported
Was the same mode of data collection used for all subjects? Was there a standardised data extraction form?	Unclear	All papers were treated equally but it is unclear if there was a data collection form
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	Yes	The data provided in the results matches the methods
Overall risk of bias	Moderate risk	

Tisce 2014

Aim of study	To describe the omissions in the declaration of conflicts of interest and of ethics committee approval in studies published in biomedical journals published in SCIELO Peru.
Journals	biomedical journals indexed in Scielo Peru: RPG-O: Revista Peruana de Ginecología y Obstetricia; RPMESP: Revista Peruana de Medicina Experimental y Salud Pública; RMH: Revista Médica Herediana; RGP: Revista de Gastroenterología del Perú; AFM: Anales de la Facultad de Medicina; AMP: Acta Médica Peruana
Selection criteria	All research papers published during the The period 2007-2012 in the "original" sections and "Brief originals" of these magazines. Excluded The letters to the editor
How were papers selected?	All research papers published during the period 2007-2012 in the "original" and "Brief original" sections of eligible journals. Excluded: Letters to the editor

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Number of papers eligible	672	
Number of papers selected	672	
Country of authors of selected papers	Peru	
Number used for analysis	672	
Topic	Conflict of interest	
Outcomes:	Declaration of conflict of interest	
Outcome measurement	Proportion of studies reporting conflicts of interest	
Definition of outcome	Not reported	
Risk of bias	Judgement	Justification
Eliibility criteria of papers clear and does this link to the question?	Yes	Eligibility clearly described: All research papers published during the period 2007-2012 in the "original" and "Brief original" sections of eligible journals. Excluded: Letters to the editor.
Was the sampling frame adequate and representative of the targeted papers?	Yes	Eligible papers in Biomedical journals indexed in Scielo Peru: RPG-O: Revista Peruana de Ginecología y Obstetricia; RPMESP: Revista Peruana de Medicina Experimental y Salud Pública; RMH: Revista Médica Herediana; RGP: Revista de Gastroenterología del Perú; AFM: Anales de la Facultad de Medicina; AMP: Acta Médica Peruana
Was some form of random selection used to select the sample, OR was a census undertaken?	Yes	Authors selected all papers that met eligibility criteria (no sampling)
Were papers excluded for a good reason? Are there any papers that were excluded from the analysis without any reason?	Yes	No papers were excluded from the analysis
Were data collected directly from the papers?	Yes	It is the only way this study could have been conducted
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	No	
How did authors define the outcome of interest?	No	No information provided about how to decide if a paper had properly reported conflicts of interest or approval of ethics committees.
Was data collection done rigorously? How was outcome of interest measured? Was it done by 2 authors independently?	Yes	Two authors collected study data
Was the same mode of data collection used for all subjects? Was there a standardised data extraction form?	Unclear	All papers were treated equally but it is unclear if there was a data collection form
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	Yes	The data provided in the results matches the methods
Overall risk of bias	Moderate risk of bias	

Tucker 2011

Aim of study	"to examine overlap publication and its proper notation, but also to situate this scientific discussion within an appropriate systems framework that haas the potential to help clarify and broaden the voice of non-English speaking scientific communities"
Journals	English language manuscripts from Chines institutions indexed in Medline (searched via PubMed)
Selection criteria	1) institutions in China 2) published between 01.01.2000 and 12.04.2009 3) human subjects 4) English language No reviews, case reports or letters were included
How were papers selected?	randomly selected using a random number generator

Number of papers eligible	58816	
Number of papers selected	100	
Country of authors of selected papers	China	
Number used for analysis	100	
Topic	Duplicate publication (overlap publication)	
Study design	Cross-sectional study of papers published in journals	
Outcomes:	Overlap in publications: Substantail overlap Minor overlap	
Outcome measurement	Prevalence	
Definition of outcome	Substantial overlap: greater than 30% similarity in any of the content of the introduction, methods, results or discussion Minor overlap: less than 30% similarity within a single article section	
Risk of bias	Judgement	Justification
Eliibility criteria of papers clear and does this link to the question?	unclear	Eligibility criteria not clear: PubMed manuscripts with search limits: insitution in China, humans and English, from 2000-April 2009 - the aim was to examine overlap publications from Chinese institutions
Was the sampling frame adequate and representative of the targeted papers?	unclear	Not sure PubMed is an adequate sampling frame for English papers from Chines institutions
Was some form of random selection used to select the sample, OR was a census undertaken?	yes	random sample of 100 English papers
Were papers excluded for a good reason? Are there any papers that were excluded from the analysis without any reason?	unclear	random sample of eligible papers from PubMed. But not sure how many papers were identified with the search on the Chinese National Knowledge Infrastructure database - not sure which papers were selected to be examined - all?
Were data collected directly from the papers?	yes	Abstracts of papers examined for overlap
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	no	no definition of overlap publication in introduction
How did authors define the outcome of interest?	yes	"Substantial overlap was a priori defined as greater than 30% similarity in the content of the introduction, methods, results or discussion sections" "Minor overlap was a priori defined as less than 30% similarity in any of the content of these single sections"
Was data collection done rigorously? How was outcome of interest measured? Was it done by 2 authors independently?	unclear	There was duplicate assessment of abstracts for possible overlap by 5 researchers fluent in Chinese and English. However, not clear how they made judgements about the % of overlap?
Was the same mode of data collection used for all subjects? Was there a standardised data extraction form?	yes	for papers with overlap, there was a standardised data extraction form (Chinese and English)
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	yes	numerator was number of duplicate manuscripts and denominator was number of manuscripts selected
Overall risk of bias	moderate	

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Appendix 2.6: Summary of risk of bias across studies

2.6.1 Risk of bias in cross-sectional studies of health researchers

	AdeleYe 2012	Al-Herz 2012	Borracci 2012	Das 2013	Das 2016	Dhaliwal 2006	Dhingra 2014	Ghajarzadeh 2012a	Ghajarzadeh 2012b	Ghajarzadeh 2014	Gultekin 2010	Jain 2015	Jawaid 2013	Kurdi 2015	Mirzazadeh 2011	Okonta 2013	Poorolajal 2012	Rathore 2015	Roussos 2011	Shirazi 2010	Singh 2014	Tadakamadla 2013
Was the study's target population a close representation of the national population in relation to relevant variables?	N	Y	N	N	Y	?	Y	N	?	Y	N	Y	?	Y	Y	N	N	Y	Y	N	?	Y
Was the sampling frame a true or close representation of the target population?	N	Y	N	N	N	N	N	?	Y	Y	Y	?	?	N	N	N	N	N	?	N	?	?
Was some form of random selection used to select the sample, OR was a census undertaken?	N	N	Y	N	N	Y	N	?	?	Y	?	?	Y	N	N	Y	N	N	N	N	N	Y
Was the likelihood of nonresponse bias minimal?	Y	N	Y	N	N	N	N	Y	?	N	N	Y	Y	N	N	?	Y	?	N	?	?	N
Were data collected directly from the subjects (as opposed to a proxy)?	Y	Y	?	?	Y	Y	Y	Y	Y	?	Y	Y	Y	Y	?	Y	Y	Y	Y	Y	?	Y
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	N	N	Y	?	N	Y	Y	Y	N	Y	N	Y	?	N	Y	Y	Y	Y	N	Y	Y	N
Was the reporting practice adequately defined in the questionnaire (i.e. how was it explained to participants?)	N	N	Y	?	Y	?	?	?	Y	?	?	?	?	N	Y	Y	?	?	?	N	?	N
Was the study instrument that measured the parameter of interest shown to have validity and reliability?	Y	N	N	N	N	?	?	Y	N	N	?	Y	N	?	N	Y	Y	Y	N	?	Y	N
Was the same mode of data collection used for all subjects?	Y	Y	Y	?	N	Y	Y	?	N	N	Y	Y	Y	N	N	Y	?	?	Y	Y	N	?

| Were the numerator(s) and denominator(s) for the parameter of interest appropriate? | Y | N | Y | ? | Y | ? | Y | ? | ? | Y | ? | ? | Y | N | Y | Y | ? | ? | ? | Y | ? | ? |

2.6.2 Risk of bias in cross-sectional studies of research articles

	Brannstrom 2012	Jacard 2002	Jamali 2014	Klitzmann 2010	Koushan 2014	Qi 2012	Romero 2007	Soto-Subriabre 2016	Tisce 2014	Tucker 2011
Eligibility criteria of papers clear and does this link to the question?	Y	Y	Y	N	?	Y	Y	N	Y	?
Was the sampling frame adequate and representative of the targeted papers?	Y	Y	N	N	?	Y	Y	?	Y	?
Was some form of random selection used to select the sample, OR was a census undertaken?	Y	Y	N	Y	Y	Y	Y	?	Y	Y
Were papers excluded for a good reason? Are there any papers that were excluded from the analysis without any reason?	?	N	?	?	?	Y	Y	?	Y	?
Were data collected directly from the papers?	Y	Y	Y	Y	?	Y	Y	Y	Y	Y
Case Definitions: Was there a sound and acceptable definition of relevant reporting practices in the paper?	N	Y	Y	Y	Y	Y	Y	Y	N	N
How did authors define the outcome of interest?	N	Y	Y	Y	N	Y	Y	Y	N	Y
Was data collection done rigorously? How was outcome of interest measured? Was it done by 2 authors independently?	N	?	N	Y	N	Y	Y	?	Y	?
Was the same mode of data collection used for all subjects? Was there a standardised data extraction form?	?	?	Y	Y	N	Y	?	?	?	Y
Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	?	Y	Y	Y	N	Y	Y	Y	Y	Y

Appendix 2.7: Prevalence of research misconduct

	Outcome measurement	Study ID	Total n	%
Guest authorship	Number of participants admitting to having inappropriately added authors	Al-Herz 2013	Not reported	South America 28%; Asia 44%; Africa 42%
		Das 2016	95	66%
		Gultekin 2010	87	45%
		Jawaid 2013	218	24%
		Roussos 2011	76	24%
	Number of partticipants admitting to having inappropriately received authorship	Jawaid 2013	218	29%
		Roussos 2011	76	6%
	Number of participants admitting to knowing about other people engaging in this practice	Dhingra 2014	155	65%
	Unjustified authorship according to whether contributions of authors met ICMJE criteria	Borracci 2011	214	33%
		Ghajarzadeh 2014	296	37%
		Jacard 2002*	921	6%
		Koushan 2014*	109	47%
		Mirazazadeh 2011	536	56%
Ghost authorship	Number of participants admitting to having inappropriately omitted authors	Mirazazadeh 2011	124	20%
	Number of participants admitting to knowing about other people inappropriately omitting authors	Dhingra 2014	155	34%
	Number of participants that were not included as authors when authorship felt deserved	Jawaid 2013	218	43%
	Unclear how it was measured	Koushan 2014*	109	6%
Plagiarism	Number of participants admitting to having plagiarised	Adeleye 2012	132	5%
		Okonta 2013	130	9%
		Poorolajal 2012	210	38%
		Roussos 2011	76	5%
		Shirazi 2010	82	73%
		Singh 2014	Not reported	Occasionally: 55%
				Frequently: 32%
	Number of participants admitting to knowing about other people having plagiarised	Dhingra 2014	155	54%
		Okonta 2014	131	89%
		Shirazi 2010	82	68%
	Number of articles with one or more copied sentences	Jamali 2014*: Iran	77	39%
		Jamali 2014*: China	50	36%
		Jamali 2014*: Turkey	50	38%

*Cross-sectional studies of biomedical research articles

	Outcome measurement	Study ID	Total n	%
Conflicts of interest	Number of research articles without disclosure of conflicts of interest	Brannstrom 2012*	32	56%
		Klitzman 2010*	221	80%
		Koushan 2014*	109	45%
		Romero 2007*	26	81%
		Soto Subriare 2016*	596	69%
		Ticse 2014*	672	78%
	Number of participants admitting to not declaring conflicts of interest	Das 2013	61	98%
Funding sources	Number of research articles without disclosure of funding sources	Brannstrom 2012*	32	28%
		Klitzman 2010*	221	32%
		Koushan 2014*	109	57%
		Romero 2007*	519	58%
Redundant publication	Number of research articles with redundant publication	Koushan 2014*	109	Entire article: 8%
				Sections of article: 10%
		Qi 2013*	1914	10%
		Tucker 2011*	100	Substantial overlap: 19%
				Minor overlap: 6%
	Number of participants admitting to redundant publication	Adeleye 2012	132	5%
	Number of participants knowing about duplicate submissions	Dhingra 2014	155	21%
	Participants knowing about salami publications	Dhingra 2014	155	33%
Data fabrication or falsification	Number of participants admitting to data fabrication	Adeleye 2012	132	14%
	Number of participants admitting to data falsification	Adeleye 2012	132	10%
		Okonta 2013	131	27%
	Number of participants knowing about others that have engaged in data fabrication or falsification	Dhingra 2014	155	57%
	Number of participants knowing about others having falsified data	Okonta 2014	132	91%

*Cross-sectional studies of biomedical research articles

Appendix 2.8: Summary of results of secondary outcomes

2.8.1 Knowledge of good practices

Study ID	Outcome	Total n	%
Dhaliwal 2006	Number of participants aware of ICMJE criteria	77	65%
Dhaliwal 2006	Number of participants that think all 3 ICMJE criteria should be met for authorship	77	56%
Gultekin 2010		87	55%
Jawaid 2013		218	55%
Poorolajal 2012	Mean plagiarism score (maximum score 9)	390	Mean 5.94 (SD 1.66)
Singh 2014	Number of participants that know what plagiarism is	unclear	83%
Shirazi 2010	Number of participants that understand need for referencing	82	22%
	Number of participants that understand the need to paraphrase work of others		54%
	Number of participants that know how to incorporate direct quotations		16%
	Number of participants that know what is meant by "self-plagiarism"		88%
Das 2013	Number of participants that have heard of the term "conflict of interest"	61	18%
	Number of participants that know the meaning of the term "conflicts of interest"		11%

2.8.2 Attitude towards research misconduct

Study ID	Outcome	n	% (95%CI)
Ghajararzadeh 2012a	Attitude towards plagiarism: ATP questionnaire	198	Results reported as % of false answers
Ghajararzadeh 2012b		87	Results reported as % of correct and false answers
Rathore 2015		95	Number of participants with score <42.0: 15% (95%CI 9 to 23) Number of participants with score 43-47: 34% (95%CI 25 to 44) Number of participants with score >48: 52% (95%CI 42 to 61)
Jain 2015		164	Median score for factor 1: 34 (dental students) and 32 (medical students) Median score for factor 2: 21.5 (dental students) and 19 (medical students) Median score for factor 3: 29 (dental students) and 27.5 (medical students)

Poorolajal 2012	Mean attitude score (max score 27)	390	24.12 SD 1.66

2.8.3 Perceptions on research misconduct and on factors influencing research misconduct

Study ID	Outcome	Total n	%
Perceptions on authorship:			
Gultekin 2010	Gift authorship is widespread	87	93%
	Gift authorship is common in national and international publications		69%
	Gift authorship is particularly common in national publications		24%
	Adding names who may not deserve authorship may increase chances of getting a paper accepted for publication		48%
	Gift authorship is linked to academic expectations		93%
	Not adding names of colleagues may affect their friendship negatively		28%
Tadakamadla 2013	Limiting the number of authors in an article is good practice	unclear	65%
	Funding of a study entitles a person for authorship		14%
	Just supervising a study merits authorship		40%
Reasons for plagiarism:			
Kurdi 2015	Researchers think they can get away with it	600	29%
	Regulations stipulate that it is compulsory to publish		32%
	Ambition and fierce competition		20%
	To increase speed		8%
	Poor writing skills		31%
	Ignorance		17%
Conflicts of interest:			
Tadakamadla 2013	Mandatory to disclose conflicts of interest	unclear	86%
Research misconduct in general:			
Tadakamadla 2013	Publishing findings lacking statistical significance is unimportant	unclear	25%
Okonta 2014	Number of participants concerned about the amount of misconduct	132	89%
	Number of participants that think the responsibility for the scientific integrity of a study lies with the principal investigator		12%
	Number of participants that believe all professional education programmes should include information about standards of research ethics		97%
	Number of participants that feel uncomfortable when talking with researchers about unethical behaviour		9%

	Number of participants that think dishonesty and misrepresentation of data are common in society and do not really hurt anybody		7%
Strong behavioural influences on scientific misconduct			
Okonta 2013	Pressure for tenure	131	27%
	Pressure for external funding		50%
	Need for recognition		59%
	Unclear definition what constitutes misconduct		22%
	Insufficient censure for misconduct		53%
	Financial conflict of interest		37%
	Low interest of PI in study, enrolment and outcomes		22%
	High interest of PI in study, enrolment and outcomes		19%
	Number of research protocols PI is responsible for		26%
Researchers' rating of work environment factors that affect scientific misconduct			
Okonta 2014	Severity of penalties for scientific misconduct	132	Low or very low: 81%
	Chances of getting caught for scientific misconduct if it occurs		Low or very low: 76%
	Researchers' understanding of rules and procedures related to scientific misconduct		Low or very low: 59%
	Own understanding of rules and procedures related to scientific misconduct		High or very high: 82%
	Researchers' support of rules and procedures related to scientific misconduct		Low or very low: 54%
	The effectiveness of your institution's rules and procedures for reducing misconduct		Low or very low: 61%

Appendix 3

Appendix 3.1: List of low- and middle-income countries according to the World Bank and number of contact authors of published Cochrane reviews per country

(siteresources.**worldbank**.org/DATASTATISTICS/Resources/CLASS.XLS)

Low-income countries	Lower middle income countries	Upper middle-income countries
Afghanistan	Armenia	Albania
Bangladesh (1)	Bhutan	Algeria
Benin	Bolivia (1)	American Samoa
Burkina Faso	Cabo Verde	Angola
Burundi	Cameroon (5)	Argentina (18)
Cambodia (1)	Congo, Rep.	Azerbaijan
Central African Republic	Côte d'Ivoire	Belarus
Chad	Djibouti	Belize
Comoros	Egypt, Arab Rep. (10)	Bosnia and Herzegovina
Congo, Dem. Rep.	El Salvador	Botswana
Eritrea	Georgia	Brazil (92)
Ethiopia (1)	Ghana (2)	Bulgaria
Gambia, The (3)	Guatemala	China (167)
Guinea	Guyana	Colombia (15)
Guinea-Bissau	Honduras	Costa Rica (2)
Haiti	India (50)	Cuba (1)
Kenya (7)	Indonesia (3)	Dominica
Korea, Dem. Rep.	Kiribati	Dominican Republic
Liberia	Kosovo	Ecuador (1)
Madagascar	Kyrgyz Republic	Fiji
Malawi (3)	Lao PDR	Gabon
Mali	Lesotho	Grenada
Mozambique	Mauritania	Hungary
Myanmar	Micronesia, Fed. Sts.	Iran, Islamic Rep. (13)
Nepal	Moldova	Iraq
Niger	Mongolia	Jamaica (4)
Rwanda	Morocco	Jordan (2)
Sierra Leone	Nicaragua	Kazakhstan
Somalia	Nigeria (30)	Lebanon (1)
Tajikistan	Pakistan (6)	Libya
Tanzania (2)	Papua New Guinea	Macedonia, FYR
Togo	Paraguay	Malaysia (19)
Uganda (5)	Philippines (12)	Maldives
Zimbabwe	Samoa	Marshall Islands
	São Tomé and Principe	Mauritius
	Senegal	Mexico (8)
	Solomon Islands	Montenegro
	South Sudan	Namibia
	Sri Lanka (2)	Palau
	Sudan	Panama
	Swaziland	Peru (4)
	Syrian Arab Republic (5)	Romania (1)

	Timor-Leste	Serbia (3)
	Ukraine	Seychelles
	Uzbekistan	South Africa (57)
	Vanuatu	St. Lucia
	Vietnam	St. Vincent and the Grenadines
	West Bank and Gaza	Suriname
	Yemen, Rep.	Thailand (47)
	Zambia	Tonga
		Tunisia
		Turkey (1)
		Turkmenistan
		Tuvalu
		Venezuela, RB (2)
Total: 23	Total: 126	Total: 458

Appendix 3.2: Questionnaire for online survey

Study on health research reporting practices

Section A: Please answer the following questions:

12. Which country are you currently working in?

13. Where do you currently work?
    a. University
    b. Other research institution
    c. Other (please specify)

14. How long have you been working here? (months and years)

15. What is your highest qualification?
    a. Bachelor's degree
    b. Master's degree
    c. PhD

16. On average, how much of your time (%) do you spend on research?

17. How many peer reviewed research articles have you been an author on?

18. What was the year of your first publication?

19. How many Cochrane reviews are you an author on?

20. What is your first language?

21. What is your gender?
    a. Male
    b. Female

22. What is your age?

Section B: Please read the following scenarios and answer the questions that follow:

10. A junior researcher, J, adds the head of department, D, as the last author on a research paper. D provided suggestions for direction of J's work that helped her obtain the grant, although he hasn't contributed to the actual research or the publication.

My view on this is:

- This is acceptable because D should be an author
- This is not best practice, but it does not really matter, as it doesn't affect the science
- This is unacceptable because D has not contributed to this paper

Have you ever done something like this?

- Yes
- No, and I am not aware of anybody else doing it
- No, but I am aware of other people doing it

In my current department or unit, this pattern of authorship

- Is usual practice and happens most of the time
- Happens occasionally
- Happens rarely
- Never happens
- Other: (please specify)

Comments or clarifications:

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11. A professor, M, who did not contribute to study design, data collection or data analysis but is an expert in the field, reviews the draft manuscript and suggests some minor changes to the English. He asks to be listed as an author on the paper.

My view on this is:

- This is acceptable because M should be an author
- This is not best practice, but it does not really matter, as it doesn't affect the science
- This is unacceptable because M has not sufficiently contributed to this paper

Have you ever done something like this?

- Yes
- No, and I am not aware of anybody else doing it
- No, but I am aware of other people doing it

In my current department or unit, this pattern of authorship

- Is usual practice and happens most of the time
- Happens occasionally
- Happens rarely
- Never happens

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- Other: (please specify)

Comments or clarifications:

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12. A Master's student consults with the resident biostatistician, P, to help with data analysis on her research project. In the manuscript that she submits for publication, she lists P in the "Acknowledgement" section.

My view on this:

- This is acceptable because P should be acknowledged in this way
- This is not best practice, but it does not really matter, as it doesn't affect the science
- This is unacceptable because P has made substantial contributions to the work

Have you ever done something like this?

- Yes
- No, and I am <u>not</u> aware of anybody else doing it
- No, but I <u>am</u> aware of other people doing it

In my current department or unit, this pattern of authorship

- Is usual practice and happens most of the time
- Happens occasionally
- Happens rarely
- Never happens
- Other: (please specify)

Comments or clarifications:

---

13. A PhD student "copies and pastes" nearly all of the introduction from a paper that she has previously published into her next manuscript, since she is doing a series of experiments on the same topic.

My view on this is:

- This is acceptable because it is her own work
- This is not allowed by journals but it does not really matter, as it doesn't affect the science
- This is unacceptable behaviour

Have you ever done something like this?

- Yes
- No, and I am <u>not</u> aware of anybody else doing it
- No, but I <u>am</u> aware of other people doing it

In my current department such text-recycling

- Is usual practice and happens most of the time
- Happens occasionally
- Happens rarely
- Never happens
- Other: (please specify)

Comments or clarifications:

---

14. A researcher in Mozambique wants to submit his manuscript to a journal published in English. He finds a text book in Portuguese that explains an aspect of the background to the disease very well. He translates one paragraph into English, and puts this into his introduction without reference to the book.

My view on this is:

- This is acceptable because the text has been translated
- This is not best practice, but it does not really matter, as it doesn't affect the science
- This is unacceptable behaviour

Have you ever done something like this?

- Yes
- No, and I am not aware of anybody else doing it
- No, but I am aware of other people doing it

In my current department or unit, such use of other people's material:

- Is usual practice and happens most of the time
- Happens occasionally
- Happens rarely
- Never happens
- Other: (please specify)

Comments and clarifications:

---

15. A researcher, T, is working on a diagnostic test study. The company manufacturing the test has supplied the kits for free but did not design or fund the research. T was paid for a consultancy for the same company two years ago. In the publication of the study, he declares that he has no conflicts of interest.

My view on this is:

- This is acceptable because T does not have a conflict of interest
- This is not best practice, but it does not really matter, as it doesn't affect the science
- This is unacceptable because T should disclose this consultancy

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Have you ever done something like this?

- Yes
- No, and I am <u>not</u> aware of anybody else doing it
- No, but I <u>am</u> aware of other people doing it

In my current department or unit, this behaviour:

- Is usual practice and happens most of the time
- Happens occasionally
- Happens rarely
- Never happens
- Other: (please specify)

Comments or Clarifications:

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16. A researcher, K, writes a review for treatment guidelines of herbal remedies for children's cough. K's wife is employed by the company that manufactures one of these remedies. In the review, K declares that he has no conflicts of interest.

My view on this is:

- This is acceptable because K does not have a conflict of interest
- This is not best practice, but it does not really matter, as it doesn't affect the science
- This is unacceptable because K should disclose his wife's link to the company

Have you ever done something like this?

- Yes
- No, and I am <u>not</u> aware of anybody else doing it
- No, but I <u>am</u> aware of other people doing it

In my current department or unit, this behaviour:

- Is usual practice and happens most of the time
- Happens occasionally
- Happens rarely
- Never happens
- Other: (please specify)

Comments or clarifications:

---

17. A researcher, S, contributes to the design and does most of the data collection in a study but goes on maternity leave as it is being analysed. When she returns to her post she discovers

that the research has been published by her supervisor without her name or any acknowledgement of her contributions.

My view on this is:

- This is acceptable because S did not contribute to the publication
- This is not best practice, but it does not really matter, as it doesn't affect the science
- This is unacceptable because S should have been invited to contribute to the publication

Have you ever done something like this?

- Yes
- No, and I am <u>not</u> aware of anybody else doing it
- No, but I <u>am</u> aware of other people doing it

In my current department or unit, this type of practice (leaving out a junior author who has made substantial contributions):

- Is usual practice and happens most of the time
- Happens occasionally
- Happens rarely
- Never happens
- Other: (please specify)

     Comments or clarifications:

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18. A researcher from India attends an international conference where a European research study with a novel design is presented. He submits a protocol for an identical study to the ethics committee at his home institution. He does not reference the European study.

My view on this:

- This is acceptable
- This is not best practice, but it does not really matter, as it doesn't affect the science
- This is unacceptable because the original idea should be acknowledged

Have you ever done something like this?

- Yes
- No, and I am <u>not</u> aware of anybody else doing it
- No, but I <u>am</u> aware of other people doing it

In my current department or unit, this behaviour:

- Is usual practice and happens most of the time
- Happens occasionally
- Happens rarely
- Never happens
- Other: (please specify)

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Comments or clarifications:

_____

Section C: Please answer the following questions:

4. Are you aware of any written institutional policies that cover the situations described in our scenarios?
    a. Yes
    b. No

5. Would you be interested in participating in an interview via Skype or telephone to discuss research reporting practices further?
    a. Yes
    b. No

6. Would you be interested in receiving feedback on this study?
    a. Yes
    b. No

Thank you for participating in the survey.

Appendix 3.3: Interview guide

Hi *(Name)*

Thanks so much for agreeing to talk to me about research reporting today. I just want to check – have you read the information sheet? Is there anything that is unclear? As noted in the sheet, I will record our conversation – are you fine with that? Please note that all reporting is anonymous and you will not be identified in any way, and you are free to stop the interview at any time.

Another thing I want to mention is that we invited you to complete the survey because you are an author on a Cochrane review, but I would like you to think about any research publication – not just Cochrane reviews – during our conversation.

Let's start then. You work at the *(institution as provided by participant)*, right? What is your job there?

Let's talk about the survey that you completed a few weeks ago. What did you think about the situations we gave, did any seem familiar? What do you remember?

Some of the scenarios were about being an author on a paper. Have you come across any issues here yourself? What happened?

- *Prompts depending on answer:*
    o What about omitting an author that has contributed sufficiently to the research paper?
    o What about adding an author that has not made a big enough contribution to the research paper?
- Have you experienced something like this?
- How do you decide on authorship at your institution?
- Are there any guidelines about authorship at your institution? Are these being followed?

Some of the scenarios were about people copying other people's work, often called plagiarism.

What do you think about this? What do you understand by it? What do you think are the main problems with plagiarism?

- *Prompts depending on answer:*
    o What about translating a text into another language?
    o What about copying a text from another paper?
    o What about using someone else's idea?
- Do you have guidelines on plagiarism at your institution?

There were also scenarios about conflict of interest. How do you understand conflict of interest? Why do you think this is a problem?

- *Prompts depending on answer:*
    o What about being paid by a drug company for a consultation not related to the research project?
    o What about conflicts of interest that do not involve money?
- How do you deal with these competing interests at your institution and how are they reported in a paper?

What about other problems that we did not address in the survey, like making-up or manipulating data - Are you aware of any other poor practices happening at your institution?

Why do you think people engage in this bad practice?
What do you think can be done to prevent this behaviour?
Any other comments or questions?

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Appendix 3.4: Final list and categories of codes

Poor practices happening at institutions
Adding authors that have not contributed substantially
Being added as an author when not contributed substantially
Being omitted
Omitting authors that have contributed
Ranking of authors not according to contributions
Change in author team
Changing author names on published papers
Using ideas without acknowledging their origin
Detection of plagiarism when doing systematic reviews
Students using existing projects
Academic CoI
Non-financial CoI
Data dredging
Data fabrication
Duplicate publication in different languages
Influence of sponsor
Non-reporting of results
Inaccurate reporting to public
Data manipulation
What was done when irregularity was detected?
Discussions within author team
Nothing was done
Formal complaint
Punishment
Discussions within author team
Decline further participation
Channels for complaints
Feelings associated with experience
Upset about what happened
Feeling powerless
Unfair process
Frustration
Did not care
Not sure how to handle situation
Insecurity
Discomfort
Concerned
Factors influencing practices/reasons for poor practices
Author team dynamics
Academic (personal) gain
Payment for assistance
Endorsement
Personal relationships

Professional relationships
Publication fees
Lack of knowledge and skills
Direct research environment (research team)
Institutions
Hierarchies within institutions
Requirements for promotion
Personal values
Lack of resources
Journal requirements
Guidelines
Cultural environment
Lack of time for research
Lack of funding
Lack of interest
Journals
Providing a service
Academic status
Researcher
Funders
Who is an author?
Challenges with authorship criteria
Timing of authorship discussions
What contribution warrants authorship? (ICMJE criteria)
Other criteria that warrant authorship
Guidelines
Arbitrary
Role of authors
What is plagiarism?
Various degrees of plagiarism
Not acknowledging origin of ideas
Using text without acknowledging source
Not sure about meaning
Translating text
Challenges related to plagiarism
What are conflicts of interest?
Levels of COI
Relationships with industry
Academic CoI
Difficult to understand CoI
Guideline panels
Professional relationships
Personal relationships
Anything that influences research
Research misconduct in general
Levels of misconduct

Complex issue
Crime
Global issues
Implications of poor practices
Affects organizational culture
Image of institution
Bias study results
Impact on researcher
Mistrust of study results
Impact on patients
Far-reaching consequences
Dealing with poor practices
Forgive
Responsibilities of researcher
Challenging
Institutional guidelines
Institutional support
Disciplinary action
Using Technology
Declaring COI
Decline participation
Relationships with industry
Need universal system
Learn from others
Promoting good practices
Training
Research team
Role-modelling
International collaborations
Organizational culture
Creating awareness
Auditing research
Institutional structures and channels
Rewards and punishments
Funding
Clear and accessible guidelines for all staff
Realistic research projects
Perceptions of prevalence of poor practices
Adding authors very common
Adding not common
Omitting authors relevant to clinical trials
Links with Pharmaceutical industries
Plagiarism does occur
Relevant topic
Common issue but not always overt
Attitudes of researchers

Criteria restrictive
Arrogance
Hopeless?
Not tolerated
Difficult to be 100% honest
Accountability
Aware of research integrity issues

Appendix 3.5: Detailed survey responses

3.5.1 Researchers' perceptions of irresponsible research reporting practices

Health research reporting practice Total n=198	This is acceptable	This is not best practice, but it does not really matter, as it doesn't affect the science	This is unacceptable
	n (%)	n (%)	n (%)
Authorship practices			
Adding the head of department who has not contributed sufficiently	26 (13)	43 (22)	129 (65)
Adding an expert in the field who has not contributed sufficiently to the research	21 (11)	43 (22)	134 (68)
Acknowledging a biostatistician for assistance with data analysis (as opposed to listing as an author)	127 (64)	5 (3)	66 (33)
Omitting an author who has contributed substantially to the research	1 (0.5)	2 (1)	195 (98)
Redundant publication			
Text-recycling (using one's own work from a previous publication in another)	34 (17)	23 (12)	141 (71)
Plagiarism			
Translating a text without acknowledging the original source	3 (2)	6 (3)	189 (95)
Copying an idea without acknowledgement of the original source	5 (3)	15 (8)	178 (90)
Conflict of interest			
Not declaring previous financial reimbursement from a company involved in a research project	13 (7)	12 (6)	173 (87)
Not declaring the wife's link to a company involved in a research project	26 (13)	21 (11)	151 (76)

3.5.2 Researchers' awareness of occurrence of irresponsible research reporting practices

Health reporting practice Total n=198	Have done this before	Have not done this but *are* aware of other people doing it	Have not done this and are *not* aware of other people doing it
	n (%)	n (%)	n (%)
Authorship practices			
Adding the head of department who has not contributed sufficiently	48 (24)	113 (57)	37 (19)
Adding an expert in the field who has not contributed sufficiently to the research	42 (21)	103 (52)	53 (27)
Acknowledging a biostatistician for assistance with data analysis (as opposed to listing as an author)	103 (52)	60 (30)	35 (18)
Omitting an author who has contributed substantially to the research	4 (2)	83 (42)	111 (56)
Redundant publication			
Text-recycling (using one's own work from a previous publication in another)	22 (11)	95 (48)	80 (40)
Plagiarism			
Translating a text without acknowledging the original source)	4 (2)	73 (37)	121 (61)
Copying an idea without acknowledgement	5 (3)	84 (42)	109 (55)
Conflict of interest			
Not declaring previous financial reimbursement from a company involved in a research project)	5 (3)	85 (43)	108 (55)
Not declaring the wife's link to a company involved in a research project	3 (2)	58 (29)	137 (69)

3.5.3 Occurrence of irresponsible health research reporting practices in respondents' current institution

Health reporting practice Total n=198	Happens most of the time	Happens occasionally	Happens rarely	Never happens	Don't know
	n (%)	n (%)	n (%)	n (%)	n (%)
Authorship practices					
Adding the head of department who has not contributed sufficiently	26 (13)	78 (39)	49 (25)	35 (18)	10 (5)
Adding an expert in the field who has not contributed sufficiently to the research	26 (13)	65 (33)	49 (25)	51 (26)	7 (4)
Acknowledging a biostatistician for assistance with data analysis (as opposed to listing as an author)	70 (35)	62 (31)	34 (17)	22 (11)	10 (5)
Omitting an author who has contributed substantially to the research	2 (1)	28 (14)	51 (26)	103 (52)	14 (7)
Redundant publication					
Text-recycling (using one's own work from a previous publication in another)	16 (8)	50 (25)	52 (26)	56 (28)	24 (12)
Plagiarism					
Translating a text without acknowledging the original source	3 (2)	24 (12)	47 (24)	101 (52)	23 (12)
Copying an idea without acknowledgement	2 (1)	24 (12)	59 (30)	91 (46)	22 (11)
Conflict of interest					
Not declaring previous financial reimbursement from a company involved in a research project	3 (2)	30 (15)	47 (24)	95 (48)	23 (12)
Not declaring the wife's link to a company involved in a research project	1 (0.5)	14 (7)	41 (21)	110 (56)	32 (16)

Appendix 3.6: Comparison of quantitative survey results between regions

Health research reporting practice per region Total n=198	Perception: Acceptable or does not really matter	Behaviour: Have done this themselves	Occurrence at institution: This happens
Adding the head of department who has not contributed sufficiently			
Sub-Saharan Africa (n=48)	6 (13)	5 (10)	32 (67)
Latin America (n=52)	16 (31)*	14 (27)	40 (77)
South and South East Asia (n=44)	16 (36)*	10 (23)	30 (68)
East Asia (n=36)	24 (67)*	12 (33)	36 (100)
Other (n=18)	7 (39)*	3 (17)	15 (83)
Difference between regions	p<0.001	p=0.178	p=0.003
Adding an expert in the field who has not contributed sufficiently to the research			
Sub-Saharan Africa (n=48)	10 (21)	7 (15)	25 (52)
Latin America (n=52)	16 (31)	14 (27)	39 (75)*
South and South East Asia (n=44)	17 (39)	5 (11)	29 (66)
East Asia (n=36)	17 (47)	11 (31)	34 (94)*
Other (n=18)	4 (22)	5 (28)	13 (72)
Difference between regions	p=0.083	p=0.109	p=0.001
Acknowledging a biostatistician for assistance with data analysis (as opposed to listing as an author)			
Sub-Saharan Africa (n=48)	29 (60)	21 (44)	35 (73)
Latin America (n=52)	37 (71)	31 (60)	45 (87)
South and South East Asia (n=44)	33 (75)	25 (57)	39 (89)
East Asia (n=36)	19 (53)	16 (44)	32 (89)
Other (n=18)	14 (78)	10 (56)	15 (83)
Difference between regions	p=0.146	p=0.211	p=0.204
Omitting an author who has contributed substantially to the research			
Sub-Saharan Africa (n=48)	1 (2)	0 (0)	15 (31)

Latin America (n=52)	0 (0)	3 (6)	20 (38)
South and South East Asia (n=44)	1 (2)	0 (0)	17 (39)
East Asia (n=36)	1 (3)	1 (3)	21 (58)
Other (n=18)	0 (0)	0 (0)	8 (44)
Difference between regions	p=0.784	p=0.546	p=0.153
Text-recycling (using one's own work from a previous publication in another)			
Sub-Saharan Africa (n=48)	7 (15)	2 (4)	18 (38)
Latin America (n=52)	27 (52)*	10 (19)	35 (67)*
South and South East Asia (n=44)	9 (20)	4 (9)	26 (59)*
East Asia (n=36)	13 (36)*	4 (11)	29 (81)*
Other (n=18)	1 (6)	2 (11)	10 (56)
Difference between regions	p<0.001	p=0.015	p=0.001
Translating a text without acknowledging the original source			
Sub-Saharan Africa (n=48)	1 (2)	1 (2)	8 (17)
Latin America (n=52)	4 (8)	1 (2)	20 (38)*
South and South East Asia (n=44)	3 (7)	0 (0)	14 (32)
East Asia (n=36)	1 (3)	1 (3)	23 (64)*
Other (n=18)	0 (0)	1 (6)	9 (50)*
Difference between regions	p=0.478	p=0.105	p<0.001
Copying an idea without acknowledgement of the original source			
Sub-Saharan Africa (n=48)	0 (0)	0 (0)	9 (19)
Latin America (n=52)	6 (12)	2 (4)	25 (48)*
South and South East Asia (n=44)	4 (9)	0 (0)	18 (41)*
East Asia (n=36)	8 (22)	3 (8)	25 (69)*
Other (n=18)	2 (11)	0 (0)	8 (44)*
Difference between regions	p=0.022	p=0.013	p<0.001

Not declaring previous financial reimbursement from a company involved in a research project			
Sub-Saharan Africa (n=48)	2 (4)	0 (0)	11 (23)
Latin America (n=52)	4 (8)	1 (2)	21 (40)
South and South East Asia (n=44)	3 (7)	2 (5)	18 (41)
East Asia (n=36)	11 (31)*	1 (3)	22 (61)*
Other (n=18)	5 (28)*	1 (5)	8 (44)
Difference between regions	p=0.001	p=0.02	p=0.013
Not declaring a spouse's link to a company involved in a research project			
Sub-Saharan Africa (n=48)	6 (13)	0 (0)	6 (13)
Latin America (n=52)	10 (19)	1 (2)	15 (29)
South and South East Asia (n=44)	12 (27)	0 (0)	11 (25)
East Asia (n=36)	14 (39)*	2 (6)	19 (53)*
Other (n=18)	5 (28)	0 (0)	5 (28)
Difference between regions	p=0.062	p=0.043	p=0.002

*Indicates significant difference compared to Sub-Saharan Africa

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Appendix 3.7: Selected comments from free-text survey responses

Health research reporting practice	Quotes
Authorship	*"This has happened only once in my case and I never did it again. A mentor was the one who suggested that I do such a study (exactly as in the example given). I felt that I owed him something. He was very happy when he saw that he was included as an author".*
	"In my institution, worse practices happen, sometimes due to lack of knowledge but in most instances, it is deliberate".
	"In my experience the above mentioned often happens with junior researchers as they struggle to establish themselves in the scientific community. The power struggle is just too much and there is pressure to publish and establish oneself".
	"Anybody who makes contribution to a paper should be an author if they so desire. The expert reading through the manuscript and approving of its quality for publication, with suggestions of some changes, contributes in finalizing the manuscript especially to instil confidence on the authors that they have done a good job."
	"The seniors need publications and make their juniors add their names with or without any contributions. A number of project supervisors go ahead to publish their students' work with or without them as co-authors".
Plagiarism	*"No matter how many words or phrases were cited, and no matter if the comments came from the same language or not, reference should be (made)".*
	"This action is stealing so it is not acceptable".
	"Sometimes we published different language editions…with the same results. But when we published these papers, we modified careful (sic), so as to avoid simply copying and pasting, even though they were different languages".
Conflicts of interest	*"Conflicts of interest policy is not well understood in my current department".*
	"The rules of to what extent back it goes for one to declare a conflict of interest or not are more often vague than not".
	"In developing countries, I think consultancy money and freebies from industry are almost a necessity to provide opportunities to network outside one's own institution and country".
	"Only if the wife's opinion came into the conclusion or design of the study, the link should be disclosed".
	"In my opinion this really is a matter of personal ethics. If the wife could have ANY influence in the results, then most definitely yes. If they don't even discuss these matters it should not. It may be an issue of it 'looking bad' though".
	"The connections of the immediate family members should be revealed".

Appendix 4

Appendix 4.1. Data extraction forms

4.1.1 Data extraction form for journal policies and guidelines

General information		
Journal name		
Website		
Scope		
Publisher		
Country where publisher is based		
Country where editor in chief is based		
LMIC journal?	Yes	
	No	
Impact factor	Yes	
	No	
Publication frequency		
Open access	Yes	
	No	
Scope general?	Yes	
	No	
Plagiarism		
Policy available	Yes	
	No	
Description on what constitutes plagiarism?	Yes	Describe:
	No	
Reference to plagiarism software?	Yes	
	No	
Consequences of plagiarism described?	Yes	Describe:
	No	
Reference to COPE flow-diagram?	Yes	
	No	
Authorship		
Guideline available	Yes	Describe:
	No	
Guideline in line with updated ICMJE crietira (i.e. 4 criteria)?	Yes	
	No	
Guideline in line with old ICMJE crietira (i.e. 3 criteria)?	Yes	
	No	
Contributorship policy	Yes	Describe:
	No	

Information on acknoweldgement practices	Yes	Describe
	No	
Conflict of interest		
Guideline available	Yes	
	No	
Definition of a conflict of interest	Yes	Describe
	No	
Guidance on what to declare	Yes	
	No	
Funding sources		
Guideline available	Yes	
	No	
Information on what to declare	Yes	Describe
	No	
Guidance on how to declare funding	Yes	Describe
	No	
Funding statement in publication	Yes	
	No	
ICMJE		
Do they mention ICMJE recommendations?	Yes	
	No	
Is there a link to the ICMJE website?	Yes	
	No	
Is there a link to the ICMJE document?	Yes	
	No	
Notes		

4.1.2 Data extraction form for all research articles

General information		
Study ID		
Type of study		
Number of authors		
Country of contact author		
Authorship		
Did authors disclose contributions of authors?	Yes	Describe
	No	
For each author: Which ICMJE criteria are met?	Yes	
	No	
Are any other contributors listed in the acknowledgement section?	Yes	Describe
	No	
Conflicts of interest		
Did authors declare conflicts of interest	Yes	None known
		Financial conflicts of interest
		Non-financial conflicts of interest
	No	
Funding sources		

Did authors disclose funding sources?	Yes	Commercial funding	
		Non-commercial external funding e.g. grants, NPOs, private funders	
		No external funding	
	No		
Plagiarism			
Turnitin similarity score			
Score >10%?	Yes		
	No		
No plagiarism	Yes		
	No		
Abstract	Plagiarism	Level 1	
		Level 2	
		Level3	
	Redundancy	Level 1	
		Level 2	
		Level3	
Introduction	Plagiarism	Level 1	
		Level 2	
		Level3	
	Redundancy	Level 1	
		Level 2	
		Level3	
Methods	Plagiarism	Level 1	
		Level 2	
		Level3	
	Redundancy	Level 1	
		Level 2	
		Level3	
Results	Plagiarism	Level 1	
		Level 2	
		Level3	
	Redundancy	Level 1	
		Level 2	
		Level3	
Discussion	Plagiarism	Level 1	
		Level 2	
		Level3	
	Redundancy	Level 1	
		Level 2	
		Level3	
Overall	Plagiarism	Mild	
		Moderate	
		Severe	
	Redundancy	Mild	
		Moderate	
		Severe	
Notes			

Appendix 4.2: Permission to use Turnitin for research

Dear Anke,

I trust this finds you well.

Your message was passed to me by my counterpart at Crossref, Rachael Lammey. As you may or may not know, Turnitin are the developers behind the iThenticate service, which powers Crossref Similarity Check.

I have checked with senior management. While we would not be able to offer you an iThenticate or Crossref Similarity Check account to conduct your research, they note that Stellenbosch University is an existing Turnitin customer; and they would be happy for you to use the Turnitin service to carry out this study. While the Turnitin service is intended for screening student work, both Turnitin and iThenticate compare against our Webcontent and Publication databases (and additionally, Turnitin compares against a Student Papers database). Thus, the Similarity Reports generated by both services are identical, for the most part.

If you choose to use a Turnitin account for this study, you'll need to set up a dummy class, and ensure that it is configured to not match against the Student Papers database; not deposit submissions to the Turnitin database (this is very important, as we would not want your sample articles being uploaded to our Student Papers database); and not compare submissions against each other (this feature is usually used for checking for collusion among students).

If you'd like any further guidance on how you can use Turnitin to carry out this study, I'd be happy to schedule a conference call with you to discuss this further. Do get in touch if you have any questions.

Kind regards,

Shivendra

--
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Appendix 4.3: Examples of levels of plagiarism

Level 1: One to two copied sentences

ABSTRACT

Background: Asthma is a chronic disease which places considerable economic, social and public health burdens on the society. Education, occupation and income are the most widely used indicators of socioeconomic status (SES). Studies have shown increased asthma hospital admissions for those who are materially deprived and increased asthma severity in low social class groups. The aim of this study is to determine the impact of socioeconomic status on control of asthma in adults

INTRODUCTION

Sweating is the body's major way of getting rid of 85% body heat produced from metabolism, working muscles or from the environment. The amount of sweat produced depends on emotional states and physical activity. During exposure to heat and exercise, blood vessels near the skin surface dilate and lose their heat through sweat gwu, 2007).
Women differ from men in thermal responses to exogenous heat load and heat loss as well as to endogenous heat load during exercise, because they usually have a larger ratio of body surface to body mass,

a greater bcutaneous fat content, and lower exercise capacity. In addition, the changing rate of sex hormone release during the menstrual cycle modifies thermoregulation in women, so there are differences in resting body temperature and thermal responses to positive or negative heat loads depending on the phase of the cycle (Kaciuba-Uscilkoa and Grucza, 2001).
Thirst is a perception, "the subjective experience evoked by fluid deficits" (Engell *et al.,* 1987), or as explained by Johnson (2007), a motivational mechanism for the acquisition and consumption of water created in the brain as the synthesis of multiple source of information, but physiological and psychological.

Appropriate use of asthma medications reduces morbidity and rtality from asthma and improves quality of life. The World Bank defines poverty as a condition in which a person, family, or community ks the essentials necessary for material well-being. [4]
Poverty is usually measured and quantified as an income below the minimum level of income considered necessary to meet the basic necessities of life.[5] The

SCD has major social and economic implications for the affected child as well as the family. Recurrent sickle-cell crises interfere with the patient's life, especially with regards to education, work and psychosocial development. Also, the disease is associated with high rates of childhood mortality. Mortality rates ranging between 50%-90% have been reported among African children with sickle cell anemia[3]. Qualitatively, experts have stated that vast majority or nearly all Africans born with HbSS die during childhood.[1]

CT urography is essentially defined as a CT examination of the urinary tract before and after the administration of intravenous contrast material that includes excretory phase images. Despite the acceptance of this new use of CT, there is no universally accepted technique for performing urography. An un-enhanced CT scan is obtained to detect calculi, reveal the unenhanced appearance of masses (throughout the urinary tract), and provide a baseline attenuation value to calculate enhancement of masses and other abnormalities. Unenhanced images are also useful for evaluating masses for fat or calcium. Enhanced images (by using intravenous

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Level 2: Three to six copied sentences

bud for self-ear cleaning.[7,10] Cotton buds consist of small pad of cotton wrapped around one or both ends of a short rod usually made of either wood, rolled paper, 2 plastic.[10] The Cotton bud was said to have been developed in 1923 by Leo Gerstenzang to faci 2 te cleaning of his baby's ear.[11] Medical concerns over the use of cotton buds and consequent complications were first reported in 1972, with reports of tympanic membrane perforation, oti 2 externa, and cerumen impaction.[3,12,13] Nowadays, cotton bud-related injuries have become a common reason for attendances at ear, nose, and throat clini 8 .[14] In a study, from the United States cotton-buds were associated with 75% of cerumen occlusion on the left side, but not on the right side. More so, cotton bud-induced injury was reported to be common.[5,14]

In this CD4 cell matched cohort study at baseline, the viral load of dually infected (HIV/TB) was significantly hig 4 er than HIV uninfected with TB patients. A number 4 studies have indicated that the development of TB is associate 2 with increased HIV-1 replication.(9-11, 21) Although the effect of active TB has on HIV infection is not well understood, invitro studies have shown that M. 4 berculosis induces HIV-1 replication.(9,22-24) Both HIV -1 load and heterogeneity appear to be affected by MTB infection. A study conduc 4 d in United State demonstrated that viral load increased in serum 4 mples from HIV-1 infected patients at the time of 4 agnosis of TB, compared with serum samples 4 tained before diagnosis.(9) Similarly, in a survey of pu 4 ified protein derivative (PPD) skin-test-positive HIV-1 infected subjects who were evaluated for preventive chemotherapy,(25) HIV activity was shown to be enhanced at the time of diagnosis of TB(21) and was sustained in a subgroup of patients.
Consistent w 21 previous study among African

This is consistent with Metin et al.[3] who found significant relationship between recurrence 1 and temporal pattern of wheeze with serum VD. It has also been reported that there is an association between VD deficiency and the number of asthma attacks in children 1 ith asthma[36]. In agreement with our results, some studies have shown a relationsh 3 between lower VD levels and hospitalization[3]. A large cohort study for children with asthma in Costa Rica showed an association between low VD levels and asthma severity in terms of hospitalizations, 1 dication use and airway responsiveness[34]. However, a study from Canada failed to show this relationship[37].

it affects this group due to atrophy and loss of the preperitoneal fat around the obturator vess 1 s in the canal predisposing hernia formation. The hernia proceeds through the obturator foramen situated bilaterally in the a 1 erolateral pelvic wall, inferior to the acetabulum. The obturator nerves and vessels pass through this tunnel, protected by extraperitoneal connective tissue and fat. Emaciation and advanced age cause the loss of this tissue as evidenced by most patients being in their seventh and eighth decades.

management such as the American Pain Society, the World Health Organization, and the Agency for Health Care Policy and Research. The content validity of this questionnaire was established by a review of pain expe 7 (Breu et al., 2008), whereas construct validity was established by comparing scores of nurses at various levels of expertise such as students, new graduates, oncology nurses, graduate students, and senior pain experts. The tool was identified as discriminating between levels of expertise. Test-retest reliability was established (a > 0.80) by repeat testing in a continuing education class of staff nurses (n=60) (Breu et al., 2008). The questionnaire was originally developed in

People around the world wash their han 12 with water, [1] but very few wash their hands at critical moments (for example after using the toilet, a 6 er cleaning a child or before feeding a child). The belief that washing with water alone to remove visible dirt is sufficient to make hands c 9 an is common place in most countries. But washing hands with water alone is significantly less effective than washing hands with soap in terms of removing germs and hand 10 ashing with soap is seldom practiced. Using soap adds to the time spent washing, breaks down the grease and dirt that carry most germs by facilitating the rubbing and friction that dislodges them and leaves hands smelling fresh.[11] While soap is found in most households it is often reserved for

INTRODUCTION

Early diagnosis and treatment of the newborn infant with suspected sepsis is essential to prevent severe and life-threatening complications. In this era of multidrug resistance, it is important to avoid unnecessary use of antibiotics to treat noninfected infants.[1,2] Thu 24 agnostic test(s) that differentiate infected from noninfected neonates has/have the potentials of making a significant impact on neonatal

care.[3] Various strategies to reduce morbidity and mortality in newborns with sepsis involve the use of combination 1 of clinical signs with laboratory investigations for identification and intervention in babies at risk. Unfortunately, clinical signs are nonspecific and often manifest themselves in the absence of a positive culture.[1] Procalcitonin, a precursor of calcitonin, is now being assayed as a specific marker for bacterial infections and 2 ses markedly in sepsis.[4] Polymerase chain reaction (PCR)

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Level 3: At least four linked or more than six copied sentences

INTRODUCTION

Wheezing is a very common complaint on admission to the pediatric emergency department and it is one of the most common causes of morbidity and mortality worldwide[1]. Thirty percent of children have at least one wheezing attack before the age of three, and 50% before the age of six. It has been reported that recurrent wheezing attacks might frequently be seen before school-age and 40% of children with recurrent wheezing attacks can suffer from wheezing symptoms later in life[2]. The relationship between wheezing in infancy and ensuing development of asthma has been under investigation for a long time. There is also detailed research determining the risk factors of recurrent wheezing[3].

Early recognition of the infectivity of the saliva of rabid dogs led Roman writers to describe the infectious material as a poison, for which Latin word was "virus" (2). Lyssa virus, the genus to which rabies and rabies-related viruses belong, owes its name to the Greek "lyssa" or "lytta," meaning "madness." The first recorded description of canine rabies apparently was made by Democritus in 500 B.C. In his Natural History of Animals, Aristotle's writings on rabies described dogs suffering from a madness causing irritability and how following their bite other animals became diseased. Little has changed in the epidemiology of rabies, as dogs and other carnivores remain the common sources of human infection in most areas of the world where the virus is enzootic.

A study carried out by Lembo et al. 2006, in Tanzania result in the conclusion that DRIT showed a sensitivity and specificity equivalent to those of the DFA. The test is simple, requires no specialized equipment or infrastructure, and can be successfully performed on samples preserved in glycerol solution for 15 months or frozen for 24 months and in variable conditions of preservation. These qualities make it ideal for testing under field conditions and in developing countries. Although further laboratory and field evaluations are required, results are promising and highlight the potential value of the DRIT for countries with limited diagnostic resources. First, this technique could greatly enhance epidemiologic surveillance in remote areas where rabies incidence data are difficult to obtain. Second, the test could improve the ability to respond to outbreaks with effective management decisions. Third, it could be extremely valuable in guiding decisions regarding rational use of rabies PEP.

CONCLUSION

It should be kept in mind that an obturator hernia is a rare but significant cause of intestinal obstruction, especially in emaciated elderly women. Detailed history taking and physical examination provide diagnostic clue for suspected obturator hernia. CT scan is valuable to establish preoperative diagnosis. Early diagnosis and prompt surgical treatment are essential to reduce the morbidity and mortality.

of the research findings indicate that mindfulness could be developed and cultivated (Kabat-Zinn, 1990). Thus 3 might be a plausible preventive measure or intervention to decrease doping in sport. Mindfulness-based interventions have multiple components, including mindfulness-practice exercises, didactic instruction and social support (Bishop, 2002). To date, most research on the effects of mindfulness on stress, mood and other indicators of mental health and well-being has been conducted within the context of treatment interventions including *Mindfulness-based Stress Reduction* (MBSR), and *Mindfulness-based Cognitive Therapy* (MBCT) (Kabat-Zinn, 1990; Segal *et al.*, 2002). The primary aim of these interventions is to cultivate mindful presence, to facilitate stress reduction and enhance well-being. Controlled and uncontrolled trials with MBSR, MBCT and other mindfulness-based and mindfulness-integrated interventions have demonstrated success in producing these and other effects over both short- and long-term follow-up periods (Baer, 2003; Grossman *et al.*, 2004).

Appendix 4.4: Excluded journals

Journal Name	Reason
1. Abia State University Medical Students' Association Journal	Last issue in 2015
2. Africa Sanguine	Last issue in 2015
3. African Journal for the Psychological Study of Social Issues	Not health research
4. African Journal of AIDS Research	Not LMIC journal – Editor in chief not in LMIC
5. African Journal of Cross-Cultural Psychology and Sport Facilitation	Last issue 2008
6. African Journal of Environmental Science and Technology	Not LMIC journal – Editor in chief not in LMIC
7. African Journal of Neurological Science	Not LMIC journal – Editor in chief not in LMIC
8. African Journal of Oral Health	Last issue in 2006
9. African Journal of Oral Health Sciences	Last issue in 2008
10. African Journal of Physiotherapy and Rehabilitation Science	Last issue in 2015
11. African Journal of Urology	Not LMIC journal – Publisher not in LMIC
12. Afrimedic Journal	No issue in 2016
13. Alexandria Journal of Medicine	Not LMIC journal – Publisher not in LMIC
14. Annals of Pediatric Surgery	Not LMIC journal – Publisher not in LMIC
15. Arab Journal of Nephrology and Transplantation	Last issue in 2014
16. Archives of Ibadan Medicine	Last issue in 2006
17. Archives of Medical and Biomedical Research	Not LMIC journal – Editor in chief not in LMIC
18. Benin Journal of Postgraduate Medicine	Last issue in 2010
19. Clinics in Mother and Child Health	Not LMIC journal – Editor in chief and publisher not LMIC
20. Continuing Medical Education	Not LMIC journal – Publisher not in LMIC
21. Counsellor (The)	Last issue in 2014
22. Dar Es Salaam Medical Students' Journal	Last issue in 2012
23. East African Journal of Public Health	Last issue in 2015
24. East and Central African Journal of Pharmaceutical Sciences	Last issue in 2013
25. Ebonyi Medical Journal	Last issue in 2012
26. Edo Journal of Counselling	Last issue in 2011
27. Edo Journal of Counselling	Last issue 2011
28. Egyptian Journal of Medical Human Genetics	Not LMIC journal – Publisher not in LMIC
29. Egyptian Journal of Medical Laboratory Sciences	Last issue in 2001
30. Ethiopian Pharmaceutical Journal	Last issue in 2015
31. Gender and Behaviour	Not health research
32. Global Journal of Community Medicine	Last issue in 2009
33. Global Journal of Medical Sciences	Last issue in 2011
34. Health SA Gesondheid	Not LMIC journal – Publisher not in LMIC
35. IMTU Medical Journal	Last issue in 2015
36. Indo-Pacific Journal of Phenomenology	Not LMIC journal – Publisher not in LMIC

37. International Journal of Emotional Psychology and Sport Ethics	Last issue 2008
38. International Journal of Health Research	Last issue in 2012
39. International Journal of Malaria and Tropical Diseases (IJMTD)	Last issue in 2005
40. International Journal of Medicine and Health Development	Last issue in 2014
41. Journal of Biomedical Investigation	Last issue 2009
42. Journal of Child and Adolescent Mental Health	Not LMIC journal – Publisher not in LMIC
43. Journal of Ethiopian Medical Practice	Last issue in 2002
44. Journal of Health and Visual Sciences	Last issue in 2015
45. Journal of Medical Investigation and Practice	Last issue 2015
46. Journal of Medical Laboratory Science	Last issue 2012
47. Journal of Medicine and Medical Science	Last issue in 1999
48. Journal of Phytomedicine and Therapeutics	Last issue 2015
49. Journal of Psychology in Africa	Not a LMIC journal – Publisher not in LMIC
50. Journal of Surgical Technique and Case Report	Last issue 2015
51. Journal of the Eritrean Medical Association	Last issues 2009
52. Journal of the Nigerian Infection Control Association	Last issue 2001
53. Journal of the Nigerian Optometric Associatio	Last issue in 2010
54. Journal of the Obafemi Awolowo University Medical Student's Association (IFEMED)	Last issue in 2014
55. Journal Tunisien d'ORL et de Chirurgie Cervico-Faciale	Publishes in French.
56. Libyan Journal of Medicine	Not LMIC journal – Editor in chief and publisher not in LMIC
57. Mary Slessor Journal of Medicine	Last issue 2013
58. Nigerian Dental Journal	Last issue 2014
59. Nigerian Endocrine Practice	Last issue 2013
60. Nigerian Journal of Clinical and Counselling Psychology	Last issue 2002
61. Nigerian Journal of Health and Biomedical Sciences	Last issue 2010
62. Nigerian Journal of Nutritional Sciences	Last issue 2012
63. Nigerian Journal of Orthopaedics and Trauma	Last issue in 2013
64. Nigerian Journal of Otorhinolaryngology	Last issue in 2006
65. Nigerian Journal of Pharmaceutical Research	Last issue 2011
66. Nigerian Journal of Postgraduate Medicine	Last issue 2010
67. Revue Africaine de Chirurgie et Spécialités	Publishes in French
68. Revue de Médecine et de Pharmacie	Publishes in French
69. Rwanda Journal of Health Sciences	Last issue 2013
70. SAHARA-J: Journal of Social Aspects of HIV/AIDS	Not LMIC journal – Publisher not in LMIC
71. Science et Technique, Sciences de la Santé	Last issue in 2015.
72. Scientific Medical Journal	Last issue 2001
73. Sokoto Journal of Veterinary Sciences	Veterinary Medicine
74. Sudanese Journal of Dermatology	Last issue 2010
75. Tanzania Dental Journal	Last issue 2014

76. Tanzania Medical Journal	Last issue 2015
77. West African Journal of Medicine	Last issue in 2013
78. West African Journal of Pharmacology and Drug Research	Last issue in 2015
79. Zagazig Journal of Occupational Health and Safety	Last issue 2010

Appendix 4.5: Characteristics of included journals

Journal ID	Journal Name	Publisher	Type of publisher	Country		Scope	Open access	First online issue	Impact Factor	Issues/ year	AJPP member	Member of COPE	
				Publisher	Editor-in-Chief							Journal	Publisher
AJOL_1	African Health Sciences	Faculty of Medicine, Makerere University	Non-commercial	Uganda	Uganda	General	Yes	2001	0.642	4	yes	no	no
AJOL_2	African Journal for Physical Activity and Health Sciences	LAM publications Limited	Commercial	South Africa	South Africa	General	No	2002	no	4	no	no	no
AJOL_3	African Journal of Anaesthesia and Intensive Care	Mirral Printing Press	Non-commercial	Nigeria	Nigeria	Specialised	No	2008	no	2	no	no	no
AJOL_4	African Journal of Biomedical Research	Biomedical Communications Group	Non-commercial	Nigeria	Nigeria	General	Yes	1999	no	3	no	no	no
AJOL_5	African Journal of Clinical and Experimental Microbiology	AJCEM Life line publishers	Non-commercial	Nigeria	Nigeria	General	Yes	2002	no	3	no	no	no
AJOL_6	African Journal of Drug and	African Centre for Research and Information	Non-commercial	Nigeria	Nigeria	Specialised	Yes	2008	no	not reported	no	no	no

	Alcohol Studies	on Substance Abuse (CRISA)											
AJOL_7	African Journal of Health Professions Education	Health and medical publishing group	Commercial	South Africa	South Africa	Specialised	Yes	2009	no	2	no	no	no
AJOL_8	African Journal of Health Sciences	Kenya Medical Research Institute and African Forum for Health Sciences	Non-commercial	Kenya	Kenya	General	No	2002	no	4	no	no	no
AJOL_9	African Journal of Infectious Disease	Obafemi Awolowo University	Non-commercial	Nigeria	Nigeria	Specialised	Yes	2007	no	2	no	no	no
AJOL_10	African Journal of Paediatric Nephrology	African Paediatric Nephrology Association (AFPNA)	Non-commercial	Nigeria	Nigeria	Specialised	No	2014	no	2	no	no	no
AJOL_11	African Journal of Paediatric Surgery	Medknow Publications	Commercial	India	Nigeria	Specialised	Yes	2004	no	2	No	No	yes
AJOL_12	African Journal of Reproductive Health	Women's Health and Action Research Centre (WHARC)	Non-commercial	Nigeria	Nigeria	Specialised	No	1999	no	4	no	no	no
AJOL_13	African Journal of Rheumatology	African League of Associations	Non-commercial	Africa (regional	South Africa	Specialised	No	2013	no	2	no	no	no

		for Rheumatology (AFLAR)		offices in Africa)									
AJOL_14	African Journal of Traditional, Complementary and Alternative Medicines	African Networks Ethnomedicines	Non-commercial	Nigeria	Nigeria	Specialised	No	2004	0.553	3	no	no	no
AJOL_15	Anatomy Journal of Africa	Association of Anatomical Societies of Africa	Non-commercial	Kenya	Kenya	Specialised	Yes	2012	no	2	no	no	no
AJOL_16	Annals of African Medicine	Medknow Publications	Commercial	India	Nigeria	General	Yes	2002	no	2	no	no	yes
AJOL_17	Annals of African Surgery	The Surgical Society of Kenya/Medics Management services	Non-commercial	Kenya	Kenya	Specialised	Yes	2007	no	2	yes	no	no
AJOL_18	Annals of Ibadan Postgraduate Medicine	Bookbuilders Africa	Commercial	Nigeria	Nigeria	General	Yes	2003	no	2	no	no	no
AJOL_19	Annals of Medical and Health Sciences Research	Medknow Publications	Commercial	India	Nigeria	General	Yes	2011	no	not specified	no	no	yes
AJOL_20	Annals of Nigerian Medicine	Medknow Publications	Commercial	India	Nigeria	General	Yes	2005	no	2	no	no	yes

AJOL_21	Central African Journal of Medicine	University of Zimbabwe	Non-commercial	Zimbabwe	Zimbabwe	General	No	1999	no	not specified	no	no	no
AJOL_22	East African Medical Journal	Kenya Medical Association	Non-commercial	Kenya	Kenya	General	No	1999	no	12	no	no	no
AJOL_23	East African Orthopaedic Journal	Kenya Orthopaedic Association	Non-commercial	Kenya	Kenya	Specialised	Yes	2007	no	2	no	no	no
AJOL_24	East and Central African Journal of Surgery	Association of Surgeons of East Africa/College of surgeons of East Africa (COSECSA)	Non-commercial	Tanzania	Uganda	Specialised	Yes	1996	no	2	no	no	no
AJOL_25	Egyptian Journal of Pediatric Allergy and Immunology (The)	The Egyptian Society of Pediatric Allergy and Immunology	Non-commercial	Egypt	Egypt	Specialised	Yes	2003	no	2	no	no	no
AJOL_26	Ergonomics SA	Ergonomics Society of South Africa	Non-commercial	South Africa	South Africa	Specialised	No	2008	no	2	no	no	no
AJOL_27	Ethiopian Journal of Health Development	Ethiopian Public Health Society	Non-commercial	Ethiopia	Ethiopia	General	Yes	2000	no	3	no	no	no
AJOL_28	Ethiopian Journal of Health Sciences	Jimma University	Non-commercial	Ethiopia	Ethiopia	General	Yes	1999	no	6	yes	yes	no

AJOL_29	Ghana Medical Journal	Ghana Medical Association	Non-commercial	Ghana	Ghana	General	Yes	2004	no	4	yes	yes	no
AJOL_31	Highland Medical Research Journal	Highland Medical Research Limited	Non-commercial	Nigeria	Nigeria	General	No	2002	no	2	no	no	no
AJOL_32	IFE PsychologIA	The Ife Center for Psychological Studie	Non-commercial	Nigeria	Nigeria	Specialised	No	1998	no	2	no	no	no
AJOL_33	International Journal of Basic, Applied and Innovative Research	Anthonio Research publications	Non-commercial	Nigeria	Nigeria	General	Yes	2012	no	4	no	no	no
AJOL_34	International Journal of Herbs and Pharmacological Research	Anthonio Research publications	Non-commercial	Nigeria	Nigeria	Specialised	Yes	2012	no	4	no	no	no
AJOL_35	International Journal of Medicine and Biomedical Research	Michael Joanna Publications	Commercial	Nigeria	Nigeria	General	Yes	2012	no	3	no	yes	no
AJOL_36	Internet Journal of Medical Update - EJOURNAL	AKS publication	Commercial	Mauritius	Mauritius	General	Yes	2006	no	2	no	no	no
AJOL_37	Jos Journal of Medicine	Association of Resident Doctors of Jos	Non-commercial	Nigeria	Nigeria	General	Yes	2009	no	3	no	no	no

		University Teaching Hospital											
AJOL_38	Journal of Basic and Clinical Reproductive Sciences	Nigerian Medical Association	Non-commercial	Nigeria	Nigeria	Specialised	Yes	2012	no	2	no	no	no
AJOL_40	Journal of Community Medicine and Primary Health Care	Association of Community Physicians of Nigeria	Non-commercial	Nigeria	Nigeria	Specialised	Yes	2004	no	2	no	no	no
AJOL_41	Journal of Endocrinology, Metabolism and Diabetes of South Africa	Medpharm Publications	Commercial	South Africa	South Africa	Specialised	Yes	2004	no	3	no	no	no
AJOL_42	Journal of Experimental and Clinical Anatomy	Medknow Publications	Commercial	India	Nigeria	Specialised	Yes	2003	no	2	no	no	yes
AJOL_43	Journal of Medical and Biomedical Sciences	School of Medicine and Health Science, University for Devel-opment Studies	Non-commercial	Ghana	Ghana	General	Yes	2012	no	not specified	no	no	no
AJOL_44	Journal of Medicine and Biomedical Research	Fine Print and Manufacturer Ltd	Commercial	Nigeria	Nigeria	General	Yes	2002	no	2	no	no	no

AJOL_45	Journal of Medicine in the Tropics	Medknow Publications	Commercial	India	Nigeria		Yes	2002	no	2	no	no	yes
AJOL_46	Journal of Obstetrics and Gynaecology of Eastern and Central Africa	Kenya Obstetrical and Gynaecological Society (KOGS)	Non-commercial	Kenya	Kenya	Specialised	No	2011	no	4	no	no	no
AJOL_47	Journal of Pharmaceutical and Allied Sciences	Department of Pharmaceutics University of Nigeria	Non-commercial	Nigeria	Nigeria	General	No	2004	no	2	no	yes	no
AJOL_48	Malawi Medical Journal	College of Medicine, University of Malawi and Medical Association of Malawi.	Non-commercial	Malawi	Malawi	General	Yes	1986	0.837	4	yes	yes	no
AJOL_49	Medical Journal of Zambia	Zambia Medical Association	Non-commercial	Zambia	Zambia	General	Yes	2008	no	3	no	yes	no
AJOL_50	Nigerian Health Journal	Nigerian Medical Association	Non-commercial	Nigeria	Nigeria	General	Yes	2008	no	4	no	no	no
AJOL_51	Nigerian Hospital Practice	CME Ventures	Commercial	Nigeria	Nigeria	General	No	2007	no	24	no	no	no
AJOL_52	Nigerian Journal of Clinical Medicine	Association of Resident Doctors of the Lagos State University	Non-commercial	Nigeria	Nigeria	General	No	2008	no	2	no	no	no

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		Teaching Hospital Ikeja											
AJOL_53	Nigerian Journal of Clinical Practice	Medknow Publications	Commercial	India	Nigeria	General	Yes	2001	0.524	6	no	no	yes
AJOL_54	Nigerian Journal of Family Practice	Society of Family Physicians of Nigeria. (SOFPON).	Non-commercial	Nigeria	Nigeria	Specialised	No	2012	no	2	no	no	no
AJOL_55	Nigerian Journal of Gastroenterology and Hepatology	Society for Gastroenterology & Hepathology	Non-commercial	Nigeria	Nigeria	Specialised	No	2009	no	4	no	no	no
AJOL_56	Nigerian Journal of General Practice	Medknow Publications	Commercial	India	Nigeria	General	Yes	2011	no	2	no	no	yes
AJOL_57	Nigerian Journal of Guidance and Counselling	Department of Counsellor Education, University of Ilorin, Ilorin, Nigeri	Non-commercial	Nigeria	Nigeria	Specialised	No	1998	no	1	no	no	no
AJOL_58	Nigerian Journal of Medicine	University of Nigeria	Non-commercial	Nigeria	Nigeria	General	No	2005	no	4	no	no	no
AJOL_59	Nigerian Journal of Natural Products and Medicine	Nigerian Society of Pharmacognosy	Non-commercial	Nigeria	Nigeria	Specialised	No	1997	no	1	no	no	no

AJOL_60	Nigerian Journal of Ophthalmology	Medknow Publications	Commercial	India	Nigeria	Specialised	Yes	2000	no	2	no	no	yes
AJOL_61	Nigerian Journal of Paediatrics	Paediatric Association of Nigeria	Non-commercial	Nigeria	Nigeria	Specialised	Yes	2001	no	4	no	yes	no
AJOL_62	Nigerian Journal of Parasitology	Parasitology and Public Health Society of Nigeria	Non-commercial	Nigeria	Nigeria	Specialised	No	2000	no	2	no	no	no
AJOL_63	Nigerian Journal of Physiological Sciences	Physiological Society of Nigeria	Non-commercial	Nigeria	Nigeria	Specialised	Yes	2003	no	2	no	no	no
AJOL_64	Nigerian Journal of Plastic Surgery	Medknow Publications	Commercial	India	Nigeria	Specialised	Yes	2006	no	2	no	no	yes
AJOL_65	Nigerian Journal of Psychiatry	Associations of Psychiatrists in Nigeria	Non-commercial	Nigeria	Nigeria	Specialised	No	2005	no	3	no	no	no
AJOL_66	Nigerian Journal of Surgery	Medknow Publications	Commercial	India	Nigeria	Specialised	Yes	2009	no	2	no	no	yes
AJOL_67	Nigerian Journal of Surgical Research	Medknow Publications	Commercial	India	Nigeria	Specialised	Yes	2000	no	4	no	no	yes
AJOL_68	Nigerian Journal of Surgical Sciences	Medknow Publications	Commercial	India	Nigeria	Specialised	Yes	2005	no	2	no	no	yes

AJOL_69	Nigerian Medical Journal	Medknow Publications	Commercial	India	Nigeria	General	Yes	2005	no	4	no	no	yes
AJOL_70	Nigerian Medical Practitioner	SAME ventures	Commercial	Nigeria	Nigeria	General	No	2003	no	12	no	no	no
AJOL_71	Nigerian Quarterly Journal of Hospital Medicine	Lagos University Medical Society	Non-commercial	Nigeria	Nigeria	General	No	2003	no	4	no	no	no
AJOL_72	Obstetrics and Gynaecology Forum	In House Publications	Commercial	South Africa	South Africa	Specialised	No	2002	no	4	no	no	no
AJOL_73	Orient Journal of Medicine	Nigerian Medical Association of South-East Nigeria	Non-commercial	Nigeria	Nigeria	General	Yes	2003	no	4	no	no	no
AJOL_74	Pan African Medical Journal	PAMJ-Center for Public Health Research and Information African Field Epidemiology Network	Non-commercial	Kenya	Kenya	General	Yes	2008	no	not specified	no	yes	no
AJOL_75	Port Harcourt Medical Journal	Medknow Publications	Commercial	India	Nigeria	General	Yes	2006	no	3	no	no	yes
AJOL_76	Research Journal of Health Sciences	Osun State University	Non-commercial	Nigeria	Nigeria	General	Yes	2013	no	4	no	no	no

AJOL_77	Rwanda Journal	University of Rwanda	Non-commercial	Rwanda	Rwanda	General	Yes	2013	no	4	yes	no	no
AJOL_78	SA Journal of Radiology	AOSIS publishing	Commercial	South Africa	South Africa	Specialised	Yes	2004	no	4	no	no	yes
AJOL_79	Sahel Medical Journal	Medknow Publications	Commercial	India	Nigeria	General	Yes	2002	no	4	no	no	yes
AJOL_80	Savannah Journal of Medical Research and Practice	University of Ilorin Teaching Hospital	Non-commercial	Nigeria	Nigeria	General	No	2012	no	2	no	no	no
AJOL_81	Sierra Leone Journal of Biomedical Research	College of Medicine and Allied Health Sciences, University of Sierra Leone	Non-commercial	Sierra Leone	Sierra Leone	General	Yes	2009	no	3	yes	yes	no
AJOL_82	South African Family Practice	Medpharm Publications	Commercial	South Africa	South Africa	Specialised	Yes	2002	no	12	no	no	no
AJOL_83	South African Gastroenterology Review	In House Publications	Commercial	South Africa	South Africa	Specialised	No	2003	no	4	no	no	no
AJOL_84	South African Journal for Research in Sport, Physical Education and Recreation	Stellenbosch University	Non-commercial	South Africa	South Africa	Specialised	No	2001	no	2	no	no	no
AJOL_85	South African Journal of Child Health	Health & Medical Publishing Group	Commercial	South Africa	South Africa	Specialised	Yes	2008	no	4	no	no	no
AJOL_86	South African Journal of	Medpharm Publications	Commercial	South Africa	South Africa	Specialised	Yes	2004	no	4	no	no	no

	Clinical Nutrition												
AJOL_87	South African Journal of Obstetrics and Gynaecology	Health & Medical Publishing Group	Commercial	South Africa	South Africa	Specialised	Yes	2005	no	3	no	no	no
AJOL_88	South African Journal of Psychiatry	AOSIS publishing	Commercial	South Africa	South Africa	Specialised	Yes	2002	0.193	1	no	yes	yes
AJOL_89	South African Journal of Sports Medicine	South African Sports Medicine Association	Non-commercial	South Africa	South Africa	Specialised	Yes	2003	no	3	no	no	no
AJOL_90	South African Journal of Surgery	Health & Medical Publishing Group	Commercial	South Africa	South Africa	Specialised	Yes	2004	0.462	4	no	no	no
AJOL_91	South African Medical Journal	Health & Medical Publishing Group	Commercial	South Africa	South Africa	General	Yes	1983	1.5	12	no	no	no
AJOL_92	South Sudan Medical Journal	South Sudan Doctors' Association	Non-commercial	South Sudan	South Sudan	General	Yes	2008	no	4	no	no	no
AJOL_93	Southern African Journal of Anaesthesia and Analgesia	Medpharm publications	Commercial	South Africa	South Africa	Specialised	Yes	2002	no	6	no	no	no
AJOL_94	Southern African Journal of Critical Care	Health & Medical Publishing Group	Commercial	South Africa	South Africa	Specialised	Yes	2004	no	2	no	no	no
AJOL_95	Southern African	AOSIS publishing	Commercial	South Africa	South Africa	Specialised	Yes	2000	0.529	1	no	yes	yes

	Journal of HIV Medicine												
AJOL_96	Sudan Journal of Medical Sciences	Omdurman Islamic University	Non-commercial	Sudan	Sudan	General	Yes	2006	no	3	no	no	no
AJOL_97	Tanzania Journal of Health Research	National Institute for Medical Research	Non-commercial	Tanzania	Tanzania	General	Yes	2001	no	4	no	no	no
AJOL_98	Tropical Journal of Health Sciences	College of Medicine, University of Ilorin	Non-commercial	Nigeria	Nigeria	General	No	2005	no	2	no	no	no
AJOL_99	Tropical Journal of Medical Research	Medknow Publications	Commercial	India	Nigeria	General	Yes	2004	no	2	no	no	yes
AJOL_100	Tropical Journal of Obstetrics and Gynaecology	Medknow Publications	Commercial	India	Nigeria	Specialised	Yes	2001	no	2	no	no	yes
AJOL_101	Tropical Journal of Pharmaceutical Research	Pharmacotherapy Group	Non-commercial	Nigeria	Nigeria	Specialised	Yes	2002	0.543	24	no	no	no
AJOL_102	West African Journal of Radiology	Medknow Publications	Commercial	India	Nigeria	Specialised	No	2000	no	1	no	no	yes

Appendix 4.6: Additional characteristics of journals with relevant policies

Characteristic Total n=100	Journal policy/guideline					
	Authorship	**Contributorship**	**Acknowledgement**	**Conflict of interest**	**Funding sources**	**Plagiarism**
Impact factor (n=9)	8 (89%)	7 (78%)	4 (44%)	9 (100%)	7 (78%)	6 (67%)
Member of AJPP (n=7)	4 (57%)	3 (43%)	4 (57%)	5 (71%)	4 (57%)	1 (14%)
Open Access (n=69)	45 (65%)	42 (61%)	43 (62%)	55 (80%)	46 (67%)	24 (35%)
Not open-access (n=31)	7 (23%)	6 (19%)	6 (19%)	8 (26%)	6 (19%)	2 (6%)
Journal member of COPE (n=11)	8 (73%)	7 (64%)	8 (73%)	8 (73%)	7 (64%)	3 (27%)
Journal not member of COPE (n=89)	44 (49%)	41 (46%)	41 (46%)	55 (62%)	45 (51%)	23 (26%)
Publisher member of COPE (n=22)	20 (91%)	22 (100%)	18 (82%)	22 (100%)	22 (100%)	3 (14%)
Publisher not member of COPE (n=78)	32 (41%)	26 (33%)	31 (40%)	41 (53%)	30 (38%)	23 (29%)
Commercial publisher (n=41)	32 (78%)	29 (71%)	23 (56%)	36 (88%)	31 (76%)	13 (32%)
Non-commercial publisher (n=59)	20 (34%)	19 (32%)	26 (44%)	27 (46%)	21 (36%)	13 (22%)
General scope (n=48)	21 (44%)	21 (44%)	23 (48%)	27 (56%)	23 (48%)	6 (13%)
Scope specialised (n=52)	31 (60%)	27 (52%)	26 (50%)	36 (69%)	29 (56%)	20 (38%)
Country of publisher						
Nigeria (n=39)	12 (31%)	14 (36%)	16 (41%)	15 (38%)	10 (26%)	9 (23%)
South Africa (n=18)	13 (72%)	8 (44%)	7 (39%)	15 (83%)	13 (72%)	13 (72%)
India (n=19)	17 (89%)	19 (100%)	15 (79%)	19 (100%)	19 (100%)	0
Other	10 (42%)	7 (29%)	11 (46%)	14 (58%)	10 (42%)	4 (17%)

(n=24)						
Country of editor in chief						
Nigeria (n=57)	29 (51%)	33 (58%)	31 (54%)	34 (60%)	29 (51%)	9 (16%)
South Africa (n=20)	13 (65%)	8 (40%)	7 (35%)	15 (75%)	13 (65%)	13 (65%)
Other (n=23)	10 (43%)	7 (30%)	11 (48%)	14 (61%)	10 (43%)	4 (17%)

Appendix 4.7: Detailed characteristics of included research articles

Characteristic	
Number of authors	
Mean (SD)	3.8 (1.8)
Mode (min, max)	3 (1, 10)
Type of study	n (%)
Cross-sectional	241 (48.7)
Retrospective cohort	61 (12.3)
Case Report	42 (8.5)
Cohort	22 (4.4)
Literature review	19 (3.8)
Randomised controlled trial (RCT)	19 (3.8)
Case series	12 (2.4)
Case-control	12 (2.4)
non-RCT (animal)	10 (2.0)
Qualitative	9 (1.8)
Before-after	7 (1.4)
Controlled before-after study	7 (1.4)
Mixed-method	7 (1.4)
Descriptive (lab)	6 (1.2)
RCT (animal)	6 (1.2)
Diagnostic test accuracy study (DTA)	5 (1.0)
Retrospective audit	4 (0.8)
Experimental (lab)	2 (0.4)
Systematic review	2 (0.4)
non-RCT	1 (0.2)
Repeated cross-sectional study	1 (0.2)
Country of corresponding author	n (%)
Nigeria	250 (50.5)
South Africa	83 (16.8)
Kenya	27 (5.5)
India	24 (4.8)
Ethiopia	11 (2.2)
Ghana	10 (2.0)
USA	9 (1.8)
Saudi Arabia	6 (1.2)

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Tanzania	6 (1.2)
Egypt	5 (1.0)
Zambia	5 (1.0)
Zimbabwe	5 (1.0)
Iran	4 (0.8)
Malawi	4 (0.8)
Rwanda	4 (0.8)
Turkey	4 (0.8)
Cameroon	3 (0.6)
China	3 (0.6)
Sudan	3 (0.6)
Uganda	3 (0.6)
Botswana	2 (0.4)
Chad	2 (0.4)
Sierra Leone	2 (0.4)
South Sudan	2 (0.4)
United Kingdom	2 (0.4)
Brazil	1 (0.2)
Canada	1 (0.2)
DR Congo	1 (0.2)
Italy	1 (0.2)
Korea	1 (0.2)
Libya	1 (0.2)
Malaysia	1 (0.2)
Mali	1 (0.2)
Mauritius	1 (0.2)
Mexico	1 (0.2)
New Zealand	1 (0.2)
Portugal	1 (0.2)
Senegal	1 (0.2)
Switzerland	1 (0.2)
Taiwan	1 (0.2)
Ukraine	1 (0.2)

Appendix 4.8: Additional characteristics of research articles that disclosed author contribution, conflicts of interest and funding sources.

Characteristic Total n=495	Contributorship statement	Acknowledged other contributors	Declared conflicts of interest	Disclosed funding sources
Impact factor (n=45)	17 (38%)	17 (38%)	25 (56%)	20 (44%)
AJPP (n=35)	8 (23%)	19 (54%)	16 (46%)	14 (40%)
Scope general (n=239)	28 (12%)	93 (39%)	122 (51%)	97 (41%)
Open access journal (n=342)	56 (16%)	119 (35%)	194 (57%)	161 (47%)
Country of publisher				
Nigeria (n=190)	22 (12%)	52 (27%)	65 (34%)	35 (18%)
South Africa (n=90)	18 (20%)	29 (32%)	27 (30%)	26 (29%)
India (n=95)	0 (0%)	17 (18%)	94 (99%)	94 (99%)
Other (n=120)	20 (17%)	58 (48%)	43 (36%)	38 (32%)
Country of editor-in-chief				
Nigeria (n=280)	22 (8%)	66 (24%)	158 (56%)	127 (45%)
South Africa (n=100)	18 (18%)	34 (34%)	30 (30%)	28 (28%)
Other (n=115)	20 (17%)	56 (49%)	41 (36%)	38 (33%)
Country of corresponding author				
Nigeria (n=250)	17 (7%)	58 (23%)	125 (50%)	95 (38%)
South Africa (n=83)	17 (20%)	31 (37%)	27 (33%)	23 (28%)
Other African country (n=99)	15 (15%)	51 (52%)	35 (35%)	33 (33%)
Non-African country (n=63)	11 (17%)	16 (25%)	42 (67%)	42 (67%)
Type of study				
Cross-sectional study (n=247)	28 (11%)	80 (32%)	109 (44%)	89 (36%)
Retrospective study (n=65)	8 (12%)	24 (37%)	41 (63%)	27 (42%)
Case Report (n=42)	4 (10%)	5 (12%)	19 (45%)	12 (29%)
Trial (n=36)	5 (14%)	13 (36%)	15 (42%)	16 (44%)
Cohort study (n=22)	2 (9%)	5 (23%)	12 (55%)	12 (55%)
Review (n=21)	2 (10%)	3 (14%)	5 (24%)	5 (24%)
Case-control study (n=12)	1 (8%)	3 (25%)	6 (50%)	6 (50%)
Case Series (n=12)	1 (8%)	4 (33%)	6 (50%)	6 (50%)
Qualitative study (n=9)	2 (22%)	4 (44%)	3 (33%)	4 (44%)
Laboratory study (n=8)	3 (38%)	4 (50%)	4 (50%)	4 (50%)
Mixed-methods (n=7)	2 (29%)	5 (71%)	1 (14%)	3 (43%)
Before-after (n=7)	1 (14%)	3 (43%)	5 (71%)	5 (71%)
Controlled before-after (n=7)	0 (0%)	3 (43%)	3 (43%)	4 (57%)

Appendix 4.9: Adherence to guidelines

Adherence to guidelines and policies	Non-commercial journal	Commercial journal	Total
Authorship	11/99 (11%)	18/160 (11%)	29/259 (11%)
Contributorship	26/91 (29%)	17/145 (12%)	43/236 (18%)
Acknowledgement of other contributors	45/126 (36%)	27/115 (23%)	72/241 (30%)
Conflict of interest	62/135 (46%)	122/180 (68%)	184/315 (58%)
Funding statement	27/97 (28%)	103/135 (76%)	130/232 (56%)

Appendix 4.10: Levels of plagiarism and redundancy per section of the article, according to publisher

	Non-commercial journals (n=211)			Commercial journals (n=147)		
	Level 1	Level 2	Level 3	Level 1	Level 2	Level 3
	1-2 copied sentences	3-6 copied sentences	4+ linked copied or 6+ copied sentences	1-2 copied sentences	3-6 copied sentences	4+ linked copied or 6+ copied sentences
Plagiarism						
Abstract	24 (11%)	5 (2%)	0	12 (8%)	1 (0.6%)	1 (0.6%)
Introduction	51 (24%)	43 (20%)	31 (15%)	36 (24%)	18 (12%)	18 (12%)
Methods	37 (18%)	30 (14%)	6 (3%)	26 (18%)	20 (14%)	3 (2%)
Results	5 (2%)	4 (2%)	1 (0.5%)	3 (2%)	2 (1%)	0
Discussion	42 (20%)	41 (19%)	29 (14%)	32 (22%)	21 (14%)	13 (9%)
Redundancy						
Abstract	7 (3%)	2 (1%)	2 (1%)	2 (1%)	3 (2%)	0
Introduction	4 (2%)	3 (1%)	4 (2%)	3 (2%)	1 (0.6%)	1 (0.6%)
Methods	10 (5%)	13 (6%)	13 (6%)	4 (3%)	6 (4%)	3 (2%)
Results	5 (2%)	4 (2%)	1 (0.5%)	0	3 (2%)	0
Discussion	3 (1%)	3 (1%)	1 (0.5%)	3 (2%)	3 (2%)	0

Appendix 4.10: Additional characteristics of studies with any level of plagiarism

Characteristic	Overall plagiarism n (%)		
	Some	Moderate	Extensive
Impact factor (n=45)	9 (20%)	10 (22%)	4 (9%)
Open Access (n=342)	63 (18%)	61 (18%)	55 (16%)
Scope general (n=239)	50 (21%)	54 (23%)	40 (17%)
Member of AJPP (n=35)	10 (29%)	6 (17%)	4 (11%)
Country of publisher			
Nigeria (n=190)	28 (15%)	43 (23%)	42 (22%)
South Africa (n=90)	16 (18%)	8 (9%)	6 (7%)
India (n=95)	20 (21%)	17 (18%)	16 (17%)
Other (n=120)	29 (24%)	20 (17%)	16 (13%)
Country of editor in chief			

Nigeria (n=280)	48 (17%)	60 (21%)	56 (20%)
South Africa (n=100)	16 (16%)	8 (8%)	11 (11%)
Other (n=115)	29 (25%)	20 (17%)	13 (11%)
Country of corresponding author			
Nigeria (n=250)	42 (17%)	58 (23%)	47 (19%)
South Africa (n=83)	14 (17%)	6 (7%)	6 (7%)
Other African country (n=99)	25 (25%)	14 (14%)	17 (17%)
Non-African country (n=63)	12 (19%)	10 (16%)	10 (16%)
Type of study			
Cross-sectional study (n=247)	56 (23%)	46 (19%)	34 (14%)
Retrospective study (n=65)	13 (20%)	9 (14%)	8 (12%)
Case Report (n=42)	9 (21%)	8 (19%)	8 (19%)
Trial (n=36)	3 (8%)	10 (28%)	6 (17%)
Cohort study (n=22)	1 (5%)	4 (18%)	4 (18%)
Review (n=21)	3 (14%)	0 (0%)	10 (48%)
Case-control study (n=12)	0 (0%)	5 (42%)	3 (25%)
Case Series (n=12)	2 (17%)	0 (0%)	2 (17%)
Qualitative study (n=9)	1 (11%)	1 (11%)	0 (0%)
Laboratory study (n=8)	2 (25%)	2 (25%)	2 (25%)
Mixed-methods (n=7)	0 (0%)	0 (0%)	1 (14%)
Before-after (n=7)	2 (29%)	1 (14%)	0 (0%)
Controlled before-after (n=7)	1 (14%)	2 (29%)	2 (29%)

Appendix 4.11 Additional characteristics of studies with any level of redundancy

Characteristic	Overall redundancy n (%)		
	Some	Moderate	Extensive
Impact factor (n=45)	6 (13%)	5 (11%)	0 (0%)
Open Access (n=342)	17 (5%)	16 (5%)	8 (2%)
Scope general (n=239)	12 (5%)	7 (3%)	4 (2%)
AJPP member (n=35)	6 (17%)	3 (9%)	1 (3%)
Country of publisher			
Nigeria (n=190)	6 (3%)	8 (4%)	6 (3%)
South Africa (n=90)	5 (6%)	10 (11%)	2 (2%)
India (n=95)	1 (1%)	0 (0%)	0 (0%)
Other (n=120)	8 (7%)	4 (3%)	3 (3%)
Country of editor in chief			
Nigeria (n=280)	7 (3%)	8 (3%)	6 (2%)
South Africa (n=100)	5 (5%)	10 (10%)	2 (2%)
Other (n=115)	8 (7%)	4 (3%)	3 (3%)
Country of corresponding author			
Nigeria (n=250)	7 (3%)	6 (2%)	6 (2%)
South Africa (n=83)	3 (4%)	10 (12%)	2 (2%)
Other African country (n=99)	6 (6%)	3 (3%)	3 (3%)
Non-African country (n=63)	4 (6%)	3 (5%)	0 (0%)

Type of study			
Cross-sectional study (n=247)	12 (5%)	14 (6%)	2 (1%)
Retrospective study (n=65)	1 (2%)	1 (2%)	1 (2%)
Case Report (n=42)	0 (0%)	0 (0%)	0 (0%)
Trial (n=36)	3 (8%)	3 (8%)	4 (11%)
Cohort study (n=22)	1 (5%)	1 (5%)	0 (0%)
Review (n=21)	0 (0%)	1 (5%)	1 (5%)
Case-control study (n=12)	0 (0%)	0 (0%)	0 (0%)
Case Series (n=12)	0 (0%)	1 (8%)	0 (0%)
Qualitative study (n=9)	1 (11%)	0 (0%)	1 (11%)
Laboratory study (n=8)	0 (0%)	1 (13%)	0 (0%)
Mixed-methods (n=7)	1 (14%)	0 (0%)	0 (0%)
Before-after (n=7)	1 (14%)	0 (0%)	2 (29%)
Controlled before-after (n=7)	0 (0%)	0 (0%)	0 (0%)

Appendix 5

Appendix 5.1: PowerPoint slides used during the workshop

It's not me, it's them!

- Systematic review (screened 3207 papers)
- Meta-analysis (18 studies)
  - surveys of fabrication or falsification
- **2%** admitted misconduct themselves (95% CI 0.9-4.5)
- **14%** aware of misconduct by others (95% CI 9.9-19.7)

Fanelli *PLoS One* 2009;**4**(5):e5738

Good conduct and misconduct are a spectrum

Technical problems   Salami science   Poor referencing   Plagiarism

Honest error   Under-powered studies   **Poor reporting**   Image manipulation   Falsification   **Fraud**

Weak methods   Inappropriate analysis   Data trimming   Fabrication

Missing data
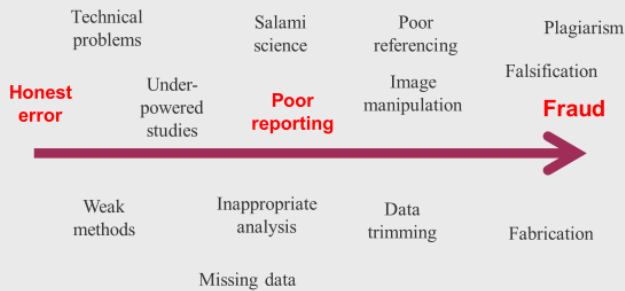
Research and publication ethics are a spectrum

Unethical research design   Inappropriate analysis   Data falsification   Plagiarism   Selective / non-publication

Design   **Analysis**   **Reporting**

Conduct

Authorship abuse   Redundant publication

Lack of patient consent   Data fabrication   Image manipulation

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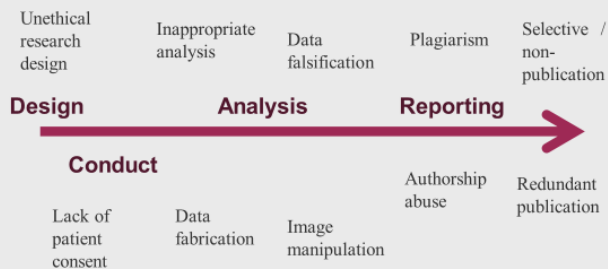
Why do publications matter?

- Other researchers rely on them
  (eg base future work on them)
- Decisions may be based on them (especially
  for applied research: medicine, engineering,
  agriculture, environment, education)
- The academic record is used to reward
  researchers

Who can be at fault?

- Misconduct by **authors**
  - *Plagiarism, fabrication, falsification*
- Misconduct by **editors**
  - *Abuse of position, unfairness*
- Misconduct by **peer reviewers**
  - *Theft of ideas/data*
- Misconduct by **publishers**
  - *Undue commercial influence*

RI is a state of mind
(not simply following a recipe)

- Defining 'questionable practices' requires
  judgement / knowledge of context

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Why Most Published Research Findings Are False

John P. A. Ioannidis

Published: August 30, 2005 • https://doi.org/10.1371/journal.pmed.0020124

MULTI MEDIA | THE PSYCHE | THEORY & PRACTICE | VIDEO

Replicability Crisis in Psychology

Zeyno Ustun — November 5, 2015

CHALLENGES IN IRREPRODUCIBLE RESEARCH

BBC | Sign in

NEWS

Home | UK | World | Business

Science & Environment

Most scientists 'can't replicate studies by their peers'

NATURE | NEWS

Over half of psychology studies fail reproducibility test

Largest replication study to date casts doubt on many published positive results.

'Minor' problems may have a bigger, cumulative effect than 'major' fraud

- Under-powered studies
- Selective reporting

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Poor design in animal studies on multiple sclerosis

- Meta-analysis of 1117 publications
  - 9% reported random allocation to group
  - 16% had blinded assessment of outcome
  - <1% had sample size calculation

Vesterinen et al *MS* 2010;**16**:1044

Selective reporting

- Comparison of protocols cf publications (N=102)
- Found incomplete reporting of:
  - 50% of efficacy
  - 65% of safety/AE outcomes
- Statistically significant outcomes more likely to be reported
- 62% of trials had at least one **primary outcome** changed, introduced or omitted

Chan *et al JAMA* 2004;**291**:2457-65

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COMPARE
TRACKING SWITCHED OUTCOMES IN CLINICAL TRIALS

Here's what we found.

67	9	354	357
TRIALS CHECKED	TRIALS WERE PERFECT	OUTCOMES NOT REPORTED	NEW OUTCOMES SILENTLY ADDED

Since Jan 2006, **all major trial sponsors** completed 29,377 eligible trials and **haven't published results for 13,266 trials**. That means 45.2% of their trials are missing results.
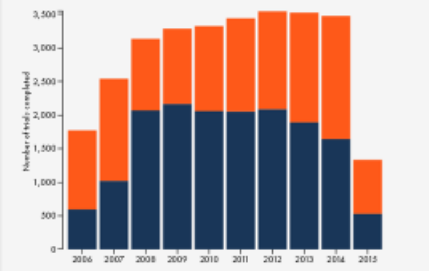
Trials Tracker

Much research is never published
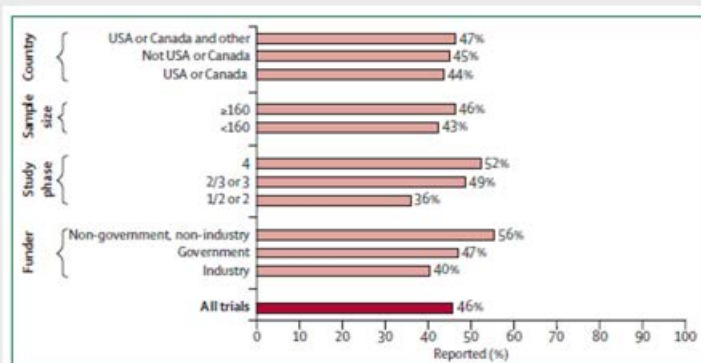
Figure 2: Reporting of completed trials, by study characteristic
Data taken from Ross and colleagues' analysis[11] of a random sample of 677 completed trials registered with ClinicalTrials.gov between 2000 and 2007.

What do we know about research integrity and attitudes towards misconduct?

- Most studies have been done in North America and Europe
- Many focus on cheating by students (rather than academic misconduct)
- Some data from LMICs

Small group discussion

- In your small groups, discuss the following questions:
  - Why does this matter?
  - Why do researchers engage in this practice?
  - What can we do differently?
- Designate one person to write down important points on the flipchart
- Designate one person to feedback to the big group

Feedback from survey

A researcher in Mozambique wants to submit his manuscript to a journal published in English. He finds a text book in Portuguese that explains an aspect of the background to the disease very well. He translates one paragraph into English, and puts this into his introduction without reference to the book.

Workshop participants (n=19)
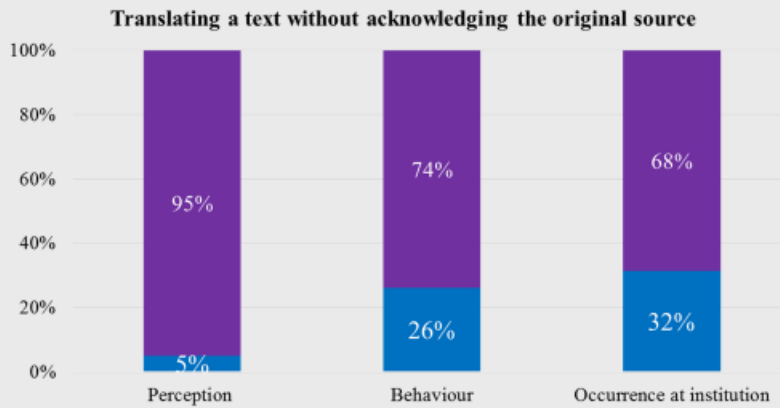
Translating a text without acknowledging the original source

Perception: Acceptable or does not really matter
Behaviour: Have done this themselves or are aware of others doing it
Occurrence at institution: This happens

Cochrane authors from LMICs (n=198)

Translating a text without acknowledging the original source

Perception: Acceptable or does not really matter
Behaviour: Have done this themselves or are aware of others doing it
Occurrence at institution: This happens

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A researcher from India attends an
international conference where a European
research study with a novel design is
presented. He submits a protocol for an
identical study to the ethics committee at his
home institution. He does not reference the
European study.

Workshop participants (n=19)

Copying an idea without acknowledgement of the original source
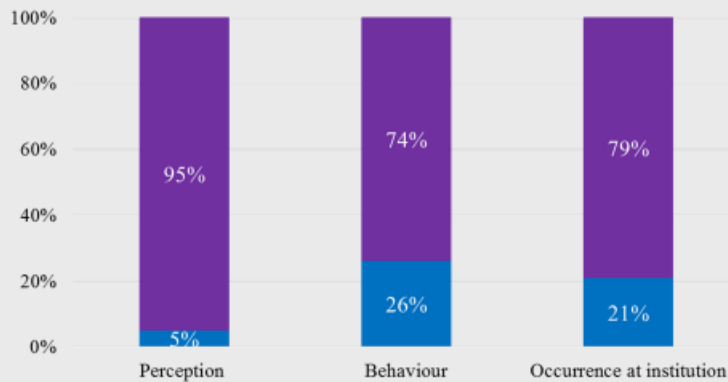
	Perception	Behaviour	Occurrence at institution
No	95%	74%	79%
Yes	5%	26%	21%

Perception: Acceptable or does not really matter
Behaviour: Have done this themselves or are aware of others doing it
Occurrence at institution: This happens

Yes
No

Cochrane authors from LMICs (n=198)

Copying an idea without acknowledgement of the original source

	Perception	Behaviour	Occurrence at institution
No (purple)	90%	55%	57%
Yes (blue)	10%	45%	43%
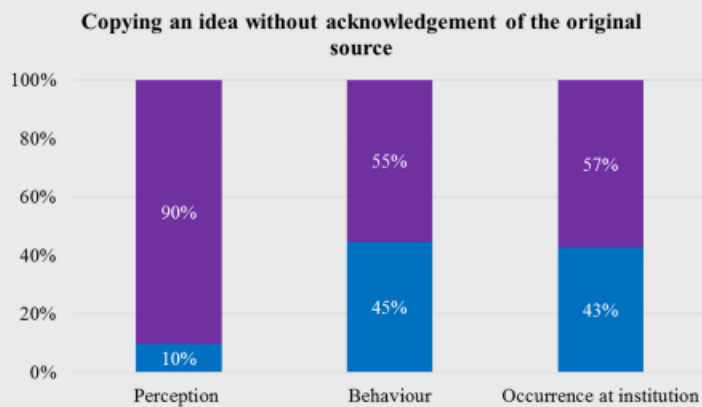
Perception: Acceptable or does not really matter
Behaviour: Have done this themselves or are aware of others doing it
Occurrence at institution: This happens

Yes
No

1. Plagiarism

- *"to copy (ideas, passages of text, etc.) from **someone else's** work and use them **as if they were one's own**"* (Chambers Dictionary)

- *"ranges from unreferenced use of others' published and unpublished ideas … to submission under 'new' authorship of a complete paper"* (COPE guidelines)

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Many journals now screen articles (and universities screen students' work)

- CrossRef Similarity Check (formerly CrossCheck)
- iThenticate / Turnitin

How much copying becomes plagiarism?

Phrase	Hits for exact phrase	
	Google	Google Scholar*
P<0.05 was considered statistically significant	588,000	70,600
performed according to the Declaration of Helsinki	410,000	1860
double-blind, double-dummy, placebo-controlled	56,800	882
numbered, opaque, sealed envelopes	12,200	912
randomised in a 1:1 ratio	8510	1020
computer-generated random number list	5120	354

*Google Scholar searches for academic publications only

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Simple rules to avoid plagiarism

- If you refer to somebody else's work,
  always reference it
- If you copy more than a few words from someone
  else's publication, put them in quotation marks and
  reference them
- If you want to use a figure or table from another
  publication, get permission from the copyright holder
- There is no rule against plagiarizing your own work!
- BUT you need to avoid redundant publication

A PhD student "copies and pastes" nearly all
of the introduction from a paper that she has
previously published into her next manuscript,
since she is doing a series of experiments on
the same topic.

Workshop participants (n=19)

Text-recycling (using one's own work from a previous publication in another)
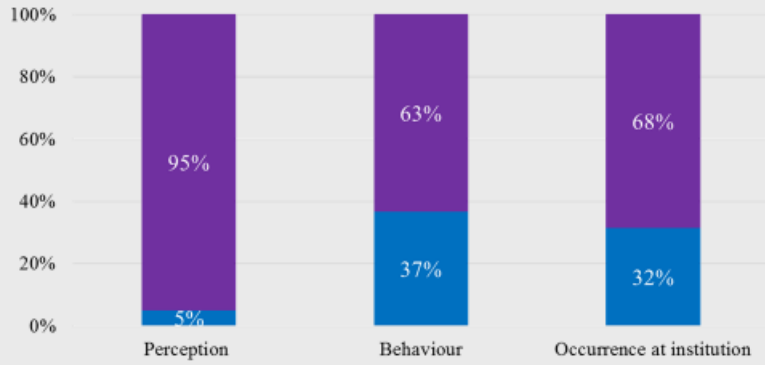
Perception: Acceptable or does not really matter
Behaviour: Have done this themselves or are aware of others doing it
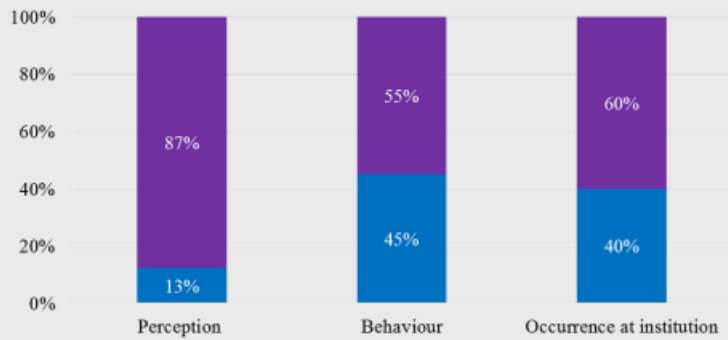Occurrence at institution: This happens

Cochrane authors from LMICs (n=198)

Text-recycling (using one's own work from a previous publication in another)
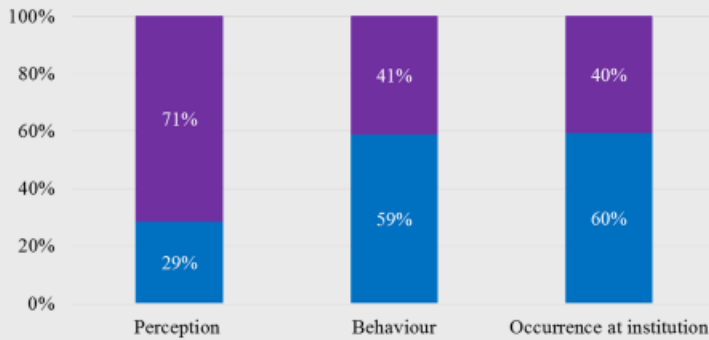
Perception: Acceptable or does not really matter
Behaviour: Have done this themselves or are aware of others doing it
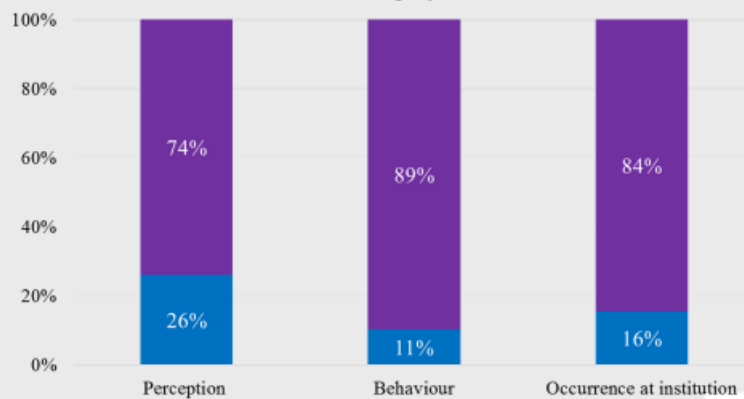Occurrence at institution: This happens

2. Redundant publication

- Also known as:
  - duplicate publication
  - overlapping publication
  - 'self-plagiarism'
  - text recycling
  - salami slicing
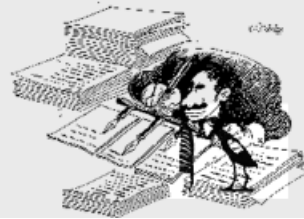
Why does this matter?

- Publication bias distorts the literature

- Evidence-based medicine relies on meta-analyses and systematic reviews

- Findings of meta-analyses can be skewed by duplicate data

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Publication bias

Over-published (redundancy)	Under-published (non-publication)
Statistically significant findings	Statistically non-significant findings
Results that favour product / theory	Negative, disappointing, inconvenient results

Acceptable multiple presentations

- Presentation at meetings (talks and posters) is OK before full publication

- No limit on the number of abstracts presented at meetings

- Multiple presentations at conferences are OK so long as you follow conference requirements (some big meetings only want new data – smaller ones tend to be more relaxed)

- Translations are OK but the source should be acknowledged

- Follow-ups / secondary analyses should reference the original primary publication

How much 'text recycling' becomes redundant publication?

- Updated articles (e.g. literature reviews)
- Repeated methods
- Standard descriptions (e.g. of database)
- Description and analysis of previous studies (e.g. in Discussion of different publications)
- Introductory material

Self-plagiarism (WAME)

- "Self-plagiarism refers to the practice of an author using portions of their previous writings on the same topic in another of their publications, without specifically citing it formally in quotes. This practice is widespread and sometimes unintentional, as there are only so many ways to say the same thing on many occasions, particularly when writing the Methods section of an article. Although this usually violates the copyright that has been assigned to the publisher, **there is no consensus as to whether this is a form of scientific misconduct, or how many of one's own words one can use before it is truly "plagiarism."** Probably for this reason self-plagiarism is not regarded in the same light as plagiarism of the ideas and words of other individuals."

Simple rules to avoid redundant publication

- Check journal and conference guidelines
- Read ICMJE guidelines
- Seek permission from publisher to re-use or translate material
- Send a copy of linked publications (or manuscripts) to journal with your submission
- Mention linked publications in your cover letter
- Clearly reference previous work

A researcher, T, is working on a diagnostic test study. The company manufacturing the test has supplied the kits for free but did not design or fund the research. T was paid for a consultancy for the same company two years ago. In the publication of the study, he declares that he has no conflicts of interest.

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Workshop participants (n=19)

Not declaring previous financial reimbursement from a company involved in a research project

	Perception	Behaviour	Occurrence at institution
No	84%	74%	89%
Yes	16%	26%	11%

Perception: Acceptable or does not really matter
Behaviour: Have done this themselves or are aware of others doing it
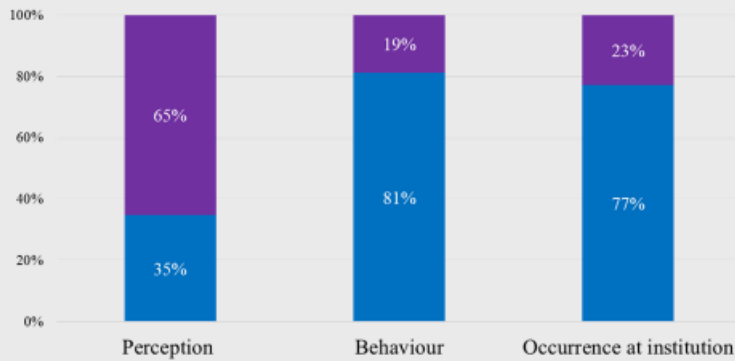Occurrence at institution: This happens

Yes
No

Cochrane authors from LMICs (n=198)

Not declaring previous financial reimbursement from a company involved in a research project

	Perception	Behaviour	Occurrence at institution
No	87%	55%	60%
Yes	13%	45%	40%

Perception: Acceptable or does not really matter
Behaviour: Have done this themselves or are aware of others doing it
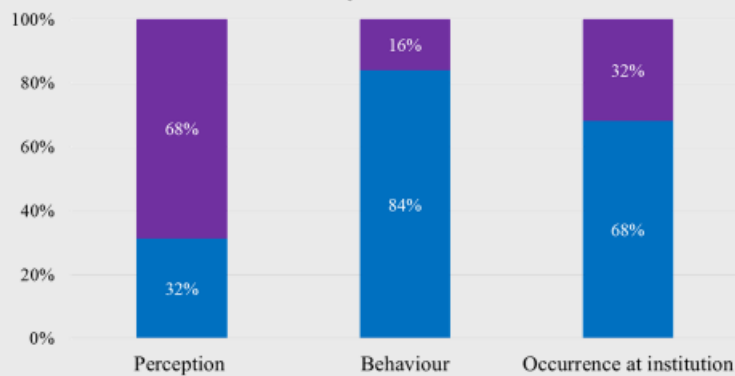Occurrence at institution: This happens

Yes
No

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A researcher, K, writes a review for treatment guidelines of herbal remedies for children's cough. K's wife is employed by the company that manufactures one of these remedies. In the review, K declares that he has no conflicts of interest.

Workshop participants (n=19)

Not declaring your spouse's link to a company involved in a research project
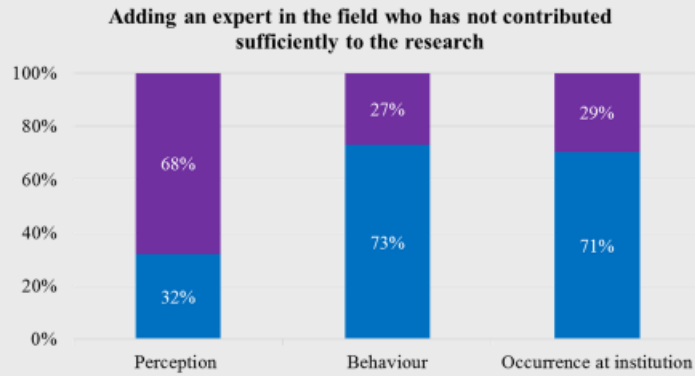

Perception: Acceptable or does not really matter
Behaviour: Have done this themselves or are aware of others doing it
Occurrence at institution: This happens

Yes
No

Cochrane authors from LMICs (n=198)

Not declaring your spouse's link to a company involved in a research project

Perception: Acceptable or does not really matter
Behaviour: Have done this themselves or are aware of others doing it
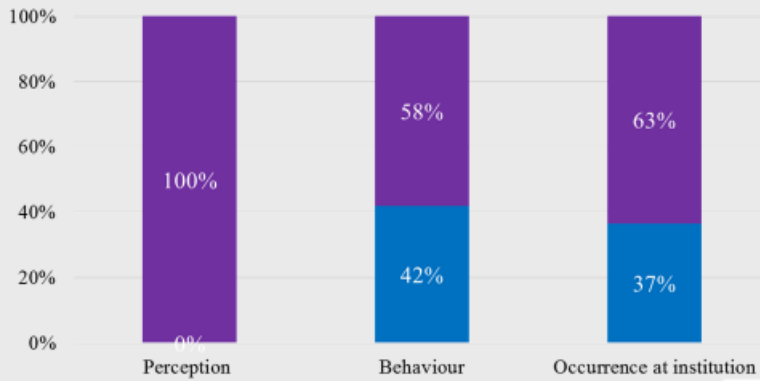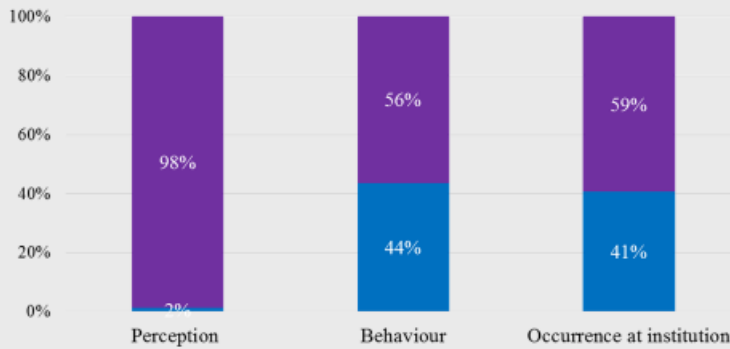Occurrence at institution: This happens

Yes
No

3. Competing interests

- Also called
  Conflict of interests

Conflict of interest

- Conflict of interests exists when there is a divergence between an individual's private interests (competing interests) and his or her responsibilities to scientific and publishing activities such that a reasonable observer might **wonder** if the individual's behavior or judgment was motivated by considerations of his or her competing interests

WAME policy statement

ICMJE states

- Public trust in the scientific process and the credibility of published articles depend in part on how transparently CoIs are handled …
- A CoI exists when professional judgment concerning a primary interest (such as patients' welfare or the validity of research) may be influenced by a secondary interest (such as financial gain). Perceptions of CoI are as important as actual CoIs.

Competing interests may be:

- **Financial**
  e.g. share ownership / employment
- **Personal**
  e.g. partners, relations involved
  (should you review a paper by your ex-wife?)
- **Other**
  e.g. religious, political, ethnic
  (what do readers need to know?)

Competing interests

- ANY relationship to an organization or individual who might benefit from (or be harmed by) the research / publication

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Competing interests

- Not about whether YOU think you may be biased…

- It's about what READERS (and editors) feel they need to know

A junior researcher, J, adds the head of department, D, as the last author on a research paper. D provided suggestions for direction of J's work that helped her obtain the grant, although he hasn't contributed to the actual research or the publication.

Workshop participants (n=19)

Adding the head of department who has not contributed sufficiently
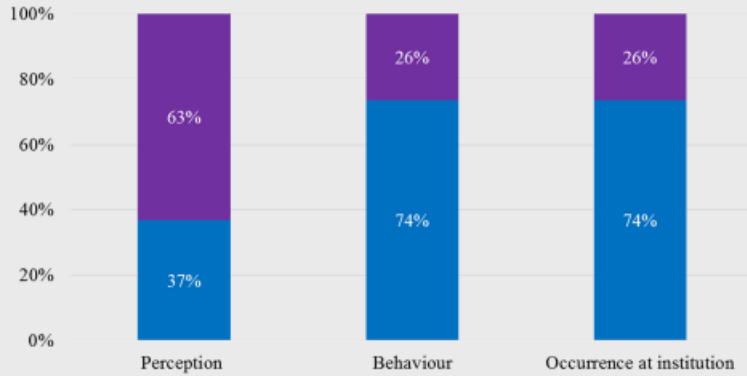
	Perception	Behaviour	Occurrence at institution
No (purple)	63%	26%	26%
Yes (blue)	37%	74%	74%

Perception: Acceptable or does not really matter
Behaviour: Have done this themselves or are aware of others doing it
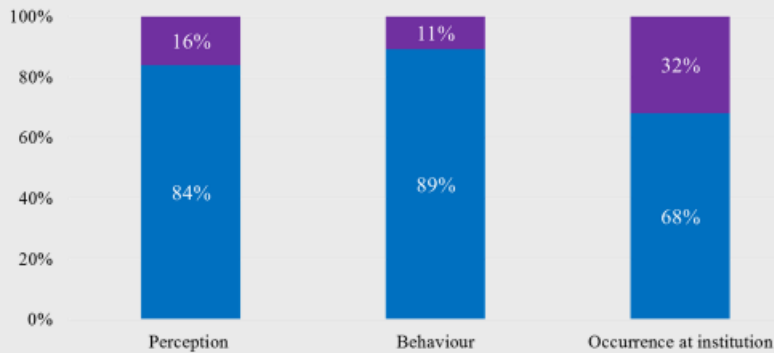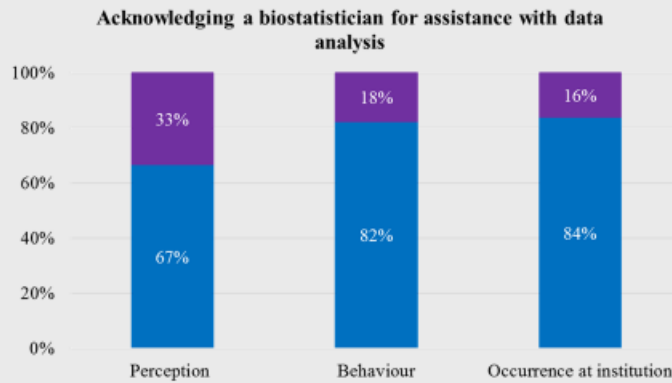Occurrence at institution: This happens

Yes
No

Cochrane authors from LMICs (n=198)

Adding the head of department who has not contributed sufficiently

	Perception	Behaviour	Occurrence at institution
No (purple)	65%	19%	23%
Yes (blue)	35%	81%	77%

Perception: Acceptable or does not really matter
Behaviour: Have done this themselves or are aware of others doing it
Occurrence at institution: This happens

Yes
No

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A professor, M, who did not contribute to study design, data collection or data analysis but is an expert in the field, reviews the draft manuscript and suggests some minor changes to the English. He asks to be listed as an author on the paper.

Workshop participants (n=19)

Adding an expert in the field who has not contributed sufficiently to the research

Perception: Acceptable or does not really matter
Behaviour: Have done this themselves or are aware of others doing it
Occurrence at institution: This happens

Yes
No

Cochrane authors from LMICs (n=198)

Adding an expert in the field who has not contributed sufficiently to the research

Perception: Acceptable or does not really matter
Behaviour: Have done this themselves or are aware of others doing it
Occurrence at institution: This happens

A researcher, S, contributes to the design and does most of the data collection in a study but goes on maternity leave as it is being analysed. When she returns to her post she discovers that the research has been published by her supervisor without her name or any acknowledgement of her contributions.

Workshop participants (n=19)

Omitting an author who has contributed substantially to the research

Perception: Acceptable or does not really matter
Behaviour: Have done this themselves or are aware of others doing it
Occurrence at institution: This happens

Cochrane authors from LMICs (n=198)

Omitting an author who has contributed substantially to the research

Perception: Acceptable or does not really matter
Behaviour: Have done this themselves or are aware of others doing it
Occurrence at institution: This happens

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A Master's student consults with the resident biostatistician, P, to help with data analysis on her research project. In the manuscript that she submits for publication, she lists P in the "Acknowledgement" section.

Workshop participants (n=19)

Acknowledging a biostatistician for assistance with data analysis (as opposed to listing as an author)

	Perception	Behaviour	Occurrence at institution
No	16%	11%	32%
Yes	84%	89%	68%

Perception: Acceptable or does not really matter
Behaviour: Have done this themselves or are aware of others doing it
Occurrence at institution: This happens

Yes
No

Cochrane authors from LMICs (n=198)

Acknowledging a biostatistician for assistance with data analysis

Perception: Acceptable or does not really matter
Behaviour: Have done this themselves or are aware of others doing it
Occurrence at institution: This happens

Yes
No

4. Authorship

Authorship of research is <u>not</u> straightforward!

Why is authorship an ethical issue?

- Authorship is about
  - Credit
  - Responsibility
  - Transparency

©Sideview

Authorship misattribution

- Denies credit
- Shifts responsibility
- Reduces transparency

©Sideview

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ORIGINAL ARTICLE

A Correction Has Been Published ›

An International Randomized Trial Comparing Four Thrombolytic Strategies for Acute Myocardial Infarction

The GUSTO Investigators
N Engl J Med 1993; 329:673-682 | September 2, 1993

The GUSTO study
- 1081 hospitals in 15 countries
- 41,021 patients
- 972 authors

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Journal of Instrumentation > Volume 3 > August 2008
The ATLAS Collaboration et al 2008 JINST 3 S08003 doi:10.1088/1748-0221/3/08/S08003

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The ATLAS Experiment at the CERN Large Hadron Collider

OPEN ACCESS THE CERN LARGE HADRON COLLIDER: ACCELERATOR AND EXPERIMENTS

The ATLAS Collaboration, G Aad[91], E Abat[18], J Abdallah[162], A A Abdelalim[46], A Abdesselam[116], O Abdinov[10], B A Abi[111], M Abolins[86], H Abramowicz[150], E Acerbi[87], B S Acharya[159], R Achenbach[55], M Ackers[20], D L Adams[23], F Adamyan[169], T N Addy[53], M Aderholz[98], C Adorisio[35], P Adragna[72], M Aharrouche[78], S P Ahlen[21], F Ahles[45], A Ahmad[146], H Ahmed[2], G Aielli[133], P F Åkesson[28], T P A Åkesson[76], A V Akimov[93], S M Alam[1], J Albert[164], S Albrand[52], M Aleksa[28], I N Aleksandrov[62], M Aleppo[87], F Alessandria[87], C Alexa[24], G Alexander[150], T Alexopoulos[9], G Alimonti[87], M Aliyev[10], P P Allport[70], S E Allwood-Spiers[50], A Aloisio[101], J Alonso[14], R Alves[122], M G Alviggi[101], K Amako[63], P Amaral[28], S P Amaral[28], G Ambrosini[16], G Ambrosio[87], C Amelung[28], V V Ammosov[126], A Amorim[122], N Amram[150], C Anastopoulos[151], B Anderson[74], K J Anderson[29], E C Anderssen[14], A Andreazza[87], V Andrei[55], L Andricek[98], M-L Andrieux[52], X S Anduaga[67], F Anghinolfi[28], A Antonaki[9], M Antonelli[44], S Antonelli[19], R Apsimon[127], G Arabidze[8], I Aracena[142], Y Arai[63], A T H Arce[14], J P Archambault[27], J-F Arguin[14], E Arik[18], M Arik[18], K E Arms[108], S R Armstrong[23], M Arnaud[135], C Arnault[113], A Artamonov[94], S Asai[152], S Ask[79], B Åsman[144], D Asner[27], L Asquith[74], K Assamagan[23], A Astbury[164], B Athar[1], T Atkinson[84], B Aubert[4], B Auerbach[168], E Auge[113], K Augsten[125], V M Aulchenko[106], N Austin[70], G Awolio[28], R Awramidou[9], A Axen[163], C Ay[51], G Azuelos[91], G Baccaglioni[87], C Bacci[134], H Bachacou[135], K Bachas[151], G Bachy[28], E Badescu[24], P Bagnaia[132], D C Bailey[154], J T Baines[127], O K Baker[168], F Ballester[162], F Baltasar Dos Santos Pedrosa[28], E Banas[37], D Banfi[87], A Bangert[98], V Bansal[121], S P Baranov[93], S Baranov[5], A Barashkou[62], E L Barberio[84], D Barberis[47], G Barbier[48], P Barclay[127], D Y Bardin[62], P Bargassa[118], T Barillari[98], M Barisonzi[39], B M Barnett[127], R M Barnett[14], S Baron[28], A Baroncelli[134], M Barone[44], A J Barr[116], F Barreiro[77], J Barreiro Guimarães da Costa[54], P Barrillon[113], A Barriuso Poy[28], N Barros[122], V Bartheld[98], H Bartko[98], R Bartoldus[142], S Basiladze[96], J Bastos[122], L E Batchelor[127], R L Bates[50], J R Batley[26], S Batraneanu[28], M Battistin[28], G Battistoni[87], V Batusov[62], F Bauer[135], B Bauss[78], D

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Authorship criteria: ICMJE 2013

Authorship should be based on the following 4 criteria:

- 1) substantial contributions to conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; *and*
- 2) drafting the work or revising it critically for important intellectual content; *and*
- 3) final approval of the version to be published; *and*
- 4) agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any parts of the work are appropriately investigated and resolved.

Summary of ICMJE

- All authors must be:
1. Involved with the research
2. Involved with the publication
3. Agree to be listed
4. Accountable if problems arise

Inappropriate authorship

- Gift
  (guest, i.e. undeserving) authors

- Ghost
  (omitted) authors
  (writers or deserving contributors)

The gift that wasn't so nice …

- Professor Geoffrey Chamberlain resigned as editor of the *British Journal of Obstetrics and Gynaecology* after co-authoring a paper that later turned out to be fraudulent
- Professor Chamberlain said that in hindsight he agreed that gift authorship was a bad idea but that he had "rubber stamped this paper out of politeness and because he asked me to as head of the department"

How much responsibility should co-authors take?

- Gerald Schatten co-author on Hwang cloning paper
- Found guilty of 'research misbehaviour' by University of Pittsburgh
  - Aware that some cell lines were lost through contamination in Jan 05, failed to realise there was insufficient time to grow and analyse replacements by mid March when paper was submitted

©Sideview

Order of listing

- Important to funders / institutions
  - China
  - Medical Council of India only counts first 2

- Varies across disciplines
- Virtually no guidance in medicine
- Growth in joint 1st authorship

©Sideview

How to avoid authorship disputes

- Agree authorship CRITERIA
  (i.e. how authorship will be decided)
  at the **start** of the study
- Discuss expectations
- Keep a record of contributions
- Check institution / journal policies
- (Form writing group)
- Agree authorship

How to avoid ethical problems

- Read guidelines
  - From individual journals
  - ICMJE
    www.icmje.org
  - COPE: for editors, publishers, peer reviewers
    www.publicationethics.org
  - WAME policy statements
    www.wame.org
  - Responsible Research Publication
    - Guidelines for authors and editors
      www.publicationethics.org
  - Publisher guidelines (Wiley, Elsevier)
  - Good Publication Practice (GPP3)
    www.ismpp.org/gpp3
  - Council of Science Editors White Paper
    www.councilscienceeditors.org

International standards for authors

Responsible research publication:
international standards for authors
A position statement developed at the 2nd World Conference on Research Integrity,
Singapore, July 22-24, 2010

Elizabeth Wager & Sabine Kleinert

- **Summary**
- The research being reported should have been conducted in an ethical and responsible manner and should comply with all relevant legislation.
- Researchers should present their results clearly, honestly, and without fabrication, falsification or inappropriate data manipulation.
- Researchers should strive to describe their methods clearly and unambiguously so that their findings can be confirmed by others.
- Researchers should adhere to publication requirements that submitted work is original, is not plagiarised, and has not been published elsewhere.
- Authors should take collective responsibility for submitted and published work.
- The authorship of research publications should accurately reflect individuals' contributions to the work and its reporting.
- Funding sources and relevant conflicts of interest should be disclosed.

http://publicationethics.org/international-standards-editors-and-authors

Why RI is everybody's problem

1. It's easy to commit misconduct inadvertently
2. Defining good practice requires judgement
3. 'Minor' problems can have big effects
4. RI is a state of mind, not a recipe
5. Researchers face many pressures
6. RI requires a healthy research environment

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How do we create a 'healthy research ecosystem'?

- Individual responsibility
  - As researchers, authors, peer-reviewers
- Team responsibility
  - To colleagues, peers, other researchers
  - To students, trainees, junior researchers
- Institutional responsibility
  - Training
  - Rewards and incentives
- 'System' responsibility
  - Guidelines
  - Incentives

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research integrity

What training do we get?

For our role as:

- researchers
- authors
- peer reviewers
- journal editors / editorial board members
- supervisors
- mentors
- institutional leaders

What can go wrong with scientific publications?

- Making up data (fabrication)
- Misleading data presentation (falsification)
- Selective reporting (missing out inconvenient results)
- Misleading authorship (guests and ghosts)
- Stealing other people's work (plagiarism)
- Redundant publication (salami slicing)
- Lack of transparency (conflict of interest)

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Appendix 5.2: Reading list

Committee on Publication Ethics (COPE)
www.publicationethics.org

Council of Science Editors
www.councilscienceeditors.org

White paper on Publication Ethics
https://www.councilscienceeditors.org/resource-library/editorial-policies/white-paper-on-publication-ethics/

Declaration of Helsinki
http://www.wma.net/en/30publications/10policies/b3/

European Medical Writers Association guidelines
http://www.emwa.org/documents/about_us/EMWAguidelines.pdf?hkey=77a01040-aab8-4850-9d7f-a5b4a8722241

Good Publication Practice for Communicating Company Sponsored Medical Research: GPP3
http://annals.org/aim/article/2424869/good-publication-practice-communicating-company-sponsored-medical-research-gpp3

ICMJE Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals
www.ICMJE.org

Responsible Research Reporting
International Standards for Authors
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3868814/

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(also available at www.publicationethics.org)

Suggested books for further reading

- Institute of Medicine: *Integrity in Scientific Research. Creating an Environment that Promotes Responsible Conduct.* National Academies Press, Washington DC. 2002
- Goodstein D. On Fact and Fraud. Cautionary Tales from the Front Line of Science. Princeton University Press, Princeton, 2010
- Hudson Jones A, McLellan F (eds). *Ethical Issues in Biomedical Publication*
- Johns Hopkins University Press, Baltimore, 2000
- Wells F & Farthing M (eds) Fraud and Misconduct in Biomedical Research. Royal Society of Medicine Press, London, 4e, 2008

Appendix 5.3: Consent form for evaluation of research integrity workshop

PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

TITLE OF THE RESEARCH PROJECT: Research integrity in reporting research: Documenting understanding and perceptions around plagiarism, conflict of interest and authorship criteria in low- and middle income countries

REFERENCE NUMBER:

PRINCIPAL INVESTIGATOR: Ms Anke Rohwer

ADDRESS: Centre for Evidence-based Health Care, Faculty of Medicine and Health Sciences, Stellenbosch University, Francie van Zijl drive, 7500 Parow, Cape Town, South Africa

CONTACT NUMBER: +27-21-938 9886

Dear Colleague,

My name is Anke Rohwer and I am a researcher at the Centre for Evidence-based Health Care, Stellenbosch University, South Africa. As you are participating in a research integrity workshop, I would like to invite you to take part in the evaluation of this workshop in order improve it for future offerings. The evaluation is part of a bigger research project that aims to investigate perceptions and experiences of good research reporting practices related to plagiarism, conflict of interest and authorship, amongst researchers in low- and middle-income countries.

Please take some time to read the information presented here, which will explain the details of this project. Please ask the workshop facilitators any questions about any part of this evaluation that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the **Health Research Ethics Committee at Stellenbosch University** and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

What is this research study all about?

We are conducting a formal evaluation of the research integrity workshop in order to improve future workshops. We would therefore like to know whether you are satisfied with the workshop and how you experienced it; what you learned and whether you will do anything linked to research reporting practices differently based on what you have learned in the workshop.

Why have you been invited to participate?

You have been invited to take part in the evaluation, as you are a participant of the workshop. You can help us to improve further workshops in order to promote research integrity in low- and middle income countries.

What will your responsibilities be?

You will be invited to complete an online survey before the workshop as well as after the workshop. We will ask you about your views on research reporting practices and about your research reporting practices. We will also ask you to complete an evaluation form after the workshop, where you can indicate your satisfaction with each session during the workshop and can tell us what you liked and what you did not like.

The workshop will be interactive and we anticipate a lot of discussions. You can decide whether or not you want to participate in the discussions. With your permission, we will record all discussions with a digital voice recorder. In addition, one of the facilitators will take written notes.

Will you benefit from taking part in this research?

The research will help us to improve the workshop so that we can actively promote research integrity across Sub-Saharan Africa.

Are there in risks involved in your taking part in this research?

We do not anticipate any risks. Responses from the survey and the evaluation will be anonymous. We will record the discussion with a digital audio recorder and take notes during the discussions. The audio recording will not be released to any persons or entities other than the research team of this study, based at the Centre for Evidence-based Health Care at the Faculty of Medicine and Health Sciences, Stellenbosch University. The audio recording and typed transcription of the discussions will be stored in a password protected computer file to which only the PI of this study will have access and will be destroyed within 12 months of the workshop.

If you do not agree to take part, what alternatives do you have?

You can still participate in the workshop even if you do not want to take part in the evaluation. There will be no implications.

Will you be paid to take part in this study and are there any costs involved?

No, you will not be paid to take part in the study and there will be no costs involved for you, if you do take part.

Is there anything else that you should know or do?

You can contact the Health Research Ethics Committee at 021-938 9207 if you have any concerns or complaints that have not been adequately addressed. The anonymous scientific data – in which no individuals will be named or identified – resulting from the study may be presented at meetings within the Faculty of Medicine and Health Sciences, used for PhD theses and published in national or international journals, for dissemination purposes.

You will receive a copy of this information and consent form for your own records via email.

Declaration by participant

By signing below, I ……………………………….…………. agree to take part in a research study entitled **Research integrity in reporting research: Documenting understanding and perceptions around plagiarism, conflict of interest and authorship criteria in low- and middle income countries (Evaluation of research integrity workshop)**

I declare that:

- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.

- I have had a chance to ask questions and all my questions have been adequately answered.

- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.

- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.

- I may be asked to leave the study before it has finished, if the study doctor or researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at (*place*) ....……....…………….. on (*date*) ………….…………. 2017.

Signature of participant

Appendix 5.4: Workshop evaluation form

The presentation was	Very good	Good	Moderate	Slightly poor	Poor
The content was	Very Useful	Useful	Moderately useful	Slightly useful	Not useful
I learnt	A great deal	Quite a deal	A moderate amount	Only a little	Almost nothing
Additional commentary					
Please list three things that you liked most about this session:					
Please list three things that would improve the usefulness of the session or that would help your learning:					

Appendix 5.5: Survey results (Nigeria)

Health research reporting practice Total n=21	Perception: Acceptable or does not really matter	Behaviour: Have done this themselves	Occurrence at institution: This happens
	n (%)	n (%)	n (%)
Authorship			
Adding the head of department who has not contributed sufficiently[1]	8 (38)	3 (14)	15 (71)
Adding an expert in the field who has not contributed sufficiently to the research	7 (33)	7 (33)	13 (62)
Acknowledging a biostatistician for assistance with data analysis	18 (86)	12 (57)	15 (71)
Omitting an author who has contributed substantially to the research	0	0	9 (43)
Redundant publication			
Text-recycling (using one's own work from a previous publication in another)	1 (5)	0	6 (29)
Plagiarism			
Translating a text without acknowledging the original source	3 (14)	0	6 (29)
Copying an idea without acknowledgement of the original source	1 (5)	0	4 (19)
Conflicts of interest			
Not declaring previous financial reimbursement from a company involved in a research project	3 (14)	0	2 (10)
Not declaring your spouse's link to a company involved in a research project	5 (24)	0	3 (14)

Appendix 5.6: Collated participant feedback (Nigeria)

The presentation was	Very good	Good	Moderate	Slightly poor	Poor
	20	6	2	0	0
The content was	Very Useful	Useful	Moderately useful	Slightly useful	Not useful
	25	4	0	0	0
I learnt	A great deal	Quite a deal	A moderate amount	Only a little	Almost nothing
	16	12	1	0	0

Additional comments

- Presentation was simple but rich
- Particularly useful to me as the chairman of Dept of Faculty Research Committee
- This kind of Workshop should come up regularly

Please list three things that you liked most about this workshop:	- Emphasis on research integrity. The group discussions were very stimulating. - Clarity of presentation. Frankness of presenters. Simplicity of audience participation - The size of the participation. The clarity of presentation. Use of working groups. - It was interactive in nature. It utilized various scenarios to illustrate the points. - Conflict of interest. Authorship and redundant publication - Presentation was to the point. Different scenarios captured and well discussed. Group participation was good. - The organization of the meeting. Time management. Delivery of content. - The manner of presentation was very good. It was participatory. The issues on RI and publication ethics were very rewarding. - Presentations, Audio, Graphics - The workshop was interactive. - The passion of the presenters. The fact that researcher's integrity is a state of the mind. The mode of presentations – very clear. - Group workshop or discussion. Presentation was short & precise. Practical scenarios, presentation and responses. - Presentation was precise. Interactive and limited number of people involved. Basis of different research scenarios were discussed. - Classifications of Critical terms in Research Integrity & publication ethics. The group discussion & feedback that generated interesting perspectives on issues raised. Highly focused. - Precise & to the point. Wide spectrum. Good time management. - Knowledge on Redundant publication was enhanced in this workshop. The span of self-plagiarism was made more elaborate. Authorship misattribution was made easier to understand. - This has opened my mind on research integrity especially in relation to authorship & essence of world views of research authors.

	• Choice of discussion was that usually create problems in definition of authorship & ranking. The illustrations were very well prepared in terms of graphics. The feedback proven was so illuminating. • Its concise nature. Its practical nature. Its interactive nature. • Interactive. Used examples. • Organization of the presentation. The venue was ok & conclusive. The presentation was concluded on time. • Criteria of Authorship. Plagiarism. Ethical Value. • Clarity & Presentation. Open discussion. Used adult learning techniques. Made certain definition clearer like plagiarism & salami slicing. • The way the presentation was done especially with use of specific scenarios. The interactive nature of the sessions. • The scenario used to explain the presentation. Explanation on redundant publication. • Very good timings of each session. There is enough forum for group interaction and discussion. The serene location. • The extent of knowledge displayed in explaining plagiarism. Redundant publication and conflict of interest. • Mode of presentation and interaction. Course content.
Please list three things that would improve the usefulness of the session or that would help your learning:	• More visual aids. Actual review of articles. • More hands-on experience. Elaborate Conference materials. Software packages & follow up. • Less time for participants to keep repeating what has been said already or relating personal experiences. Start earlier so end earlier. • A safe copy of presentation in addition to usual aids. • What was used was adequate. • More focused group discussion. Session should be extended to 2 days. Extra activities to avoid boredom/sleepiness • Post graduate students and young researchers need to get this type of training. • Better environment, good meals, allowance (cash) • Electronic presentation of the materials. Involvement of my Institution the University of Calabar. Frequency of presentation. • Anonymous pre-workshop questionnaire • Very satisfactory. The facilitators in subsequent sessions should be as knowledgeable as this set, so that there will be no ambiguity in presentation. • If training materials/resources could be made available to participants electronically. • More of this interactions. Step-down of this interact was to the Department. Re-training. • Constant training & mentoring of researchers. Provision of institutional guidelines. Make RI a common-place discussion topic to improve research. • Would have liked to have the copies of presentation on CDs for sale to participants. It would be highly appreciated. • Print/Electronic copies of this workshop. Emailing to the group. • Should have wider presentation particularly to young researchers. Should also target senior researchers to understand their

	• responsibilities. Institution should be advised to monitor research. They should be equipped. • Provision of computers to academics. Sponsorship to attend Workshops. More publicity. • Training sessions like this. More effort on writing of papers. • Improved audio-visual facility.
Based on what you have learned, is there anything that you will do differently? Please describe briefly.	• I will not accept gift authorship. I will not allow anyone without significant contribution to be listed as an author • Host to arrange a more comfortable venue • Prior determination of authorship. • Certainly, pay more attention to trainee project supervision. Not be part of any publication I cannot take responsibility for. • I will accord redundant publication. Proper using of authors. • It would be nice to adhere to guidelines/principles guiding research work. Very important to agree on authorship at start of research work. • Yes, in the area of authorship knowing who should be included or not as an author. • I will discourage salami slicing. • Nothing really because I always believe in research integrity. • I now know that I should only acknowledge a superior who only made a minor review to a manuscript. • Stop unproductive research practice. Do the right thing. • Authorship & competing Interests. • Inclusion of authors in study especially when they don't merit it. • That for every publication or start-off of any research, there should be a deliberate & conscious plan laid out for research conduct and publication. • Was aware of most of the content. Redundant publication explained better. • Quite a lot. • Nothing to be done differently but will represent what has been learned to colleagues to ensure the knowledge gained is shared. • Would have preferred a large audience participation involving academics & PHD Students. • I will be more careful with authorship attribution especially denying credit to any qualified author. • Raise awareness about research integrity. • Use definite guidelines for research integrity and authorship of Publications. • Extreme careful in authorship or co-author • Papers should be viewed ever more critically. There should be no assumptions that researchers understand research principles in tutor Institution should create help tables for these who will seek it. • We will only now apply what we have learnt. • Properly handle the issue of authorship. I will endeavor to be transparent in the reporting of research findings. • Yes, after this workshop, I shall be more careful about whom to include as an Author in an Article.

	• Write more papers so as to enable me practice all that I've learnt today. • Insist on strict application of authorship criteria.