Describing the rehabilitation workforce capacity data in the public sector of three rural provinces in South Africa

by

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DECLARATION

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Abstract

Background

Rehabilitation capacity resources are limited or sometimes may be missing completely in low- and middle-income countries. Workforce is intricately linked with all the other health system components and is essential in leadership and governance, management of financial resources and technology, and rehabilitation service delivery. A workforce that is sufficient in number, skills and equitably distributed is vital. The classification of the rehabilitation workforce lacks a common, global definition. A standardised set of descriptors and indicators to describe rehabilitation workforce capacity allows comparison between countries or regions. This rehabilitation workforce data is important to provide a baseline for advocating to improve rehabilitation workforce capacity.

Aim

The aim of the study is twofold. Firstly, the aim of the scoping review was to see how rehabilitation workforce capacity data is described and to synthesise the descriptors and indicators used to describe the workforce. Secondly, the aim of the primary study was to describe the rehabilitation workforce in the public sector of South Africa in three rural provinces with respect to number of therapists, distribution by population, type of therapists and qualifications, distribution between rural and urban, salary levels and level of care.

Method

The research consisted of a scoping review and a primary study. The scoping review was conducted according to the five-step framework developed by Arksey and O’Malley. The scoping review included primary peer reviewed studies on rehabilitation workforce. Data on the rehabilitation workforce indicators and descriptors were extracted and synthesised. The results were used to describe the primary study workforce data. The primary study was a cross-sectional web-based survey using REDCap. The data was extracted and collated in MS Excel and analysed in SPSS and STATA.

Results

The findings from the scoping review showed that population adjusted ratios and absolute number of therapists are used to indicate the supply of the rehabilitation workforce. The distribution between urban versus rural and public versus private sectors are used to describe disparities between regions. Age and gender are used to describe the demographics of the
rehabilitation workforce. The primary study results indicated that the population adjusted ratios for the rehabilitation workforce are alarmingly low. The number of therapists at primary level are minimal in comparison with secondary hospitals. There is a large disparity between the number of therapists working in rural areas versus the large number who work in urban areas. A third of the rehabilitation workforce rely on community service posts to staff their facilities.

**Conclusion**

Collectively these findings imply that many people depending on the public sector arguably do not have access to rehabilitation services. South Africa will have to invest in strategies to monitor workforce capacity overtime to ensure further declines in the public health sector.
Opsomming

Agtergrond

Rehabilitasie kapasiteit hulpbronne is beperk of soms vermis in lae- en middelinkomstelande. Arbeidsmag is ingewikkeld gekoppel met ander gesondheidsisteme komponente en is noodsaaklik in leierskap en bestuur, die bestuur van finansiële hulpbronne en tegnologie en rehabilitasie dienstlewering. ’n Arbeidsmag wat voldoende in nommer, vaardighede en word billik versprei is noodsaaklik. Die klassifikasie van die rehabilitasie arbeidsmag is te kort aan ’n algemene definisie. ’n Standaard stel van beskrywers en aanwysers om die rehabilitasie arbeidsmag kapasiteit te beskryf sal toelaat vir vergelyking tussen lande en streke. Hierdie rehabilitasie arbeidsmag data is belangrik om ’n basislyn te voorsien vir bepleit om rehabilitasie arbeidsmag kapasiteit te verbeter.

Doel

Die doel van die omvangsbepaling studie was om te sien hoe rehabilitasie arbeidskrag kapasiteit data te beskryf en om die beskrywers en aanwysers te sintetiseer. Die doel van die primêre studie is om die rehabilitasie arbeidskrag in die openbare sektor van Suid-Afrika te beskryf in drie plattelandse provinsies met betrekking tot die nommer van terapeute, die verspreiding volgens bevolking, tipe professie en kwalifikasies, verspreiding tussen plattelandse en stedelike streke, salarisvlakke en vlak van sorg.

Metode

Die navorsing bestaan uit ’n omvangsbepaling studie en ’n primêre studie. Die ombangsbepalingstudie het primêre eweknie geëvalueerde studies oor rehabilitasie arbeidskrag ingesluit. Rehabilitasie arbeidskrag beskrywers en aanwysers was onttrek en gesintetiseer. Die resultate was gebruik om die primêre studie se arbeidskrag data te beskryf. Die primêre studie was deursnee web-gebaseerde opname studie deur REDCap. Die data was onttrek en saamgestel in Excel en geanaliseer in SPSS en STATA.

Hoofresultate

Die bevindings van die omvangsbepaling studie wys dat bevolkings aangepaste verhouding en absolute nommer van terapeute word gebruik om die verskaf van die rehabilitasie arbeidsmag aan te dui. Die verspreiding tussen plattelandse en stedelike, en openbare en privaatsektore word gebruik om die oneweredige verskaffing te verduidelik. Onderdom en geslag word gebruik om die demografiese inligting van die rehabilitasie arbeidskrag inligting
te beskryf. Die resultate van die primêre studie wys kommerwekkende lae vlakke van die rehabilitasie arbeidskrag verspreiding volgens bevolking. Die aantal terapeute in die primêre vlak is minimaal in vergelyking met die sekondêre vlak. Die oneweredigheid tussen terapeute in plattelandse areas en stedelike areas is groot. 'n Derde van die rehabilitasie arbeidskrag is afhankend van gemeenskapsdiens poste om die fasiliteite te beman.

**Gevolgtrekking**

Gesamentlik impliseer hierdie bevindinge dat baie mense wat afhanklik is op die openbare sektor waarskynlik nie toegang tot rehabilitasie dienste het nie. Suid Afrika sal in strategieë moet belê om die arbeidsiens kapasiteit te monitor oor tyd om seker te maak dat daar geen verder afname in die openbare gesondheid sektor is nie.
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List of acronyms

LMICs: Low-middle-income countries
WHO: World Health Organisation
HRH: Human Resources for Health
HICs: High-income countries
PHC: Primary Health Care
FTE: Full-time equivalent
PT: Physiotherapy
OT: Occupational therapy
SLT: Speech-language therapy
ST: Speech therapy
AU: Audiology
STA: Speech therapy and audiology (dually qualified)
STARS: Systematic Assessment of Rehabilitation Situation
TRIC: Template for Information Collection
DoH: Department of Health
MOPs: Medical orthotists and prosthetists
REDCap: Research Electronic Database Capture
QR code: Quick response code
HPCSA: Health Profession Council of South Africa
PERSAL: Personnel and Salary System
NDoH: National Department of Health
CHAI: Clinton Health Access Initiative
OMP: Orientation mobility practitioners
CPD: Continuous Professional Development
OSD: Occupation specific dispensation
PMDS: Performance monitoring and development system
Glossary

**Physiotherapist**: “A Physiotherapist assesses, treats and manages a wide variety of illnesses and injuries, including ailments from the fields of orthopaedics, neurology, respiratory and thoracic, cardiovascular, obstetrics, sports medicine, paediatrics, geriatrics, intensive care units and general rehabilitation [1].”

**Occupational therapist**: “Occupational Therapy is a skilled treatment that helps individuals achieve independence in all facets of their lives. It gives people the skills necessary for independent and satisfying lives. Occupational Therapists work across the lifespan with newborns, young children, people with disabilities, the elderly, and with anyone who has a permanent or temporary impairment in their physical or mental functioning. Occupational Therapists help with rehabilitation of neuropsychological deficits, including memory and attention, as well as motor function, sensory function, and interpersonal skills [1].”

**Speech-language therapist**: “A Speech-Language Therapist optimises an individual’s ability to communicate and swallow, thereby enhancing the quality of life. Speech-Language Therapists provide services across the lifespan to all age groups from neonates to the geriatric population, to individuals, families and groups from diverse linguistic and cultural backgrounds. The professional functions in Speech-Language Therapy include clinical/educational services (diagnosis, assessment, planning and treatment), prevention, advocacy, education and administration [1].”

**Audiologist**: “Evaluating and determining the range, nature and degree of people’s hearing function in relation to their auditory efficiency and communication needs, including observation, the use of electro-acoustic instrumentation, and assessing receptive and expressive speech and language pathologies associated with hearing impairment. The planning, conducting or directing of or participating in the habilitation and/or rehabilitation of people with hearing pathologies, including the fitting and use of hearing aids, auditory training, speech reading, signing systems, speech conservation, speech and language acquisition, counselling and guidance related to the hearing impairment and to hearing conservation programmes [1].”

**Speech Therapist and Audiologist**: Dual qualified Speech-language therapist and audiologist [2].

**Primary health care**: “Is the first level of contact for individuals seeking healthcare [1].”
Secondary health care: “Is specialist care that is typically rendered in a hospital setting following a referral from a primary or community health facility [1].”

Tertiary health care: “Specialist services rendered at this level will include theatre and ICU physiotherapy, as well as services rendered at the regional level [1].”

Supply: “Supply is influenced by a range of factors, namely the actual number, type, and geographic distribution of healthcare providers, the production, recruitment and retention, licensing, regulation, and scope of practice, migration, and employment status of health care providers [3].”

Ratios: “An overall measure of supply within a workforce is the HHR ratio, which is generally expressed as a ratio in the absolute number of health professionals to a sub-set of the population [4].”
1 Chapter 1: Introduction

1.1 Background

Rehabilitation capacity is the extent to which a health system can provide rehabilitation services in a country or region [6]. The local context, need and opinions of an area can significantly influence the capacity of the rehabilitation services [7]. An assessment of rehabilitation services is the first step towards understanding rehabilitation capacity [8]. The assessment of rehabilitation capacity should consider the availability of resources [7–9]. These resources are also influenced by the context and may vary from financial to human resources [6, 7]. Rehabilitation capacity resources are limited or sometimes may be missing completely in low- and middle-income countries (LMICs) [10]. In these countries, the empowerment of the community to build the capacity of their public health systems have been encouraged ever since the conversations on the improvement of capacity were started in the 1970s [7, 11]. However, policies and literature have not recognised that the idea of capacity building and development are not specific and can therefore not be applied to all contexts [11]. As a result, nearly four decades later, the elements of rehabilitation capacity improvement are however still not fully understood [7].

The World Health Organization (WHO) developed the Rehabilitation in Health Systems: A Guide to Action (the Guide) to assist countries or regions to assess their baseline rehabilitation capacity [6]. As a framework for this assessment, the Guide suggests using the WHO's six building blocks of the health system: leadership and governance, financing, service delivery, health information systems, medicines and technology, and health workforce [6, 12]. These can be used as components to better understand rehabilitation capacity. In addition to these building blocks, the Guide has added emergency preparedness as another component to understand the rehabilitation capacity of a country or region [6]. This is especially relevant to our current situation where we have seen how the COVID-19 pandemic has put pressure on health services [6, 10]. One of the health services that has suffered the most during this time is the rehabilitation service [13]. The lack of resources that have become apparent in each of these building blocks has shown not only how unprepared rehabilitation services are for emergencies, but also the gaps in these services [14]. Notably, the component that has been affected the most during this time is the rehabilitation workforce [13]. Without a sufficient workforce, none of the other components can function properly [15].

Workforce is intricately linked with all the other health system components and is essential in leadership and governance, management of financial resources and technology, and rehabilitation service delivery [8]. A workforce that is sufficient in number, skills and equitably distributed is vital [8]. Rehabilitation workforce capacity influence the accessibility and quality of the rehabilitation
services [15]. To provide a quality and equitable service that is accessible, the rehabilitation capacity should be known in order for monitoring and planning purposes. It is therefore paramount to first assess the rehabilitation workforce capacity, particularly in under-served rural regions [8, 15]. Understanding rehabilitation workforce capacity is a complicated process as it should consider the country contexts in different geographical regions [10]. Therefore, various elements of the rehabilitation workforce should be taken into consideration when assessing the workforce capacity [16].

Rehabilitation workforce capacity encapsulates various aspects such as profession types, level of appointment, distribution between levels of care, urban and rural areas and public versus private sector. According to the WHO Rehabilitation Competency Framework, the rehabilitation workforce can be diverse and consists of multiple disciplines, levels within each disciple that are not universal and formal or informal recognition specialisation in disciplines [17]. WHO defines a rehabilitation worker as "a person delivering or supporting the delivery of rehabilitation, whether interacting directly or indirectly with a person, their family or service-user groups" [8]. It also defines rehabilitation as "a set of interventions designed to optimize function and reduce disability in individuals with a health condition in interaction with their environment" [8]. According to the above definitions, any healthcare worker that is involved with a person needing rehabilitation can be classified under the rehabilitation workforce [18]. In many countries, a professional falling under the above category is classified as an "allied health worker" [7, 16]. An "allied health worker" can often also be a radiographer or dietitian in some countries [16]. The WHO classification of a "rehabilitation worker" also include other professionals such as nurses and psychologists who specialize in rehabilitation [8, 17]. However, WHO includes occupational therapists, audiologists, speech-language therapists, physiotherapists and orthotists and prosthetists as the core rehabilitation professionals globally [8].

The classification of the rehabilitation workforce, therefore, lacks a common, global definition [15, 16, 19]. This can also apply to the classification of rehabilitation workforce elements [15, 19]. As a result, very little research has been conducted on the rehabilitation workforce and there are, therefore, gaps in the literature on the descriptors and indicators used to describe the rehabilitation workforce capacity [15, 16, 19]. Consequently, descriptors and indicators appear to be variable, despite similarities [17]. Some of these are the number of rehabilitation workers; density per population or beds; distribution across levels of care, geography (e.g., rural versus urban), position or qualifications; and rehabilitation need or demand [15, 16, 19, 20]. A standardised set of descriptors and indicators to describe rehabilitation workforce capacity allows comparison between countries or regions [8, 10].

In many LMICs the rehabilitation services are provided at specific levels only, such as tertiary levels, and are often only provided by one or two of the rehabilitation workforce types [8]. Often this is due
to scarcity and disintegrated data and information on the rehabilitation workforce [15, 19]. This in turn is due to the lack of awareness or political willpower in a country [19]. The rehabilitation workforce data is important to provide a baseline for advocating to improve rehabilitation workforce capacity (if needed) [21].

Identifying these gaps and having baseline data is important as it assists with the comparison of the rehabilitation workforce, particularly under-served rural regions [18]. Those living in the rural areas of South Africa especially do not have access to rehabilitation services [4]. The Framework Strategy for Disability and Rehabilitation Services in South Africa (FSDR) further states that there is an inequitable distribution of rehabilitation workforce and high vacancy rates across all levels of care, but more specifically at primary health care. There is a general lack of information, evidence and poor quality in rehabilitation workforce data [2]. Evidence-based information on rehabilitation workforce data cannot occur unless work is put into better availability, timeliness, comprehensive and reliable data [3]. In South Africa’s Human Resources for Health Strategy (HRH Strategy) it states that there is a need for a workforce registry which has the capacity to provide reliable data that is immediately available to inform the planning and management of human resources for health [5]. The HRH Strategy’s second strategic priority, Intelligence and Planning, states that the establishment of an electronic database and an electronic health workforce registry can validate the status of current healthcare workers and capture important information about the health workforce in South Africa [6]. The HRH strategy also highlights the lack of reliable data of rehabilitation in the public sector, which limits planning of services as well as inclusion of rehabilitation into initiatives such as NHI.

This study will therefore aim to scope for literature on rehabilitation workforce capacity to collate and summarize the evidence on rehabilitation workforce descriptors and indicators. To the best of our knowledge, this is the first study that will attempt to collate data on all rehabilitation workforce professions across countries. The results of this study may assist with the development of a framework for future research to standardize the classification of the rehabilitation workforce capacity data and information.

1.2 The aim of this study is twofold;

1) To see how rehabilitation workforce data is described and secondly to synthesise the descriptors and indicators of the workforce data.

To achieve the study aim, the following objectives will be completed:

a) understand the data collection methods or data sources used to collate rehabilitation workforce capacity information (descriptors and indicators),
b) synthesize which descriptors and indicators are used to describe (or quantify) how national or regional rehabilitation workforce data (e.g., type of therapist, qualifications and work setting), explore how the rehabilitation workforce is described relative to population needs.

2) To describe the rehabilitation workforce in the public sector of South Africa in three rural provinces with respect to number of therapists, distribution by population, type of therapists and qualifications, distribution between rural and urban, salary levels and level of care.

The study objectives were to describe the rehabilitation workforce data by:

a) the total number of rehabilitation workers per profession: audiology, occupational therapy, physiotherapy, speech and language therapy, and speech and audiology therapists

b) the distribution of each of the professions per province

c) the distribution of each of the professions per level of care: primary, secondary and tertiary

d) the distribution of each of the professions into rural and urban facilities

e) the distribution of each of the professions into salary grades: technician/assistant, community service, production level, chief and assistant director

f) the distribution of each of the professions per 10 000 population

1.3 Problem statement

The rehabilitation workforce capacity in South Africa is insufficient and is inequitably distributed. The rehabilitation workforce data that is captured is unreliable and does not contain sufficient information to determine the workforce capacity. Without this information planning for rehabilitation workforce cannot be done efficiently. It is generally known that the areas where the rehabilitation need is the greatest has the least number of therapists. Without this information this problem cannot be addressed. Provincial rehabilitation managers are attempting to maintain databases to estimate the distribution and number of therapists in their provinces. DoH have implemented the community service program to improve the capacity of the rehabilitation workforce in the public sector. However, an improved system should be implemented to collect and maintain the information and data on rehabilitation workforce capacity.

1.4 Structure of this thesis

This thesis is presented as follows:
Chapter 1: An introduction chapter which provides information on the background and rationale for this study.

Chapter 2: A scoping review presented in journal article ready format.

Chapter 3: The methodology of the study.

Chapter 4: The results of the study.

Chapter 5: The discussion of the study.

Chapter 6: The conclusion of the study.
2 Chapter 2: Scoping Review

Title: Describing the quantity and characteristics of the rehabilitation workforce: a scoping review

2.1. Introduction

There are numerous recommendations and suggestions in the literature regarding standardisation, classification and descriptors of rehabilitation workforce capacity [16]. Understanding how rehabilitation workforce data is described can be useful to promote and advocate for strengthening of the rehabilitation workforce and allocation of funding for research into this field at a national level. Globally standardisation of workforce descriptors can enable comparisons between countries and monitoring of the quality and availability of rehabilitation workforce across world bank regions [10, 15, 16, 18, 19]. Arguably the first step is to understand how rehabilitation workforce is described in the literature.

This chapter presents a scoping review on published information on rehabilitation workforce descriptors and indicators. To the best of our knowledge, this is the first attempt to scope the information of workforce descriptors which includes all rehabilitation professions. The results of this study can assist in defining how rehabilitation workforce in South Africa is described and classified.

2.2. Methods

2.1.1 Study design

The scoping review was conducted according to the five-step framework first developed by Arksey and O’Malley [22]. These steps are i) identifying the research objective(s), ii) identifying relevant studies, iii) study selection, iv) charting the data, and v) collating, summarising and reporting the results. The review included a broad search on literature regarding the rehabilitation workforce and how countries quantify and describe the rehabilitation workforce.

2.1.2 Identifying the research question

The research objectives assisted in determining the eligibility criteria, guided the scope of the study and determined an effective search strategy.

To achieve the overall study aim, the following objectives were completed:
1) understand the data collection methods or data sources used to collate rehabilitation workforce capacity information (descriptors and indicators),

2) synthesis of which descriptors and indicators were used to describe (or quantify) national or regional rehabilitation workforce data (e.g., type of therapist, qualifications and work setting) and explore how the rehabilitation workforce is described relative to population needs.

2.1.3 Identifying Relevant Studies

2.1.3.1 Search Strategy

A broad and comprehensive three-step search strategy was undertaken to identify published studies in each of the following five databases: PubMed, CINAHL, Scopus, Science Direct and Web of Science. These databases were chosen in consultation with a librarian as they yielded the most relevant results. Databases such as Africa Wide and EBSCOHost were excluded for this reason. As a first step, an initial limited keyword search was conducted in PubMed using key terms related to “rehabilitation workforce”, “physiotherapy”, “physical therapy”, “occupational therapy”, “speech therapy”, “speech-language therapy”, “audiology”, “allied health”, “rehabilitation workforce”, “human resources”, “human resources for health”, “staffing”, “supply”, “population needs” and “demographics”.

This was followed by an analysis of the text words of the titles and abstracts of potentially relevant articles, and of keywords used to index the article. A second search was undertaken including the identified additional or refined index and keywords across all databases. The preliminary search string that was developed for PubMed is provided in Addendum 1. Thirdly, all the reference lists of identified literature were searched to include additional evidence that might have been missed in the electronic database searches. A librarian was consulted to ensure that these searches were methodical and transparent.

All database search outcomes were transferred to Rayyan – software for systematic reviews [23]. Deduplication of all articles was conducted using Rayyan before the screening of titles and abstracts.

2.1.3.2 Inclusion and exclusion criteria

Type of evidence sources

The scoping review included peer-reviewed primary studies, published in English, on rehabilitation workforce. We considered descriptive, cross-sectional and cohort designs. Grey literature and studies published before 2000 were excluded from this study. Studies, where the full texts were not available, were also excluded. No geographical limitations were applied.
Types of Outcomes

Rehabilitation workforce capacity demographics such as profession type, gender, age, race, whether they are working in the private or public sector or are they working full- or part-time. Rehabilitation workforce capacity indicators such as the total number of rehabilitation workforce, ratio per population, rural vs urban distribution, distribution between levels of care or rehabilitation needs or demand. Studies only reporting on forecasting will be excluded.

Population

Only literature that included the rehabilitation workforce or at least one of the professions that are classified as rehabilitation professionals in the relevant countries (such as physiotherapy, occupational therapy, speech-language and hearing therapy/p enhology and audiology) were considered [1].

2.1.4 Study selection

Following deduplication, one reviewer (TC) screened all the titles and abstracts retrieved and determined whether they were eligible for inclusion. Titles and abstracts that were eligible was included for full-text review, which was again screened against the review eligibility criteria. If the reviewer (TC) was unsure of a study’s eligibility, they discussed these studies with the second (QAL) and third reviewers (KB). Ineligible studies were excluded and reasons for ineligibility was documented. If any further clarification of the literature was needed during the screening process, the authors were contacted directly.

2.3 Data charting

Based on a discussion between the reviewers, a draft data extraction form was developed in Microsoft Excel to ensure that all important and relevant data about the study objectives were included in the form. The form was piloted using four or five randomly selected articles that fitted the eligibility criteria. The form was adapted when additional unforeseen data were found that were deemed important in terms of contributing to the review objectives. The data from the final sample of included articles were extracted using the final version of the data extraction form (see Addendum 2).

2.4 Data analysis

The data from the final sample of included articles was extracted using the final version of the data extraction form. Descriptive information, including the overall number of studies included, types of study design, years of publication, countries included, and professional type was summarised quantitively. Information and data on type of data collection methods and data
sources used to collate the rehabilitation workforce capacity information was described narratively. The demographic and work setting related descriptions (e.g., urban and rural, private and public or age and gender) of the rehabilitation workforce data was also described in a similar manner. Metrics used to describe or quantify how the national or regional rehabilitation workforce data was described and synthesised. To enable comparison and ease of interpretation of the findings regarding the workforce supply, percentages were calculated and, where data was available, ratios per 10 000 of the population were determined. Where ratios were per 1000 or 100 000, the ratio was adjusted to 10 000 population. Studies that conducted retrospective analyses, the most recent year’s data were reported.

2.5 Results

2.5.1 Selection of studies

The first search produced 538 studies, 213 duplicates were excluded and 287 did not comply with the inclusion criteria based on title and abstract screening (500 in total). Full text records of the remaining 38 studies were screened and 4 further studies were identified via PEARLing. After full-text screening, a further 24 studies were excluded, and 18 studies remained for analysis (Figure 2.1).
2.5.2 Study characteristics

The included studies were published between 2005 and 2020. Ten out of the 18 studies were published in the last five years. The included studies were conducted in 10 countries (see Figure 2.2), except for the one article including 35 HICs [24].
In the study conducted by Jesus et al (2020) [21], five of the ten countries are also included in
the 35 countries (see Table 2.1). Only four of the countries included in the studies are LMICs
[2, 25–28]. Of the four LMICs, South Africa [2, 28] and Brazil [26] are higher middle-income
countries, while Pakistan [27] and Bangladesh [25] are lower-income countries. The United
States (US) was included in nine of the studies [24, 25, 29–34], Canada in five [4, 24, 30, 35,
36] and Australia in three [24, 37, 38].

Table 2.1: 35-HICs included in Jesus, 2020

<table>
<thead>
<tr>
<th>35-HICs</th>
<th>Argentina</th>
<th>Australia</th>
<th>Belgium</th>
<th>Canada</th>
<th>Chile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyprus</td>
<td>Czech Republic</td>
<td>Denmark</td>
<td>Finland</td>
<td>France</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>Greece</td>
<td>Iceland</td>
<td>Ireland</td>
<td>Italy</td>
<td></td>
</tr>
<tr>
<td>Israel</td>
<td>Japan</td>
<td>Latvia</td>
<td>Lithuania</td>
<td>Luxembourg</td>
<td></td>
</tr>
<tr>
<td>Malta</td>
<td>Netherlands</td>
<td>New Zealand</td>
<td>Norway</td>
<td>Panama</td>
<td></td>
</tr>
</tbody>
</table>
One of the studies, compares physiotherapy between Canada and the US [30], the data used in that study was sourced from one of the other studies reporting on Canada only [4]. The other two studies reporting on physiotherapy in Canada are both based in Saskatchewan and published in the same year using the same data sources [35, 36]. One of these studies reported on the distribution of rural versus urban physiotherapists, and the other reported on PHC physiotherapists. The fifth study reporting on Canada is the study comparing 35-HICs [24] which is also one of the studies that included the US and Australia. Physiotherapy was the more dominant profession included in the studies (n=13, 76%) and seven of these reported on physiotherapy only [4, 25, 29, 30, 35–37, 39].

Two studies [35, 37] described a specific level of care and two studies [31, 41] described specific population groups. One study described only the primary health care (PHC) [36] workforce, the second study looked at the workforce providing services to adults requiring inpatient general rehabilitation [38]. There were two studies that reported the audiology workforce [31, 32]. The one study included the workforce licenced to issue hearing aids and considered the population ≥ 65 years of age with hearing loss [31]. Seventeen of the studies were database reviews and one of the studies was a cross-sectional survey [38] (see Table 2.2).
Table 2.2: Summary of study characteristics

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Country</th>
<th>Study design</th>
<th>Aim</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physiotherapy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anderson, 2005</td>
<td>Australia</td>
<td>Database Review</td>
<td>To generate a profile of the physiotherapy profession in New South Wales.</td>
</tr>
<tr>
<td>Landry, 2007</td>
<td>Canada</td>
<td>Database Review</td>
<td>To estimate HHR ratios across provincial jurisdictions by combined population data with lists of registered PTs</td>
</tr>
<tr>
<td>Landry, 2009</td>
<td>US &amp; Canada</td>
<td>Database Review</td>
<td>To estimate PT HHR ratios across the US to conduct a comparative analysis of US and Canada</td>
</tr>
<tr>
<td>Zimbelman, 2010</td>
<td>US</td>
<td>Database Review</td>
<td>To examine current and future PT job surplus/shortage trends across the US</td>
</tr>
<tr>
<td>Bath, 2015</td>
<td>Canada</td>
<td>Database Review</td>
<td>To compare demographics and clinical characteristics and map the distribution between PTs in rural &amp; urban areas</td>
</tr>
<tr>
<td>Shah, 2015</td>
<td>Canada</td>
<td>Database Review</td>
<td>To investigate differences in geographic accessibility to community-based PTs and FPs</td>
</tr>
<tr>
<td>Jesus, 2016</td>
<td>US, Singapore, Portugal, Bangladesh</td>
<td>Database Review</td>
<td>To examine the PT supply across 4 countries to reflect contextual factors likely to affect PT supply needs</td>
</tr>
<tr>
<td>Eighan, 2018</td>
<td>Ireland</td>
<td>Database Review</td>
<td>To estimate the supply of PTs in Ireland and profile PTs across acute and non-acute sectors and across public &amp; private</td>
</tr>
<tr>
<td><strong>Occupational Therapy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ned, 2020</td>
<td>South Africa</td>
<td>Database Review</td>
<td>To describe the demographic trends of occupational therapists from 2002 to 2018 in South Africa</td>
</tr>
<tr>
<td><strong>Audiology</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windmill, 2013</td>
<td>US</td>
<td>Database Review</td>
<td>To apply the Physician Supply Model to audiology and determine supply of audios and if it will meet future demands</td>
</tr>
<tr>
<td>Planey, 2016</td>
<td>US</td>
<td>Database Review</td>
<td>To assess the relationships between socio-demographic and structural factors and audiologist supply</td>
</tr>
<tr>
<td>Coco, 2018</td>
<td>US</td>
<td>Database Review</td>
<td>To present results from a geographic analysis as part of teleaudiology planning assessment for Arizona</td>
</tr>
<tr>
<td><strong>Audiology &amp; Speech Therapy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pillay, 2020</td>
<td>SA</td>
<td>Database Review</td>
<td>To examine the demographic profile and supply of audios and speech therapists in South Africa</td>
</tr>
<tr>
<td><strong>Physiotherapy and Occupational Therapy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Author, Year</td>
<td>Country</td>
<td>Study Type</td>
<td>Objective</td>
</tr>
<tr>
<td>--------------</td>
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<td>------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Rathore, 2011</td>
<td>Pakistan b</td>
<td>Database Review</td>
<td>To present an overview of Physical Medicine and Rehabilitation in Pakistan, its origins, current status and future plans.</td>
</tr>
<tr>
<td>Jesus, 2020</td>
<td>35 Countries a</td>
<td>Database Review</td>
<td>To determine whether population-adjusted rates of rehabilitation needs are associated with the PT &amp; OT supply across 35 HICs.</td>
</tr>
<tr>
<td>Wilson, 2009</td>
<td>US a</td>
<td>Database Review</td>
<td>To assess the distribution of rehabilitation health professional shortages and the differences between metro/ non-metro counties.</td>
</tr>
<tr>
<td>Barrett, 2015</td>
<td>Australia a</td>
<td>Cross-sectional</td>
<td>To profile staffing levels of allied health professionals and support staff in Queensland Health inpatient services</td>
</tr>
<tr>
<td>Rodes, 2017</td>
<td>Brazil b</td>
<td>Database Review</td>
<td>To estimate the distribution trend of rehabilitation HR in Brazilian HCN, especially for PHC of STs, PTs and PTs</td>
</tr>
</tbody>
</table>

a HICs and b LMICs
2.5.3 Rehabilitation data sources used in included studies

The data analysed by the included studies were retrieved from various publicly accessible resources. More than half of the studies (n=11) used data from professional associations [2, 4, 24, 25, 28, 32, 33, 35, 37, 39]. The professional associations were either regional (n=3) [35–37], national (n=6) [2, 25, 28, 30, 32, 33, 39] or international professional associations (n=2) [24, 25] and were either profession-specific (n=9) [21, 28, 30, 31, 34–36, 38] or general health regulatory boards (n=2) [2, 28]. Eight of the studies [2, 26, 28, 30, 31, 37, 39, 41] used general health databases and some used other government databases such as national census results or government bureau statistics. Only one [38] of the included studies conducted a cross-sectional study specifically aimed at describing rehabilitation workforce.

2.5.4 Workforce descriptions

2.5.4.1 Education

Only two [35, 37] studies reported on qualifications or education of the rehabilitation workforce. One study reported on the number of physiotherapists with postgraduate degrees in New South Wales, Australia [37]. In 2001, 23% of physiotherapists had at least one postgraduate degree. This has increased significantly from 1975 where only 5.4% of physiotherapists had postgraduate qualifications. The second study [35] reported on three elements, institution of qualification, the highest level of qualification and whether they had completed the Physiotherapy Competency Exam in Saskatchewan, Canada. Eighty-one percent of physiotherapists working in Saskatchewan qualified at the University of Saskatchewan, 13% qualified at another university in Canada and 6% qualified internationally. The majority of the physiotherapists (69%) had a bachelor’s degree, 12% had a diploma or certificate and 19% had a postgraduate degree. Physiotherapists who had completed the Physiotherapy Competency Exam was equally distributed.

2.5.4.2 Age and gender

Six of the included studies reported on the age and/or gender of the rehabilitation workforce [2, 28, 32, 35, 37, 39]. Four of these studies examined both age and gender, one study reported on age only and the other study on gender only. Two of the studies that reported on the age of the workforce examined the number per age group [2, 32]. One study reported the median age of physiotherapists working in Saskatchewan [35], and another study reported the modal age of physiotherapists per gender [37]. The remaining four studies that examined the gender of the rehabilitation workforce calculated the distribution between males and females [2, 28, 35, 39]. Table 2.3 shows that at least 70% of the rehabilitation workforce are female most of the therapists are female and that the majority...
of the population are <40 years of age. Only one study had an almost even distribution of audiologists between the age groups of 31-40, 41-50 and 51-60 years.

Table 2.3: Data on age and gender

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Age</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physiotherapy</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Anderson, 2005 | Female Modal Age: 40-44 y  
Male Modal Age: 30-34 y | Female: 76.5% (n=439.11)  
Male: 23.5% (n=134.89) |
| Bath, 2015 | Median age: ≤40 y | Female: 79% (n=508)  
Male: 21% (n=135) |
| Eighan, 2018 | Not reported | Female: 74% (n=1 940)  
Male: 26% (n=677) |
| **Occupational Therapy** | | |
| Ned, 2020 | <40 y: 67.7% (n=3019) | Female: 95% (n = 4193)  
Male: 5% (n = 267) |
| **Audiology** | | |
| Windmill, 2013 | Number in age range  
<30 y: 11% (n=1760)  
31-40 y: 26% (n=4160)  
41-50 y: 25% (n=4000)  
51-60 y: 26% (n=4160)  
>60 y: 12% (n=1920) | Not reported |
| **Audiology and Speech Therapy** | | |
| Pillay, 2020 | <40 y: 63.6% (n=2078)  
>50 y: 12.6% (n=397) | Female: 94.6% (n=3090)  
Male: 5.4% (n=176) |
2.5.4.3 Full-time and part-time

Five studies[32, 35, 37–39] reported on either the distribution of the rehabilitation workforce between full-time and part-time or on the full-time equivalent (FTE) numbers. One study reported part-time as working less than 30 hours a week [37]. Another study reported part-time status as working less than 20 hours a week [32]. A third study reported part-time status as less than 37 hours a week [39]. One study found that 39.4% of the physiotherapists, in New South Wales, worked part-time of which 93.2% were female and 58.7% of the physiotherapists working full-time, 59% were female [37]. The second study reported that only 25% of audiologists in the US worked part-time [32]. Audiologists that did not have a full-time clinical role were included in the 25%. One study reported 202 FTE, allied health staff, for 466 inpatient rehabilitation beds [38]. The fourth study reported that 17% of physiotherapists in Ireland work part-time, with the FTE number at 2617 [39]. The fifth study reported that 25% of physiotherapists in Saskatchewan work part-time [35].

2.5.4.4 Type of Rehabilitation Professions

The majority of studies reported on physiotherapy (76.4%), six of these reported on physiotherapy only [4, 29, 30, 36, 37, 39] (see Table 2.4). Two studies compared physiotherapy to other professions. One of these studies compared physiotherapy to family physicians [35] and the second study compared physiotherapy with occupational therapy, as well as doctors and nurses, although the primary aim was to report on physiotherapy [25]. Four studies reported on audiology, three of these included audiology only [31–33] and the fourth study reported on both audiology and speech therapy [2]. Six studies report on occupational therapy with one study which reports on occupational therapy only [28]. Two studies report on physiotherapy, occupational therapy and speech therapy [26, 34] and another two report on physiotherapy and occupational therapy [24, 27]. The last study reports on physiotherapy, occupational therapy and speech therapy, but also reports on other allied health staff [38].
### Table 2.4: Study and profession type

<table>
<thead>
<tr>
<th>Professions</th>
<th>Author, Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physiotherapy</strong></td>
<td></td>
</tr>
<tr>
<td>Anderson, 2005</td>
<td></td>
</tr>
<tr>
<td>Landry, 2007</td>
<td></td>
</tr>
<tr>
<td>Landry, 2009</td>
<td></td>
</tr>
<tr>
<td>Zimbelman, 2010</td>
<td></td>
</tr>
<tr>
<td>Bath, 2015</td>
<td></td>
</tr>
<tr>
<td>Shah, 2015</td>
<td></td>
</tr>
<tr>
<td>Jesus, 2016</td>
<td></td>
</tr>
<tr>
<td>Eighan, 2018</td>
<td></td>
</tr>
<tr>
<td><strong>Occupational Therapy</strong></td>
<td></td>
</tr>
<tr>
<td>Ned, 2020</td>
<td></td>
</tr>
<tr>
<td><strong>Audiology</strong></td>
<td></td>
</tr>
<tr>
<td>Windmill, 2013</td>
<td></td>
</tr>
<tr>
<td>Planey, 2016</td>
<td></td>
</tr>
<tr>
<td>Coco, 2018</td>
<td></td>
</tr>
<tr>
<td><strong>Audiology &amp; Speech Therapy</strong></td>
<td></td>
</tr>
<tr>
<td>Pillay, 2020</td>
<td></td>
</tr>
<tr>
<td><strong>Physiotherapy &amp; Occupational Therapy</strong></td>
<td></td>
</tr>
<tr>
<td>Rathore, 2011</td>
<td></td>
</tr>
<tr>
<td>Jesus, 2020</td>
<td></td>
</tr>
<tr>
<td><strong>Physiotherapy, Occupational Therapy and Speech Therapy</strong></td>
<td></td>
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<td></td>
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</tbody>
</table>

#### 2.5.4.5 Rehabilitation workforce distribution between public versus private sector

The distribution of the rehabilitation workforce between the public and private sectors was reported in six studies. Four of these studies reported on physiotherapy, one on audiology and speech therapy
and one on occupational therapy. Two of the four studies both reported on the physiotherapy workforce in Saskatchewan, Canada [35, 36]. Both studies reported similar findings, the gap between private and public are almost equally distributed with public supply being just more than 50%. One study distributes the physiotherapy workforce into own practice, private and public sectors, for the purposes of this study own practice and the private sector have been combined [37]. A study conducted in Ireland reported that they had physiotherapists working in either private or public sectors and 3% worked in both the private and public sectors [35]. The previous two studies had similar findings to the two conducted in Canada with the difference of the distribution between public and private sector is small. The two studies conducted in South Africa have a very different distribution where more than 70% are working in the private sector (see Table 2.5 for detail) [2, 28].

Table 2.5: Rehabilitation workforce distribution between public vs private

<table>
<thead>
<tr>
<th>Author</th>
<th>Public</th>
<th>Private</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physiotherapy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anderson, 2005*</td>
<td>41% (n=1231)</td>
<td>59% (n=1756)</td>
</tr>
<tr>
<td>Bath, 2015*</td>
<td>58% (n=347)</td>
<td>42% (n=250)</td>
</tr>
<tr>
<td>Shah, 2015*</td>
<td>53.9% (n=301)</td>
<td>39.4% (n=220)</td>
</tr>
<tr>
<td></td>
<td>Other: 6.6% (n=37)</td>
<td></td>
</tr>
<tr>
<td>Eighan, 2019</td>
<td>53% (n=1682)</td>
<td>43.6% (n=1383)</td>
</tr>
<tr>
<td></td>
<td>Public and Private: 107</td>
<td></td>
</tr>
<tr>
<td>Occupational therapy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ned, 2020</td>
<td>25.2% (n=1305)</td>
<td>74.8% (n=3875)</td>
</tr>
<tr>
<td>Speech therapy and audiology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pillay, 2020</td>
<td>22% (n=719)</td>
<td>78% (n=2548)</td>
</tr>
</tbody>
</table>

*HICs
2.5.4.6 Rehabilitation workforce distribution between urban versus rural

Four of the 18 studies reported on the distribution of the rehabilitation workforce in urban versus rural areas (see Table 2.6). Two of these studies report on physiotherapy only, where large differences can be seen between the rural and urban distribution (see Table 2.6) [35, 37]. One study reports on the distribution of physiotherapy, occupational therapy and speech therapy per 100 000 population [34]. The fourth study reports on the distribution of audiologists who provide hearing aids between rural and urban settings [31]. Table 2.6 shows that most of the rehabilitation workforce are located in an urban setting. The study reporting on the physiotherapy, occupational therapy and speech therapy workforce the difference is not as large as in the other three studies.

Table 2.6: Rehabilitation workforce distribution between urban vs rural

<table>
<thead>
<tr>
<th>Author</th>
<th>Urban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physiotherapy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anderson, 2005*</td>
<td>80% (n=5520)</td>
<td>20% (n=1380)</td>
</tr>
<tr>
<td>Bath, 2015*</td>
<td>89% (n=571)</td>
<td>11% (n=72)</td>
</tr>
<tr>
<td>Physiotherapy, occupational therapy and speech therapy</td>
<td>Number per 10 000 population</td>
<td>Number per 10 000 population</td>
</tr>
<tr>
<td>Wilson, 2009*</td>
<td>PT: 5.09</td>
<td>PT: 3.55</td>
</tr>
<tr>
<td></td>
<td>OT: 2.47</td>
<td>OT: 1.53</td>
</tr>
<tr>
<td></td>
<td>ST: 3.5</td>
<td>ST: 2.95</td>
</tr>
<tr>
<td>Audiology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coco, 2018*</td>
<td>94% (n=829)</td>
<td>6% (n=50)</td>
</tr>
</tbody>
</table>

*HICs

2.5.4.7 Workforce distribution between level of care

Only four studies reported quantitative data, two studies on the distribution of the rehabilitation workforce per level of care [26, 39] and the other two studies reported on data from a level of care
[36, 38]. The study reporting on the rehabilitation workforce in São Paolo, Brazil examined the distribution per level of care for São Paolo the city and at the state level and nationally [26]. In Brazil the levels of care are PHC, Specialised Ambulatory Care and Hospital Care. The other study reporting on physiotherapists per level of care calculates the distribution between acute and non-acute care. There were 1774 physiotherapists working in non-acute care and 846 in acute care [39]. One study reported on the rehabilitation workforce capacity of general inpatient beds in Queensland, Australia (466 beds) [38]. One of the studies conducted on physiotherapists in Saskatchewan report on the availability at PHC level [36].

2.5.5 Rehabilitation workforce density/ supply

2.5.5.1 Supply

More than half (n=13) of the studies [2, 4, 39, 27, 28, 30, 31, 35–38] reported the absolute totals of the rehabilitation workforce. Eight of these studies provide totals at the national level and the other five at the regional level. Two of these four studies report on totals not only for a specific region but also for a specific population. One study reports on the number of audiologists (n=879) who serve the population in Arizona, United States who are most likely to have hearing impairments [31] and the other study in Queensland, Australia report on the FTE (n=119) of general inpatient beds [38]. Two studies report on the total physiotherapists (n=643) in Saskatchewan, Canada [35, 36] and the third study reported on physiotherapists (n=6900) in New South Wales, Australia [37]. Three of the studies reporting on national totals were conducted in Canada (n=15 772), the US (n=167 810) and Ireland (n=3172) for physiotherapy [4, 30, 39]. One of the studies reported on the physiotherapy and occupational therapy workforce in Pakistan (n=1150) [27]. Two studies reported on the occupational therapy (n=5180), and audiology and speech therapy (n=3266) workforce in South Africa [2, 28]. See Table 2.7 for the supply of professions not included in the national ratios.
Table 2.7: Supply of professions (not included in national ratios)

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Province or State</th>
<th>Total PT</th>
<th>Total OT</th>
<th>Total ST</th>
<th>Total AU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anderson, 2005</td>
<td>NSW, Australia</td>
<td>n=718</td>
<td>Not reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wilson, 2009</td>
<td>United States a</td>
<td>4.28/ 10 000</td>
<td>2.67/ 10 000</td>
<td>2.94/ 10 000</td>
<td></td>
</tr>
<tr>
<td>Shah, 2015</td>
<td>Saskatchewan, Canada</td>
<td>4.6/ 10 000 b</td>
<td>Not reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(n=615)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bath, 2015</td>
<td>Saskatchewan, Canada</td>
<td>5.97/ 10 000</td>
<td>10 000</td>
<td>Not reported</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(n=617)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barrett, 2015</td>
<td>Queensland, Australia c</td>
<td>44.5% (n=53)</td>
<td>36.8% (n=43.8)</td>
<td>18.82% (n=22.4)</td>
<td></td>
</tr>
<tr>
<td>Coco, 2018c</td>
<td>Arizona, Canada</td>
<td>Not reported</td>
<td></td>
<td></td>
<td>4.25/ 10 000 d</td>
</tr>
<tr>
<td></td>
<td>(n=332)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend: PT-physiotherapy, OT-occupational therapy, ST-speech therapy, AU-audiology and NSW-New South Wales

Ratios per 10 000 population

a Health shortage areas population
b PHC population
c General inpatient rehabilitation beds
d Audiologists registered to issue hearing aids
e Population ≥65 with hearing loss

2.5.5.2 Population adjusted ratios

Thirteen of the studies reported on the population-adjusted ratios [2, 4, 39, 43, 24–26, 28–30, 33, 37] . The population ratio varied from 1000 per capita to 100 000. All four of the LMICs reported population-adjusted ratios of less than one per 10 000 capita [2, 25, 26]. One of the studies compares the population-adjusted ratio of 35-HIC [24].

Figure 2.3 shows the ratio of physiotherapists per 10 000 population of those studies that included ratios [4, 25, 26, 29, 30] in their findings and for those that provided total numbers, population ratios were calculated [27, 39].
Figure 2.3: Comparison of population adjusted ratios for physiotherapists.

Figure 2.4 shows the ratios of occupational therapists per 10 000 years reported in the study findings [25, 26, 28] and the ratio for Pakistan was calculated [27].

Figure 2.4: Comparison of population-adjusted ratios for occupational therapists.

Figure 2.5 shows the ratios of audiologists and speech therapists reported in study findings [2, 26, 32, 41].
Figure 2.5: Comparison of population-adjusted ratios for speech therapy and audiology


Figure 2.6 shows the ratios of physiotherapy and occupational therapy combined per 10 000 population of the 35-HICs [16] and for the studies that provided data to calculate the combined ratios [25, 26].
Figure 2.6: Physiotherapy and occupational therapy combined number per 10,000 population per country
2.6 Discussion

This is the first scoping review on examining the descriptors and indicators of the rehabilitation workforce capacity. Although only four LMICs were included in the review, the main descriptors and indicators included can be applied to various contexts and settings. The outcome of this review illustrates descriptors that are applicable across a range of settings with consideration of contextual factors.

One third (33%) of the studies included [2, 28, 32, 35, 37, 39] reported on the age and gender of the rehabilitation workforce. Many of the studies used publicly available data which did not include data on age and gender. Anderson et al (2005) commented that the modal age is a “statistic of great significance” and that it can be a predictor of the profession’s longevity [37]. A profession that is aging (>45 years) may affect the number of hours worked by the therapists. Ned et al (2020) comments that a younger profession (<40 years) may show that there is poor retention of therapists in the profession [28].

The majority (78%; n=13) of the included studies reported on physiotherapy, many of these were conducted on physiotherapy only (n=8) [4, 25, 29, 30, 35–37, 39]. Physiotherapy is often seen as the main profession that addresses physical disabilities [15, 25]. This is especially the case in LMICs where there are few rehabilitation professionals, physiotherapy is the dominant profession. Rathore et al (2011) reported that there is only one occupational therapy training program in Pakistan which contributed to the low number (n=150) of occupational therapists [27].

The distribution of the rehabilitation workforce between rural and urban settings is reported in four of the studies [31, 35, 37, 44], while some studies only commented that there was disparity between urban and rural settings [25]. In many of the studies there was also no information on whether rehabilitation professionals worked in rural or urban areas. The studies that did report on the disparity between urban and rural rehabilitation workforce practices obtained their data from various sources. Two of the studies used the place of employment address requested from the professional body registration data. Other studies used data provided by universities or government registries.

Six of the studies (33%) [2, 28, 35–37, 39] report data on the distribution of the rehabilitation workforce between the public and private sectors and only two countries reported on the distribution per level of care. In the HICs there was not a large disparity between the number of therapists working in private or public practice and some studies may have not included the distribution due to this. Some studies reported that the data was not available in the registries which were used as sources.
Majority of the studies [2, 4, 39, 27, 28, 30, 31, 35–38] indicated the total number of rehabilitation workforce. Many of the studies used the absolute total numbers as baseline data and to conduct further calculations or analyses. Some used it for forecasting the rehabilitation workforce supply, determining the need for rehabilitation or calculating the ratio of therapists. The absolute totals were also used to conduct a retrospective analysis of the growth trend in the rehabilitation workforce.

More than half of the studies [2, 4, 39, 43, 24–26, 28–30, 33, 37] reported on population adjusted ratios to compare the rehabilitation workforce capacity within regions of the same country and across countries. Although some of the studies reported that the population adjusted ratios are not as useful without a benchmark, many studies used the population adjusted ratios to compare the distribution of therapists across counties or states, between urban and rural divide and even across countries. Two of the studies [25, 36] also found it useful to compare ratios of rehabilitation professionals to other health professionals as a way to determine the rehabilitation workforce capacity.

2.7 Limitations

There was only one reviewer doing the initial search and screening of titles and abstracts which may introduce bias. The review included primary peer-reviewed studies, this may have limited the data available in the grey literature or secondary studies. Only studies published in English were included which possibly excluded studies from LMICs. None of the authors were contacted for a better understanding of their study findings. The included studies were limited to studies reporting on rehabilitation workforce capacity, this excluded studies that were on rehabilitation workforce but did not include the capacity thereof. Studies conducted on occupational therapy only were therefore excluded. Only four databases were used to conduct this study which would exclude studies only available in other databases that the researcher and librarian were not aware of. These are excluding the databases that did not yield relevant search results.

2.8 Conclusion

This scoping review provided an overview of which descriptors and indicators are used to describe rehabilitation workforce capacity internationally. This study is a first step towards the development of a minimum framework to standardise the description of the rehabilitation workforce and allow comparison between different settings. This will contribute to the recommendations of the studies that a benchmark or minimum standard on rehabilitation workforce capacity be established.
3 Chapter 3: Methodology

3.1 Chapter introduction

This chapter outlines the study methodology for the primary study. Key aspects highlighted include study design, setting and population, data instrument and design, data collection, data analysis, ethical considerations and methodological rigour.

This study aimed to obtain data from all the rehabilitation workers employed by the Department of Health (DoH) in three rural provinces of South Africa.

The study objectives were to describe the rehabilitation workforce data by:

1. the total number of rehabilitation workers per profession: audiology, occupational therapy, physiotherapy, speech and language therapy, and speech and audiology therapists
2. the distribution of each of the professions per province
3. the distribution of each of the professions per level of care: primary, secondary and tertiary
4. the distribution of each of the professions into rural and urban facilities
5. the distribution of each of the professions into salary grades: technician/ assistant, community service, production level, chief and assistant director
6. the distribution of each of the professions per 10 000 population

3.2 Theoretical Framework of the Study

This study falls under a larger study which is conducting a baseline assessment of rehabilitation services in South Africa (SA). The study is based on a guideline developed by the World Health Organisation (WHO), *Rehabilitation in Health Systems: Guide for Action* [6], to assist countries in conducting the aforementioned research. This study is part of Phase A of the larger project under the Health Workforce section. The Health Workforce section forms part of Phase 1: Assess the Situation (see Figure 3.1 - 3.3) which uses the *Systematic Assessment of Rehabilitation Situation* (STARS) tool as a guide on how to prepare for a situation assessment, conduct data collection and country assessment. The STARS tool
provides a template for guidance on the content of the data collection, *Template for Information Collection (TRIC)* [45].

**Figure 3.1: Guide for Action Process**

**Phase 1. STARS**

**ASSESS THE SITUATION**

- Follow the four steps of the *Systematic Assessment of Rehabilitation Situation (STARS)* to undertake a comprehensive situation assessment.
- Use the *Template for Rehabilitation Information Collection (TRIC)* within STARS to direct collection of data and information.
- Use the *Rehabilitation Maturity Model (RMM)* within STARS to structure the assessment and its findings.
- Produce a high-quality situation assessment report.

**Phase 2. GRASP**

**DEVELOP A REHABILITATION STRATEGIC PLAN**

- Follow the four steps of the *Guidance for Rehabilitation Strategic Planning (GRASP)* to undertake a strategic planning process.
- Produce a high-quality strategic plan.

**Phase 3. FRAME**

**ESTABLISH MONITORING, EVALUATION, AND REVIEW PROCESSES**

- Follow the two steps of the *Framework for Rehabilitation Monitoring and Evaluation (FRAME)* to establish a monitoring framework for the strategic plan and an evaluation and review process.
- Use the *Rehabilitation Indicator Menu (RIM)* to guide selection of indicators, then identify baselines and targets.

**Phase 4. ACTOR**

**IMPLEMENT THE STRATEGIC PLAN**

- Follow the two steps of the *Action on Rehabilitation (ACTOR)* guidance to establish the recurring implementation cycle.
- Build capacity of rehabilitation governance and leadership to improve implementation of the rehabilitation strategic plan over time.

**Figure 3.2: Overview of the phases**
3.3 Study design

In this study, a cross-sectional web-based survey was conducted as this enabled us to collect the rehabilitation workforce information. The cross-sectional design assisted in establishing a good baseline of data to assess the current situation of the rehabilitation workforce in South Africa. Conducting a cross-sectional study also allowed us to measure a large amount of information [46], which is needed to assess the rehabilitation workforce capacity as there is currently very little data on this subject in South Africa [1]. A cross-sectional web-based survey design was also appropriate as both cross-sectional studies and web-based surveys use minimal resources (e.g., financial, time or human) [46, 47]. This was particularly beneficial considering that the study population covers a large geographical area.

3.4 Study setting

The study was conducted in three of South Africa’s rural provinces. These three provinces will be referred to as Province One, Province Two and Province Three. All three provinces have rehabilitation managers who were able to assist with the data collection logistics.
Geographical regions of the study

Provinces One, Two and Three have the highest rural population rates in South Africa compared to the other six provinces [48]. In 2001, 61.2% (n=3 936 529) Province One’s population were classified as "rural dwellers" and 38.8% as urban. The rural vs urban divide in Province Three is smaller with the rural population being 58.7% (n=1 834 556). Province Two has the largest divide between rural and urban populations with 86.7% of the population classified as rural. Provinces One, Two and Three have the highest poverty levels in South Africa [49]. Province One has the largest population of the three provinces (the third highest in South Africa) at 6 996 976, Province Two is next with 5 799 090 (fifth highest in South Africa) and then Province three with a population of 4 335 964 (sixth highest in South Africa) [50]. Province One’s land area is the second-largest in the country at 168 966 square kilometres, Province Two the fifth largest at 125 755 square kilometres, and Province Three the second smallest at 76 495 square kilometres [49]. Currently, 84% of South Africa’s population do not have health insurance and are dependent on the public sector for health care services [51]. According to the most recent general household survey Province Three has the lowest expenditure of health with Provinces Two and One the third and fourth lowest, respectively [52].

3.5 Study population

The study population was limited to the rehabilitation workforce employed by the DoH working at all levels of care (primary, secondary and tertiary) in the public sector of South Africa. Recruitment was done via existing communication channels in the province (WhatsApp groups and memorandums sent to clinical managers of each facility) social media platforms (Facebook, Instagram and Twitter), and word of mouth.

3.5.1 Inclusion criteria

- Audiologists
- Dually qualified Speech and Audiology Therapists
- Occupational Therapists
- Physiotherapists
- Speech and Language Therapists
- Employed by the Department of Health in South Africa
- Physiotherapy assistants and technicians
- Occupational therapy assistants and technicians
- Rehabilitation workers doing their community service
3.5.2 Exclusion Criteria

- Rehabilitation workers employed in non-clinical posts
- Rehabilitation workers employed in the private sector, by non-governmental organisations or non-profit organisations
- Rehabilitation workers employed by the Department of Education
- Medical Orthotists and Prosthetists (MOPs). Although MOPS are also included under rehabilitation in the DoH, they were excluded as few MOPs are working for the DoH and it is, therefore, easier to take stock of their numbers.

3.6 Descriptors of rehabilitation professionals

We collected the following information about each of the rehabilitation professionals who participated in the study:

- Profession Type
- Date of appointment
- Salary grade
- Full- or part-time employment
- Province
- District
- Facility
- Rural versus urban
- Level of Care (primary, secondary or tertiary facility)

3.7 Instrumentation

3.7.1 Data collection tool

The data collection was conducted via a web-based survey using the Research Electronic Database Capture (REDCap) tool. The survey was an open survey distributed via a web link and a quick response (QR) code. The reason for this was so that the link could be distributed among the rehabilitation workforce of each province and ensure that there were no restrictions in the case that someone might have been missed in the distribution of the survey. The survey link and QR code could be used to open the survey on any mobile phone that had internet connectivity. The survey could also be opened on a tablet, laptop or desktop. For those who preferred, the survey was also made available as a PDF document.
3.7.2 Development of the data collection tool

As part of the preparation for the assessment, various government officials and any other relevant stakeholders were consulted to determine whether the survey content covered all of the necessary information required for capturing the relevant data to describe the rehabilitation workforce. Following this, researchers at Stellenbosch University, who are conducting electronic-based research, were consulted to advise on which software would be best suited to the functionality required for the survey. The software for the survey was specifically chosen to ensure that the web-based survey could be opened with any browser on the most basic smartphones, use a minimal amount of mobile data and could be completed with minimal network coverage. The software program was also chosen because it was able to provide automated reports and allowed live monitoring of data collection.

REDCap was chosen as the most appropriate software. The study data was collected and managed using REDCap electronic data capture tools hosted at Stellenbosch University [53, 54]. REDCap is a secure, web-based software platform designed to support data capture for research studies, providing 1) an intuitive interface for validated data capture; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages, and 4) procedures for data integration and interoperability with external sources. REDCap has a two-step verification process to ensure the security of data. It allowed users to access a survey from any browser on a mobile phone with internet. It could also be used on a laptop or desktop.

Once the survey content was determined and the software chosen, the survey was designed with the assistance of a software engineer. The software engineer assisted with ensuring that data validation occurred automatically, that there were no double entries and prevented participants who did not comply with the inclusion criteria from completing the survey. The survey was developed in a format that ensured that the data collection process was user friendly. This was achieved by simplifying the content by minimising the number and the complexity of data fields and ensuring that all required fields were completed. The survey was designed in a format that allowed participants to enter personal information whilst maintaining confidentiality during data analysis.

The survey consisted of two screens. The first page included informed consent details and personal details (see Addendum 1), and the second screen data fields related to employment demographics (see Addendum 2). The first screen consisted of seven data fields and the second screen had more than 50 data fields. Adaptive questioning (e.g., branching logic) was added so that participants were required to complete only 12 data fields. The first screen of
the tool contained information about the study, ethical considerations and informed consent. Personal information about the participant was included on this screen (see Figure 3.4). Participants were required to fill in their Health Professions Council of South Africa (HPCSA) number and, in Province Three, the participants were required to enter their Personnel and Salary System (PERSAL) number. These numbers were used as a unique identifier which prevented participants from entering their data twice. The reason for the change from HPCSA number to PERSAL number in Province Three was due to direct collaboration with NDoH and Clinton Health Access Initiative (CHAI) who will be using this data to validate the PERSAL system. Demographical information on this page, as suggested by the TRIC tool, were initial and surname and date of birth. Participants were also requested to enter their email addresses to allow researchers to contact them with regards to gratuity. To continue to the next screen participants were required to confirm participation in the study. If they chose not to participate the survey would end. In Province Three, the type of profession was added to the first page as the rehabilitation manager requested inclusion of MOPs and orientation mobility practitioners (OMP) in their survey. Adding professions to the first page allowed the OMP participants to skip questions that were not relevant to them (e.g., PERSAL number as they are not on the PERSAL system) and to simplify data analysis.

Figure 3.2: First screen of web-survey
The second screen (see Figure 3.5) included the following data fields; profession type (physiotherapist, occupational therapist, speech and language therapist, audiologist and speech and audiology therapy), undergraduate university, year of graduation and additional qualifications (i.e., master’s or doctoral). In Province Three, the managers requested that we include a data field option for the institute where relevant participants had obtained postgraduate qualifications. Work-related information included salary grade (assistant, technician, community service, production level, chief and assistant director), date of appointment, whether they were working full- or part-time, district and sub-district, and facility where they were employed. If their facility provided outreach services participants were required to select the relevant facilities. An “Other” data field was included as an option in the case where the participants’ relevant facility was not included in the provided options.
Figure 3.3: Screen two of survey
Each province’s survey was created as a separate project. This allowed the researcher to modify the survey according to each province’s needs and to modify the survey as specified by the feedback received from participants in previous provinces. The survey was also converted to a PDF format (see Addendum 3) as an alternative mode, in the cases where participants did not have a smartphone or preferred this mode due to data costs and network coverage.

Mandatory fields were marked with “*must provide value” as seen in Figure 1 and 2. If these fields were not completed an error message appeared at the end of the survey and prevented the participant from submitting the survey unless these data fields were completed. After a review of the survey content and usability, it was decided that a section where participants can check the data they have entered was added at the end of the survey. Participants were then able to go back and change a field if they had found an error. If participants were unable to complete the survey in one session a return code was provided to allow the participant to return to the survey and pick up where they stopped.

3.8 Piloting the data collection tool

The web-based survey was piloted on a group of 15 people working in the same team as the researchers in the Department of Health and Rehabilitation Sciences. The aim of the pilot was to test whether the survey link could be opened on different mobile device brands, operating systems and different browsers, to test the ease of the survey, whether there were any errors or technical difficulties and to ensure that the adaptive questioning worked accordingly. Informal feedback on the experience of completing the survey was asked to determine whether any technical difficulties were experienced, ease of completion and whether the process was easy to understand. The software engineer was consulted again to assist with any errors and improvements on the survey as per the feedback received. The “dummy data” was analysed to ensure the desired reports were achieved. These steps of entering “dummy data” and checking for errors were repeated until all errors and technical difficulties were eliminated. After data completion in each province, feedback and errors were reviewed. The survey was adapted accordingly to ensure that errors and ease of data entry were improved.

The feedback from the survey pilot was that there were some wording errors, adaptive questioning for “other universities” was giving an error message and on some of the entries there was also an error with the “other” option under facilities. These were minor errors that could be easily fixed. Pilot participants were requested to complete the survey again and report whether the error still occurred.
3.9 Data collection procedure

A web-based survey was chosen as the most suitable data collection tool as this would enable us to collect the demographic information from the participants themselves. The link with the instructional video was sent out to the participants again, once the survey was opened, using the existing communication channels. The communication channels were WhatsApp groups, which the managers used to communicate with the therapists or facility managers, professions specific forum managers or district managers. Once the link was received, participants were able to complete the survey. REDCap allows researchers to view the participants’ entries in real-time and to monitor the number of entries completed each day. The managers added the researcher to their WhatsApp communication groups. This allowed the researcher to update the participants on the progress of the data entries, answer any questions which the participants had, or give feedback on any errors or difficulties that were experienced. A meeting with managers and participants was held to validate the data and provide feedback on the data that was received to date. An information session about the project and a short workshop or presentation were included in these meetings as motivation to attend. These sessions were certified to provide participants with Continuing Professional Development (CPD) points. The above processes differed slightly in each of the provinces, as they have different systems in place and some accommodations were made due to the COVID-19 pandemic.
Unfortunately, the first COVID-19 case was identified that week and lockdown level 5 was enforced the following week. Due to this, the data collection process was put on hold to comply with lockdown regulations (see Figure 3.7 for the timeline per province).

Figure 3.5: Data Collection Timeline

The rehabilitation managers of the three provinces were contacted beforehand to ensure that all permission was in place to conduct the data collection, and to discuss which process would be most plausible in their provinces. One month before the data collection started in the relevant provinces, an awareness campaign of the data collection was started via the communication channels that are already in place amongst the rehabilitation workers in that province. This was done in the form of short video clips explaining the purpose of the study, the need for participants and a demonstration of how the survey should be completed. These videos were uploaded to YouTube (https://youtube.com/playlist?list=PLiyhtc3f6Y8nCLy2Pu8Mjqx8JhgGEkqgH) and were also distributed via social media platforms (Facebook, Twitter and Instagram) and any other networks that are known for that province. The social media accounts were created on social media to create awareness around the project.

- Facebook: https://www.facebook.com/CaRe4SA/
- Instagram: https://www.instagram.com/care4sa/
- Twitter: https://twitter.com/CaRe4SA

3.9.1 Province One

Recruitment

Recruitment in Province One commenced on 27 February 2020. The YouTube links to the videos on the project information were sent to the Province One rehabilitation manager via email. The rehabilitation manager distributed these links via their provincial WhatsApp group
with the rehabilitation workforce in their province. These links were also distributed via Facebook, Twitter and Instagram.

**Survey administration**

On 2 March 2020 the survey link was opened and distributed via the provincial WhatsApp group. The researcher was temporarily added to the group to answer any queries or help with technical difficulties, and to give regular updates on how many people had completed the survey.

**Data validation and feedback**

On Friday the sixth of March 2021 an in-person meeting was held with the Province One manager and the therapists in the province who were able to attend. During the meeting data collected to date was presented, participants were requested to contact colleagues from facilities where data was missing and let the researcher know whether the data collected was correct. Data validation was done with the profession-specific provincial coordinators for physiotherapy, occupational therapy, and speech therapy and audiology. At the end of the meeting, 74% of the data had been collected. Once the data was collated the profession-specific coordinators were contacted again to confirm that the data collected was correct and compare with known numbers per facility.

### 3.9.2 Province Two

**Recruitment**

Recruitment of participants in Province Two was initiated by the rehabilitation manager in the province on 4 November 2020. The manager sent a memorandum to all hospital managers, with rehabilitation staff included in the communication, about the project which asked everyone to participate in the therapist survey. The survey advert and video links were sent to the rehabilitation manager who distributed it on their provincial co-ordinators group to distribute via their WhatsApp groups. These links were also distributed via Facebook, Twitter and Instagram.

**Survey administration**

On 23 November 2020, the survey link was opened and distributed via the above channels. The researcher was added to the coordinators WhatsApp group to give regular updates on data collected and answer any questions participants may have had or help with technical difficulties. Unfortunately, data entries were a bit slower in Province Two due to various managers being on leave and the increased workload of the therapists due to the festive
season and COVID-19 infections. We therefore decided to conduct a facility survey by contacting each of the allied health managers at hospitals with rehabilitation staff to provide us with the number of therapists at their facility, profession type, salary level and whether their facility conducted outreach. We initially contacted the managers telephonically to discuss how they would like to provide the information. The following options were presented to them: hold an online meeting with the hospital and help with data entry on the therapist survey, phone the managers again to provide information, send the information via email, or to send it via WhatsApp. For the managers that we were unable to contact telephonically, we sent the above information via an email and WhatsApp. Following this, we had an online meeting with one of the hospitals on 8 December 2020 where we discussed the aims and objectives of the study and gave them assistance on how to complete the survey. We conducted the facility survey until 18 December 2020 and decided to continue with the facility survey in January 2021. Only 21% of data was collected via the therapist survey and the numbers of profession type and salary level were completed via the facility survey.

**Data validation and feedback**

On 1 December 2020 a feedback meeting was held online via Microsoft Teams. This meeting was to provide feedback on the data that we had received up to that point. Following this we conducted the facility survey which was concluded in the week of 2-5 February 2021. The final feedback and data validation meeting was held on 15 February 2021 via Microsoft Teams where we presented data on both the therapist survey and the facility survey.

### 3.9.3 Province Three

After the experiences and lessons learnt from the other provinces, we decided to change the data collection procedure in Province Three and conducted the data collection per district. As Province Three is a relatively small province, this adapted strategy worked well. The district managers were included in the discussion from the beginning. We held planning meetings with the provincial rehabilitation manager and the district co-ordinators on 25 June 2021 and 7 July 2021 via Microsoft Teams. In the meeting, we proposed to conduct the data collection district by district as Province Three is a fairly small province.

**Recruitment**

On 23 July 2021 recruitment was initiated in the first district where information on the survey was distributed to the therapists via WhatsApp. The researcher was also added to the district’s WhatsApp group to assist with any questions or queries about the project. Recruitment in the second district commenced on 30 July 2021 via the WhatsApp group in their district. On 6 August 2021 recruitment in the third district was started via their WhatsApp group.
Survey administration

The co-ordinator in the first district provided us with known numbers of the facilities beforehand so that we could monitor the progress. Data collection commenced on 26 July 2021 in the first district and concluded on 30 July 2021. However, the district co-ordinator in the first district continued to encourage therapists to complete the therapist survey until data collection in the whole province was concluded.

In the second district, the survey was opened for the second district on 2 August 2021. The district co-ordinator from the second district also provided us with the known number of therapists per facility. In the second district, the coordinator contacted the researcher with any queries or provided the participants with the researcher’s contact details for any further queries or difficulties.

The survey was opened on 9 August 2021 in the third district. Queries and difficulties were also communicated via the district co-ordinator or participants contacting the researcher privately. We were also provided with known number of therapists per hospital for the third district by the district co-ordinator.

Data validation and feedback

A data validation meeting was held with the hospital managers of the first district on 29 July 2021 via Microsoft Teams, followed by a feedback meeting on 30 July 2020 where all therapists from the district were invited to attend. A data validation meeting was held via Microsoft Teams on 3 August 2021 in the second district followed by a feedback meeting on 5 August 2021. The first meeting was also mainly for hospital managers and the second meeting for any therapists who were able to attend. A data verification meeting was held via Microsoft Teams on 12 August 2021 and the feedback meeting on 17 August 2021. To conclude the provincial data collection, there was a meeting for everyone in the province to provide feedback on the data collected. By the end of the data collection, we had collected 92% of the data via the survey.

3.9.4 Research Team

Study team

The study was initiated by Prof Quinette Louw with the collaboration of the WHO South Africa office and falls under Prof Louw’s South African Research Chairs Initiative (SARChI) Chair. The research team working with Prof Quinette Louw in the Department of Health and Rehabilitation Sciences assisted with the planning and implementation of the study. The team members involved assisted with recruitment and the organising of the CPD events. The team
members included were Prof Quinette Louw, Prof Karen Grimmer, Dr Karina Berner, Marisa Coetzee and Dr John Cockcroft. The design of the form was developed by me with technical assistance from Tamsin Purkis from Central Analytics Facility (CAF) at Stellenbosch University. The Centre for Health Professions Education (CHPE) Learning Technologies at Stellenbosch University created the promotional videos.

The NDoH together with provincial DoH offices and stakeholders have been a vital part of the team in terms of consultation, assisting with data collection in relevant provinces. Tucker Bbosa from the Clinton Health Access Initiative (CHAI) assisted us with permissions and contact of provincial governments, and with the data collection.

### 3.10 Data analysis

Data was downloaded from REDCap in CSV format. Microsoft Excel (version 2019) was used to open the files and convert the data to XML format. REDCap allows the creation of reports online where you can choose which data you would like to download. This allows the researcher to only download relevant data and can therefore leave out all personal information. During the design of the form, REDCap automatically codes the data. The data downloaded from REDCap therefore already had codes allocated to each category. The codes were adjusted when all three provinces’ data were collated into one Microsoft Excel sheet. Data was entered into SPSS Version 23 and cleaned for analysis. Descriptive statistics were presented using tables and graphs to visualize the data. To test the difference between profession type, highest level of qualification, undergraduate training and salary level a chi-squared test was done. The mean age and years at current facility were calculated using the sum of all the data divided by observations in STATA.

Participants who started the survey but did not complete it were those that did not comply with the inclusion criteria. These entries were excluded from the data extracted to Microsoft Excel. In the cases where participants wither forgot their return code or did not see it, the researcher was contacted and was able to provide the participant with a return code or delete the entry so that they could start from the beginning. Due to the data validation system participants were not able to start a new entry using the same HPCSA or PERSAL number.

Surveys where participants were unable to return (either forgotten return code or did not see it) participants contacted the researcher either gave them their return code or deleted the record and allowed them to start over. In the instances where surveys were incomplete but there was still sufficient data (i.e., profession and facility), the recorded data was used in the analysis.
3.11 Quality assurance

3.11.1 Credibility

Data collection results were continually compared to the estimated number of staff with the managers and participants to get feedback on whether data collected were correct and an accurate representation of the rehabilitation workforce in that province was captured. REDCap's functionality also allowed data validation measures such as preventing double entries using the participants' HPCSA or PERSAL numbers. To ensure that this was accurate the researcher also checked the data to ensure that no double entries were missed.

3.11.2 Transferability

This refers to the generalisability of the findings and whether they can be transferred to other contexts or general populations. As mentioned previously, this study was based on the human workforce section of the TRIC Tool which was designed by the WHO so that it could be generalised to any country's rehabilitation context. Relevant stakeholders from various provinces in South Africa were also consulted to ensure that the survey will be feasible in all the provinces.

3.12 Reporting

The researcher followed the criteria for the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) [55] and the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklists [56]. CHERRIES is a 30-item checklist to improve web-based survey quality and reporting and to ensure the methods and analysis procedures were followed. The STROBE Statement consists of 22 items that guide authors on how to improve the reporting of observational studies and facilitates critical appraisal and interpretation of studies by reviewers, journal editors and readers.

3.13 Ethical considerations

Ethical approval for the study was obtained from the Health Research Ethics Committee (HREC) of Stellenbosch University (References Number: N19/04/048) (see Addendum 3). Ethical approval was renewed for 2020 and 2021 (see Addendum 4 and 5). Together with the renewal in 2020, an amendment was made to include this study as part of the primary study (see Addendum 6). Permission to conduct the study was also requested from the Department of Health of Provinces One, Two and Three through the National Health Research Database (NHRD) and these permissions were renewed for 2021.
3.13.1 Consent

At the beginning of the survey, there is a section that provides participants with information regarding the purpose and procedures of the study (see Addendum 1). The information includes that the participation in the study is voluntary, participants have the right to decline answering questions and that the survey can be exited at any point without a reason. It also states that their decision would have no negative impact on them. This section further states that all the information will be anonymised and that email addresses were required only to contact the participants regarding the gratuity. This information was also included in the information and instruction videos and highlighted during contact with the participants or managers. Contact details were also given in the case that participants requested further information on the study.

3.13.2 Confidentiality and Privacy

As mentioned previously, REDCap allows the data to be downloaded without personal identifiers. REDCap is specifically designed to assist data collection for research projects. The REDCap application is therefore secure and has 128 bit encryption between data entry and the server. Although REDCap is designed and maintained by Vanderbilt University, the data and application are stored on servers provided by Stellenbosch University Information and Communications Technology Division (see Addendum 7). The personal information stored online can only be accessed by the researcher and the software engineer, each needing to follow a two-step verification process to access the REDCap projects, i.e., sign-in with Stellenbosch University username and password, followed by entering a code using Google Authenticator.

3.13.3 Beneficence

Following the principle of beneficence, participants were provided feedback on the results regularly. Participants were also made aware that the results may affect the human resources policies in the DoH. Participants also received a Takealot voucher or had a choice of attending a free online CPD event hosted by the Stellenbosch University Department of Health and Rehabilitation Sciences.

3.14 Chapter Summary

A cross-sectional web-based survey study design was used to conduct the research study in the selected three provinces. The data was collected using the REDCap application. The research study complied with the ethical considerations for web-based surveys. The results will be presented in the next chapter, Chapter 4.
Chapter 4: Results

4.1 Chapter Introduction

This chapter presents the results of the therapist and facility surveys on the characteristics and indicators of the rehabilitation workforce capacity.

The study objectives were to describe the rehabilitation workforce data by:

1. the total number of rehabilitation workers per profession: audiology, occupational therapy, physiotherapy, speech and language therapy, and speech and audiology therapists
2. the distribution of each of the professions per province
3. the distribution of each of the professions per level of care: primary, secondary and tertiary
4. the distribution of each of the professions into rural and urban facilities
5. the distribution of each of the professions into salary grades: technician/ assistant, community service, production level, chief and assistant director
6. the distribution of each of the professions per 10 000 population

The response rate of the therapist survey (i.e., the total percentage of therapists who completed the online survey in relation to the actual number of therapists based on the facility survey) is 54% (n=639 out of 1188). In Province One the response rate was 72% (n=286). Province Two had a much lower participation rate at only 22% (n=100). Province Three had the highest participation rate at 75% (n=337). In this chapter the web-based survey will be referred to as the therapist survey and the data collected from managers will be referred to as the facility survey.

4.2 Profession type

Figure 4.1 shows the total in all three provinces by profession based on the therapist survey (i.e., the total number of survey results) and the actual true totals based on facility survey (n=1188). The facility survey shows that occupational therapy contributes the largest proportion (n=252) of all therapists in the three provinces. Speech therapy and audiology (STA) had the smallest number of therapists (n=47). Figure 4.1 also shows the proportion of therapists who completed the survey compares well to the true composition of the therapists found in the facility survey.
Figure 4.1: Total therapists based on the therapist survey and facility survey total number of three provinces and percentage of profession type (n; % - indicated above)

Legend: PT - physiotherapy, OT - occupational therapy, SLT - speech-language therapy, AU - audiology and STA - speech therapy and audiology

Figure 4.2 shows the comparison of therapist survey and facility survey percentage of profession per province. There was a significant difference (p<0.000) in the distribution of professions per province for the therapist survey. The facility survey shows the distribution is similar between the three provinces. Based on the facility survey, physiotherapy has the largest number in Province One compared to Province Two and three where occupational therapists were more. In the therapist survey STA has a larger proportion in Province Two than in the other two provinces.
Figure 4.2: Distribution of therapist survey and facility survey of profession per province

Legend: PT-physiotherapy, OT-occupational therapy, SLT- speech-language therapy, AU-audiology, STA-speech therapy and audiology, P-province
4.3 Full-time or Part-time

In DoH a part-time post can either be a three-eighths post or a five-eighths post. In total DoH employees work 40 hours a week, eight hours a day. A three-eighths post is therefore 15 hours a week and a five-eighths post 25 hours a week. Overall, there are only six part-time posts in the three provinces. Audiology had two part-time posts and each of the other professions, physiotherapy, occupational therapy, speech-language therapy and STA, had one part-time post.

4.4 Age

Table 4.1 shows the ages of the therapists obtained from the therapist survey. Overall, the range of ages between all three provinces are 22-64 years. The oldest mean age was in Province Two (n=34.47) and between professions, occupational therapy had the oldest mean age (n=31.71).

Table 4.1: Therapist survey mean ages between provinces and professions

<table>
<thead>
<tr>
<th>Province</th>
<th>Mean age (SD)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lowest</td>
<td>Highest</td>
</tr>
<tr>
<td>1</td>
<td>27.82 (6.43)</td>
<td>22</td>
</tr>
<tr>
<td>2</td>
<td>34.47 (7.63)</td>
<td>23</td>
</tr>
<tr>
<td>3</td>
<td>30.87 (9.33)</td>
<td>22</td>
</tr>
</tbody>
</table>

Profession

| PT | 29.35 (6.84) | 22 | 56 |
| OT | 31.71 (10.02) | 22 | 64 |
| SLT | 26.68 (4.60) | 22 | 44 |
| AU | 27.9 (6.20) | 22 | 59 |
| STA | 31.6 (6.82) | 22 | 51 |

Legend: PT-physiotherapy, OT-occupational therapy, SLT- speech-language therapy, AU-audiology, STA-speech therapy and audiology

4.5 Years at current facility

Table 4.2 shows the number of months working at their current facility which was obtained from the therapist survey data. Between provinces, Province Two has the highest number of
mean years (n=7.88). Between professions STA had the highest mean years (8.47 years). The lowest number was less than a month and the longest duration is 21.17 yrs.

Table 4.2: Therapist survey in yrs at current facility between provinces and professions

<table>
<thead>
<tr>
<th>Province</th>
<th>Mean months (SD)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lowest value</td>
</tr>
<tr>
<td>1</td>
<td>3.08 (7.82)</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>7.88 (5.18)</td>
<td>0.58</td>
</tr>
<tr>
<td>3</td>
<td>4.79 (6.50)</td>
<td>0.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Profession</th>
<th>Mean months (SD)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lowest value</td>
</tr>
<tr>
<td>PT</td>
<td>3.8 (4.53)</td>
<td>0.08</td>
</tr>
<tr>
<td>OT</td>
<td>5.40 (6.75)</td>
<td>0.08</td>
</tr>
<tr>
<td>SLT</td>
<td>2.35 (3.18)</td>
<td>0.08</td>
</tr>
<tr>
<td>AU</td>
<td>2.85 (3.40)</td>
<td>0.17</td>
</tr>
<tr>
<td>STA</td>
<td>8.47 (17.51)</td>
<td>0.17</td>
</tr>
</tbody>
</table>

Legend: PT-physiotherapy, OT-occupational therapy, SLT- speech-language therapy, AU-audiology and STA-speech therapy and audiology

4.6 Highest level of qualification

Table 4.3 shows the qualifications of the therapists who completed the therapist survey. There was a significant difference (p<0.000) in the highest qualification between professions. The highest proportion of postgraduate degrees were occupational therapy with 16 out of the 369. There were 2.4% of physiotherapists (n=252) and 6.5% of occupational therapists (n=232) who had a master’s degree.
Table 4.3: Count and percentage of qualification per profession in the therapist survey (n=639)

<table>
<thead>
<tr>
<th>Qualification</th>
<th>PT</th>
<th>OT</th>
<th>SLT</th>
<th>AU</th>
<th>STA</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diploma</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>1</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>21</td>
</tr>
<tr>
<td>% Within qualification</td>
<td>4.8%</td>
<td>95.2%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>21</td>
</tr>
<tr>
<td><strong>Bachelors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>214</td>
<td>212</td>
<td>51</td>
<td>54</td>
<td>42</td>
<td>573</td>
</tr>
<tr>
<td>% Within qualification</td>
<td>37.3%</td>
<td>37.0%</td>
<td>8.9%</td>
<td>9.4%</td>
<td>7.3%</td>
<td>573</td>
</tr>
<tr>
<td><strong>Masters</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>6</td>
<td>15</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>37</td>
</tr>
<tr>
<td>% Within qualification</td>
<td>16.2%</td>
<td>40.5%</td>
<td>18.9%</td>
<td>13.5%</td>
<td>10.8%</td>
<td>37</td>
</tr>
<tr>
<td><strong>Doctorate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>% Within qualification</td>
<td>100.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>1</td>
</tr>
<tr>
<td><strong>Honours</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>% Within qualification</td>
<td>100.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>1</td>
</tr>
<tr>
<td><strong>PG Diploma</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>% Within qualification</td>
<td>0.0%</td>
<td>100.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>1</td>
</tr>
<tr>
<td><strong>Certificate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>% Within qualification</td>
<td>0.0%</td>
<td>100.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>4</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>% Within qualification</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>100.0%</td>
<td>1</td>
</tr>
</tbody>
</table>

Legend: PT-physiotherapy, OT-occupational therapy, SLT- speech-language therapy, AU-audiology and STA-speech therapy and audiology

4.7 Undergraduate Training

Table 4.4 shows the total therapists per undergraduate institute as per the therapist survey. There was a significant difference (p<0.000) in the undergraduate institutes attended between professions. It shows that the majority (21.1%) of physiotherapists, occupational therapists (16.7%) and STAs (48.9%) graduated from Sefako Makgatho Health Science University. Majority of speech-language therapists (32.8%) and audiologists (42.4%) graduated from the University of Cape Town.
Table 4.4: Therapist survey distribution of professions per undergraduate training institute

<table>
<thead>
<tr>
<th>Profession</th>
<th>PT Count</th>
<th>% Within profession</th>
<th>OT Count</th>
<th>% Within profession</th>
<th>SLT Count</th>
<th>% Within profession</th>
<th>AU Count</th>
<th>% Within profession</th>
<th>STA Count</th>
<th>% Within profession</th>
<th>Total Count</th>
<th>% Within Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>SU</td>
<td>20</td>
<td>9.0%</td>
<td>38</td>
<td>15.1%</td>
<td>15</td>
<td>25.9%</td>
<td>0</td>
<td>0.0%</td>
<td>1</td>
<td>2.1%</td>
<td>74</td>
<td>11.6%</td>
</tr>
<tr>
<td>UCT</td>
<td>28</td>
<td>12.6%</td>
<td>33</td>
<td>13.1%</td>
<td>19</td>
<td>32.8%</td>
<td>25</td>
<td>42.4%</td>
<td>0</td>
<td>0.0%</td>
<td>105</td>
<td>16.4%</td>
</tr>
<tr>
<td>UWC</td>
<td>36</td>
<td>16.1%</td>
<td>34</td>
<td>13.5%</td>
<td>0</td>
<td>0.0%</td>
<td>0</td>
<td>0.0%</td>
<td>0</td>
<td>0.0%</td>
<td>70</td>
<td>11.0%</td>
</tr>
<tr>
<td>UFS</td>
<td>20</td>
<td>9.0%</td>
<td>31</td>
<td>12.3%</td>
<td>0</td>
<td>0.0%</td>
<td>0</td>
<td>0.0%</td>
<td>0</td>
<td>0.0%</td>
<td>51</td>
<td>8.0%</td>
</tr>
<tr>
<td>WITS</td>
<td>11</td>
<td>4.9%</td>
<td>24</td>
<td>9.5%</td>
<td>1</td>
<td>1.7%</td>
<td>1</td>
<td>1.7%</td>
<td>9</td>
<td>19.1%</td>
<td>46</td>
<td>7.2%</td>
</tr>
<tr>
<td>UP</td>
<td>22</td>
<td>9.9%</td>
<td>25</td>
<td>9.9%</td>
<td>15</td>
<td>25.9%</td>
<td>19</td>
<td>32.2%</td>
<td>4</td>
<td>8.5%</td>
<td>85</td>
<td>13.3%</td>
</tr>
<tr>
<td>UKZN</td>
<td>23</td>
<td>10.3%</td>
<td>6</td>
<td>2.4%</td>
<td>7</td>
<td>12.1%</td>
<td>10</td>
<td>16.9%</td>
<td>2</td>
<td>4.3%</td>
<td>48</td>
<td>7.5%</td>
</tr>
<tr>
<td>SMHSU</td>
<td>47</td>
<td>21.1%</td>
<td>42</td>
<td>16.7%</td>
<td>1</td>
<td>1.7%</td>
<td>3</td>
<td>5.1%</td>
<td>23</td>
<td>48.9%</td>
<td>116</td>
<td>18.2%</td>
</tr>
<tr>
<td>UL</td>
<td>11</td>
<td>4.9%</td>
<td>9</td>
<td>3.6%</td>
<td>0</td>
<td>0.0%</td>
<td>1</td>
<td>1.7%</td>
<td>8</td>
<td>17.0%</td>
<td>29</td>
<td>4.5%</td>
</tr>
<tr>
<td>Other*</td>
<td>5</td>
<td>2.2%</td>
<td>7</td>
<td>2.8%</td>
<td>0</td>
<td>0.0%</td>
<td>0</td>
<td>0.0%</td>
<td>0</td>
<td>0.0%</td>
<td>12</td>
<td>1.9%</td>
</tr>
<tr>
<td>TUT</td>
<td>0</td>
<td>0.0%</td>
<td>3</td>
<td>1.2%</td>
<td>0</td>
<td>0.0%</td>
<td>0</td>
<td>0.0%</td>
<td>0</td>
<td>0.0%</td>
<td>3</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

Legend: PT-physiotherapy, OT-occupational therapy, SLT- speech-language therapy, AU-audiology and STA-speech therapy and audiology

SU- Stellenbosch University, UCT- University of Cape Town, UWC- University of the Western Cape, UFS- University of the Free State, WITS- Witwatersrand University, UP- University of Pretoria, UKZN- University of KwaZulu Natal, SMHSU- Sefako Makgatho Health Science University, UL- University of Limpopo and TUT- Tshwane University of Technology

*Other included Life Esidimeni and South Africa Neurodevelopmental Therapists Association (SANDTA)
4.8 Salary level

Figure 4.3 shows the proportions of salary level of the therapist survey total. Figure 4.3 shows the total number of therapists per salary level between all three provinces. The figure shows that production level therapists contribute 61% of the total. Close to a third (27%) of all therapists are community service therapists.

Figure 4.3: Therapists survey percentage of salary levels between all three provinces

Figure 4.4 shows the proportion of salary level percentages within profession type for all three provinces as per the therapist survey. There was a significant difference (p<0.000) in the salary levels between professions. The figure shows that the speech-language therapy proportion of community service therapists is almost 50% of all speech therapists who completed the therapist survey.
4.9 Level of care

Figure 4.5 shows the proportion of professions between levels of care from the facility survey. There are no STAs at primary level, and at tertiary level (n=12) and secondary level (n=51). At tertiary level physiotherapy (n=76) has the largest number of therapists and at secondary (n=398) and primary (n=17) and at PHC occupational therapy have the highest number (n=18). In specialised care there was only a total of 35 therapists which consisted of physiotherapists (n=7), occupational therapists (n=17) and audiologists (n=4). These numbers were combined with secondary care. Many of the facilities at secondary level do outreach to primary care facilities. As per both the therapist survey and facility survey, 68% (n=42) of the included facilities in Province One run outreach services, 76% (n=31) in Province Two and 50% (n=22) in Province Three.
Figure 4.5: Facility survey distribution of profession type percentage per level of care

Legend: PT-physiotherapy, OT-occupational therapy, SLT-speech-language therapy, AU-audiology and STA-speech therapy and audiology
Figure 4.6 shows the distribution of therapists per level of care. Only three percent of the therapists work at primary health care in comparison the 80% working at secondary level.

![Facility survey proportion of therapists per level of care](image)

**Figure 4.6: Facility survey of therapists per level of care**

4.10 Rural versus Urban

Figure 4.7 shows the facility survey distribution of the number of therapists working in rural and urban facilities per province. The proportion of therapists working in rural facilities was 40% (n=470) and the other 60% (n=718) of the therapists worked in urban facilities. Figure 8 also shows a different distribution when comparing urban and rural between the provinces. Province One 15% (n=60) of the therapists work in rural facilities in contrast to Province Two where 57% (n=257) of the therapists were working in rural facilities. In Province Three, the number of therapists working in rural areas is also less than in urban but only 8% (n=29) less than the therapists working in urban areas.
4.11 Distribution

Figure 4.8 shows the facility survey profession number per 10,000 uninsured population. The uninsured population (80%) was calculated using the data provided in the 2016 Community Survey [52]. Overall (all therapists), Province One had a ratio of 0.71/10,000 population, Province Two has a ratio of 0.98/10,000 and Province Three has a ratio of 0.97/10,000 population. Occupational therapy in Province Two have the highest population adjusted ratio at 0.46 per 10,000. STA in Province One and audiology in Province Two have the lowest ratios at 0.02 per 10,000.
Figure 4.8: Facility survey profession distribution per 10 000 population per province

Legend: PT-physiotherapy, OT-occupational therapy, SLT- speech-language therapy, AU-audiology, STA-speech therapy and audiology and P-province

Figure 4.9 shows the number of profession type per 10 000 uninsured population using the facility survey data. The highest number is occupational therapy at 0.68 per 10 000 in district nine. The lowest number of therapists per 10 000 population is 0.01 for audiology in district one, two and eight and speech therapy in district two.
Figure 4.9: Facility survey profession distribution per 10 000 population per district

Legend: PT-physiotherapy, OT-occupational therapy, SLT- speech-language therapy, AU-audiology, STA-speech therapy and audiology, P-province and D-district
Table 4.5 shows the total number of therapists per district, the percentage per district and the district population as per the facility survey. The table shows that the districts with the higher populations tend to have a larger number of therapists. For example, Table 4.5 shows that district nine in Province Two had a population of over one million, had 12.54% (n=149) therapists in the district and Figure 4.9 shows that occupational therapy in district nine had the highest ratio per 10 000 population.

Table 4.5: Facility survey district details

<table>
<thead>
<tr>
<th>District</th>
<th>Total</th>
<th>Percentage</th>
<th>Uninsured Population</th>
</tr>
</thead>
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<tr>
<td>P1D1</td>
<td>62</td>
<td>5.22%</td>
<td>731 856</td>
</tr>
<tr>
<td>P1D2</td>
<td>19</td>
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<td>694 314.40</td>
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<tr>
<td>P1D3</td>
<td>76</td>
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<td>648 422.40</td>
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<tr>
<td>P1D4</td>
<td>51</td>
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<td>664 395.20</td>
</tr>
<tr>
<td>P1D5</td>
<td>16</td>
<td>1.35%</td>
<td>298 672</td>
</tr>
<tr>
<td>P1D6</td>
<td>83</td>
<td>6.99%</td>
<td>1 010 440.80</td>
</tr>
<tr>
<td>P1D7</td>
<td>76</td>
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<td>1 165 541.60</td>
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<tr>
<td>P1D8</td>
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<td>383 938.40</td>
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<tr>
<td>P2D9</td>
<td>149</td>
<td>12.54%</td>
<td>1 064 348.80</td>
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<tr>
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<td>927 348</td>
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<td>5.30%</td>
<td>935 809.60</td>
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<td>111</td>
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<td>596 606.40</td>
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<td>P3D16</td>
<td>82</td>
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Legend: P-province and D-district
4.12 Chapter summary

The therapist survey had 639 valid entries in comparison with the facility survey which had a total of 1188. The proportions of the professions in the therapist survey are similar to proportions in the facility survey. In Province One, physiotherapy contributes the largest number. Occupational therapy has the largest proportions in Province One and Two. Speech-language therapy, audiology and STA have much smaller numbers in comparison to occupational therapy and speech therapy. In the therapist survey, STA has a larger number (n=29) than physiotherapy (n=22) in Province Two.

The therapist survey shows that there are few therapists (6%) that have obtained a postgraduate degree. The number of therapists working in production level contributes the largest proportion (61%) to the number of therapists in the therapist survey. Almost a third (27%) of these therapists were doing their community service, moreover almost half (48%) of the speech-language therapists in their community service year. Majority (79%) of the therapists were working at a secondary care level facility. Only 40% of the therapists were working in rural facilities. The population adjusted ratios at provincial level are as follows, Province One at 0.71/10 000, Province Two 0.98/10 000 and Province Three 0.97/10 000. Overall, the three provinces had 0.87 therapists per 10 000 population.
5 Chapter 5: Discussion

5.1 Chapter Introduction

This thesis reports on the rehabilitation workforce capacity in three rural South African provinces. The thesis comprised of a scoping review which aimed to synthesise the descriptors and indicators that are used to describe the rehabilitation workforce data and a cross-sectional survey which described the rehabilitation workforce capacity by profession type, the number of therapists, distribution per 10 000 population, level of care, rural versus urban, age and qualifications. This assisted in establishing a good baseline of data to assess the current situation of the rehabilitation workforce in South Africa. This chapter presents an interpretation of the key findings in the context of other relevant literature and discusses the implications for the rehabilitation workforce in South Africa.

The aim of this study is twofold;

1) To see how rehabilitation workforce data is described and secondly to synthesise the descriptors and indicators of the workforce data.

To achieve the study aim, the following objectives will be completed:

a) understand the data collection methods or data sources used to collate rehabilitation workforce capacity information (descriptors and indicators),

b) synthesize which descriptors and indicators are used to describe (or quantify) how national or regional rehabilitation workforce data (e.g., type of therapist, qualifications and work setting), explore how the rehabilitation workforce is described relative to population needs.

2) To describe the rehabilitation workforce in the public sector of South Africa in three rural provinces with respect to number of therapists, distribution by population, type of therapists and qualifications, distribution between rural and urban, salary levels and level of care.

The study objectives were to describe the rehabilitation workforce data by:

a) the total number of rehabilitation workers per profession: audiology, occupational therapy, physiotherapy, speech and language therapy, and speech and audiology therapists

b) the distribution of each of the professions per province

c) the distribution of each of the professions per level of care: primary, secondary and tertiary

d) the distribution of each of the professions into rural and urban facilities
e) the distribution of each of the professions into salary grades: technician/assistant, community service, production level, chief and assistant director

f) the distribution of each of the professions per 10 000 population

This study showed alarmingly low population-adjusted ratios. The ratio of therapists per population was less than one per 10 000 (see Figure 4.8). Results noted in the scoping review in Chapter 2, specifically pertaining to South African occupational therapists [28], and speech therapists and audiologists [2] (see Figures 2.4 & 2.5) demonstrated double the ratio compared to what we found in the survey; however, the ratios were still less than one per 10 000 of the population. However, when compared to the HRH strategy [3], which is based on PERSAL data, the ratios for physiotherapy and speech therapy and audiology were similar. For occupational therapy, a slightly higher ratio is noted (0.35 compared to 0.26 per 10 000 in the HRH strategy). The differences in these findings may be explained by the data source used in the different studies as well as the calculation of the ratios, compared to the current study which was a primary study that validated the data of each facility. For example, the studies conducted by Ned et al (2020) and Pillay et al (2020) used data from the HPCSA to determine the number of therapists and used the PERSAL data to calculate the distribution between the public and private sector [2, 28]. However, different to the current study, these studies also used the total population to calculate the ratios and did not adjust the percentages according to the uninsured population. Both these studies reported that most of the workforce was employed in the private sector (see Table 2.5) and did not adjust the population ratios accordingly. The private sector only serves a small percentage of the total population and the public sector therapists 80% of the population [3]. The ratios per 10 000 population were, therefore, higher in comparison to our findings. However, despite the slight variances in findings, all these published reports and the current study overall concur that the therapist ratios to the population are very low in South Africa.

Despite being a high-middle-income country, the ratio of therapists to population in South Africa compares to very low-income countries such as Pakistan [27]. In Chapter Two (see Figure 2.6) we showed that the population ratios in some HICs [24] were almost 10 times higher than the population ratios in South Africa. The National Department of Health has neglected to include rehabilitation in the health planning and therefore have fewer financial resources to retain or create new posts for rehabilitation workers [1]. As a result, rehabilitation services are often the lowest priority when financing for human resources for health are considered [14, 57]. This is often a double burden for poorly resourced provinces as the budgeting of posts are resourced at a provincial level. In addition to this, when funds become available, infectious diseases are usually the priority [57]. This often leads to vacant
rehabilitation posts which are not filled becoming frozen and rehabilitation professionals seeking employment in the private sector or overseas. This finding compares to trends noted in other middle-income countries reported in the scoping review (Chapter 2). These low ratios show disparities in the rehabilitation workforce at levels of care.

There is a large disparity between levels of care in the public sector. The number of therapists at primary care is extremely low in comparison to the number of therapists at the secondary level of care (see Figures 4.5 and 4.6). The HRH strategy reported that there were much fewer therapists at primary care in comparison to nurses and doctors [3]. These findings are similar to a study conducted in Saskatchewan, which reported that the population at primary care had greater access to family physicians in comparison to physiotherapists [36]. Our findings of a much lower rehabilitation workforce at primary care are similar to the maldistribution between levels of care in Brazil (see Chapter 2). In contrast, some HICs such as Ireland have focused on improving access to physiotherapy primary health care and, as a result, have 74% of the physiotherapists working at the community level [39]. The South African health system is based on a westernised model of care, influenced by the colonialization of the United Kingdom [58]. The start of healthcare in South Africa was therefore hospital-based and was often only available to those who were able to access hospitals. The Free PHC policy was implemented in 1996, two years after healthcare facilities were combined after the disjointed apartheid system [59]. In the following year the White Paper on Transformation of Health was implemented which transferred the emphasis on curative healthcare at hospital level to PHC. The increase in financing and staffing at PHC has largely been driven by the response to decentralise ART access at the community level over the past decade. The PHC facilities were therefore medically focused and were managed by nurses, with doctors doing support visits. Consequently, a PHC package of care was implemented in 2001 with the PHC re-engineering document initiated in 2010 [59]. At this stage rehabilitation was still mainly hospital-based and as a result was excluded from the policies and guidelines of primary health care. The PHC re-engineering package is mainly a nursing-focused approach, but includes outreach from other professionals such as doctors, dentists and pharmacists. During the review of the re-engineering of the PHC package in 2010, rehabilitation was still seen as a “new cadre” whose roles had still not been defined [60]. This has led to the large disparity between levels of care with rehabilitation workforce mainly based at secondary and tertiary levels of care.

Rehabilitation services are excluded from most major policies and guidelines regarding PHC. The HRH strategy includes recommendations for the minimal number of therapists needed to provide a quality service, within their scope, for the PHC re-engineering guideline [3]. However, rehabilitation workers are still not included in the PHC guidelines. A study conducted
in Brazil aimed to compare staffing ratios between levels of care and calculate the growth rate of staff at primary care after implementation of the new package of care to integrate rehabilitation into their universal health coverage services [26]. This study reported that there was an increase in staff at primary care but that it was still minimal in comparison to the other levels of care. The study also reported on qualitative data reported by the therapists at PHC who part of the implementation of the system had been. The therapists reported that the policies and guidelines were difficult to follow and were not practical due to the difficulties experienced learning a new system whilst managing a high clinical load. The study, therefore, recommended that the guidelines and policies to integrate rehabilitation into PHC levels should be consolidated before integration. They also recommended that the guidelines should be population-based or can be adjusted according to population needs so that it assists with a patient load rather than hamper it. The recommendations of this study can be adapted to the situation in South Africa as Brazil has a similar economic status as South Africa. Rehabilitation guidelines for PHC should be included in the policies for PHC re-engineering.

Most of the rehabilitation workforce is based at the secondary level and some at tertiary levels of care. The services available at the hospital level are often very limited and as a result, people are discharged with no follow-up and often without assistive devices. Barret et al (2015) reported that the rehabilitation workforce planning should consider the effect that these “transition points” may have on rehabilitation services [38]. Their study aimed to profile the allied health workforce providing services to general inpatient rehabilitation beds. They found that the average length of stay (ALOS) was influenced by the availability of post-discharge services. This in turn has an impact on the capacity needed to provide services as clients may be discharged later as they may not have access to post-discharge services [38]. It is therefore important to consider how the referral pathways and the transition between hospital-based and community-based services will impact the rehabilitation workforce and the need for rehabilitation at the PHC level. Most of the population who rely on PHC services are often already disadvantaged and their access to healthcare is further complicated by lack of transport to health facilities and increased out-of-pocket expenses [61, 62]. The implications on the population are often lost on policymakers and government officials. The populations that have a larger need for rehabilitation services are thus very often those that have the least access to health facilities. This has increasingly negative knock-on effects for the most vulnerable persons in our population. There is a large disparity between levels of care with low numbers at PHC which are mostly located in rural areas.

There is an inequitable distribution of therapists between urban and rural facilities. Our study findings show that more than half of the rehabilitation workforce are situated in urban areas.
(see Figure 4.7). SAHR chapter states that recruitment and retention of healthcare workers is not only an issue in South Africa but a global problem. The findings of the scoping review (Chapter 2) show a large disparity between rural and urban areas (see Table 2.6) in both HICs and LMICs. The majority of the rural hospitals are located in what previously used to be homelands during the apartheid era. Each homeland had their own department of health and professional bodies [63]. When apartheid ended the management of these hospitals were taken over by the national government. As these hospitals were so far from the cities and universities they were often forgotten and neglected by government planning and resources. Due to the poor resources at these hospitals very few healthcare professionals were attracted to work in these areas and if they do, the working and living circumstances are often too poor to retain staff. In addition to these, therapists are not prepared for the high workload and case-mix seen at rural hospitals. Despite this longstanding disparity between urban and rural rehabilitation workforce, strategies to rectify this maldistribution have only recently been included in the HRH strategy.

After the abolishment of apartheid when the DoH took over management, they have attempted various other strategies to improve recruitment and retention to rural areas. Some of the DoH’s strategies to improve poor staffing levels at rural facilities was to implement a compulsory community service year and provide a rural allowance. This has improved the staffing crisis in some areas as a short-term solution but has been ineffective over time. In a study conducted by Khan et al (2009), they found that therapists are willing to work in rural areas and have reported at the start of their community service year that they would like to stay on for longer than a year but changed their minds at the end of the year [64]. Many therapists reported feeling isolated professionally and socially. It is often little or no supervision available and therapists have poor work satisfaction and motivation as a result. It has been observed that community service can be defined as a social intervention for middle-class healthcare workers to experience the reality of the country’s economic crisis [65]. There are very few healthcare workers, especially the rehabilitation workforce, who are from rural areas and if there are any, they often do not return to their hometowns after qualifying due to poor working conditions and lack of support. The DoH implemented provincial bursaries with the condition that the healthcare worker is employed in their hometowns or provinces for the same number of years they had received the bursaries. These reasons are similar to those reported by Bath et al (2015) amongst younger physiotherapists in Canada who felt that they had no opportunity for professional development [35]. Coco et al (2018) reported that due to poor human resources amongst audiologists in rural areas the population have delayed hearing care compared to urban populations [31]. This finding opens a can of worms as the ultimate question is, do these strategies improve the access and quality of care for the local population? Therapists have
reported that the financial incentive is often not enough to motivate longer services at rural facilities. Despite these strategies, there has been little to no improvement in the recruitment and retainment of therapists in these areas.

The rehabilitation workforce, in general, is reliant on community service therapists to improve staffing levels [64]. Our study shows that the rehabilitation workforce within the three provinces consists of a large number of community service therapists (see Figure 4.3). A study conducted in the Eastern Cape and KwaZulu Natal has found that many urban community service posts were filled and many of the rural community service posts were vacant [64]. These vacant posts are often due to a lack of funding to fill the community service posts in rural areas. More recently this situation has become worse and has had a backlash on the DoH as many healthcare workers do not have posts to complete their community service [65]. This is not only the case for community service therapists but with production level and managerial level (chief and assistant director) posts too. This means that the remaining production level therapists have to pick up the pieces of this disastrous situation or even that many hospitals are left with no rehabilitation workers. According to Khan et al (2009), this leaves us with the ultimate question of whether community service contributes to the quality of care in these rural areas and whether this has a positive impact on the population needing healthcare services [64]. This in turn discourages the therapists and leaves them feeling frustrated.

Many therapists have reported feeling unprepared for the case mix and workload at rural hospitals. Newly qualified therapists are thrown into the deep end and are expected to make a difference with minimal or non-existing supervision and support from other professions or management. The mean ages from our study (see Table 4.1) show that the rehabilitation workforce, in general, is young and have minimal experience. The mean years working at their current facility (see Table 4.2) corroborate these findings as therapists often do not stay on at public facilities in the long term. This leads to a high turnover rate at hospitals which also cause disruption and continuation to services at hospitals due to lack of continuity or “institutional memory” [66]. This links back to the quality of care for the population where community service therapists are discouraged and lack the motivation to continue working in the public sector.

Young therapists often report that there is little opportunity for career advancements in many public sector facilities where there is no supervision. Only a few of the participants in the therapist survey reported completing a postgraduate degree. A study conducted amongst physiotherapists in South Africa found similar comments from the participants. Although the majority of the participants were working in the private practice there were also very few who had obtained a postgraduate degree [67]. The findings in our scoping review showed that the
situation was different in HICs where there was a larger percentage of therapists who had completed their postgraduate degrees. Except for one study where young therapists had similar reasons to South Africans for not completing a postgraduate degree. The participants in the survey commented that there is not enough time to do a postgraduate course whilst working as there is often no study leave available and costs of studying were too expensive to study full-time. This is similar to the situation in the public sector where there is often no study leave and no financial incentive for career advancement.

In the public sector advancement to a higher salary level or grade is based on years of experience rather than postgraduate qualifications or training. There are systems in place to encourage professional growth and motivate improved performance, but these incentives are often not in place. These incentives are OSD (occupation-specific dispensation) and PMDS (performance monitoring and development system) programs. There have been numerous complaints and problems with the implementation of OSD. More often than not many therapists do not receive OSD remuneration or are sometimes not even aware of it. PMDS is a requirement for all DoH employees which should be conducted quarterly where performance is graded. This is often non-existent for the rehabilitation workforce or where it does exist is merely a formality and has no impact on performance, acknowledgement of services and career advancement. According to DoH policies if postgraduate training is included as a goal in your PMDS study leave should be granted and in rare cases funded by the hospital. Another element that contributes to decreased postgraduate education is the geographical location of facilities where access to universities or institutions are limited. Young therapists are often left feeling overwhelmed and unprepared leading to poor job satisfaction levels.

Many rehabilitation services in poorly resourced settings often consist of one or two newly qualified therapists. A well-integrated rehabilitation team with all professional types available are the ideal circumstances for rehabilitation services. A rehabilitation team with all services available creates an efficient service where team members can support one another with load sharing and task shifting. Therapists in rural or poorly resourced settings often provide a more generalised service, where the population they serve are of all ages and often only see the more common conditions. Therapists have complained that as a result there is often very little opportunity for the use of specialised skills or roles. Role plasticity is often seen for the more “general” conditions where there is an overlap of roles between physiotherapists and occupational therapists or speech therapists and occupational therapists [16, 38]. This is not only the case in LMICs such as South Africa but is reported in the studies from the scoping review. Although this is often seen in a negative light, it has various positive implications when there is a lack of a profession type. Task shifting or load sharing often occurs to improve the
quality of services. This is experienced mostly in low resourced and rural settings where there is an overlap of roles. Rehabilitation services are often staffed with only one or two young therapists working in isolation.

Rehabilitation services in LMICs often consist of only physiotherapists and sometimes an occupational therapist. The current study has similar findings, except that the number of occupational therapists in the three provinces included in our study are higher than physiotherapy (see Figure 4.1). There are very few speech therapists and audiologists available (see Figure 4.2). This is similar to the findings in the studies from the scoping review comparing physiotherapy, occupational therapy and speech therapy (see Figure 2.5). However, the studies showed that physiotherapy was the more dominant profession and is the most frequently recorded profession in the literature. Ned et al (2020) reported that there has been a 7% (in the past 15 years) annual increase in new registrations of occupational therapists with the HPCSA and that the retention rate of occupational therapy was 77.6% [28]. Rehabilitation services in the current study show occupational therapists have higher staffing levels than the other professions, but only 5% more than the number of physiotherapists.

The rehabilitation workforce capacity of the three provinces included in the current study is severely lacking in quantity and have large disparities in the distribution of the workforce between levels of care and across the urban/rural divide. The description of the rehabilitation workforce can be generalised to other rural provinces and are comparable to national figures. Although South Africa is an upper-middle-income country, the rehabilitation workforce capacity is similar to the capacity in very low-income countries. This is extremely concerning as minimal rehabilitation workforce are available in the areas with the most vulnerable populations. With an increase in rehabilitation need and an inequitable distribution of the rehabilitation workforce the future of rehabilitation services in the public sector does not look very promising for the most vulnerable persons in our population.

5.2 Recommendations

- Studies should be conducted to develop strategies to enable reliable real-time data/
- Studies on should be conducted which aim to understand more about the quality of rehabilitation services and the needs of the population.
- Studies should be conducted to understand the competencies of the rehabilitation workforce.
- Research to understand the contribution of community service therapists to the rehabilitation workforce should be conducted.
5.3 Limitations

- About 40% of the therapists did not complete the therapist survey. Therefore, the data on qualification, age, salary level and years worked at their current facility was limited to only those who completed the survey, and this could have introduced bias.

- The study was limited to quantitative data and did not include the quality or efficiency of the rehabilitation services.

- This was a cross-sectional study and therefore we were unable to describe the trends over time and the impact of COVID-19 on the rehabilitation workforce capacity.

- We collected data over one year, as the data collection was disrupted by the COVID-19 restrictions. The data collection in Province One was completed before COVID-19, while the data collection in Provinces Two and Three were conducted once lockdown levels were eased. This increased time period between data collection in the provinces may have had an impact on the change of the data due to COVID-19 which was not accounted for in this study.

- The study only included three rural provinces and therefore we were unable to compare the data between rural and urban provinces.

- The data collected was limited to the public sector and therefore excluded the workforce in other sectors such as the private sector or non-governmental organisations.
Chapter 6: Conclusion

The knowledge of rehabilitation workforce capacity is critical, especially in LMICs. The aim of this study was to see how data is described and secondly to synthesise the rehabilitation workforce capacity descriptors and indicators, and to describe the rehabilitation workforce in the public sector of South Africa in three rural provinces with respect to number of therapists, distribution by population, type of therapists and qualifications, distribution between rural and urban, salary levels and level of care.

This study found that there are alarmingly low numbers of therapists at primary levels. The population-adjusted ratios of the provinces are comparable to very low-income countries. The distribution of the rehabilitation workforce between urban and rural areas is a significant cause of poor access to rehabilitation. Approximately a third of the workforce relies on community service therapists. These posts are not guaranteed from year to year and therefore is a threat to the rehabilitation workforce in rural areas where they rely on community service therapists to improve staffing levels. Collectively these findings imply that many people depending on the public sector arguably do not have access to rehabilitation services. Consequently, the most vulnerable communities have been left behind with regards to rehabilitation and therefore do not have the necessary support for reaching their optimal levels of function which will enable them to fulfil their life roles. South Africa will have to invest in strategies to monitor workforce capacity overtime to ensure further declines in the public health sector. Urgent efforts to strengthen the rehabilitation workforce is required.
7 References


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8 Addenda

Addendum 1: PubMed Search String

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<td>((Physical Therapy Specialty[Mesh] OR Occupational Therapy[Mesh] OR Speech Therapy[Mesh] OR Speech-Language Pathology[Mesh] OR Audiology[Mesh]) OR (Allied Health Occupations[Mesh] NOT &quot;Medical Laboratory Science&quot;[Mesh] NOT &quot;Technology, Dental&quot;[Mesh] NOT &quot;Technology, Radiologic&quot;[Mesh])) OR ((physiotherap*[Title/Abstract]) OR (&quot;physical therap*&quot;[Title/Abstract]) OR (&quot;occupational therap*&quot;[Title/Abstract]) OR (&quot;speech language therap*&quot;[Title/Abstract]) OR (&quot;speech therap*&quot;[Title/Abstract]) OR (&quot;speech patholog*&quot;[Title/Abstract]) OR (&quot;speech language patholog*&quot;[Title/Abstract]) OR (audiolog*[Title/Abstract]))</td>
<td>97,099</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>(physiotherap*[Title/Abstract]) OR (&quot;physical therap*&quot;[Title/Abstract]) OR (&quot;occupational therap*&quot;[Title/Abstract]) OR (&quot;speech language therap*&quot;[Title/Abstract]) OR (&quot;speech therap*&quot;[Title/Abstract]) OR (&quot;speech patholog*&quot;[Title/Abstract]) OR (&quot;speech language patholog*&quot;[Title/Abstract]) OR (audiolog*[Title/Abstract])</td>
<td>84,718</td>
<td></td>
</tr>
</tbody>
</table>
## Addendum 2.1: Data extraction form 1

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Country</th>
<th>National or regional</th>
<th>World bank country economic classification</th>
<th>Study design</th>
<th>Data collection/ source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anderson, 2005</td>
<td>Australia</td>
<td>Regional</td>
<td>HIC</td>
<td>Database Review</td>
<td>Physiotherapy Labourforce Annual Survey Summary Reports, NSW Physiotherapists Registration Board, Department of Labour and Immigration, Australian Bureau of Statistics, Physiotherapists Registration Board, Australian Institute of Health &amp; Welfare and Labour Force Surveys</td>
</tr>
<tr>
<td>Landry, 2007</td>
<td>Canada</td>
<td>National</td>
<td>HIC</td>
<td>Database Review</td>
<td>Statistics Canada and Canadian Institute for Health Information</td>
</tr>
<tr>
<td>Shah, 2015</td>
<td>Canada</td>
<td>Regional</td>
<td>HIC</td>
<td>Database Review</td>
<td>Saskatchewan College of Physical Therapists GIS Library Services, part of The Spatial Initiative at the University of Saskatchewan</td>
</tr>
<tr>
<td>Eighan, 2018</td>
<td>Ireland</td>
<td>National</td>
<td>HIC</td>
<td>Database Review</td>
<td>Health Service Personnel Census and Irish Society of Chartered Physiotherapists Registered data.</td>
</tr>
<tr>
<td>Zimbelman, 2010</td>
<td>US</td>
<td>National &amp; regional</td>
<td>HIC</td>
<td>Database Review</td>
<td>U.S. Census Bureau, government public databases</td>
</tr>
</tbody>
</table>
| Bath, 2015    | Canada   | Regional            | HIC                                       | Database Review | • 2013 Saskatchewan College of Physical Therapists membership renewal  
• Saskatchewan Physiotherapy Association’s (SPA) 2012 membership list  
• A list of physiotherapists who had served as clinical instructors |
| Jesus, 2016   | US, Singapore | National           | HIC, HIC                                 | Database Review | • Local and international public domain data  
• Institutional reports (eg, World Report on Disability) |
<table>
<thead>
<tr>
<th>Country</th>
<th>Database Type</th>
<th>Database Type</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portugal, Bangladesh</td>
<td>HIC LMIC</td>
<td></td>
<td>• Local and international websites (eg, APTA, World Bank) • Authors’ qualitative accounts</td>
</tr>
<tr>
<td>Windmill, 2013</td>
<td>US National</td>
<td>HIC</td>
<td>Database Review</td>
</tr>
<tr>
<td>Planey, 2016</td>
<td>US National</td>
<td>HIC</td>
<td>Database Review</td>
</tr>
<tr>
<td>Coco, 2018</td>
<td>US Regional</td>
<td>HIC</td>
<td>Database Review</td>
</tr>
<tr>
<td>Ned, 2020</td>
<td>SA National</td>
<td>LMIC</td>
<td>Database Review</td>
</tr>
<tr>
<td>Jesus, 2020</td>
<td>35 Countries</td>
<td>HIC</td>
<td>Database Review</td>
</tr>
<tr>
<td>Rathore, 2011</td>
<td>Pakistan</td>
<td>National</td>
<td>LMIC</td>
</tr>
<tr>
<td>Barrett, 2015</td>
<td>Australia</td>
<td>Regional</td>
<td>HIC</td>
</tr>
<tr>
<td>Study</td>
<td>Country</td>
<td>Region</td>
<td>Income Level</td>
</tr>
<tr>
<td>------------</td>
<td>---------</td>
<td>-------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Rodes, 2017</td>
<td>Brazil</td>
<td>National &amp; Regional</td>
<td>LMIC</td>
</tr>
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## Addendum 2.2: Data extraction form 2

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Education</th>
<th>Demographics</th>
<th>Rural/Urban</th>
<th>Private/Public</th>
<th>Levels of care</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physiotherapy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anderson, 2005</td>
<td>PG Degrees: 23.1%</td>
<td>Age &amp; Gender - F: 40-44 y M: 30-34 y</td>
<td>Urban: 80 % (Rural: 20%)</td>
<td>Private: 1756</td>
<td>Public: 1231</td>
<td>Absolute Total: 574</td>
</tr>
<tr>
<td>Landry, 2007</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ratio: 4.8/10 000 population</td>
</tr>
<tr>
<td>Landry, 2009</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total: US 167 810 Canada: 15 772</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ratio: US: 6.2/10 000 Canada: 4.8/10 000</td>
</tr>
<tr>
<td>Zimbelman, 2010</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ratio: 5.5/10 000 population</td>
</tr>
<tr>
<td>Bath, 2015</td>
<td>University of Saskatchewan: 521 (81.0)</td>
<td>Gender: F- 508 (79.0) M- 135 (21.0)</td>
<td>Rural: 72 (11.2%)</td>
<td>Public: 347 (58.1)</td>
<td>Private: 250 (41.9)</td>
<td>Total: 643</td>
</tr>
<tr>
<td></td>
<td>Other Canadian: 84 (13.1)</td>
<td>Median age: ≤40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>International institute: 38 (5.9)</td>
<td>Full time: 471 (74.9)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diploma/certificate: 78 (12.1%)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Bachelor’s degree: 444 (69.1%)</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Master/doctoral degree: 121 (18.8%)</td>
<td></td>
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</tr>
<tr>
<td>Author</td>
<td>Year</td>
<td>Gender</td>
<td>Mental Health</td>
<td>Acute</td>
<td>Non-acute</td>
<td>Public</td>
</tr>
<tr>
<td>--------------</td>
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</tr>
<tr>
<td>Shah, 2015</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>301</td>
</tr>
<tr>
<td>Jesus, 2016</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>301</td>
</tr>
<tr>
<td>Eighan, 2018</td>
<td></td>
<td>Female</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coco, 2018</td>
<td></td>
<td></td>
<td>Urban: 94% (829) Rural: 6%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windmill, 2013</td>
<td></td>
<td></td>
<td>Age (FTE): &lt;30 - 1232 31-40- 2912 41-50- 2800 51-60 - 2912 &gt;60 - 1344</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planey, 2016</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Audiology

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Urban/ Rural</th>
<th>Total</th>
<th>Additional Information</th>
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</thead>
<tbody>
<tr>
<td>Coco, 2018</td>
<td></td>
<td>Urban: 94% (829) Rural: 6%</td>
<td>332</td>
<td>Average per county: 6.049:1 (SD: 5.119) (population to provider ratio)</td>
</tr>
<tr>
<td>Windmill, 2013</td>
<td></td>
<td>Age (FTE): &lt;30 - 1232 31-40- 2912 41-50- 2800 51-60 - 2912 &gt;60 - 1344</td>
<td>16 000</td>
<td>Total: 16 000 Clinical: 12 800 FTE: 11 200</td>
</tr>
<tr>
<td>Planey, 2016</td>
<td></td>
<td></td>
<td>13 479</td>
<td>State: 2.1 - 7.62/ 100 000 Total: 13 479/ 100 000 Range per county: 0-197/ 100</td>
</tr>
<tr>
<td></td>
<td>Mean per county: ± 4/ 100 000</td>
<td></td>
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<tr>
<td>--------------------------</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Occupational therapy</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Ned, 2020</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age - &lt;40y: 67.7% (n=3019)</td>
<td>Public: 25.2% (n=1305)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female: 95% (n = 4193)</td>
<td>Private: 74.8% (n=3875)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male: 5% (n = 267)</td>
<td>Total: 5147</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total ratio: 0.91/ 10 000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Speech therapy and audiology</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pillay, 2020</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STA: 46.8%; ST: 33.3%; AU: 18.9%</td>
<td>Public: Private: 78% 22%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female: 94.6%; Male: 5.4%</td>
<td>Total: 3266</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 25–29-year: 27.6% (902)</td>
<td>Total ratio: 0.57/ 10 000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 30-35 years: 20.4% (665)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>• &lt;40 years: 63.6% (2078)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• &gt;50 years: 12.6% (397)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Physiotherapy and occupational therapy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rathore, 2011</td>
<td>PT: 1000; OT: 150</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jesus, 2020</td>
<td>Total: 1150</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ratio: Mean- 15.7/ 10 000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD- 10/ 10 000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range- 0.9-38.7/ 10 000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>Profession</td>
<td>Value</td>
<td>Level of Care</td>
<td>Ratio per profession and level of care at national, state and city</td>
</tr>
<tr>
<td>-------</td>
<td>------------</td>
<td>-------</td>
<td>---------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Barrett, 2015</td>
<td>PT: 53; OT: 43.8; ST: 22.4</td>
<td></td>
<td>Inpatient rehabilitation beds (n=466)</td>
<td>FTE = 119</td>
</tr>
<tr>
<td>Rodes, 2017</td>
<td></td>
<td>National</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• PHC - PT: &lt;0.1/1000 OT: &lt;0.1/1000 ST: &lt;0.1/1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• SAC - PT: 0.2/1000 OT: &lt;0.1/1000 ST: 0.1/1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• HC: PT: 0.12/1000 OT: &lt;0.1/1000 ST: &lt;0.1/1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wilson, 2009</td>
<td></td>
<td>Ratio</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban</td>
<td>PT: 50.9/100 000 OT: 24.7/100 000 ST: 35.0/100 000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rural</td>
<td>PT: 35.5/100 000 OT: 24.7/100 000 ST: 29.5/100 000</td>
<td></td>
</tr>
</tbody>
</table>
Addendum 3: Survey Screen 1

Consent

ASSESSMENT OF REHABILITATION CAPACITY IN SOUTH AFRICA

CONSENT TO PARTICIPATE IN RESEARCH

Dear Colleague,

The Stellenbosch University Department of Health & Rehabilitation Sciences, in collaboration with the National Department of Health (NDOH) and World Health Organization (WHO), invites you to take part in a research study to assess rehabilitation capacity in South Africa (SA).

The purpose of the research is to serve as an initial assessment to understand and map the rehabilitation capacity of the SA public healthcare system.

You have been invited to participate as you are involved in the SA public health sector. Your participation is voluntary; that is to say, you are free to stop your participation at any point in the study. This will not affect you negatively in any way.

You will be asked to complete an online survey, which will take less than 5 minutes and will consist of questions regarding your profession and work setting.

You will receive a voucher as appreciation for your participation. For the voucher, you have a choice between an R100 Takealot voucher or one CPD online course of your choice from our online department. Please note you have to provide your email address to be able to receive the voucher. If you choose the Takealot option your email will be sent to Takealot who will send the voucher directly to you.

All personally identifiable information and study responses will be kept confidential, and all information will be anonymised when documenting findings or publishing the research.

RIGHTS OF RESEARCH PARTICIPANTS:

You have the right to decline answering any questions and you can exit the study at any time without giving a reason. You are not waiving any legal claims and rights by agreeing to participate in this research. If you have questions regarding your rights as a research participant, contact the Health Research Ethics Committee (HREC) at Stellenbosch University (021-938-9207).

Your information and your responses will be protected. Only the researchers will have access to the information. The research data will be made available to the public, but no individual results will be disclosed. The researchers will publish only summarised results.

If you have any questions or concerns about the research, please feel free to contact the principal investigator, Prof Quinette Louw (021-938-9667).

To save a copy of this text, save it according to the method used by your electronic device.
1) HPCSA number
   * must provide value
   PT123456789

2) Initials
   * must provide value
   e.g. JH T

3) Surname
   * must provide value
   e.g. Smith

4) Date of birth
   * must provide value

5) Calculated Age

6) Email address
   Please note that if your email address is incorrect, you will not receive the voucher
   * must provide value
   example@gmail.com
   Needed for the voucher

7) Please indicate which option you would prefer as a voucher
   * must provide value
   Free Online CPD course
   R100 Takealot voucher

8) I confirm that I have read and understood the information provided regarding the above-mentioned study.
   * must provide value
   Yes, I agree to take part in this research study
   No, I don’t agree to take part in this research study

Submit
Save & Return Later
### Addendum 4: Survey Screen 2

#### CaRe4SA HR Information

Please complete the survey below.

Thank you!

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rehabilitation Profession</strong></td>
<td></td>
</tr>
<tr>
<td>* must provide value</td>
<td></td>
</tr>
<tr>
<td><strong>At which University did you complete your undergraduate degree?</strong></td>
<td></td>
</tr>
<tr>
<td>* must provide value</td>
<td></td>
</tr>
<tr>
<td><strong>In which year did you obtain your undergraduate degree from _____?</strong></td>
<td></td>
</tr>
<tr>
<td>* must provide value</td>
<td></td>
</tr>
<tr>
<td><strong>What is your highest level of qualification?</strong></td>
<td></td>
</tr>
<tr>
<td>* must provide value</td>
<td></td>
</tr>
<tr>
<td><strong>In which [District] are you working?</strong></td>
<td></td>
</tr>
<tr>
<td>* must provide value</td>
<td></td>
</tr>
<tr>
<td><strong>In which [sub-district] are you working?</strong></td>
<td></td>
</tr>
<tr>
<td>* must provide value</td>
<td></td>
</tr>
<tr>
<td><strong>At which [Local Municipality facility] are you working?</strong></td>
<td></td>
</tr>
<tr>
<td>* must provide value</td>
<td></td>
</tr>
<tr>
<td><strong>When were you appointed at your current facility?</strong></td>
<td></td>
</tr>
<tr>
<td>* must provide value</td>
<td></td>
</tr>
</tbody>
</table>
What is your current position?
* must provide value
- Assistant/ Technician
- Community Service
- Post Community Service/ Junior
- Senior
- Chief
- Assistant Director

Are you working full- or part-time?
* must provide value
- Full-time
- Part-time

Does your facility do outreach to any other facilities?
* must provide value
- Yes
- No

At which Local Municipality facilities does your facility do outreach to?
* must provide value
- Clinic
- PHC/CHC
- Other

Today's date
* must provide value
01-12-2021

Next Page >>

Save & Return Later
Addendum 5: Survey PDF Format

CaRe4SA HR Information

Please complete the survey below.

Thank you!

What is your profession?

What is your PERSAL number?

At which University did you complete your undergraduate degree?

In which year did you obtain your undergraduate degree from?

What is your highest level of qualification?

- Diploma
- Bachelors
- Masters
- Doctorate

At which university did you complete your postgrad?
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>At which Local Municipality facility are you working?</td>
<td></td>
</tr>
<tr>
<td>At which Local Municipality facility are you working?</td>
<td></td>
</tr>
<tr>
<td>At which Local Municipality facility are you working?</td>
<td></td>
</tr>
<tr>
<td>At which Local Municipality facility are you working?</td>
<td></td>
</tr>
<tr>
<td>In which sub-district are you working?</td>
<td></td>
</tr>
<tr>
<td>At which Local Municipality facility are you working?</td>
<td></td>
</tr>
<tr>
<td>What is your current position?</td>
<td></td>
</tr>
<tr>
<td>When were you appointed at your current facility?</td>
<td></td>
</tr>
<tr>
<td>Are you working full- or part-time?</td>
<td></td>
</tr>
<tr>
<td>In which District are you working?</td>
<td></td>
</tr>
<tr>
<td>In which sub-district are you working?</td>
<td></td>
</tr>
</tbody>
</table>
At which Local Municipality facility are you working?

At which Local Municipality facility are you working?

At which Local Municipality facility are you working?

At which Local Municipality facility are you working?

At which Local Municipality facility are you working?

At which Local Municipality facility are you working?

At which Local Municipality facility are you working?

At which Local Municipality facility are you working?
In which sub-district are you working?

At which Local Municipality facility do you work?

At which Local Municipality facility are you working?

At which Local Municipality facility are you working?

At which Local Municipality facility do you work?
Addendum 6: Ethics approval 2019

Approval Notice

New Application

18/06/2019

Project ID: 9650

HREC Reference #: N19/04/048

Title: ASSESSMENT OF REHABILITATION CAPACITY IN SOUTH AFRICA

Dear Prof Quinette Louw,

The Response to Modifications received on 13/06/2019 14:42 was reviewed by members of Health Research Ethics Committee 2 (HREC2) via expedited review procedures on 18/06/2019 and was approved.

Please note the following information about your approved research protocol:

Protocol Approval Period: This project has approval for 12 months from the date of this letter.

Please remember to use your project ID [9650] and Ethics reference Number [N19/04/048] on any documents or correspondence with the HREC concerning your research protocol.

Please note that the HREC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

After Ethical Review

Please note you can submit your progress report through the online ethics application process, available at: Links Application Form Direct Link and the application should be
submitted to the HREC before the year has expired. Please see *Forms and Instructions* on our HREC website (www.sun.ac.za/healthresearchethics) for guidance on how to submit a progress report.

The HREC will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit.

**Provincial and City of Cape Town Approval**

Please note that for research at a primary or secondary healthcare facility, permission must still be obtained from the relevant authorities (Western Cape Departement of Health and/or City Health) to conduct the research as stated in the protocol. Please consult the Western Cape Government website for access to the online Health Research Approval Process, see: https://www.westerncape.gov.za/general-publication/health-researchapproval-process. Research that will be conducted at any tertiary academic institution requires approval from the relevant hospital manager. Ethics approval is required BEFORE approval can be obtained from these health authorities.

We wish you the best as you conduct your research.

For standard HREC forms and instructions, please visit: *Forms and Instructions* on our HREC website https://applyethics.sun.ac.za/ProjectView/Index/9650

If you have any questions or need further assistance, please contact the HREC office at 021 938 9677.

Yours sincerely,

Mr. Francis Masiye,

HREC Coordinator,

Health Research Ethics Committee 2 (HREC2).

*National Health Research Ethics Council (NHREC) Registration Number:*
The Health Research Ethics Committee (HREC) complies with the SA National Health Act No. 61 of 2003 as it pertains to health research. The HREC abides by the ethical norms and principles for research, established by the World Medical Association (2013). Declaration of Helsinki:


The Health Research Ethics Committee reviews research involving human subjects conducted or supported by the Department of Health and Human Services, or other federal departments or agencies that apply the Federal Policy for the Protection of Human Subjects to such research (United States Code of Federal Regulations Title 45 Part 46); and/or clinical investigations regulated by the Food and Drug Administration (FDA) of the Department of Health and Human Services.
Addendum 7: Ethics progress report approval 2020

Approval Letter
Progress Report

15/06/2020
Project ID: 9650

Ethics Reference No: N19/04/048

Project Title: ASSESSMENT OF REHABILITATION CAPACITY IN SOUTH AFRICA

Dear Prof Quinette Louw

We refer to your request for an extension/annual renewal of ethics approval dated 20/05/2020 22:41.

The Health Research Ethics Committee reviewed and approved the annual progress report through an expedited review process.

The approval of this project is extended for a further year.

Approval date: 19 June 2020

Expiry date: 18 June 2021

Kindly be reminded to submit progress reports two (2) months before expiry date.

Where to submit any documentation

Kindly note that the HREC uses an electronic ethics review management system, Infonetica, to manage ethics applications and ethics review process. To submit any documentation to HREC, please click on the following link: https://applyethics.sun.ac.za.

Please remember to use your Project Id 9650 and ethics reference number N19/04/048 on any documents or correspondence with the HREC concerning your research protocol.

Yours sincerely,

Mrs. Brightness Nxumalo
Coordinator: Health Research Ethics Committee 2

National Health Research Ethics Council (NHREC) Registration Number: REC-130408-012 (HREC1); REC-230208-010 (HREC2)

Federal Wide Assurance Number: 00001372

Office of Human Research Protections (OHRP) Institutional Review Board (IRB) Number:

IRB0005240 (HREC1); IRB0005239 (HREC2)
The Health Research Ethics Committee (HREC) complies with the SA National Health Act No. 61 of 2003 as it pertains to health research. The HREC abides by the ethical norms and principles for research, established by the World Medical Association (2013). Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects; the South African Department of Health (2006). Guidelines for Good Practice in the Conduct of Clinical Trials with Human Participants in South Africa (2nd edition); as well as the Department of Health (2015). Ethics in Health Research: Principles, Processes and Structures (2nd edition).

The Health Research Ethics Committee reviews research involving human subjects conducted or supported by the Department of Health and Human Services, or other federal departments or agencies that apply the Federal Policy for the Protection of Human Subjects to such research (United States Code of Federal Regulations Title 45 Part 46); and/or clinical investigations regulated by the Food and Drug Administration (FDA) of the Department of Health and Human Services.
Addendum 8: Ethics progress report approval 2021

Approval Letter
Progress Report

09/06/2021

Project ID: 9650

Ethics Reference No: N19/04/048

Project Title: ASSESSMENT OF REHABILITATION CAPACITY IN SOUTH AFRICA

Dear Prof QA Louw

We refer to your request for an extension/annual renewal of ethics approval dated 19/05/2021.

The Health Research Ethics Committee reviewed and approved the annual progress report through an expedited review process.

The approval of this project is extended for a further year.

Approval date: 19 June 2021

Expiry date: 18 June 2022

Kindly be reminded to submit progress reports two (2) months before expiry date.

Where to submit any documentation

Kindly note that the HREC uses an electronic ethics review management system, Infonetica, to manage ethics applications and ethics review process. To submit any documentation to HREC, please click on the following link: https://applyethics.sun.ac.za.

Please remember to use your Project Id 9650 and ethics reference number N19/04/048 on any documents or correspondence with the HREC concerning your research protocol.

Please note that for studies involving the use of questionnaires, the final copy should be uploaded on Infonetica. Yours sincerely,

Mrs A Fortuin

Health Research Ethics Committee 2 (HREC2)

National Health Research Ethics Council (NHREC)
Registration Number: REC-130408-012
(HREC1), REC-230208-010 (HREC2)
Federal Wide Assurance Number: 00001372
Office of Human Research Protections (OHRP) Institutional Review Board (IRB) Number:
IRB0005240 (HREC1) IRB0005239 (HREC2)

The Health Research Ethics Committee (HREC) complies with the SA National Health Act No. 61 of 2003 as it pertains to health research. The HREC abides by the ethical norms and principles for research, established by the World Medical Association (2013), Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects; the South African Department of Health (2006). Guidelines for Good Practice in the Conduct of Clinical Trials with Human Participants in South Africa (2nd edition); as well as the Department of Health (2015). Ethics in Health Research: Principles, Processes and Structures (2nd edition).


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Addendum 9: Ethics amendment to include this study as part of a Master’s degree

Approval Letter

Amendment

04/09/2020

Project ID: 9650

Ethics Reference No: N19/04/048

Project Title: ASSESSMENT OF REHABILITATION CAPACITY IN SOUTH AFRICA

Dear Prof Quinette Louw

Your amendment request dated 21/08/2020 10:18 refers.

The Health Research Ethics Committee (HREC) reviewed and approved the amended documentation through an expedited review process.

The following amendment was reviewed and approved:

Amendment number 1, dated 20 August 2020

1. Assessing the feasibility of collection of the Human Resources data via an online tool.

   - The study design will be according to CONSORT 2010 Extended statement for feasibility studies.

   - The feasibility study will determine whether it is possible to collect the data via a cross-sectional web-based survey.

Where to submit any documentation

Kindly note that the HREC uses an electronic ethics review management system, Infonetica, to manage ethics applications and ethics review process. To submit any documentation to HREC, please click on the following link: https://applyethics.sun.ac.za.

Please remember to use your project ID 9650 and ethics reference number N19/04/048 on any documents or correspondence with the HREC concerning your research protocol.

Yours sincerely,

Mrs. Brightness Nxumalo

Coordinator: Health Research Ethics Committee 2

National Health Research Ethics Council (NHREC) Registration Number:

REC-130408-012 (HREC1), REC-230208-010 (HREC2)
The Health Research Ethics Committee (HREC) complies with the SA National Health Act No. 61 of 2003 as it pertains to health research. The HREC abides by the ethical norms and principles for research, established by the World Medical Association (2013). Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects; the South African Department of Health (2006). Guidelines for Good Practice in the Conduct of Clinical Trials with Human Participants in South Africa (2nd edition); as well as the Department of Health (2015). Ethics in Health Research: Principles, Processes and Structures (2nd edition).

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