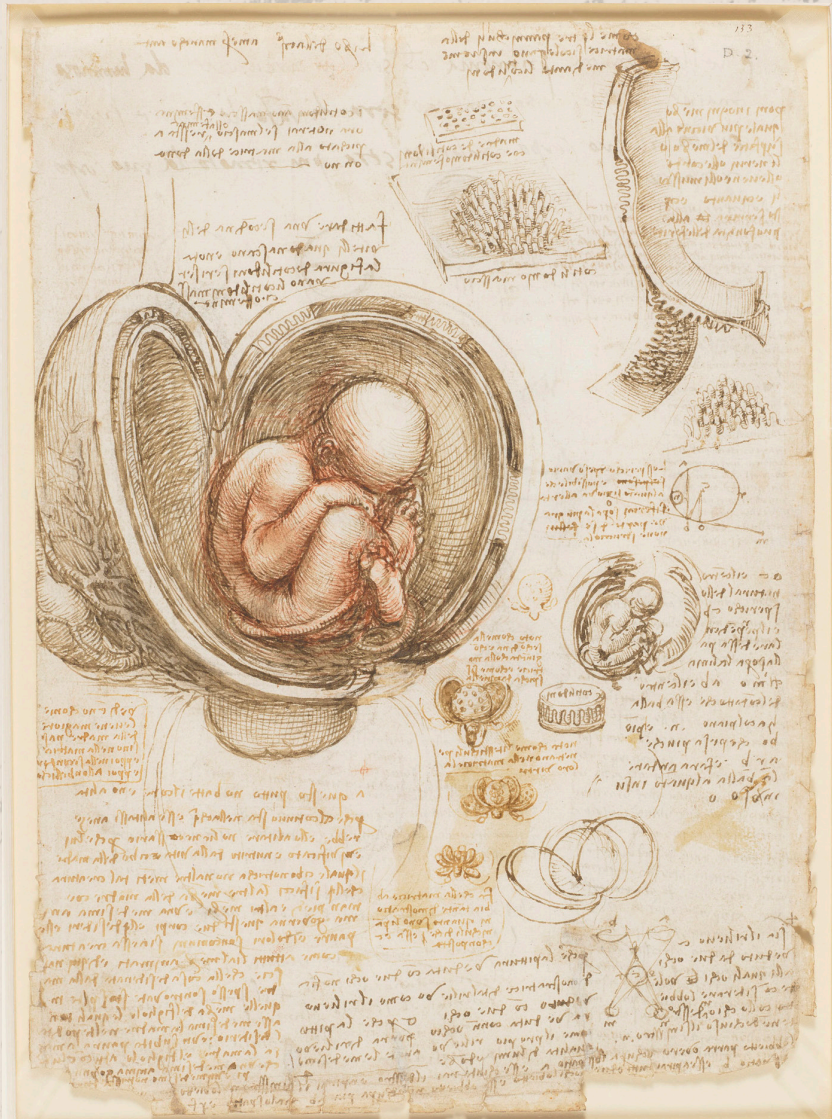


HEALTH IN TRANSITION

Translating developmental origins
of health and disease science to
improve future health in Africa



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INTERNATIONAL SOCIETY FOR DEVELOPMENTAL ORIGINS OF HEALTH AND DISEASE'S WORK AT THE STELLENBOSCH INSTITUTE FOR ADVANCED STUDY

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This chapter describes the core group at the Stellenbosch Institute for Advanced Study (STIAS) who have contributed to the long-term theme project, 'Health in Transition'. It also describes what this book is about, why it is crucial, and the different strands and topics that are covered.

Introduction

STIAS has launched several long-term research projects based on selected strategic themes. These are:⁴

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- 3 Department of Paediatrics, Peter Wall Institute for Advanced Studies, University of British Columbia, Vancouver; STIAS.
- 4 Stellenbosch Institute for Advanced Study (STIAS). 2020. Ideas/Themes. [<https://stias.ac.za/ideas/themes/>].

- ☐ Being Human Today
- ☐ Crossing Borders
- ☐ The Future of Democracy
- ☐ Understanding Complexity
- ☐ Sustainable Agro-Ecosystems
- ☐ University and Society
- ☐ Health in Transition

These projects are team-driven and conducted by STIAS fellows during and between consecutive periods of residence (annually or biennially over three to four years). In this time, they convene workshops or conferences at STIAS, direct and conduct research in support of the project goals, and nominate other scholars to join the core group from time to time. The long-term projects have led to international colloquia, roundtable meetings, policy briefs and a growing collection of seminal publications, including volumes in the STIAS Series.

The 'Health in Transition' theme (Convener: Abdallah Daar)

'Health in Transition' is a continually evolving multi-disciplinary umbrella field that is in urgent need of innovative research and fresh thinking. While it is global, the health challenges are nowhere as stark as in Africa where most sub-Saharan African countries face a double burden. According to the Lancet Commission on the Future of Health in sub-Saharan Africa, health challenges such as infectious diseases, malnutrition, and child and maternal mortality persist.⁵ At the same time, new challenges arise from an increasing burden of chronic non-communicable diseases – mental health disorders; injuries; and health problems related to climate change and environmental degradation.⁶ Despite the progress achieved, life

5 Daar, A.S., Singer, P.A., Persad, D., Pramming, S., Matthews, D., Beaglehole, R., Bernstein, A., Borysiewicz, L., Colagiuri, S., Ganguly, N., Glass, R., Finewood, D., Koplan, J., Nabel, E., Sarna, G., Sarrafzadegan, N., Smith, R., Yach, D. & Bell, J. 2007. Grand Challenges in Chronic Non-Communicable Diseases. *Nature*, (450):494-496. [<https://doi.org/10.1038/450494a>].

6 STIAS. 2016. *Moving Towards Early Implementation in Africa*. Workshop on the Developmental Origins of Health and Disease and Sustainable Development Goals, 21-23 September. [<http://stias.ac.za/events/dohad-sdgs-moving-towards-early-implementation-in-africa/>].

expectancy and most population health indicators lag behind most low income and middle-income countries in other parts of the world. The situation is worse in fragile countries, rural areas, urban slums, and conflict zones, and among the poor, the disabled, and the marginalised.

The burden of chronic non-communicable diseases is becoming increasingly severe. At the same time, nutritional challenges brought about by a nutritional transition includes a high and co-existing burden of both under-nutrition and obesity/overweight, with a huge and growing burden on children. While many are overweight or obese, a significant proportion of people go hungry every day. These burdens all affect the health of mothers and their children, who are programmed to develop chronic diseases in later life and transmit that burden to the next generation through various mechanisms, including epigenetics. Scholars working in the field of the developmental origins of health and disease (DOHaD) study the dimensions of how early life events affect future health, mostly in the development and expression of chronic non-communicable diseases; and the mechanism of how that predisposition or programming is transmitted across generations.

These multiple transitions related to health, including technological ones, have significant implications for health services, social support and morbidity and mortality rates. Both the field of study of 'Health in Transition' and planners and policy developers of national health services are genuinely beset with poverty of reliable health-related data.

A measure of the importance and impact of chronic non-communicable diseases on societies include the facts that by 2020, globally, chronic non-communicable diseases (diabetes, heart disease, stroke) will cause 60 per cent of deaths worldwide, and 80 per cent of those will be in low- and middle-income countries.⁷ However, 44 per cent of these deaths are preventable with behavioural and pharmaceutical interventions. In the next 20 years, globally, chronic non-communicable diseases will cost more than 30 trillion US dollars (48 per cent of global Gross Domestic Product). Importantly, mounting evidence highlights how millions of deaths can be averted and economic losses reduced by billions of dollars if added focus is put on the prevention of chronic non-communicable diseases. In this context, the World Health Organization (WHO) estimates that population-based prevention measures for all low- and middle-income countries would cost two billion US dollars per year. This cost amounts to less than 0.40 US dollars per person.⁸ It is

7 Ibid.

8 World Health Organization (WHO). 2018. Non-communicable diseases. [<http://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases>].

generally accepted that the best opportunity, with likely the highest returns on investment, is early childhood development, or as a WHO report states:

The early child period is considered to be the most important developmental phase throughout the lifespan. Healthy early child development (ECD) – which includes the physical, social/emotional, and language/cognitive domains of development, each equally important – strongly influences well-being, obesity/stunting, mental health, heart disease, competence in literacy and numeracy, criminality and economic participation throughout life. What happens to the child in the early years is critical for the child's developmental trajectory and life course.⁹

To this end, our core group has set out to contribute and focus on sub-Saharan Africa. Members are:

- ☐ Abdallah Daar, University of Toronto, Canada
- ☐ Shane Norris, University of Witwatersrand, South Africa
- ☐ Andrew Macnab, University of British Columbia, Vancouver, USA
- ☐ Peter Byass, University of Umea, Sweden
- ☐ Justine Davies, University of Birmingham, UK
- ☐ Tessa Roseboom, University of Amsterdam
- ☐ Moffat Nyirenda, London School of Hygiene and Tropical Medicine and MRC/UVRI, Uganda
- ☐ Eugene Sobngwi, University of Younde, Cameroon
- ☐ Atul Singhal, University College, London
- ☐ Chittaranjan Yajnik, Diabetes Research Centre, Pune, India
- ☐ Tolullah Oni, University of Cape Town/ University of Cambridge, UK
- ☐ Christoff Pauw, STIAS
- ☐ Dorairajan Balasubramanian, LV Prasad Eye Institute, Hyderabad, India

Major activities of the STIAS DOHaD Group

The DOHaD Core Group was convened under the 'Health in Transition' theme, with the title, *DOHaD and SDGs: Towards Early Implementation in Africa*. It started

9 WHO. 2007. *Early Child Development: A Powerful equalizer*. March.
[http://www.who.int/maternal_child_adolescent/documents/ecd_final_m30/en/].

work in September 2016 and launched at a STIAS and Africa-wide workshop on DOHaD.¹⁰

Seven of the papers from the STIAS DOHaD group and colleagues were published in an Africa themed issue of the *Journal of DOHaD* (Table 1.1). These publications illustrate the range of interests of the core group, and also the type of subjects under the DOHaD umbrella.

Table 1.1 Papers in an Africa-themed issue of the *Journal of Developmental Origins of Health and Disease* (J DOHaD):

Macnab, A., Daar, A., Norris, S. & Pauw, J. 2018. Advancing the DOHaD agenda in Africa. <i>J DOHaD</i> , 9(1):2-4. [https://doi.org/10.1017/S2040174417001052].
Kajee, N., Sobngwi, E., Macnab, A. & Daar, A. 2018. The Developmental Origins of Health and Disease and Sustainable Development Goals: Mapping the way forward. <i>J DOHaD</i> , 9(1):5-9. [https://doi.org/10.1017/S2040174417000630].
Pentecost, M., Ross, F. & Macnab, A. 2018. Beyond the dyad: Making Developmental Origins of Health and Disease (DOHaD) interventions more inclusive. <i>J DOHaD</i> , 9(1):10-14. [https://doi.org/10.1017/S2040174417000629].
Macharia, T., Ochola, S., Mutua, M. & Kimani-Murage, E. 2018. Association between household food security and infant feeding practices in urban informal settlements in Nairobi, Kenya. <i>J DOHaD</i> , 9(1):20-29. [https://doi.org/10.1017/S2040174417001064].
Macnab, A. & Mukisa, R. 2018. Priorities for African youth for engaging in DOHaD. <i>J DOHaD</i> , 9(1):15-19. [https://doi.org/10.1017/S2040174417000423].
Redinger, S., Norris, S., Pearson, R., Richter, L. & Rochat, T. 2018. First trimester antenatal depression and anxiety: Prevalence and associated factors in an urban population in Soweto, South Africa. <i>J DOHaD</i> , 9(1):30-40. [https://doi.org/10.1017/S204017441700071X].
Rochat, T., Houle, B., Stein, A., Pearson, R., Newell, M. & Bland, R. 2018. Psychological morbidity and parenting stress in mothers of primary school children by timing of acquisition of HIV infection: A longitudinal cohort study in rural South Africa. <i>J DOHaD</i> , 9(1):41-57. [https://doi.org/10.1017/S204017441700068X].

Other papers from the group include a call-to-action paper, a paper in the *Lancet Global Health*, and papers on the WHO 'Health-Promoting Schools' programme and the issues of messaging.¹¹

Energised by the DOHaD Core Group and under the leadership of Shane Norris, an Africa chapter of the International DOHaD Society was created, with some

10 STIAS. 2016. *DOHaD and SDGs: Moving Towards Early Implementation in Africa*. STIAS workshop, 21-23 September. [https://bit.ly/3pg33ox].

11 Norris, S.A., Daar, A., Balasubramanian, D., Byass, P., Kimani-Murage, E., Macnab, A., Pauw, C., Singhal, A., Yajnik, C., Akazili, J., Levitt, N., Maatoug, J., Mkhwanazi, N., Moore, S.E., Nyirenda, M., Pulliam, J.R.C., Rochat, T., Said-Mohamed, R., Seedat, S., Sobngwi, E., Tomlinson, M., Toska, E., Van Schalkwyk, C. 2017. Understanding and acting on the developmental origins of health and disease in Africa would improve health across generations. *Global Health Action*, 10(1):1334985. [https://doi.org/10.1080/16549716.2017.1334985]; Davies, J.I., Macnab, A.J., Byass, P., Norris, S.A., Nyirenda, M., Singhal, A., Sobngwi, E. & Daar, A. 2018. Developmental Origins of Health and Disease

members of the STIAS DOHaD Group appointed to its scientific advisory board. This Society officially launched at the DOHaD Summit in Rotterdam in October 2017.

In November 2017, the STIAS Core Group, together with the African Academy of Sciences and the MRC Developmental Pathways for Health Research Unit at the University of the Witwatersrand, organised a very successful Summer School at STIAS, attended by graduate students and post-doctoral fellows from around Africa.¹² An enthusiastic group of potential future African leaders who became the founding members of the Africa chapter of the International DOHaD Society was created. An important outcome of that workshop was the creation of a Network of Young African Scientists dedicated to DOHaD research. The successful model for the Summer School would have been reprised at STIAS in April 2020, had it not been for the restrictions imposed globally by the Covid-19 outbreak.

This book in the STIAS series is an important legacy from the DOHaD Core Group. The scope of topics included in this volume reflects the breadth of DOHaD science and the reach required for intervention measures to impact future health outcomes.

The background section sets out what the fundamental issues are. WHO has identified non-communicable diseases as one of the ten leading threats to global health, and in Africa, while communicable diseases are still the continent's immediate disease burden, there is a growing awareness of the 'epidemic' nature of the increase in non-communicable diseases on the continent. This increase has major health and economic implications, hence the need to understand what present and future data can contribute. There are key areas of DOHaD epidemiology aligned with the current United Nations' 'Sustainable Development Goals' initiatives, hence the potential for synergistic strategies as a way forward. Moreover, the historical impact of famine on health has relevance in Africa, where undernutrition is still a health determinant for a significant part of the population.

in Africa – influencing early life. *Lancet Global Health*, 6:244-245. [https://www.thelancet.com/pdfs/journals/langlo/PIIS2214-109X(18)30036-6.pdf]; Macnab, A.J. and Mukisa, R. 2019. Celebrity endorsed music videos: innovation to foster youth health promotion. *Health Promotion International*, 34(4):716-725. [https://doi.org/10.1093/heapro/day042]; Macnab, A.J. & Mukisa, R. Reducing the global burden of poor oral health through school-based programmes. *International Journal of Epidemiology*, 47(5):1379-1382. [https://doi.org/10.1093/ije/dyy180].

- 12 STIAS. 2017. Developmental Origins of Health and Disease Translational Science: from Cell to Society. *Summer school*, 21-24 November. [https://bit.ly/3ki9Mut].

The section on focus areas for intervention highlights the fundamental importance to human health of breastfeeding and addresses the challenges in urban areas of sub-Saharan Africa to ensure appropriate infant nutrition through the first 1 000 days of life. How environmental exposures early in life may influence the phenotypes of non-communicable diseases in Africa is described, as this is an essential fundamental science component able to contribute to future evidence-based intervention relevant to DOHaD. The epidemic of diabetes is discussed as this is central to current DOHaD science and thinking; the impact on health and the economy of hyperglycaemia and has valuable lessons for low and middle-income countries.

Measures with the potential to impact future outcomes are needed. The broad-ranging interests and expertise of the DOHaD Core group are reflected in this section. With a multi-lingual society where levels of education vary, the ability of photos and pictures to communicate key ideas and actions in lay essays and scientific reports offers a creative and effective means of communication. How we engage young people in the context of DOHaD is a challenge. The WHO Health-Promoting School model has proven valuable as a conduit for youth health promotion globally and offers a potential avenue to educate more than a billion children about DOHaD worldwide. However, a fundamental issue is what 'messages' will resonate with youth and which 'messengers' they will identify with most effectively? There is evidence from schools in Africa that celebrities, and their music, in particular, can be a positive influence. A fundamental step in initiating effective intervention is the need to broker intersectoral approaches and partnerships. It is also necessary to recognise that morbidity from traditional diseases that burden school-age children like malaria has to be addressed in parallel with health promotion if benefits are to be accrued from any strategies aimed at educating the next generation effectively about DOHaD.

At present, the Core Group is working to ensure the long-term sustainability of the group's work. To this end the group is developing applications for grant funding from major international agencies, to building the capacity of young scientists through funding for PhDs and post-doctoral positions; building networks; fostering excellence in DOHaD research; and targeted advocacy and policy interventions. Some of the potential areas of research projects include modelling DOHaD attributable morbidity and mortality; new studies of food security; breastfeeding, skin-to-skin care (e.g. Kangaroo Mother Care) that also involves fathers; and Fetal Alcohol Syndrome.