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Diagnostic and clinical decision support systems for antenatal care: is mHealth the future in low-resource settings?

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International Doctorate in Transdisciplinary Global Health Solutions
Erasmus Mundus Joint Doctorate Trans Global Health Programme

This thesis has been written within the framework of the Erasmus Mundus Joint Doctorate Program of the European Union for the International Doctorate in Transdisciplinary Global Health Solutions; a consortium consisting of:

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- University of Barcelona, Barcelona, Spain
- Barcelona Institute of Global Health (ISGlobal), Barcelona, Spain
- Institute of Tropical Medicine, Antwerp, Belgium
- Universiteit van Amsterdam, Amsterdam, The Netherlands
- Academisch Medisch Centrum bij de Universiteit van Amsterdam, Amsterdam, The Netherlands
- Université de Bordeaux, Bordeaux, France
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For Mariama and the other women who inspire my life’s work
Account

Part two of the thesis (Chapters 4 to 8) is based on articles that are published or accepted for publication in international peer-reviewed journals.

Chapter 4

Chapter 5

Chapter 6

Chapter 7

Chapter 8

1 Maiden name
Abbreviations

ANC  Antenatal care
Bacis  Basic Antenatal Care Information System
B4M  Bliss4Midwives
BP  Blood Pressure
CDSS  Clinical decision support systems
CHPS  Community Health Planning Services
CHWs  Community health workers
CMO  Context–Mechanism–Outcome
DESIRE  Decision Support and Integrated Record-Keeping
DHD  District Health Director
DHIO  District health information officers
eIMCI  Electronic Integrated Management of Childhood Illness
FGD  Focus group discussion
FITT  Fit between Individuals, Task and Technology
GHS  Ghana Health Service
Hb  Hemoglobin
HCW  Health care worker
HF  Health facility
HFM  Health facility managers
ICAMO  Intervention–Context–Actors–Mechanism–Outcome
ICT  Information and communications technology
IOM  Institute of Medicine
IPTp  Intermittent preventive treatment of malaria during pregnancy
LS&H4D  Life Sciences and Health Development
LMICs  Low and middle-income countries
LPM  Local program managers
mCDSS  Mobile clinical decision support system
MDG  Millennium development goal
mHealth  Mobile health
MMR  maternal mortality ratio
NR  Northern Region
PBI  Performance-based incentives
PDA  Personal digital assistant
POC  Point-of-care
QoC  Quality of care
QR  Quick Response
QUALMAT  Quality of Maternal and Prenatal Care
SDG  Sustainable Development Goal
SMS  Short messaging service
TAM  Technology acceptance model
TDR  Transdisciplinary research
TPC  Technology-to-performance
UER  Upper East Region
WHO  World Health Organization
In 2015, when I commenced my doctoral research, my passion for global health was fuelled by matters related to African women and the crippling state of health systems on the continent. I had a lofty goal that my findings would be revolutionary and have large-scale impact on the delivery and outcome of maternal health services in sub-Saharan Africa. The more I pursued answers to my questions, the more I learnt, and the more I found that I did not know. After the first year and a couple of reality-check conversations with supervisors and peers, I was forced to reassess my ambitions. I accepted that it would still be useful if my research and the answers unveiled would make a difference for at least one woman. Just one. One of the 830 women that die daily from preventable causes, while succumbing to what should only be remembered as a joyful event. I found that woman during my data collection in a rural village in Northern Ghana. I call her Mariama.

Twenty-eight years old Mariama attended the first antenatal care (ANC) visit for her fourth pregnancy at 20 weeks gestation in November 2016. To the best of the ability of the attending midwives and the capacity of the health centre, routine procedures were followed. Basic data were recorded. Her blood pressure (BP) was 110/70mmHg, height and weight were measured and haemoglobin (Hb) was 8.7g/dl. Screening revealed negative status for both malaria and HIV. In the absence of any complaints, and a positive assessment of mother and foetus, she was given folate and iron tablets and sent home to return in four weeks for a follow-up visit. Records show that Mariama paid two follow-up ANC visits in January and February 2017. In January, she was recorded to have a BP of 160/100mmHg and in February 180/120mmHg after being measured using a standard sphygmomanometer. On both occasions, she was given the routine drugs and sent home to return in four weeks for the next visit. At one of her follow-up visits, date unknown, she was screened with the pilot version of a non-invasive point-of-care diagnostic and clinical decision support device which supports early detection of pre-eclampsia, gestational diabetes and anaemia. The device, which had a non-invasive blood pressure sphygmomanometer with an automated arm cuff, reported a BP of 150/102mmHg. We would later find that the attending midwife took no referral or follow-up action and scheduled her for the next ANC visit. On a Friday afternoon in March 2017, Mariama attended her fourth ANC visit at almost 40 weeks. She was assessed and immediately referred to the district hospital on grounds of pre-eclampsia.

The rest of her pregnancy journey is told in the concluding chapter of this thesis that investigates her maternal care experience from three main perspectives: health workers’ performance, women’s experience of care, and digital innovations as mediators of quality antenatal care services. Although the revolutionary change needed for health systems in low- and middle- income countries to deliver quality maternal care is only partly reflected in this thesis, it represents an important piece of the puzzle. I invite you to keep Mariama and other women like her in mind as you read it, hoping that you will appreciate the relevance of this topic much as I have.