

Equity in Access to Quality Maternal and Child Health Services in sub- Saharan Africa

By Firew Tekle Bobo

Thesis submitted in fulfilment of the requirements for
the degree of

Doctor of Philosophy

Under the supervision of Professor Andrew Hayen,
Professor Angela Dawson, Dr. Augustine Asante, and
Professor Mirkuzie Woldie

University of Technology Sydney

Faculty of Health

September 2022

Certificate of Original Authorship

I, Firew Tekle Bobo declare that this thesis, is submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the School of Public Health, Faculty of Health at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

This research is supported by the Australian Government Research Training Program.

Production Note:
Signature removed prior to publication.

Date: 04 Sep 2022

Abstract

Background: Maternal health services, such as antenatal care (ANC), skilled birth attendance (SBA), postnatal care (PNC), and child vaccination, have been instrumental in reducing morbidity and mortality rates among women and children globally. However, despite their proven efficacy, access to and utilisation of these services in low- and lower-middle-income countries (LLMICs) remain limited. While much attention has been given to monitoring and addressing coverage disparities, there has been a notable lack of evidence on disparities in access to quality care. This study aimed to assess the status of equity in access to quality maternal and child health (MCH) services in sub-Saharan Africa (SSA).

Methods: This study analysed the SSA countries that had the latest Demographic and Health Surveys (DHS) conducted between 2013 and 2020. Socioeconomic inequalities were examined using three equity analysis methods: rate/ratio, concentration curve, and concentration index. Multilevel analysis that adjusts for clusters, countries, and sampling weights were used to explain inequalities. In addition, decomposition analysis was used to explain inequalities.

Results: The first study assessed inequalities in quality ANC. The results revealed a significant gap between the quantity of ANC contacts received by women and the quality of ANC services provided during those contacts, with just over half (54.4%) receiving four or more ANC contacts, while only 21% received quality ANC services. The second study analysed spatial patterns and inequalities in SBA and caesarean section. The proportion of SBA varied greatly across countries, with Chad having the lowest rate at 24.3% and South Africa having the highest at 96.7%. In ten out of 25 countries, the rate of caesarean delivery was less than 1% for the poorest quintile, while in nine countries, it was more than 15% for the richest quintile. The third study evaluated the continuum of care for maternal health services. About 89% of women reported

having at least one ANC contact, but only 30% of women received the recommended care package that includes four or more ANC contacts, SBA, and PNC. Nearly 9% of women reported not having contact with the health system during pregnancy or childbirth; this ranged from 0.1% in Burundi to 34% in Chad. The fourth study investigated inequalities in child vaccination across 25 SSA countries. The research findings showed that 56.5% of children received all recommended vaccinations, 35.1% had incomplete vaccinations, and 8.4% had received no vaccinations, with a disproportionate concentration of zero-dose vaccination among the poor, while full vaccination coverage was more common among wealthier households in many countries. The fifth study revealed an increase in the proportion of children who received full vaccination in Ethiopia, rising from 24.6% in 2011 to 38.6% in 2016, with higher coverage among children from wealthier households. Overall, this research highlighted the existing disparities in maternal health and child vaccination, influenced by various factors such as wealth, education, access to media, place of residence, as well as maternal factors such as age and parity.

Conclusions: Progress toward comprehensive MCH coverage has been insufficient at both the national and across equity dimensions, impeding progress toward universal health coverage (UHC). Ensuring equitable coverage of MCH services is critical to achieving UHC. Therefore, when planning interventions and assessing progress, prioritising equity considerations is essential. Regular evaluations of health inequality can serve as a diagnostic tool to identify and address the needs of vulnerable populations. To further improve MCH services in SSA, it is essential to address areas with limited coverage and tailor services to meet the specific needs of marginalized groups. Additionally, special attention must be given to child immunisation to maintain previous progress and extend coverage to all demographics.

Acknowledgements

I am incredibly grateful to my excellent supervisors, Professor Andrew Hayen, Professor Angela Dawson, Professor Mirkuzie Woldie, and Dr Augustine Asante, for their superb guidance and huge investment of time into this project. Professor Andrew Hayen gave me the opportunity and freedom to pursue my research interests and taught me a great deal about epidemiological methods. Professor Angela Dawson and Dr Augustine Asante shared their thoughtful advice and excellent expertise in health systems and services. Professor Mirkuzie Woldie provided insightful and fantastic expertise in maternal and child health programs and has also been a great role model and mentor to my academic and research career.

I gratefully acknowledge the University of Technology Sydney for funding assistance through the UTS President's Scholarship and UTS International Research Scholarship to support my study. I would also like to thank Measure DHS ICF International for the permission to use the datasets for this thesis.

My heartfelt gratitude goes to my family: Mom, Dad, Bilisuma, Hawi, and Keneni, for their endless support and care at all times. Thank you to Mom, for all the sacrifices and for setting me on this path through all the challenges and struggles. To my brother Bilisuma, thank you for always having my back. To my wonderful sisters Hawi and Keneni, thank you for all your love and care.

And last but certainly not least, I would like to thank all my friends. I am grateful to Tesfaye, Gemechu, Beky, Taye, Fekede, Asem, and Lelise for their encouragement and support during my study.

Thank you all!

Publications included in this thesis

Peer-Reviewed Papers

1. **Bobo F.T.**, Asante A, Woldie M, Hayen A. Poor coverage and quality for poor women: Inequalities in quality antenatal care in nine East African countries. *Health Policy and Planning*. 2021;36(5):662-72.
2. **Bobo F.T.**, Asante A, Woldie M, Dawson A, Hayen A. Spatial patterns and inequalities in skilled birth attendance and caesarean delivery in sub-Saharan Africa. *BMJ Global Health*. 2021;6(10).
3. **Bobo, F. T.**, Asante, A., Woldie, M., Dawson, A., & Hayen, A. (2022). Child vaccination in sub-Saharan Africa: Increasing coverage addresses inequalities. *Vaccine*, 40(1), 141-150. doi:10.1016/j.vaccine.2021.11.005
4. **Bobo, F.T.** & Hayen, A. 2020, 'Decomposition of socioeconomic inequalities in child vaccination in Ethiopia: results from the 2011 and 2016 demographic and health surveys', *BMJ Open*, vol. 10, no. 10, p. e039617.

Submitted manuscripts included in this thesis

Bobo F.T., Asante A, Woldie M, Dawson A, Hayen A. Evaluating equity across the continuum of care for maternal health services: analysis of household surveys from 25 sub-Saharan African countries. *International Journal for Equity in Health*. (Under review)

Conference abstracts

1. **Bobo F**, Asante A, Woldie M, Dawson A, Andrew H, (2022) Evaluating equity across the continuum of care for maternal health services: analysis of household surveys from 25 sub-Saharan African countries “15th Annual Conference on the Science of Dissemination and Implementation in Health” December 11-14, 2022
2. **Bobo F**, Asante A, Woldie M, Dawson A, Andrew H, (2022) Inequalities in access to quality Antenatal Care in nine east African countries “15th Annual Conference on the Science of Dissemination and Implementation in Health” December 11-14, 2022,
3. **Bobo FT**. Asante A, Woldie M, Dawson A, Hayen A. Inequalities in quality antenatal care in nine East African countries. Sixth Global Symposium on Health Systems Research, 08-12 November 2020
4. **Bobo FT**. Asante A, Woldie M, Dawson A, Hayen A. Child vaccination in sub-Saharan Africa: Increasing coverage addresses inequalities. In 33rd EPHA Annual Conference Feb 16, 2022.
5. **Bobo FT**. Asante A, Woldie M, Dawson A, Hayen A. Decomposition of socioeconomic inequalities in child vaccination in Ethiopia: results from the 2011 and 2016 demographic and health surveys. In 33rd EPHA Annual Conference 2022 Feb 16.

Media articles related to this thesis

1. **Bobo F**, Hayen A. Dawson A. December 9, 2021, Addressing Inequalities in Access to Quality Maternal and Child Health Services in Sub-Saharan Africa. Intouch Public Health. <https://intouchpublichealth.net.au/addressing-inequalities-in-access-to-quality-maternal-and-child-health-services-in-sub-saharan-africa/>
2. **Bobo F**, Asante A, Woldie M, Hayen A. April 13, 2021, A long way to ensuring access to quality antenatal care in east Africa: challenges and future directions. Health Policy and Planning Debated. <https://blogs.lshtm.ac.uk/hppdebated/2021/04/13/a-long-way-to-ensuring-access-to-quality-antenatal-care-in-east-africa-challenges-and-future-directions/>
3. **Bobo F**, Hayen A. Dawson A. Asante A, Woldie M, November 16, 2021. Accessing maternal healthcare in sub-Saharan Africa. UTS News in Health <https://www.uts.edu.au/about/faculty-health/news/accessing-maternal-healthcare-sub-saharan-africa>
4. **Bobo F**, Asante A, Woldie M, Hayen A. April 23, 2021. Quality antenatal care in East Africa. UTS News in Health <https://www.uts.edu.au/about/faculty-health/news/quality-antenatal-care-east-africa>

Table of contents

Abstract.....	i
Acknowledgements.....	iii
Table of contents	vii
List of Figures	xi
List of Tables	xiii
List of acronyms	xiv
Chapter One: Introduction.....	1
1.1 Concepts of equity and quality in health	1
1.1.1 Health inequities	2
1.1.2 Universal health coverage.....	5
1.1.3 Social determinants of health.....	6
1.1.4 Defining quality of healthcare.....	10
1.1.5 The link between equity and quality.....	15
1.2 Significance of the research	16
1.3 Research aims and objectives	20
1.4 Thesis structure.....	21
Chapter Two: Maternal and child health services in sub-Saharan Africa: A literature review.....	24
2.1 Overview	24
2.2 Status of equity in access to quality maternal and child health services	26
2.3 Antenatal care.....	29
2.3.1 Inequalities and determinants of antenatal care use.....	30
2.4 Skilled birth attendance and caesarean section	32
2.4.1 Inequalities and determinants of skilled birth attendance and caesarean section.....	32
2.5 Continuum of care for maternal health services	36
2.5.1 Inequalities and determinants of in continuum of care	36
2.6 Childhood vaccination.....	40
2.6.1 Inequalities in and determinants of child vaccination	41
2.7 Chapter summary.....	42
Chapter Three: Methods.....	43
3.1 Data source	43
3.2 Maternal and child health indicators examined in this study.....	45
3.3 Factors explaining inequalities.....	48

3.4 Statistical analysis	51
3.4.1 Measuring socioeconomic inequalities.....	51
3.4.2 Multilevel analysis.....	53
3.4.3 Decomposition analysis	54
3.5 Ethical considerations	55
3.5 Chapter summary.....	55
Chapter Four: Antenatal care quality: inequalities and determinants	56
Manuscript one: Poor coverage and quality for poor women: inequalities in quality antenatal care in nine East African countries	57
4.1 Abstract.....	58
4.2 Introduction	59
4.3 Methods.....	62
4.3.1 Data	62
4.3.2 Measures.....	62
4.3.3 Independent variables	63
4.3.4 Statistical analysis	64
4.4 Results.....	66
4.4.1 Coverage of ANC contact and content.....	66
4.4.2 Socioeconomic inequalities.....	69
4.5 Discussion.....	79
4.5.1 Conclusions	84
4.5 Chapter summary.....	86
Chapter Five: Intrapartum care: spatial patterns, inequalities and determinants	87
Manuscript two: Spatial patterns and inequalities in skilled birth attendance and caesarean delivery in sub-Saharan Africa	88
5.1 Abstract.....	89
5.2 Introduction	92
5.3 Methods.....	94
5.3.1 Data	94
5.3.2 Outcomes	94
5.3.3 Covariates	95
5.3.4 Statistical analysis	96
5.3.5 Patient and public involvement	97
5.4 Results.....	97
5.4.1 Inequality in the coverage of skilled birth attendant	97

5.4.2 Inequalities in the coverage of caesarean delivery.....	105
5.5 Discussion.....	109
5.5 Chapter summary.....	115
Chapter Six: Continuum of care for maternal health services: dropout, inequalities, and determinants	116
Manuscript three: Evaluating equity across the continuum of care for maternal health services: analysis of household surveys from 25 sub-Saharan African countries	117
6.1 Abstract.....	119
6.2 Introduction	120
6.3 Methods.....	123
6.3.1 Data.....	123
6.3.2 Measures.....	123
6.3.3 Covariates	124
6.3.4 Statistical analysis	125
6.4 Results.....	127
6.4.1 Coverage of maternal health services	127
6.4.2 Continuum of care	129
6.4.3 Inequalities in the continuum of care.....	130
6.5 Discussion.....	137
6.5.1 Policy implications.....	140
Chapter Seven: Measuring inequality and drivers of inequality in vaccination coverage in sub-Saharan Africa.....	143
Manuscript four: Child vaccination in sub-Saharan Africa: Increasing coverage addresses inequalities	145
7.1 Abstract.....	146
7.2 Introduction	149
7.3 Methods.....	151
7.3.1 Data.....	151
7.3.2 Measures.....	151
7.3.3 Independent variables	152
7.3.4 Statistical analysis	153
7.4 Results.....	154
7.5 Discussion.....	165
7.6 Chapter summary.....	173
Chapter Eight: Explaining socioeconomic inequalities in child vaccination: the case of Ethiopia.....	174

Manuscript five: Decomposition of socioeconomic inequalities in child vaccination in Ethiopia: Results from the 2011-2016 demographic and health survey data	175
8.1 Abstract.....	176
8.2 Introduction	179
8.3 Methods.....	182
8.4 Results.....	186
8.5 Discussion.....	196
8.6 Chapter summary.....	200
Chapter Nine: Discussion and conclusions	201
9.1 Magnitude and drivers of inequality in maternal and child health services	201
9.2 Patterns of inequality across countries	203
9.3 The need to improve equity in access to quality maternal and child health services.....	204
9.4 Policy implications	208
9.5 Strengths and limitations.....	212
9.6 Recommendations for future research.....	213
9.7 Conclusions	214
References	216
Appendices.....	231
Graduate study plan.....	233

List of Figures

Figure 1-1 Commission on Social Determinants of Health conceptual framework. Source WHO (2)	10
Figure 1-2 Donabedian's framework for quality improvement in healthcare. Source (45)	12
Figure 1-3 continuum of care for maternal, newborn and child flowchart.....	21
Figure 4-1 Flow chart describing included samples across nine East African countries (DHS: 2013 – 2016).	66
Figure 4-2 Coverage of four or more ANC contacts and the six services across nine East African countries	67
Figure 4-3 Coverage of the six services across nine East African countries (DHS: 2013 - 2018).	68
Figure 4-4 Coverage of ANC services by place of residence and educational status across nine East African countries (DHS: 2013 - 2018).....	69
Figure 4-5 socioeconomic inequalities in the coverage of four or more ANC contacts and the six services within and across nine East African countries (DHS: 2013 to 2018)	70
Figure 4-6 Concentration curves for four or more antenatal care contacts across nine East African countries (DHS: 2013 - 2018)	70
Figure 4-7 Concentration curves for receipts of all six services across nine East African countries (DHS: 2013 - 2018).....	71
Figure 4-8 Socioeconomic inequalities in the coverage of six ANC components by area of residence across nine East African countries (DHS: 2013 – 2018)	72
Figure 5-1 National and sub- national rates of skilled birth attendance (SBA) in 25 sub-Saharan African countries.....	98
Figure 5-2 Skilled attendant at birth and caesarean delivery rates by socioeconomic status, providers and place of service. Providers or place of service, represented by five circles (one for each wealth subgroup). Vertical lines indicate the difference between the minimum and maximum rate by provider or place of service (DHS 2013–2021).....	99
Figure 5-3 Concentration indices for skilled birth attendance and caesarean section across 25 sub-Saharan African countries (DHS 2013–2020).....	100

Figure 5-4 National and subnational coverage of caesarean delivery in 25 sub-Saharan African countries.	105
Figure 5-5 Concentration indices for providers of birth assistance and caesarean section in sub-Saharan Africa (DHS 2013–2020).	106
Figure 6-1 National and subnational rates of four or more ANC contacts in 25 sub-Saharan African countries.	128
Figure 6-2 National and subnational rates of skilled care at birth in 25 sub-Saharan African countries.	128
Figure 6-3 National and subnational rates of postnatal care in 25 sub-Saharan African countries.	129
Figure 6-4 Maternal health care pathway. Green boxes and arrows show the recommended pathway. Rates of decline were calculated for all women (196717) included in the study. ..	130
Figure 6-5 Concentration indices for women who had zero contact, 4+ ANC contacts, and 4+ ANC contacts, skilled care at facility and PNC across 25 sub-Saharan African countries (DHS 2013 to 2021).	132
Figure 7-1 Vaccination coverage among children aged 12-23 months in 25 Sub Saharan Africa countries (DHS 2013 - 2018)	155
Figure 7-2 Child vaccination coverage in 25 Sub Saharan Africa countries (DHS 2013 - 2018)	157
Figure 7-3 concentration indices child vaccination status across 25 Sub Saharan Africa countries (DHS: 2013 - 2018)	159
Figure 7-4 concentration curves full vaccination status across Sub Saharan Africa regions (DHS: 2013 - 2018)	161
Figure 8-1 Vaccination coverage among children aged 12-23 months in Ethiopia (DHS 2011, 2016).	187
Figure 8-2 Concentration curves for child vaccination status, Ethiopia (DHS 2011, 2016).....	191
Figure 8-3 Concentration indecies that shows socioeconomic inequalities in child vaccinations, Ethiopia (DHS 2011, 2016)	191
Figure 8-4 Percentage contributions of factors explaining socioeconomic inequalities in full vaccination coverage, Ethiopia (DHS 2011, 2016)	192

List of Tables

Table 3.1 maternal and child health indicators examined in this thesis	46
Table 4-1 Factors associated with four or more antenatal care contacts.....	74
Table 4-2 Factors associated with receiving all six services of antenatal care.....	77
Table 5-1 Factors associated with the use of skilled birth attendance in sub-Saharan Africa	103
Table 5-2 Factors associated with the use of caesarean section in sub-Saharan Africa	108
Table 6-1 factors associated with the uptake of care across the continuum.	135
Table 7-1 Factors associated with receiving full vaccinations	163
Table 8-1 Basic vaccination schedule for children under 12 months in Ethiopia.....	183
Table 8-2 Basic vaccination coverage by maternal and child characteristics in Ethiopia (DHS 2011 – 2016)	188
Table 8-3 Decomposition of socioeconomic inequalities in basic vaccination coverage in Ethiopia, (DHS 2011, 2016)	194

List of acronyms

ANC	Antenatal care
ANC 4+	Four or more antenatal care visits
BCG	Bacille Calmette-Guérin vaccine
CCI	Composite coverage index
CI	Confidence interval
CoC	Continuum of care
DHS	Demographic and Health Survey
DTP3	Third dose of diphtheria-tetanus-pertussis vaccine
LLMIC	Low- and -lower middle-income country
LMIC	Low-income and middle-income country
MDG	Millennium development goals
OPV3	Third dose of oral polio vaccine
OR	Odds ratio
PNC	Postnatal care
RR	Risk ratio
SBA	Skilled birth attendance
SDG	Sustainable Development Goal
SSA	Sub-Saharan Africa
UHC	Universal health coverage
UN	United nations
WHO	World Health Organization