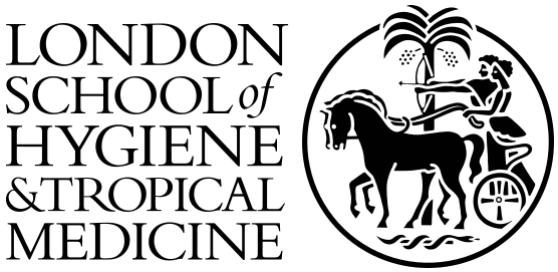

A cross-sectional study of the first and the second delays among women admitted to a maternity hospital with severe obstetric complications ('near-miss') in Afghanistan

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Abstract

In Afghanistan, the majority of women continue to give birth at home because of poverty, difficult access to health facilities, or gender-based restrictions. Women are often brought into hospitals in moribund conditions after the onset of complications at home. A detailed understanding of the determinants of healthcare seeking delays is necessary in order to help identify strategies which could reduce the incidence of very severe complications and maternal deaths and improve foetal outcomes in complicated pregnancies.

A review of existing studies of care-seeking delays indicated that durations of care-seeking time had not been well explained because of various methodological limitations. The large majority of previous studies were descriptive and fell short in identifying contributing factors that could be eliminated by interventions while analytical studies lacked methodological rigour largely due to sample size limitations associated with rarity of maternal deaths.

In this thesis, data from a hospital-based cross-sectional survey conducted among 472 women with severe obstetric complications in Afghanistan were analysed using a refined version of the conceptual framework developed by Thaddeus and Maine (1994). Three types of care-seeking delays were considered: the duration of time from onset of symptoms to decision to seek care (or 'decision delay'), the duration from the decision to departure for healthcare facilities, (or 'departure delay') and variation in self-reported travel time from GIS-modelled travel time (or 'travel delay'). The study posited that delayed care-seeking would be best explained by a combination of factors including a woman's healthcare practice during pregnancy, her family's financial and social resources, geographical accessibility to healthcare and the types of symptoms and signs associated with each complication. It was also postulated that care-seeking delay would be among important determinants of foetal death. Regression techniques were used to identify determinants of the three types of delays, and logistic

regression techniques were employed to assess the role of delays on foetal mortality.

This study showed that failure to use antenatal care ('ANC') service during pregnancy was associated with an increase in decision delay. Lack of birth plans and absence of a midwife in the locality were also associated with an increased decision delay for ante- and intra-partum women. A woman's weak relationship with her birth family was associated with an increased decision delay for complication types which did not have clear symptoms while a woman from an impoverished household appeared to experience a long decision delay when she suffered a complication with dramatic symptoms. In addition to seasonal effects, difficult geographical access to healthcare and lack of social capital were found to be positively associated with delay in departure for healthcare facilities. Multi-referrals, low household economic status, lack of community cohesion, and lack of access to vehicle were associated with an increase in travel delay. Finally, decision delay contributed to an increased risk of foetal death.

The main conclusion from this work is that ANC interventions have a significant role to play in facilitating rapid uptake of emergency care, once a complication occurs, in a setting where access to routine and emergency care is socially and geographically difficult. This in turn has implications not only for maternal but also for foetal outcomes. Future research and programmatic efforts should be directed towards understanding and exploiting the roles that social resources could play in facilitating access to emergency obstetric care.

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This thesis is dedicated to my mom, late Hisako Hirose (1944-2008), and my dad, Atsuhiko Hirose, who supported me with abundant love and prayers, and trusted in the Lord that I could accomplish the work. Mom, are you reading my thesis in heaven?

And lastly, I thank God who provided everything I needed to complete this work. During the course of my PhD, I learned to trust in nothing but you alone, O Lord...

'The LORD is my shepherd, I shall not be in want' (Psalm 23:1)

Table of contents

LIST OF FIGURES **10**

LIST OF TABLES **11**

ABBREVIATIONS **13**

INTRODUCTION **14**

CHAPTER 1: BACKGROUND **17**

1.1 Global burden of maternal mortality 17
1.2 Medical causes leading to maternal deaths 18
1.3 Strategies to reduce maternal mortality and morbidity in developing countries 20
1.3.1 Strategies during the early days of SMI 20
1.3.2 Intrapartum care 21
1.3.3 Emergency obstetric care 22
1.4 Delay model 23
1.5 From maternal mortality to maternal morbidity 25
1.6 Situation in Afghanistan 27
1.7 Rationale and objectives of PhD 30

CHAPTER 2: EXISTING STUDIES ON THE TIME PERIOD FROM ONSET OF SYMPTOMS TO ARRIVAL IN EMOC **32**

2.1. Search strategy and inclusion criteria 32
2.1.1. Search strategy 32
2.1.2. Inclusion criteria 33
2.1.3. Exclusion criteria 34
2.2. Results 34
2.2.1. Assessment of delays 35
2.2.2. Durations of delays 36
2.2.3. Factors contributing to the delays 38
2.3. Discussion 45
2.4. Conclusions 49

CHAPTER 3: METHODOLOGY **59**

3.1. Objectives 59
3.2. Overview of the study 59
3.3. Cross-sectional survey 60
3.3.1. Study site 60
3.3.2. Study population 61
3.3.3. Inclusion criteria 61
3.3.4. Sample size and power calculation 62
3.3.5. Tools 64
3.4. Implementation 67
3.4.1. Field work organization 67
3.4.2. Recruitment of eligible women 70
3.4.3. Interviews 71
3.4.4. Use of health personnel as interviewers 72

3.5. GIS component 74
3.5.1. Data collection 75
3.5.2. Processing of spatial data 76
3.5.3. Modelling method 76
3.5.4. Validation 76
3.6. Statistical analysis 77
3.6.1. Data processing 77
3.6.2. Data analyses 79

CHAPTER 4: DESCRIPTION OF THE SAMPLE 86

4.1. Recruitment of eligible women with severe obstetric complications 86
4.2. Non-response 88
4.3. Women with a complete pair of interviews compared with women with only one or no interview 89
4.4. Comparison of the study participants with other populations in Afghanistan 89
4.5. Morbidity characteristics 90
4.6. Summary 92

CHAPTER 5: FROM RECOGNITION OF ILLNESS TO DECISION TO SEEK CARE 100

5.1. Conceptual framework 100
5.2. Average decision-making time by complication types 105
5.3. Bivariable analyses 105
5.3.1. Bivariable analysis stratified by complication types 106
5.3.2. Bivariable analysis stratified by the three complication sub-groups 111
5.4. Multivariable analyses 113
5.4.1. Group 1 – Complication type with dramatic symptoms 114
5.4.2. Group 2 – Complication type with less dramatic symptoms 115
5.4.3. Group 3 – All women post-22nd gestational week before childbirth 116
5.5. Summary 116

CHAPTER 6: FROM DECISION TO SEEK CARE TO DEPARTURE FOR HEALTHCARE FACILITY 141

6.1. Conceptual framework 141
6.2. Average decision-to-departure delay time by complication types 144
6.3. Bivariable analyses 144
6.4. Multivariable analyses 148
6.5. Summary 150

CHAPTER 7: FROM DEPARTURE FROM HOME TO ARRIVAL AT THE HOSPITAL 161

7.1. Conceptual framework 161
7.2. Model development 164
7.3. Determinants of the travel delay 168
7.4. Description of the travel delay by complication types 168

7.5. Bivariable analyses 169
7.5.1. Stratified by the season of admission 169
7.5.2 Stratified by the number of referrals 171
7.6. Multivariable analyses 173
7.7. Summary 174

CHAPTER 8: THE VITAL STATUS OF THE FOETUS AT ADMISSION 190

8.1. Conceptual framework 190
8.2. Bivariable analysis 195
8.3. Multivariable analyses 198
8.4. Summary 199

CHAPTER 9: DISCUSSION 206

9.1. Summary of key findings 206
9.2. Interpretation of findings 207
9.2.1. Discussions of our findings in the context of previous findings 207
9.2.2. Interpretations of findings in the context of Afghanistan 214
9.3. Strengths of the study 217
9.4. Limitations of the study 221
9.5. Programme implications for Afghanistan 225
9.6. Generalizability of the programme implications to other post-conflicts states 229
9.7. Future research areas 231
9.8. Conclusion 233

APPENDICES 236

Appendix 1 QUESTIONNAIRE 236
Appendix 2 Data Extraction Form 261
Appendix 3.1. Travel speeds and friction values used for GIS models 1 and 2 in chapter 7 267
Appendix 3.2. Cartographic model 1 268
Appendix 3.3. Cartographic model 2 269
Appendix 3.4. Travel speeds and friction values used for Model 3-1 270
Appendix 3.5. Friction values used for Model 3-2 271
Appendix 3.6. Friction values used for Model 3-3 272

REFERENCES 275

List of figures

Figure 3.1: Ratios of delay times the study can detect as a function of standard deviation of log of delay time....84

Figure 3.2: Diagram showing the three types of delay....85

Figure 4.1: Study profile....93

Figure 4.2: Pregnancy profile of eligible women....94

Figure 5.1: Conceptual framework to explain determinants of decision delay....118

Figure 6.1: Conceptual framework to explain determinants of departure delay....151

Figure 7.1: Conceptual framework to explain determinants of travel delay....176

Figure 7.2: Villages used for validation, on an elevation contour map....177

Figure 7.3: Villages used for validation, on a topographic map with slope gradients....178

Figure 7.4a: Illustration of modelled travel times – area reached within two hours....179

Figure 7.4b: Illustration of modelled travel times – area reached within five hours....180

Figure 7.4c: Illustration of modelled travel times – area reached within eight and twelve hours....181

Figure 8.1: Conceptual framework to explain determinants of vital status of foetus at admission....201

List of tables

Table 2.1: Summary of descriptive studies to investigate substandard factors with the delay model.....51

Table 2.2: Summary of descriptive studies to investigate substandard factors without the delay model.....54

Table 2.3: Summary of descriptive studies to understand care-seeking behaviours.....55

Table 2.4: Summary of analytical studies.....57

Table 3.1: Criteria of severe obstetric complications.....82

Table 3.2: Muslim prayer times and their corresponding 24-hour clock times used in the study.....78

Table 4.1: Pregnancy outcomes by complication types.....95

Table 4.2: Characteristics of women who had completed both male and female interviews and those who did not complete either one or both interviews.....96

Table 4.3: Reasons for non-response, and proportions of non-response according to women's complication types.....97

Table 4.4: Characteristics of the sample and those of other populations in Afghanistan.....98

Table 4.5: Characteristics of study participants by complication types.....99

Table 5.1: Grouping of complication types used in the analyses of decision delay.....110

Table 5.2: Results of censored normal regression model predicting the average durations of decision-making time by complication types.....118

Table 5.3: Results of series of bivariable censored normal regression models predicting the duration of decision-making time according to women's characteristics.....120

Table 5.4: Results of series of bivariable censored normal regression models predicting the duration of decision-making time according to women's characteristics (Group 1 —Complication types with dramatic symptoms)129

Table 5.5: Results of series of bivariable censored normal regression models predicting the duration of decision – making time according to women's

characteristics (Group 2 —Complication types with less dramatic symptoms).....131

Table 5.6: Results of series of bivariable censored normal regression models predicting the duration of decision-making time according to women's characteristics (Group 3 —All women after 28 gestational weeks before childbirth).....133

Table 5.7: Results of multivariable censored normal regression models predicting the duration of decision-making time for women in Group 1....135

Table 5.8: Results of multivariable censored normal regression models predicting the duration of decision-making time for women in Group 2....137

Table 5.9: Results of multivariable censored normal regression models predicting the duration of decision-making time for women in Group 3....139

Table 6.1: Results of the censored normal regression model predicting the average duration of departure delay according to complication types.....152

Table 6.2: Results of series of bivariable censored regression models predicting the duration of departure delay according to women's characteristics.....153

Table 6.3: Results of multivariable censored normal regression models predicting the duration of departure delay.....159

Table 7.1: Results of model validation.....182

Table 7.2: Distribution of self-reported and modelled travel time statistics according to the type of complication.....183

Table 7.3: Results of regression models predicting the travel delay stratified by the season of admission.....184

Table 7.4: Results of regression models predicting the travel delay stratified by the type of referral.....186

Table 7.5: Results of the multivariable regression models predicting the ratios of the travel delay experienced by women of different characteristics to the travel delay experienced by the baseline groups.....188

Table 8.1: Proportions of live and dead foetuses at admission and odds ratios for foetal death according to women's characteristics.....202

Table 8.2: Results of multivariable logistic regression models assessing the associations between foetal death and selected characteristics of women.....204

Abbreviations

AIMS	Afghanistan Information Management Services
ANC	Antenatal Care
APH	Antepartum Haemorrhage
BMI	Body Mass Index
BPHS	Basic Package of Health Services
DEM	Digital Elevation Model
EmOC	Emergency Obstetric Care
GIS	Geographic Information System
ICD-10	The International Statistical Classification of Diseases and Related Health Problems 10th Revision
LSHTM	London School of Hygiene & Tropical Medicine
MDG	Millennium Development Goal
MMR	Maternal Mortality Ratio
NGO	Non-governmental Organization
PPH	Postpartum Haemorrhage
SD	Standard Deviation
SMI	Safe Motherhood Initiative
TBA	Traditional Birth Attendant
USAID	United States Agency for International Development
WHO	World Health Organization
WVA	World Vision International - Afghanistan
WVJ	World Vision Japan

Introduction

Over 30 years of wars and conflicts have adversely affected the health care system of Afghanistan, and Afghan women's health has suffered greatly. The Maternal Mortality Ratio (MMR) of the country is one of the highest in the world, estimated at 1800 per 100,000 live births in 2005 [1].

The current recommendation for safe motherhood programmes is to provide a skilled attendant for every birth, backed up by transport to higher levels of care in case emergency referral is required [2]. Since 2002, the Afghan Ministry of Public Health, in partnership with non-governmental organisations (NGOs), has been rebuilding the country's health care system through provision of the essential primary health care services known as Basic Package of Health Services (BPHS) [3]. Individuals are invited to access the health care system, including maternity care, first at health posts or health centres, from where cases that cannot be managed at these levels are referred to higher levels. Although the health care system has gradually strengthened, [4] and a large number of maternal deaths are expected to be averted, multi-level referrals may delay treatment and increase the risk of death for women who have developed severe obstetric complications.

There are indications that a well-functioning maternity care system remains difficult to establish in Afghanistan. Because of the financial constraints of impoverished households, difficult terrain, gender restrictions on travel or movements, and lack of security, utilization of skilled birth attendants in health centres is still very low, and the majority of women continue to give birth at home without a skilled attendant [5]. Women who develop complications during home birth may experience delay in deciding to seek care before referring themselves to a health facility [6]. As a result, many women are in a moribund condition when they finally reach the treatment facility.

Those women in a life-threatening condition who would need immediate intervention to secure their survival are often called 'near-miss' [7]. Since the introduction of the concept of obstetric near-miss in the UK [8], a number of studies that include near-miss -cases have been conducted in low-income countries [9]. The main goals of many of these studies are to facilitate the improvement of the quality of obstetric care in health facilities, either through the implementation of an audit cycle or through a simple description of cases. Descriptive hospital-based studies have also suggested recurrent difficulties related to delayed care-seeking and weak referral systems, because large proportions of near-miss cases attending health facilities in low-income countries are found to be already in a critical condition upon arrival in the facilities [10-11]. For example, the proportions of women who had near-miss complications upon arrival out of all near-miss cases identified in health facilities were as high as 90% in certain African settings [10]. Since there are limitations in predicting obstetric complications antenatally and progress from onset of complication to fatality is rapid for certain types of complication [12-13], it is necessary to understand in detail the reasons for prolonged care-seeking processes for women after the onset of obstetric complications. Detailed knowledge could help to reduce the burdens of maternal morbidity and mortality and associated foetal mortality by helping to identify risk factors which could be modified by targeted interventions.

The thesis examines the care-seeking and referral patterns of women who were in a life-threatening condition on arrival in a large referral hospital in Afghanistan, using a cross-sectional study design. The study postulates that care-seeking for obstetric emergencies may be determined by a combination of distal and proximate determinants, including in particular geographical accessibility to health care staff, programmes or facilities; a woman's healthcare practice during pregnancy; her position in her household; levels of financial resources and social capital of her family; and the type of complication. The study was conducted in the western part of Afghanistan during a 12-month period from February 2007 to January 2008.

The thesis has the following plan. Chapter 1 reviews the magnitude of the problem associated with maternal mortality and programmatic issues in safe motherhood, in an attempt to establish the importance of studying the critical time period between onset of symptoms and arrival in emergency obstetric care (EmOC) facilities (or 'delay') for women with severe obstetric complications. Chapter 2 reviews the findings and methodologies of previous studies that investigated delays in accessing EmOC facilities in order to identify their weaknesses and knowledge gaps. Chapter 3 presents the objectives and the methods used in the research. The study sample is described in Chapter 4. Determinants of three types of care-seeking and referral delays are presented in Chapters 5, 6 and 7. Chapter 8 assesses whether care-seeking and referral delays are among the important determinants of foetal death. The final chapter interprets the findings and discusses their implications for future safe motherhood strategies.

1 Background

This chapter provides the underlying background for the theme of the thesis which is care-seeking delays experienced by women after onset of severe obstetric complication before arrival in an EmOC facility in the context of Afghanistan. The chapter starts off broadly by introducing the global burden of maternal mortality in Section 1. Major obstetric complications that lead to maternal deaths are described in Section 2. In Section 3, the evolution of the strategies adopted during the history of SMI for reduction of maternal deaths and arguments supporting the current strategies are presented. Section 4 introduces a framework to analyse barriers to an effective implementation of one of the strategies, the EmOC strategy. In section 5, the concept of near-miss and its importance and advantages in research in comparison to maternal death are presented. Section 6 describes the particularities of the study context, Afghanistan. Section 7 concludes the chapter with the rationale and objectives of the PhD.

1.1 Global burden of maternal mortality

ICD-10 defines maternal death as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes [14]. Such women's deaths had been neglected in the international development forums for decades [15], until the end of the UN Decade for Women (1976–1985) when it was announced that half a million women die each year from pregnancy-related complications. Subsequently, the Safe Motherhood Initiative (SMI) was launched at the international Safe Motherhood Conference in 1987in Nairobi, Kenya, sponsored by UNFPA, the World Bank and the World Health Organization (WHO)[16]. The importance of maternal survival as an international development concern first culminated at the turn of the century, when reduction of maternal mortality by 75% from the 1990 level by the year 2015 was included in a series of time-bound

targets to tackle the world's main development challenges, known as Millennium Development Goals (MDGs)[17].

With just a half decade remaining until the year 2015, it is widely understood that the maternal mortality target of the Millennium Development Goals ('MDG-5') would not be achieved unless the annual rate of decline in the maternal mortality ratio(MMR) [a], which has been less than 1% between 1990 and 2005, be increased to 5.5% [1]. The most recent statistics still estimate that 536,000 women die annually during pregnancy and childbirth, and 99% of these deaths occur in developing countries, with Sub-Saharan Africa having the highest MMR at around 950 maternal deaths per 100,000 live births, followed by South Asia at around 450 deaths per 100,000 live births [1]. As the MMR has been described as the health indicator with the largest disparity between the developed and developing countries [16], failure to progress as rapidly as initially hoped in the past, particularly in the countries that initially had the worst statistics, has probably contributed to widening the gap between countries [18]. Women in the developed world have only a 1 in 7300 chance of dying from pregnancy-related complications during their life time, but the risk for women in developing countries is 1 in 75 [1].

1.2 Medical causes leading to maternal deaths

WHO estimates that, globally, most maternal deaths (80%) are due to direct obstetric causes – haemorrhage, puerperal sepsis, pregnancy-induced hypertension (i.e., pre-eclampsia and eclampsia), obstructed labour and unsafe abortion [18] –, and a small proportion (20%) are due to indirect causes related to malaria, anaemia, heart disease and HIV/AIDS.

Although haemorrhage had been the leading cause of maternal deaths [19] and it is still the dominant cause of maternal deaths globally [20], more recent analyses of causes of maternal deaths report that geographical variations exist in their distribution [20]. In Africa and Asia, haemorrhage is the leading cause of maternal

[a] MMR is the ratio of the number of maternal deaths per 100,000 live births.

deaths, contributing to 34 % and 31% of all maternal deaths respectively, while in Latin America, hypertensive disorders is the most important cause, responsible for 26% of maternal deaths [20].

Haemorrhage can happen during pregnancy, delivery or after childbirth. Vaginal bleeding in early pregnancy [b] is due to abortion or ectopic pregnancy. If vaginal bleeding occurs in late pregnancy or during labour before delivery (antepartum haemorrhage or APH), abruptio placentae (detachment of a normally located placenta from the uterus before the foetus is delivered) or placenta praevia (implementation of the placenta at or near the cervix) are suspected. Bleeding after childbirth in excess of 500 ml is defined as postpartum haemorrhage (PPH) [21], although in practice the cut-off point of 500 ml is problematic because of the difficulty in measuring the volume and because bleeding tolerance levels differ between women, depending on their underlying health status (including whether they suffer from low haemoglobin level). The main causes of PPH are uterine atony (failure of the uterus muscles to contract normally), retained placenta or retained placenta fragments [21].

Pre-eclampsia is a disease specific to pregnant women after the 20th week of gestation, characterized by high blood pressure and proteinuria, which may lead to symptoms such as headache or oedema. Eclampsia is characterized by syndromes of pre-eclampsia and one or more convulsions. The hypertensive disorders may result in oliguria or anuria (decreased or reduced production or urine) due to reduced glomerular [c] filtration, which may lead to liver failure [22]. Complications of the hypertensive disorders also include cerebral infarction (or an area of tissue death due to a blockage of tissue's blood supply) [22]. Obstructed labour is characterized by failure to progress because of mechanical problems due to either cephalopelvic disproportion, or an abnormal presentation or lie [23]. The most devastating complication of obstructed labour is rupture of the uterus [21].

[b] During the first 22 weeks of pregnancy or before viability of the foetus.
[c] Glomerular is a tiny structure in the kidney that filters blood to form urine.

When the woman has been in labour for a long time with rupture of membrane and open cervix, and has had repeated vaginal examinations, infection can set in. Retained products of conception also predispose a woman to genital tract infection in the puerperium[22]. Postoperative wound infection following caesarean section or hysterectomy is also an important cause of illness in the pueriperium [24-26]. Complications of infection in the genital tract or surgical site can lead into septicaemia or septic shock, which has a high fatality rate.

1.3 Strategies to reduce maternal mortality and morbidity in developing countries

1.3.1 Strategies during the early days of SMI

To reduce the number of maternal deaths, in particular from direct obstetric causes, a number of strategies have been suggested during more than twenty years of SMI. Arguably, the current recommendations of safe motherhood programmes do not originate from particularly strong evidence in epidemiological terms, as few randomized controlled trials with maternal mortality as end points exist. Instead, they result from descriptive evidence that has accumulated over time, in particular historical evidence and case studies of successful countries [27], as well as weak evidence for certain strategies [28]. Initially, WHO and other agencies active in SMI promoted the 'risk screening strategy' to reduce maternal mortality [29]. The aim was to identify women who would develop complications, and to intervene at an early stage so that limited resources could be better allocated to those who would need them most. However, the strategy was later replaced by the new message that every pregnancy faces risks [2] because obstetric complications have a low predictability and women at low risk can also develop complications [30-31]. No single indicator or combination of indicators routinely collected during antenatal consultations was found to be specific or sensitive enough to screen for prolonged labour [32-33] or postpartum haemorrhage [32]. A consensus was finally reached in the late 1990s that every pregnant woman needs access to professional intrapartum care [2]. This is reflected in one of the most important messages that came out of the

Safe Motherhood Technical Consultation in 1997: 'Ensure skilled attendant at delivery, backed up by transport in case emergency referral is required' [2].

1.3.2 Intrapartum care

In addition, as most maternal deaths are understood to take place between the third trimester and the first week after the end of pregnancy, in particular during the 24 hours postpartum [34-36], further emphasis has been placed on the importance of intrapartum care. Intrapartum care can be made available to pregnant women in various ways [37]. In the early days, WHO in particular promoted training of traditional birth attendants (TBAs) in the 1970s [38], and training of non-physician health workers including TBAs to identify and refer high-risk pregnancies was a recommended strategy at the international Safe Motherhood Conference [16]. However, TBAs' lack of capacity to manage obstetric complications and a lack of convincing evidence of TBA training having an impact on maternal mortality [28 39] shifted the recommendation to one in which intrapartum care by a professional attendant with midwifery skills is preferred to that by an unskilled attendant [2]. The documentation of the historical success of Sweden in reducing maternal mortality with the policy of training midwives during the early twentieth century was also used to support the new Safe Motherhood strategy to promote professional care with midwifery skills. In Sweden, the MMR was reduced to 200–300 per 100,000 live births with the introduction of a large number of midwives at the beginning of twentieth century, before modern hospital technology, blood transfusion, caesarean sections and antibiotics became available [27]. More recently, Sri Lanka, Malaysia and Thailand saw the same pattern of decline in the MMR with the policy of promoting midwives to attend delivery care [27 37 40].

In the early days of skilled birth attendance promotion, the place of delivery was not specified in the recommendations for safe motherhood programmes [2 41] and the strategy to promote the home-based skilled birth attendant, as opposed to the facility-based skilled birth attendant, with a back-up of emergency obstetric care,

was one of the viable options suggested in the 1990s [37]. In fact, it was possible to reduce maternal mortality with the policy of promoting professional delivery care for home births in some countries historically (e.g. the Netherlands and Sweden[27] [37]). However, more recently, the experiences of Bangladesh, where midwives were trained to assist home births between 1987 and 1996, and later on in Indonesia, raised questions regarding the logistics of delivering good quality care in women's homes and the difficulty that the providers faced in doing so [42-43]. Inadequate environments particularly in impoverished households and lack of medical supervision of professional home births could compromise community confidence in midwives. As nearly half of the women in developing countries are still giving birth at home, it may take much time and effort before transition takes place from home birth to universal facility-based delivery, though historically countries such as Malaysia and Sri Lanka have made the transition relatively quickly and successfully reduced maternal mortality [37].

1.3.3 Emergency obstetric care

Recognition of scientific limitations in predicting obstetric complications antenatally led to another shift in strategies towards a focus on the curative management of complications from the time they occur in order to avoid deaths[31] [44-45]. WHO addressed this issue in 1986 in a publication titled *Essential Obstetric Functions at First Referral Level to Reduce Maternal Mortality* [46], and later the Averting Maternal Death and Disability (or 'AMDD') programme of Columbia University presented the Emergency Obstetric Care (EmOC) strategy [31]. Although different terminologies have been used by the two different organizations, the strategic focuses are similar in that they aim to ensure sufficient availability of facilities that are equipped to provide a number of life-saving essential obstetric services. Comprehensive EmOC services include administration of antibiotics, oxytocic drugs, sedatives for eclampsia, manual removal of placenta and retained products, assisted vaginal delivery with forceps or vacuum extractor, surgery, anaesthesia and blood transfusion [47-49], while Essential Obstetric Care also includes

essential neonatal care [d]. Although the current recommendation for safe motherhood programmes is to provide professional intrapartum care with access to an EmOC facility [50], the stand-alone EmOC strategy still remains a viable alternative to the facility-based intrapartum care strategy [50]. While the epidemiological evidence for causality between reduction of maternal mortality and EmOC is not strong [51], studies from Bangladesh suggest that reduction of maternal mortality is possible with a functioning hospital with capacities to provide blood transfusion and caesarean section [52-53]. The reduction of maternal mortality in many developed countries in the early twentieth century and the high maternal mortality ratio observed among women of a religious organization which bans medical intervention are both often used to support the case for prioritizing availability of EmOC [54-56].

In order for the EmOC strategy to be effective, it needs to be available to women who need the care and treatment, ideally within a couple of hours from the onset of complications [50], because some complications can develop rapidly to the fatal stage [31]. For example, women with PPH can die within 2 to 6 hours from onset of the complication without treatment [12-13] and women with APH within 12 hours [12-13]. The limited reduction in the number of maternal deaths in developing countries could be attributed to obstacles to timely provision and utilization of EmOC services by women with complications.

1.4 Delay model

In order to understand the obstacles in accessing EmOC during the most critical time period, from the onset of the complication until the outcome of the complication, Thaddeus and Maine (1994) presented a simple, yet useful, time model [45]. The model is based on a review of the literature from different disciplines that is not limited to maternal mortality. It divides the time period into three phases, and considers the factors associated with undue delays in each of the

[d] In this thesis, I will use the term EmOC rather than EOC because official policy and strategy papers by the Afghan Ministry of Public Health use EmOC rather than EOC.

phases. The first phase is the interval from the onset of complication to the decision to seek care, the second phase is from the decision to reaching an appropriate medical facility, and the third is from reaching the health facility to receiving appropriate care at the facility [45].

1st delay- decision delay

According to Thaddeus and Maine, the first phase, which is the duration of time to reach a decision to seek medical care, is influenced by various factors. Economic factors, socio-cultural factors, including women's status in the society and within the family and their education status, illness factors including perceived aetiology, financial and physical accessibility, and factors related to quality of care in the health facility, are among the factors that could influence the duration of the first phase [45].

2nd delay – referral delay

After the decision to seek medical care is made, women need to proceed to appropriate medical facilities quickly, and the time period to reach the health facility makes up the second phase. Distribution of health facilities which affect actual travel distance to the facilities, transportation problems including lack of transportation means, the cost of transportation and unwillingness of drivers are among the factors that influence the second delay [45 57].

3rd delay – care at EmOC

The third phase is the delay associated with obtaining appropriate care as, even after overcoming all the obstacles and reaching health facilities, women may still face obstacles in receiving adequate care. This delay is mainly influenced by inadequate care in health facilities that may result from shortage of skilled staff, essential equipment, supplies, drugs and blood or even unavailability of operating theatres because of case overload. However, poor families are at risk of further delay because equipment, supplies, drugs or blood may have to be purchased.

Inappropriate management of cases due to failure to appreciate the severity of a condition and wrong diagnosis also causes delay [45].

1.5 From maternal mortality to maternal morbidity

In the history of SMI, much attention has been paid to the very end of a continuum of pregnancy-related illness, in other words, death [2 13 16 31]. For example, the MMR has been chosen as an indicator to monitor the progress toward MDG-5 [58]. However, measuring progress using maternal mortality is difficult, because maternal death is a relatively rare event even in settings with a high MMR, and therefore the resources required to obtain statistics that would be valid for comparisons over time or across different groups are considerable. In the search for indicators to monitor progress towards safe motherhood, a new concept was introduced nearly twenty years ago as an alternative or complement to maternal mortality for measuring progress and as a useful end-point in itself for safe motherhood programme activities: the concept of 'near-miss'.

The severe end of the maternal morbidity spectrum, or 'near-miss', has been defined as a life-threatening condition that would need immediate intervention or good luck for survival [7 59]. Interest in looking into obstetric 'near-miss' first grew in the UK mainly because the number of maternal deaths was falling and has stabilized around 5–15 per 100,000 live births [60]. William Stones wrote an article in *Health Trends* in 1991, in which he suggested that enquiries into near- miss maternal morbidity might provide an alternative means to *Confidential Enquiries into Maternal Deaths* in highlighting areas of deficiency in obstetric management [8]. Though the absolute number of maternal deaths became small, many of these deaths remained avoidable if optimal care were to be provided and there was still considerable need to evaluate quality of obstetric care for quality improvement in health facilities [8 61-62]. A small number also meant that collaboration across a large geographical area or across a long time period was necessary [8]. It also meant that case studies that were based on such unusual events might be of little relevance to

most women's maternity care in the UK [62]. Another argument for investigating into near-miss is understanding the causes of severe obstetric complications was also important in itself because women would bear considerable morbidity even if they survived [63].

Since the first investigation into severe obstetric complications was conducted in the UK [8], the concept of 'near-miss' in obstetrics has been used in several ways in developing countries [9]. In order to inform safe motherhood programmes, there was initial enthusiasm to measure the population-based incidence of maternal morbidity using survey methods where health service coverage was low [64-65]. It was suggested that measuring near-miss morbidity in surveys would be useful for progress monitoring because the condition was very close to death and also because it was so severe that women's reporting of morbidity would be reliable [64]. However, a number of studies found that women were unable to report severe complications with sufficient sensitivity and specificity in retrospective interview surveys [66-68]. Since then, epidemiologists have focused on the measurement of near-miss complications in referral hospitals, mainly to obtain the unmet need for surgical intervention or to study the quality of obstetric care among other specific purposes [9]. Near-miss audits in health facilities have now become a feasible alternative or complement to maternal death audits to identify and resolve quality of care deficiencies within facilities in low-income countries [59 61].

Proponents of audits of near-miss cases indicate that they have a number of advantages. First, as indicated earlier, near-miss cases can be found more frequently than maternal deaths, and therefore more comprehensive reviews can be done [59]. Secondly, because the women survived, investigating the case is less frightening to healthcare providers, and positive elements may come out of the case reviews for which the healthcare providers may even receive praise. Thirdly, it is also possible to include the women and the family members in the near-miss case reviews because the women survived. The women and the family members may be

able to raise certain aspects of quality of care that would not be revealed if they had not survived [59].

Although near-miss audits were initially conducted to identify and resolve deficiencies in quality of care in health facilities, investigations of near-miss cases have also brought to attention problems associated with care-seeking on the part of women and their families as well as failures in healthcare systems, particularly related to the referral system in developing countries. It has been shown that many near-miss cases identified in health facilities were already in a critical condition upon arrival at the health facilities [11]. For example, a multi-centre study conducted in African countries has shown that the proportion of women who had near-miss complications upon arrival was on average 83% among all near-miss cases identified in the health facilities (ranging between 54 and 90%) [10]. Understanding why women arrive at health facilities in moribund conditions is important in order to reduce the incidence and the case fatality of severe obstetric complications and associated foetal deaths [69]. Studying near-miss cases in referral hospitals might also be useful for understanding the reasons for the delay and to finding practical solutions [70].

1.6 Situation in Afghanistan

Afghanistan is situated at the crossroads of Central, South and West Asia, bordering with Pakistan on the east and south, Iran on the west, the former Soviet republics of Turkmenistan, Uzbekistan and Tajikistan on the north and China on the north-east. Because of its unique geo-strategic location, the long history of Afghanistan has seen various invaders coming into the country, most recently the Soviet invasion of the late 1970s and the US-coalition force that toppled the Taliban regime in 2001. Although the country has been labelled as post-conflict after the fall of the Taliban regime in 2001, anti-government elements have regained some strength in recent years, accounting for many security incidents in the country. The on-going conflicts

that span more than three decades have devastated the country and the country is ranked 174 out of 178 countries on the Human Development Index [71].

Lifting Afghanistan out of poverty is difficult not only because of the ongoing conflicts but because the country's harsh climate and rugged terrain have impeded the country from moving forward in all areas of life, including economic prosperity and political stability. Afghanistan's climate is characterised by extremely cold winters and hot summers, typical of a semi-arid steppe climate, which are further intensified by variations in altitude across the country. The Hindu Kush (a mountain range stretching from north-west Pakistan to central and eastern Afghanistan) reaches a height over 7000 m at one of its peaks in the north-eastern part of the country, while the Sistan Basin that stretches across south and south-western parts of the country creates one of the driest regions of the world that is subjected to prolonged droughts. In Kabul, situated at 1800 m above sea level, the daily temperature goes down to as low as -20 degrees Celsius with snow lying for over three months during winter while in Kandahar, located at the south of the county, the daily temperature goes up above 40 degrees Celsius during summer. Sand storms during the summer months of June to September in the western and southern regions are infamous for bringing intense heat and drought to the regions.

Provision of healthcare has also been adversely affected by these factors. The health system in Afghanistan was 'in the state of near-total disrepair' right after the Taliban government was ousted in 2002 [72]. Health facilities were poorly distributed and sometimes nonexistent particularly in areas where the access was difficult in south and central regions of the country[72-73]. Where health facilities did exist, essential utilities such as water sources or electricity were lacking [73]. The health services that existed at the time had largely been provided by NGOs, often organised in vertical programmes such as malaria, tuberculosis or, leishmaniasis control programmes, without much coordination by the previous government [74-75]. The health status of the population was reported to be one of the worst in the world. This is reflected in the high MMR, but also in other health indicators such as

under-5 mortality risk of 257 out of 1000 newborns and life expectancy at birth of merely 42 years [76].

Furthermore, the strict gender rules that are based on Pashtunwali [e] or honour codes have taken a great toll on women's health in this patriarchal society. Men are expected to protect *Zan* (or women) [f], particularly the chastity of female relatives, which is strongly tied to family honour. Death is not too high a price to pay when shame is brought upon the family by loss of honour or female chastity. To protect the female chastity and family honour, the behaviour of women, such as their mobility, is strictly controlled by men, which in turn influences access to and utilization of healthcare by women, as well as other social, economic and educational opportunities for women. The high maternal mortality in Afghanistan, which was estimated to be around1800 per 100,000 live births in 2005[1], epitomizes not only the poverty, civil conflicts and harsh topography that have hampered a healthcare system from developing in the country for so many years but also Afghan women's poor position which is socially constructed by the tribal and patriarchal ideologies. The level of the MMR in Afghanistan is considered to be as high as or even higher than the level sometimes referred to as 'natural maternal mortality' [18 27].

The Ministry of Health of the Transitional Islamic Government of Afghanistan began a process of rebuilding the health system in 2002 to address the greatest health problems of its population in a cost-effective way, through provision of a Basic Package of Health Services [77]. Because the national MMR in 2002 [6] was timely estimated and the statistics were published during the time when the service policy was being formulated after the fall of the Taliban regime, it had a significant impact on the policy formulation process [78]. Maternal and newborn health became one of the core services included in the BPHS, which were to be provided at four levels of primary health care facilities in order to extend coverage

[e] the unwritten law or ideology of Pashtun people, the major tribe in Afghanistan.
[f] In Pashtunwali, men are expected to protect the 'three Zs'; *zan, zar* and *zamin*, or women, property and land.

of the population who can access the services. [77]. According to the national policy set out in 2002 and revised in 2005, community health workers (CHWs) operate from their own home to provide limited antenatal, delivery and postnatal care to1000-1500 people in their own community. Basic health centre (BHC) is a small outpatient facility staffed by a nurse, a community midwife and two vaccinators; it provides the same services as the CHWs for a larger population of up to 30,000 people, and has a referral connection to a comprehensive health centre (CHC). CHC is designed to offer a wide range of services including management of some obstetric complications. The revised BPHS policy states that BHC's and CHC's are to provide basic emergency obstetric care[79]. Finally, district hospitals endeavour to provide all services included in BPHS including comprehensive emergency obstetric care[77 79],

Major donors such as the World Bank, the US Agency for International Development (USAID), the European Union, and the Asian Development Bank have funded over US$140 million in support of BPHS as of 2006 [80]. In order to improve coverage of skilled birth attendants and access to EmOC facilities [81], UNICEF committed to providing EmOC facilities to all provinces of Afghanistan at an early stage of the post-conflict era. At the same time, major donors including USAID, the World Bank and the European Commission pushed forward the agendas of training a large number of midwives and formation of the Afghan Midwives Association [82]. However, because of a number of remaining problems, including security difficulties and shortage of qualified health personnel which affect mostly in rural areas, the health care system is still in the process of expansion and strengthening. The proportion of births attended by skilled personnel has been slow in increasing, and it is currently estimated around 14–19% [5 83-84].

1.7 Rationale and objectives of PhD

Since studies have revealed that many near-miss cases identified in health facilities in developing countries were already in a life-threatening condition at admission,

and care-seeking and referral delays are thought to be responsible for the critical conditions, detailed studies examining care-seeking and referral patterns of women with severe obstetric complications are necessary.

The thesis reports on the results of a research project conducted among women who were in life-threatening conditions at admission to an EmOC facility in Western Afghanistan. The objectives of this research were to understand the factors prolonging the durations of care seeking before accessing the EmOC facility and their relative importance and to inform global safe motherhood strategies and policies related to facilitating the access to the EmOC facility. I hypothesized that patterns of care-seeking and referral delays vary by complication types, which may interact with the levels of social and financial resources of women and their family members and accessibility to health care, and that the care-seeking and referral delays are among the important determinants of foetal deaths in the women. I postulated that the knowledge gained from this work would be able to formulate more specific policies and advocacy strategies that are targeted to increasing timely utilization of life-saving obstetric care.

2. Existing studies on the time period from onset of symptoms to arrival in EmOC

This chapter reviews existing studies that investigated the critical time interval from onset of symptoms to arrival in EmOC facilities (or delays in deciding to seek EmOC and reaching EmOC facilities experienced by women with obstetric complications), conducted in low- or low-middle income countries. The objectives are first to document the methods of the studies and their findings in relation to the durations and factors contributing to delays; to provide a summary on their substantive findings; and to interpret the patterns of the findings across different studies, including those related to the strengths and limitations of the studies. The review will help to identify gaps in knowledge and to inform the way in which the proposed research will advance our understanding of the delays. In the following sections, the search strategy used to locate relevant studies and the inclusion and exclusion criteria are explained, after which summary findings from the relevant studies are presented.

2.1. Search strategy and inclusion criteria

2.1.1. Search strategy

I searched two electronic databases (Pubmed and EMBASE) in August 2009 to identify studies published prior to 1 August 2009 with no restriction on the starting date. I combined search terms related to obstetric complications with search terms related to care-seeking behaviours or referral delay that might occur after onset of complication. More specifically, the search strategy used for the Pubmed database was as follows. Terms used for obstetric complications were [(Maternal mortality [MeSH]) or (near miss maternal morbidity) or (near miss maternal mortality) or (near miss obstetric) or (severe maternal morbidity) or (pregnancy complication [MeSH]) or (SAMM) or (severe acute maternal morbidity)]. Terms used for care-seeking or referral delay were [(health care seeking behaviour) or (referral) or ('Transportation'[MeSH]) or ('Transportation of Patients'[MeSH]) or (decision AND care) or (decision AND

treatment) or (delay AND decision) or (delay AND transport) or (delay AND referral) or ('Referral and Consultation'[MeSH])]. The search was limited to studies on 'humans' and to articles written in English or with an English abstract.

The search strategy used for the EMBASE database was as follows. Terms used for obstetric complications are [maternal morbidity, maternal mortality, pregnancy complication, near miss obstetric, severe maternal morbidity, labor complication, postpartum hemorrhage, intrapartum hemorrhage, dystocia, eclampsia, 'eclampsia and preeclampsia', uterus rupture, obstructed labor, puerperal infection, puerperal fever, puerperal sepsis]. Terms used for care seeking or referral delay are [health care seeking behaviour, (decision making) AND (obstetric care or maternal care or emergency care),(decision making) AND (delay), delay AND 'patient transport', delay AND 'patient referral', 'patient referral', 'patient transport'].

Because of the breadth of the topic and the large number of studies, review articles were searched first from the citations found in the two databases. Only Thaddeus and Maine (1994) [45] and Filippi et al. (2009) [70] were found to be relevant. Articles referencing Thaddeus and Maine's article, and the articles referenced by Filippi et al. were manually checked. In the next instance, original research articles were searched. The citations identified by the first method and the second method were evaluated on the basis of their titles and their abstracts. The full text of potentially relevant articles was read and only the studies that fitted the following inclusion criteria were included in this review.

2.1.2. Inclusion criteria

1. Studies that addressed the time period from onset of symptoms to arrival in health facilities (or the first or second delays or both) for women needing EmOC were included.
2. Facility-based or population-based observational studies were included. Audits or case reviews were also included.
3. Only studies conducted in low and low-middle income countries (according to the classification by the World Bank) were included.

2.1.3. Exclusion criteria

1. Studies that focused on the third delay (e.g. [85-86]) or care-seeking delays for non-EmOC services (e.g. antenatal care or facility-based delivery care) were excluded.
2. Qualitative studies (e.g. [87]), editorials and proceedings papers were excluded.
3. Repeated data that resulted in a second publication from the same study were excluded (e.g. [88-89]).

2.2. Results

Among the total of 5693 citations identified by the searches, over 70 articles were found to be relevant, their entire texts were read and 23 studies fulfilled the inclusion criteria (Table 2.1–4). Depending on the study objectives and designs, the 23 studies can be classified into four groups.

The first group (Table 2.1), which includes the majority of the studies, is descriptive studies [7] in which Thaddeus and Maine's model [45] was used implicitly or explicitly to identify substandard factors that contributed to maternal deaths in communities (Tanzania [90], Haiti [91] and Indonesia [92]), en route to a health facility (Nigeria [93]) or in health facilities (Pakistan [94], the Gambia [95], Zambia [96], and Nigeria [97]) or severe obstetric complications in health facilities (Nigeria[98] and Uganda [99]) or in a community (Indonesia [100]).

The second group (Table 2.2) includes descriptive studies which sought to identify substandard factors for maternal deaths without Thaddeus and Maine's framework (Zimbabwe [88 101], the Gambia [102] and Nigeria [103]). Thaddeus and Maine's model was not appropriate in these studies because factors that may not be related to the time period after onset of symptoms (such as preventive care) were included, in addition to delay, as a substandard factor.

The third group (Table 2.3) includes two cross-sectional studies (Bangladesh[104-105]) and one case-series study (Ghana [106]), whose objectives were to describe care-seeking behaviours of women who were identified in a household survey

[7] They are all case-series studies. See Table 2.1.

to have had maternal morbidity that was perceived to be serious or life-threatening ([104-105]) or to describe care-seeking behaviours of a sample of women admitted for haemorrhage in a health facility ([106]).

The fourth group (Table 2.4) includes five analytical studies. In four of the five studies, risk factors for maternal deaths were identified by comparing maternal deaths and survivors of all-cause complications with a community-based case-control design (India [12]) or a facility-based case-control study (Nigerian[107]), or by comparing deaths and survivors specifically related to eclampsia with facility-based cross-sectional designs (Pakistan[108] and Nigeria [109]). In addition to the risk factors for maternal death, the Nigerian case-control study[107] assessed selected women's characteristics for association with delay, to some extent. The fifth analytical study is a facility-based cross-sectional study of maternal deaths (Nigeria [110]) in which occurrence of delay in each case of maternal death was assessed and reported in relation to selected women's characteristics.

2.2.1. Assessment of delays

The term 'delay' may be used ambiguously to refer to both an entire duration of care-seeking process as well as an excess duration from what is acceptable from an investigator's or medical professionals' point of view. In the studies included in the review, a 'delay' appears to refer to an excess from what is acceptable in each case or circumstance, and does not necessarily mean the duration of an entire care-seeking process. In the majority of the studies, the investigators' subjective assessment was used to decide if women delayed seeking treatment or not, without referring to time duration (e.g. [88 90-92 94-97 99 101-103 107 110]). In two studies (Nigeria [93 98]), cases were judged 'late' or 'delayed' on the basis of the clinical conditions of the women when they reached the hospital. Two studies (Pakistan[108] and Nigeria[109]) used definitions based on 'cut off points' and explicitly stated that delay was to be greater than a certain quantifiable duration of time (e.g. reaching the hospital within 3 hours from seizure [108] or from home [109]). In another five studies (Bangladesh [104-105], Ghana [106], Indonesia[100], and India [12]), the actual duration of time was measured

retrospectively for each woman in the sample from onset of symptom to the time the decision was taken to seek care and then to arrival in health facilities. Each case was further assessed to establish whether there had been unnecessary delay, independent of the quantified durations in three of these studies (e.g. [100 104-105]). The last seven studies provide information on durations of delays, as discussed in the following section.

2.2.2. Durations of delays

Seven studies reported the durations of the delays with various degrees of methodological quality.

a. Delay in deciding to seek care

In an Indian study [12], the study subjects comprised of 121 maternal deaths identified through multiple information sources and complication-matched controls[8]. The leading medical cause of deaths was PPH (30.6%), followed by puerperal sepsis (13.2%), eclampsia (8.3%), anaemia with associated heart failure (5.8%) and APH (4.9%). Maternal deaths due to indirect causes made up 28.1% of the cases. Complication-matched controls were drawn from the same population base as the maternal death cases. The study reported that the median time interval between the onset of symptoms and the decision to seek care for maternal deaths was 8 hours and that for the complication-matched controls was 2 hours ($p=0.02$)[12].

In a first Bangladeshi study[104], among ever-married women of reproductive age identified from the sampled households, 18,117 women reported having had obstetric complication perceived to be life-threatening during pregnancy or postpartum periods in the previous 3 years, of whom 3614 women reported time-sensitive complications (i.e. convulsion and excessive bleeding). The durations of the time to decide to seek care were reported to be less than 6 hours for half of the women and more than 6 hours for 18% while the rest (32%) did not seek any care [104]. No median time was reported.

[8] The number of complication-matched controls was not specifically mentioned.

In a second Bangladeshi study [105], 881 out of 2177 sampled households reported a member who experienced an episode of illness perceived to be serious, among which only 22 were maternal causes. The study did not present the types of maternal morbidity experienced by the women. The median time to make the decision to seek care was only 24 minutes [105].

b. Delay in reaching health facilities

The Indian study [12] reported two time intervals associated with the so-called second delay, separately for cases and for controls. Among the cases, the median time interval between the decision to seek care and making the first health service contact was 4.1 hours whilst among the controls it was 2.5 hours ($p=0.05$). The median time interval between the first health service contact and reaching an appropriate treatment facility was 12 hours for cases and 4.9 hours for controls ($p<0.01$)[12].

The first Bangladeshi study reported that among those who sought care outside the home for perceived life-threatening complications, 75% took less than one hour to reach a health facility. No median time was reported [104].

The second Bangladeshi study reported that the median time taken to reach a facility among the 22 women with perceived obstetric complications was 150 minutes (or 2 hours and 30 minutes) [105].

c. Total duration of the 1st and the 2nd delay

The interval from perceived onset of haemorrhage to arrival varied considerably for the different types of haemorrhage in a sample of hospitalized women in Ghana [106]. The average duration was reported to be 2 hours and 12 minutes for ruptured ectopic pregnancy, 7 hours and 9 minutes for PPH, 14 hours and 4 minutes for APH and 31 hours and 10 minutes for threatened abortion [106].

In an Indonesian study, the duration of the interval ranged from one to 19 hours among 13 obstetric emergency cases (including maternal deaths) purposely selected for audit [100]. In Pakistan [108], 59% of women with eclampsia took more

than 3 hours to reach the hospital after the onset of seizure. The proportion was similar at 56% in Nigeria[109]. No median time was reported in these studies.

d. Duration from onset of symptoms to death

The Indian study [12] calculated the time interval from onset of symptoms to death for untreated cases. The median time was 5.7 hours for PPH, 11.5 hours for APH, 1.7 days for eclampsia and 2.4 days for puerperal sepsis.

2.2.3. Factors contributing to the delays

a. Delay in seeking care

Across the studies, the first delay was identified as a contributing factor for maternal deaths in 46% (range: 27–77%) of death cases identified in population-based descriptive studies and in 37% (range: 12–67%) of deaths identified in facility-based descriptive studies. The four broad themes presented by Thaddeus and Maine (1994) (i.e., socio-economic status/cultural factors, accessibility, illness factors and quality of care) will guide the following presentation of key findings of the descriptive and analytical studies. The most important factors for each study are presented in Table 2.1–2.4, which provides complementary information to this section. The Gambia [95], Zambia [96], Nigeria [97] [103] [109] are not included in the following section because these studies did not investigate the reasons for delay.

Results of descriptive studies

Socio-economic and cultural factors

Economic status: Thaddeus and Maine suggest that there are two possible ways in which economic status can influence the decision to seek care: because of household income constraints and because health facilities serving the poor are often of low quality which may discourage use [45]. In the majority of the studies reviewed, financial constraints was suggested as one of the reasons for the delay. The proportion of occurrences of the first delay that was attributed to financial constraints ranged from roughly 5% in Gambia [102] to over 50% in Pakistan [94].

Woman's status/autonomy: In many parts of the world, the decision to seek medical care or not does not belong to the woman herself but to her spouse or senior members of her family [45]. Particularly where women's mobility is restricted, permission to leave home will not be granted unless the decision makers are present [45] and there is someone to accompany her to a health facility. In Tanzania [90], Pakistan [94], Uganda [99] and the Gambia [102], the decision was delayed because male members/decision makers were not home [90 94 102], because women waited for the spouse to give permission [99], because of 'interference by relatives who advised the women not to go to hospital' [99] or because 'spouse refused to give money to pay for transportation to the hospital' [99]. All of these contingencies suggest women's lack of decision making power and lack of financial autonomy. The Pakistan study [94] reported that a small proportion of women delayed because they were victims of domestic violence.

<u>*Access*</u>:

Physical access: Physical distance separating patients from health facilities is a considerable disincentive to seek care for those who live far away [45]. In Haiti [91] and Bangladesh [104], distance or geographical access as well as the perception that there is no doctor or health facility nearby (see section on economic status above) was among the reasons for not seeking care or delaying the decision. The authors of a Zimbabwe study deduced that 'the necessity of travelling for long distances to obtain care... were likely deterrents in deciding to seek care' for the rural sample because the incidence of both the first and the second delays was higher in the rural sample than in the urban sample [88].

Financial access (cost): In their review, Thaddeus and Maine did not provide strong support for cost of care as a direct deterrent to seeking care, although its effect on utilization is 'commonly assessed through interviews and surveys of users and nonusers in which respondents are asked to give reasons for their choice of actions' [45]. However, they acknowledge its effects indirectly by including socio-economic status. In the first Bangladeshi study [104], for example, a sizable proportion (38%) of the women who reported life-threatening complications did not seek care and 'cost-related considerations' was the most

prominent reason, given by 44% [104]. Many reviewed studies did not specifically report that the 'cost of care' was a deterrent although they suggested that lack of money and household financial constraints were among the important reasons for the first delay as discussed earlier.

Thaddeus and Maine also addressed the importance of the opportunity cost of the time used to seek care. In particular, they wrote that 'time spent getting to, waiting for and receiving health services is time lost from other, more productive activities such as farming, fetching water and wood for fuel, herding, trading, cooking and so on' [45]. Data on this delay factor was not frequently presented in the reviewed studies. The problem of opportunity costs was suggested in Zimbabwe [88] and Nigeria [98]. One third of both the rural and urban maternal deaths experienced a delay in decision-making in Zimbabwe [88] and 'economic and child-care responsibilities that made leaving home difficult for the women' was among the reasons suggested by relatives of the women [88]. One of the reasons for late presentation in Nigeria was attributed to women being 'in teaching/learning' [98].

Quality of care:

Patients' own assessment of quality of care, which is often based on their own past empirical experiences of the health system or on those of people they know, plays an important role in the decision to seek care [45]. Negative assessment is likely to induce delays and may either reflect cultural disjuncture between allopathic medicine and health beliefs in the community or may be influenced by perceptions of the adequacy of resources and the quality of care provided. For example, preconceived beliefs that there would be no doctor or nurse who could help the woman at a local hospital were a reported reason for fatally delayed care-seeking in Haiti[91]. Attitude of hospital staff was reported to be a reason for delays in Nigeria[98]. small proportion (6%) of those who did not seek care reported that 'concerns related to service quality' was the reason for non-utilization in Bangladesh [104]. Quality of hospital care also influences the decision to seek care through different mechanisms. Thaddeus and Maine mentioned that the culture of modern healthcare, which often clashes with the culture of potential users, is also a deterrent to seeking care in modern health

facilities [45]. The Tanzanian study [90] reported that consultation with local healers contributed to 16% of occurrence of the first delay.

Illness factors

Recognition of illness:

If a particular condition is considered as normal, the condition can be easily ignored and a timely decision to seek care delayed [45]. Disagreement between the patient's view of the health condition and the criteria held by medical practitioners [45] are manifested in many of the studies' findings that women delayed because they 'lack knowledge of danger signs of complications' [92]. The decision was delayed because patients 'fail(ed) to appreciate the severity of a condition' [88], 'overlooked disease seriousness' [90], 'did not consider their condition to be serious and had hoped that it would resolve quickly' [99], thought that 'treatment was not necessary or that the condition was not serious' [104] or did 'not recogniz(e) severity of the problem' [102] or for 'lack of awareness' [94]. Perception of severity of illness may also interact with quality of available care because the perception that a particular condition is inevitable or not amenable to treatment can be an important factor that causes women to delay [45]. For example, a small proportion of maternal deaths in rural Gambia were attributable to women's lack of knowledge of treatment possibilities [102].

Even when the signs and symptoms or seriousness of a health condition are fully recognized, a decision can be delayed because of social or legal sanctions [45]. In Zimbabwe [88] and Tanzania [90], decisions were delayed because patients 'worry about the criminal consequences of having undergone (abortion) procedure' [88].

Results of analytical studies

Two Nigerian studies (one case-control[107] and one cross-sectional[110]) explored factors responsible for the first delay.

Economic status

Results of the two studies were ambiguous in relation to economic status. It was not clear if socio-economic status was specifically tested for association with the occurrence of delay as it was not reported to be a factor contributing to the first delay in the case-control study[107]. Education was, however, reported to be protective against maternal death (crude OR = 0.07) [107]. In the cross-sectional study[110], low socio-economic status was reported to be associated with overall delay though no statistical evidence of association (p-value) was presented[110].

Women's status

Some aspects of woman's status explained decision delay. In the cross-sectional study[110], the maternal death cases that experienced the first delay were compared with those who did not experience the first delay. They found that the cases that experienced the first delay were more likely to be unmarried [9]. From the result, the authors argued that because single women lacked social support, they were prone to delay in seeking care [110], which might have contributed to their death.

Other factors – age and parity

In the case-control study[107], the women with the first delay were found to be significantly younger than the women who did not have the first delay in both cases and in controls. No difference in parity was found [107]. In the cross-sectional study [110], the maternal death cases that experienced the first delay were younger and more likely to be nulliparous than the maternal death cases that did not experience the first delay [110]. Age and parity was not explored in Thaddeus and Maine's review, and the pathway of influence is not entirely clear. The authors of the case-control study [107] argued that young women delayed because they were 'more likely to be from the lower socioeconomic class and more likely to be unmarried' [107] suggesting confounding effects of socio-economic status and woman's status.

b. Delay in reaching health facilities

[9] The proportion of unmarried women was 100% among those who had the first delay, but the proportion of unmarried women among those who did not have the first delay was not reported.

Overall, the second delay was identified as a contributing factor for maternal deaths in 25% (0–70%) of death cases identified in facility-based descriptive studies and 18% (3–33%) of death cases identified in population-based descriptive studies.

Results of descriptive studies

Distribution of facilities

In developing countries, there is a general shortage of health facilities in rural areas [45]. 'No health provider near case' contributed to a small proportion of occurrences of the delay in reaching health facilities in Indonesia[92]. Since the distribution of facilities is reflected in the distance travelled, 'travel distances' was more frequently used to describe the phenomenon of sparsely distributed health facilities in other studies (see below).

Travel distances

The long distance between women and the health facility is a factor that contributes to the second delay [92 94 99]. Furthermore, people usually cannot travel in a straight line to reach a facility, and therefore 'the nature of the terrain and the condition of the roads often dictate that distances will be longer' [45] and travel time longer as well. However, only in the Indonesian study [92] was 'difficult road condition' cited among the reasons for occurrences of the second delay.

Transportation

The scarcity of transportation particularly in rural areas is also another important contributing factor to the second delay [45]. This factor was mentioned in all the reviewed studies that investigated into the causes of the second delay, with varying proportions, depending on the context of the studies.

Deaths on the way to the hospital

Thaddeus and Maine also pointed out that there are 'deaths on the way' due to the double effect of the first delay and the second delay [45]. The decision may not have been made in a timely manner and the situation can be further

exacerbated by the long distance and/or unavailability of transportation [45]. The Nigerian study [93] focused on maternal deaths en route to the facility. In addition to transportation problems and cost-related issues, factors related to quality of care of the referring facility was among the reasons for death en route to the hospital [93], because 'inability of the health care staff to detect obstetric problems early' or 'inability of the referring hospital to perform emergency c-section' were among the factors contributing to late arrival. In the Tanzanian study [90] and the Pakistan study [94], delayed referral due to lack of transportation or disapproval of referral by relatives [90] and 'multiple referral' [94] were responsible for large proportions of occurrences of the second delay.

Results of analytical studies

Travel distances

In the Indian study, travelled distances were presented separately for maternal deaths and for complication matched controls. Though the median distance to the first health facility visited was similar for both cases and for controls (3 km and 2.5 km respectively, p=0.43), the median distance between the first health facility and the appropriate treatment facility was much greater for maternal death cases than for controls (60.5 km and 35 km respectively, p=0.03) [12]. The author summarized that the greater distance travelled by the maternal death cases contributed to longer delays and hence resulted in the woman's death. Furthermore, they quantified the number of referrals made for maternal death cases and controls and found that the number of referrals was greater for maternal deaths than for controls (3 and 2 respectively, p=0.034), suggesting that multi-referral was another factor contributing to the delay. In the Nigerian case-control study[107], however, the distance was not suggested as a reason for the occurrence of the second delay. The median distance travelled by the maternal death cases and the distance travelled by the survivors were found to be similar although the proportion of women who experienced the second delay among the maternal death cases was greater than that among the survivors [10].

Transportation

[10] The average distance travelled by those who experienced the 2nd delay and those who didn't was not compared in the study.

The Nigerian case-control study [107] found that mothers with the second delay were 'significantly younger than mothers without'. They argue that young mothers delayed because 'young mothers are more likely to be from the lower socioeconomic class' and 'such features of transportation as the absence of vehicles, irregular traffic , bad roads, high fares and unfriendly drivers... are more likely to affect women of low socioeconomic status more severely'[107].

2.3. Discussion

Durations of the delays

Thaddeus and Maine's delay model is referred by more than 400 articles according to Google scholar, yet only seven studies described the durations of the first or the second delays. The identified studies varied in methodological quality and used different ways to describe the durations. Pooling of data or 'meta-analysis' was not the objective of this review, and it would have been difficult to do so because the studies did not report their duration findings in the same way. Therefore I do not attempt to obtain a summary estimate of the duration of the delays. Instead, the findings of the studies can be summarized as follows.

First, maternal deaths were associated with longer durations of the first and the second delay or of total delay in comparison to survivors of obstetric complications [12 108-109], suggesting that deaths may be averted by reduction of delay. However, all these studies were retrospective. Fieldworkers and investigators were not blinded as to whether the women were maternal deaths or survivors, which may have influenced the results of the studies.

Second, the median as opposed to the mean was more frequently used to describe the average or central tendency of the delay times, which suggest that the distributions of the delay times may be skewed. In addition, the median durations of the first delay differed greatly across the studies. This might be explained by cultural or socio-economic factors, but the most likely explanations for these differences are probably methodological. Because some studies relied on women's perception of illness[104-105], which differs considerably from medical diagnosis [64], the samples may have included women

who did not need EmOC. In addition, it is likely that study samples included different case mix of complications. These different case mixes may elicit different responses from women and their families because their symptoms may appear to have different urgency. Although no investigation was conducted into the durations of the first delays alone for different types of complication, it can be assumed from the findings of the reviewed studies (India[12] and Ghana[106]) that some variation in the duration of the first delay across complication types does exist.

Thirdly, no study reported variations in the duration of the first delay by the factors that Thaddeus and Maine suggested could contribute to the delays (e.g. socio-economic status, cultural factors, and accessibility). This may be because of the sample size limitation (e.g. [105]), or because the study was not specifically designed to provide explanations for variations of the delay time (e.g. [12]).

Finally, the median time to travel to health facilities also varied from one study to another. While there may be some methodological explanations for these variations, in relation to the measurement of duration in particular, these differences can also be explained by the different contexts in which the studies were conducted.

Factors contributing to the 1st and 2nd delays

Overall, financial constraints seem one of the most important factors contributing to the first delay in the majority of the descriptive studies included in the review (eg. [88 91-94 98-100 102 104-105]) although the role of financial constraints was ambiguous in the analytical studies [107 110]. Other core factors for the first delay appear to vary according to settings and possibly the investigator's conceptual frameworks or interpretations. They range from lack of woman's control over decisions regarding her healthcare needs[90 94 98-99 102 104 108] or over money [99], perceptions of difficult access to healthcare[88 104], concerns about quality of care [98]or perception of lack of quality care[91]to perception of severity of illness [88 90 92 94 99 101 104-105] which appears to interact with availability of appropriate care[91].

The main factor for the second delay, which was reported in all the descriptive studies and one of three analytical studies, was lack of or poor transportation [88 90-94 98-100 102

[108]. Other reported factors are also concerned with poor geographical access to health care and include travel distance[12 92 94 99], road conditions[92] delayed referral[90 94] sometimes due to multiple referrals [94 12]and lack of capacity in lower health facilities[92-93].

There were a number of methodological weaknesses that need to be taken into account. First, most studies that were reviewed were descriptive studies that attempted to attribute occurrence of delay to a single or multiple explanatory factors (even though there may not always have been an undue delay) on the basis of subjective assessment as opposed to a systematic investigation of a conceptual framework. The weakness of these studies is that the results could be subjective and have limited reliability. Many factors may have contributed to the adverse outcomes, and relying on one assessor's attempt to pinpoint a single factor that might have prevented the deaths or severe complications is not only subjective, but more importantly, it may undermine other important contributing factors. In addition, lack of a comparison group in the descriptive studies limits our interpretation of the information because without a comparison group, a relationship can be easily obscured, or a spurious association may be suggested where no association actually exists [111]. These weaknesses, among other methodological and design issues, may partly explain why very few descriptive studies addressed the effect of hospital fees on occurrence or duration of decision delay although household financial constraints were frequently mentioned. The analytical studies did not investigate the effect of hospital costs. Although the review by Thaddeus and Maine concluded that 'the literature simply does not provide systematic evidence that cost of services is a major barrier to seeking care in the developing world' [45], there is more evidence accumulated to date that suggests that user fees are a major barrier to utilization of obstetric care [112].

Second, the small number of analytical studies that existed lacked depth in the analyses. The numbers of study participants were often very small because even in large health facilities maternal death is a rare event. In addition, the facility-based analytical studies only explored certain factors that could be easily measured and obtained from hospital records (such as age and parity)

and information of important risk factors and potential confounders was often lacking. None of the studies was designed to conduct an in-depth multivariable analysis to identify the risk factors of delay [11]. These design or methodological issues are likely to explain the ambiguous association between socio-economic status and delay in the two analytical studies [107 110], despite economic constraints being cited as an important reason for decision delay in a number of descriptive studies. The slightly different findings related to women's status between the analytical and descriptive studies may also be partly explained by methodological issues, particularly those related to data sources. In many descriptive studies, absence of decision maker (such as spouse or male family members) was a frequent reason for the first delay while analytical studies focussed on the effect of marital status. Unmarried women, while free from the control of husband in the marital home, were more likely to delay than married women, which the authors attributed to lack of social support of single women. Both the findings probably point to the same important phenomenon – that someone needs to be there to help the women to obtain care during illness. Different study contexts may also explain the slight difference of emphasis between the findings of the descriptive and analytical studies. However a more rigorous analytical study with a comprehensive set of appropriate variables to measure various aspects of women's status and confounders may help to clarify how women's status influences decision delays. Similarly, a more in-depth multivariable analysis would make clearer the association between age or parity and delay which the authors of Nigerian study suggested was due to a confounding effect of socio-economic status or women's status without further multivariable analysis.

The review by Thaddeus and Maine as well as many of the descriptive studies indicated that the perception of severity and the perception or the belief of illness causation play a role in the decision to seek medical care. One facility-based study used the information of types of haemorrhage to suggest different reactions from women and care-takers but there were a number of limitations in the methodologies of the study (see Table 2.3).

[11] The Indian study did conduct a multivariable analysis for identification of risk factors of maternal deaths only.

Overall, most studies were reported from the perspective of the healthcare providers and the blame was put on the women themselves. For example, many studies used such language as 'lack of knowledge of danger signs of complications' or 'lack of awareness' to describe the disagreement between healthcare providers' expectation and the women's understanding of health condition that led to prolonged decision making.

Detailed studies of the second delay were particularly scarce. The reasons given by the descriptive studies for the second delay included physical accessibility, transportation problems and failure of healthcare providers or weak healthcare systems that resulted in multiple referrals. Though physical accessibility was among the most frequently reported factors contributing to the second delay, the magnitude of distance travelled experienced by women with complications was scarcely reported.

There was some indication that women of low socio-economic status may be more likely to be affected by transportation problems. However, no evidence of interaction between transportation problems and individual woman's characteristics was presented in any of the studies I reviewed because no study was specifically designed to provide such evidence.

Limitations

Because I only searched two databases, some studies may not have been covered in this review if they were not indexed in the two databases. Studies that were published in languages other than English may also have been missed.

2.4. Conclusions

One of the strategies of safe motherhood programmes is to improve access to EmOC by shortening delay times before arrival in EmOC facilities that may occur at the family, community and health facility levels. Many studies have investigated the delays in deciding to seek care and in reaching health facilities in an attempt to understand the causes of the delays and to formulate interventions to reduce the delays. Most of the studies that have been conducted to date are descriptive studies with limitations in the study

methodologies. Attempts were made in some studies to remedy some of the limitations. For example, in order to increase reliability, assessments were done by three different reviewers to reach a consensus in the cause of maternal death or delay (e.g.[102 113]). There is no doubt that the information provided by descriptive studies is useful; it constitutes the important first step to formulate hypotheses and to identify determinants or risk factors that are amenable to interventions or that can be altered or eliminated [111]. However, in order to obtain more detailed understanding of the delays and to identify factors that can be eliminated, more rigorous analytical studies of delays may be needed. The shortage of study participants that is inherent in the studies of maternal death cases has hampered detailed analysis of delays and the risk factors. Inclusion of women who did not die from severe complications, or 'near-miss' cases, can increase the number of subjects (e.g. see [98-99 109]) within a reasonable study period. This, along with collection of all necessary confounding factors, will allow detailed analysis of delay and the risk factors that will provide insights into pragmatic interventions to reduce the delay and maternal mortality.

Table 2.1: Summary of descriptive studies to investigate substandard factors with the delay model

Location	Year of fieldwork	Study design and sample (N)	Method of collecting information	Occurrence / duration of delays	Reasons for the delays	Note
Tanzania [90]	Feb 1991–Jan 1993	Population-based case series of maternal deaths (117)	Interviews with relatives and health staff, review of medical records, and verbal autopsy	1st delay 27%	1. Concealed abortion (17/32) 2. Delay at home (e.g. decision-maker not at home) (11/32) 3. Consulted local healer(5/32) 4. Overlooked seriousness of disease (3/32) 5. Refused preventive treatment (2/32)	The study was nested within a community-based case-control study of maternal deaths and surviving mothers.
				2nd delay 10%	1. Delayed referral (12/12) 2. No/poor transport(5/12) 3. Delay in travel (4/12) 4. No money for transport (0/12) 5. Unpassable roads (0/12)	
				Total delay N/A	Not studied	
Haiti [91]	1990–1991	Case series of maternal deaths (12) nested within a population cohort of pregnant women	Demographic data from the initial interviews during pregnancy. Verbal autopsy and structured discussions with husband, mother and TBA (if applicable) after women's death.	1st delay 67%	1. Accessibility/transport problem (2/8) 2. No money for transportation/care (2/8) 3. Perceived lack of health facility nearby (1/8) 4. No specific reason (4/8)	Because of political disturbances in the country, only a portion of follow-up visits were performed. Of 21 reported maternal death cases, only 12 were followed up. Very small sample.
				2nd delay 17%	1. Poor/lack of transport (2/2)	
				Total delay N/A	Not studied	
South Kalimantan, Indonesia [92]	1995 – 1999	Population based case series of maternal death (audit) (30)	Verbal autopsy/interviews with the family of the deceased	1st delay 77%	1. Refusal to seek care (53%) 2. Economic constraints (37%) 3. Lack of knowledge of danger signs (23%)	
				2nd delay 33%	1. Long distance (23%) 2. Lack of transportation (13%) 3. Road conditions (7%) 4. No health provider (7%)	
				Total delay N/A	Not studied	
Ilesa, Nigeria [93]	1995 – 1999	Facility-based case series of maternal death at admission	Interviews with relatives of the deceased.	1st delay (*)	1. No money to pay hospital costs	(*) the 1st delay and 2nd delay were not separately assessed.
				2nd delay (*)	1. Inability to obtain transportation on time 2. Unwillingness of drivers to travel at night	

Location	Year of fieldwork	Study design and sample (N)	Method of collecting information	Occurrence / duration of delays	Reasons for the delays	Note
		(24)			3. Inability of the referring hospital to perform emergency C/S 4. Inability of the healthcare staff to detect obstetric problems early and refer	(**) The objective of the study was to identify reasons for late presentation for women who were brought to the facility dead, hence all women in the sample were delayed.
				Total delay All women delayed (**)		
Karachi, Pakistan [94]	April 2005–May 2008	Facility-based case series of maternal deaths (104)	Interviews with the relatives of the deceased and women's case files	1st delay 67%	1. Lack of awareness 89%) 2. Lack of finances (54%) 3. Decision-maker not home (16%) 4. Domestic violence (4%) (multiple answers allowed)	
				2nd delay 70%	% among those experienced the 2nd delay 1. Long distance (40%) 2. Delayed referral (37%) 3. Multiple referrals (32%) 4. No/poor transport (11%) (multiple answers allowed)	
				Total delay N/A	N/A	
The Gambia [95]	Jan 1991–Dec 1992	Facility-based case series of maternal deaths (78)	Hospital records	1st delay 15%	Not studied	
				2nd delay 3%	Not studied	
				Total delay N/A	Not studied	
Rural Zambia [96]	1990–1994	Facility-based case series of maternal death (29)	Reviews of hospital files	1st delay 29%	Not studied	
				2nd delay 25%	Not studied	
				Total delay N/A	Not studied	
Enugu, Nigeria [97]	Dec 2003–April 2004	Multi-centred facility based case series of maternal deaths	Hospital records	1st delay 12%	Not studied	Type 3 delay was the commonest cause of delay. 63% of all maternal deaths
				2nd delay 12%	Not studied	

Location	Year of fieldwork	Study design and sample (N)	Method of collecting information	Occurrence / duration of delays	Reasons for the delays	Note
		(89)		Total delay N/A	Not studied	followed up.
Rural Nigaria [98]	Jan 1998–Dec 1998	Facility-based case-series of 'avoidable obstetric emergencies'(*) (161)	Interviews	1st delay N/A	Not studied	(*) is defined as 'cases that were identified as high risk at early stage and counselled to present in hospital for intervention, monitoring or admission to avoid complication'. All the cases were delayed according to the definition.
				2nd delay N/A	Not studied	
				Total delay All cases delayed according to their definition	1. Financial constraints (85%) 2. Transportation/access difficulty (34%) 3. Were at work (opportunity costs) (26%) 4. Relatives' objection (26%) 5. Fear of operation (22%) 6. Influence of religious leaders (18%) 7. Attitude of hospital staff (8%)	
Uganda [99]	Jan 1999–Sep 2000	Facility-based case series of near-miss women (audit) (229)	Women's clinical records and interviews with the women and/or relatives and health workers involved.	1st delay 58%	1. Overlooked disease seriousness (25%) 2. Delay at home waiting to obtain permission (25%) 3. Lack of money (20%) 4. Relatives advising not to go to the hospital (20%) 5. Spouse refused to give money (17%)	The definition of SMM is adopted from Mantel et al. [7]
				2nd delay 53%	✓ Lack of transport ✓ Long distance ✓ Inappropriate means	
				Total delay N/A	Not studied	
West Java, Indonesia [100]		Purposedly selected case series of near miss and maternal death (13)	Review of medical records and interviews	1st delay N/A	✓ Time to arrange transport ✓ Time to arrange finance ✓ Time waiting for a midwife to arrive ✓ Family or carer's prolonged decision making	The purpose of the study was to assess the quality of care provided by village midwives. Various factors that may influence the quality of care were assessed which included response and referral time.
				2nd delay N/A		
				Total delay range 1–19 hours		

Table 2.2: Summary of descriptive studies to investigate substandard factors without the delay model

Location	year of fieldwork	Study design and sample (N)	Method of collecting information	Occurrence/ duration of delays	Reasons of delays	Note
Zimbabwe [88]	1989–1990	Population-based case series of maternal deaths (105 from Masvingo and 61 from Harare)	Interviews with relatives of the deceased, TBA and /or healthcare provides if applicable.	1st delay 31%	✓ Failure to recognize the severity of symptoms ✓ Economic and child-care responsibilities ✓ Fear of criminal consequence of induced abortion ✓ Accessibility to health facilities (*)	Information for 9 maternal death cases was missing and they are not included in the study.
				2nd delay 19%	1. Lack of transportation (31)	
				Total delay N/A	N/A	
Zimbabwe [101]	March 1985–February 1997	Facility-based case series of maternal death (audit) (70)	Clinical data, medical chart and autopsy	1st delay 33%	✓ Lack of knowledge of danger signs of complications	
				2nd delay 4%	✓ Difficulty to transfer	
				Total delay N/A	N/A	
The Gambia [102]	January–September 2002	Population-based case series of maternal deaths (42)	Reviews of medical records, case notes, referral records, antenatal cards)	1st delay % varied*	✓ Absence of decision maker ✓ Not recognizing severity of illness ✓ Lack of knowledge of treatment possibilities ✓ Prolonged decision-making /disagreement ✓ Lack of money	(*) Three different reviewers assigned contributing factors to each case of maternal death.
				2nd delay % varied*	✓ Lack of transport ✓ Lack of money	
				Total delay N/A	N/A	
Enugu, Nigeria [103]	Jan 2003–Dec 2005	Hospital-based case series of maternal deaths (47)	Extraction of information from medical records and referral notes.	1st delay 6% recognition 19% decision	Not studied	
				2nd delay N/A	N/A	
				Total delay N/A	N/A	

Table 2.3: Summary of descriptive studies to understand care-seeking behaviours

Location	Year of fieldwork	Study design and sample (N)	Method of collecting information	Occurrence / duration of delays	Reasons of delays	Note
Bangladesh[104]	2001	Cross-sectional study of women with perceived life-threatening complication (18,117)	Questionnaire administered to women	1st delay 50%*,< 6 hrs 18% * >= 6 hrs 32% did not seek care	(Reasons for not seeking care - multiple answers allowed) 1. Cost-related considerations (44%) 2. Condition not serious (39%) 3. Access / transport issues (12%) 4. Family opposition (12%) 5. Quality of care (6%)	The primary purpose was to estimate the national maternal mortality rates. (*) % are of those who had excessive bleeding or convulsion(N=3614) (**) % are of those who sought care outside the home. The recall period was as long as three years.
				2nd delay 75% ** < 1hr 25% **>=1 hr	Not studied	
				Total delay N/A	Not studied	
Matlab, Bangladesh [105]	Dec 2000–Feb 2001	Cross-sectional study of households with a family member with perceived illness (N=881) among whom 22 perceived to have pregnancy-related illness	Interviews with the household heads using structured questionnaires	1st delay Median 24 minutes	1. Unable to judge seriousness of condition (45%) 2. Initially under informal care (18%) 3. Not having enough money (18%) 4. Other (18%)	The study not only focused on pregnancy-related complications (N=22) but other diseases perceived by the head of households that were sampled in the household survey (N=859). The reasons for the 1st and the 2nd delays and their distributions according to socio-economic status were presented for all illnesses. It was not possible to extract information for pregnancy-related illness alone.
				2nd delay Median 150 minutes	Not studied	
				Total delay N/A	Not studied	
Kumasi,	Not clear	Facility-based case series of women	Not clear (*)	1st delay	Not studied	The article reported results of health facility

Location	Year of fieldwork	Study design and sample (N)	Method of collecting information	Occurrence / duration of delays	Reasons of delays	Note
Ghana [106]		admitted with haemorrhage (N=not mentioned)		2nd delay	Not studied	analyses in 11 project sites (3 countries). In one project site in Ghana, the data collected included the times from onset of haemorrhage to arrival in the facility in addition to other data mainly related to quality of care. (*)It was difficult to assess the quality of this study as it did not report the methods in great detail.
				Total delay On average 2 h 20 min for ruptured ectopic pregnancy 7 h and 9 min for PPH 14 h and 4 min for APH 31 h and 10 min for threatened abortion	Perception of urgency of the illness (?)	

Table 2.4: Summary of analytical studies

Location	Year of fieldwork	Study design and sample (N)	Method of collecting information	Occurrence/ duration of delays	Comparison	Risk factors/reasons of the delays	Note
Rural India [12]	Jan 1993–Dec 1995	Population-based case-control study of maternal deaths (121) and women with complication who survived	Interviews with the woman's and the husband's family and with healthcare providers and review of available medical records.	1st delay 8 h (MD) and 3 h (survivors)	Maternal deaths and complication matched controls	No data collected	The study was not specifically designed to find the factors of the delays. It is a study to identify risk factors of maternal deaths. Therefore, only an inference of association between delays and risk factors could be drawn from the text without any statistical test proving the association (*).
				2nd delay 12 h (MD) and 4.9 h (survivors)	Maternal deaths and complication matched controls	Distance (*) Number of health facilities (*)	
				Total delay 34 hours (MD) and 12.3 hours (survivors)	Maternal deaths and complication matched controls		
Nigeria [107]	Oct 1989–Apr 1991	Facility-based case-control study comparing maternal deaths (35) with women with complications who survived (35)	Interviews with the hospital staff involved in the management of the cases, reviews of clinical records and interviews with relatives and friends of the women	1st delay 23% of MD and 29% of survivors	Yes (*)	1. Young age <20	(*) The study was not designed to find risk factors of delays. The object was to identify risk factors of maternal death, but a comparison was also made between those with delay and those without. It was not stated what test was used to assess the association between occurrence of the delays and age. Small sample size and hence no controlling of confounders.
				2nd delay 20% of MD and 6% of survivors	Yes (*)	1. Young age <20	
				Total delay N/A	N/A (*)	N/A	
Peshawar, Pakistan [108]	Jan 2001–Mar 2003	Facility-based case series of eclampsia (71)	Interviews with patients, and attendants with proforma and	1st delay N/A	No	1. Non-availability of transportation (45%) 2. No male at home (13%) 3. Not taking the condition	'No delay' was defined as reaching a health facility within 3 hours of developing
				2nd delay N/A	No		

Location	Year of fieldwork	Study design and sample (N)	Method of collecting information	Occurrence/ duration of delays	Comparison	Risk factors/reasons of the delays	Note
			hospital records.	Total delay 59% greater than 3 h	Maternal deaths and survivors of eclampsia are compared (*)	seriously (8%) 4. Sought care elsewhere (34%)(mullah etc.)	seizure. * Delay of more than 6 hours in reaching the facility was associated with higher rate of maternal death.
Northern Nigeria [109]	2002–2005	Facility based case series of eclampsia (207)	Hospital case notes	1st delay N/A	No	N/A	'Delay' was defined as inability to reach the hospital from home within 3 hours. (*) Comparison between maternal deaths and survivor of eclampsia showed maternal death had significantly higher occurrence of delay.
				2nd delay 56% (82% among maternal death cases and 53% among near-miss cases)	Maternal deaths and survivors of eclampsia were compared(*)	Not studied	
				Total delay N/A	No		
Nigeria [110]	Jan 1999–Dec 2003	Facility-based cross sectional study of maternal deaths (54)	Information was retrieved from medical records. Absence or presence of delay before admission was obtained from the relatives	1st delay 57%	Maternal death with delay and without delay were compared (Fisher's exact test)	1. Young age <24 2. Nullipara 3. Unmarried	All maternal deaths identified in the hospital during the specified period were included in the study but it was stated that information was found inadequate for five women. Comparisons were made between delay and no delay but because of the very small sample size, no multivariable analysis was conducted and no controlling of confounders.
				2nd delay 0 %	N/A	The author stated that the 2nd delay was not an important issue among the maternal deaths found in the hospital.	
				Total delay 57%	N/A		

3. Methodology

3.1. Objectives

The aim of the study is to investigate the durations, determinants and a consequence of care-seeking (1st) and referral (2nd) delays for women with severe obstetric complications who were admitted to a maternity hospital with comprehensive EmOC in Afghanistan. The ultimate goal is to explore ways to improve access to referral hospitals providing life-saving obstetric care.

To achieve the above aim, the study has the following specific objectives:

1. to describe the durations of care-seeking and referral delays of the women in life-threatening conditions on arrival in an EmOC hospital in post-conflict Afghanistan
2. to identify and quantify the effects of risk factors that influence the durations of care-seeking and referral delays
3. to identify and quantify the effects of risk factors that influence the vital status of foetus at admission.

3.2. Overview of the study

The study was a hospital-based cross-sectional study of women with severe obstetric complications in the period between 1 February 2007 and 31 January 2008 in Herat, western Afghanistan. The analysis of the survey data was complemented by modelling in the Geographic Information System (GIS). The GIS model was used to generate the shortest travel times (or the baseline values) from the women's place of residence to the hospital in order to identify the explanatory factors for long durations of self-reported travel times in comparison with the modelled travel times.

In this chapter, I will discuss the methods used in the cross-sectional survey, including description of the study site, data collection tools and fieldwork. I will then describe the methods used in development of the GIS model to estimate the shortest travel times. Finally, the methods of statistical analyses will be discussed, in particular with respect to the measurement of delays and the techniques used for analyses.

3.3. Cross-sectional survey

3.3.1. Study site

Western Afghanistan

The study took place in the Herat Regional Hospital located in the city of Herat, Herat Province, which is the socio-political centre of western Afghanistan. Herat city is relatively well-developed in terms of basic infrastructure (e.g. electricity, roads), which is largely owed to its proximity to and trade links with neighbouring Iran (1.5–2 hours by road to the border) and with Turkmenistan (2 hours by road to the border). The city has been renowned as one of the most peaceful in the country, although the power shift from a controversial but powerful governor of Tajik origin, Ismail Khan, to a new governor of Hazara origin, the ethnic minority, caused frequent security incidents inside the city during the study period. The rural population outside of Herat city mainly subsist on agricultural and livestock farming. The population of Herat city is about 250,000 and that of Herat province is about 1,200,000 (AIMS), with the majority being Dari/Farsi (Persian)-speaking Tajik[1].

According to a study conducted in March 2002, which used the indirect sisterhood method, MMR in Herat province for the previous12 years was found to be 593 per 100,000 births [114]. This is low compared with the national estimate of the MMR of 1600–2200 per 100,000 births[6], which was based on a retrospective cohort study of women of reproductive age. The disparity is likely to be explained by a number

[1] Tajik is the second largest ethnic group after Pashtuns. Pashtuns are mainly concentrated in the east and the south of the country, though Shindan district in Herat province has some Pashtun population.

of methodological factors which include differences in the approaches used to measure maternal mortality, the retrospective nature of the sisterhood estimate and the variability in settings. Though the sisterhood method should technically not be applied to a population where migration is high[115], many people in Herat province did flee to Iran, particularly after the city was captured by the Taliban in 1995, with some returning after the Taliban was ousted in November 2001. Despite this, Bartlett et al. [6] agreed that the estimate for Herat is in line with their own findings because it is at a similar level to that of another semi-urban area sampled in their study, Laghman province.

Herat Regional Hospital is the major referral hospital in Herat province and the maternity ward had 17 obstetricians and 40 beds with comprehensive EmOC at the time of the study. Although each of the three rural provinces in the western region of Afghanistan (Farah, Ghor and Badghis provinces) had a hospital in their provincial centres with EmOC capability, their capacity was limited and as a consequence complicated cases were sometimes referred to the regional hospital in Herat. There were nearly 1000 admissions each month in Herat Regional Hospital, which included complicated as well as uncomplicated deliveries.

3.3.2. Study population

The study population was composed of Afghan women who were admitted to the maternity ward of Herat Regional Hospital in life-threatening conditions during pregnancy, delivery or within 42 days after termination of pregnancy from 1 February 2007 to 31 January 2008.

3.3.3. Inclusion criteria

Near-miss women are defined as those women in life-threatening condition who need immediate intervention in order to prevent their likely deaths [116]. Clinical criteria of near-miss were adapted from other studies that used disease-specific criteria rather than organ failure or dysfunction-based criteria because of their applicability in resource-poor settings [59]. At the time of the study, WHO had not yet

developed generic criteria for near-miss conditions [116]. After discussions with the local obstetricians and with an advisory panel member who is medically qualified, the criteria were modified to suit the local practice as well as to satisfy the purpose of the study. To the extent possible, more importance was given to the inclusion of acute conditions rather than chronic conditions (e.g. acute anaemia rather than chronic anaemia) because the study was interested in reducing the delays for women with obstetric complications which are unpredictable and time-sensitive.

In order to qualify for the study, women had to exhibit one of the eight near-miss conditions (see Table 3.1) during pregnancy, delivery or 42 days after termination of pregnancy upon admission. Women who began to experience a near-miss event or condition only after being admitted to hospital were not included because the study aimed to understand the delays and barriers in reaching referral hospitals and not the quality of hospital care itself.

With these inclusion criteria, women who did not seek care or did not reach the study hospital after experiencing the symptoms of a life-threatening complication would not be included. This is a limitation of the study but the chosen study design is believed to be the most appropriate for various reasons. Because of time limitations associated with a PhD, conducting a prospective study of pregnant women is difficult, and it is financially prohibitive. Conducting a community survey to identify women who had life-threatening complications retrospectively would not be an ideal because women's perception of severity is unreliable [64].

3.3.4. Sample size and power calculation

Sample size calculation

Studies conducted in other developing countries suggest that there are on average about 10–15 survivors of very severe obstetric complications (or near-misses) for every maternal death in teaching or regional hospital settings [10 117-121], though there are variations [122]. In addition, it seems that about 15% of those survivors developed severe complications after they were admitted to the hospital [10 122]. In order to estimate the possible number of women with severe obstetric

complications that could be recruited at admission to the maternity ward of Herat Regional Hospital over a period of one year [m], an estimate of the number of maternal deaths in the hospital was necessary. At the time of developing my proposal, information on the exact number of maternal deaths over the previous year was not clear. Therefore information from a published study conducted in a large urban maternity hospital in another region in Afghanistan was used to estimate the number of maternal deaths in Herat Hospital and to calculate a possible sample size. In the published study, there were 28 maternal deaths out of over 15,000 deliveries over a 12-month period [123]. Since the maternity ward of Herat Hospital delivers about the same number of babies in a year, it was assumed that Herat Hospital would have about the same number of maternal deaths over a 12-month period. Given this information, it was estimated that it would be possible to recruit 400 women with severe obstetric complications at arrival during a 12-month period at the hospital. It was also estimated that 15% of them (or the couples) would not participate in the study, which would result in an effective sample size of 340. Among these, 70% (≈240) were expected to be antepartum or intrapartum and had passed the 22nd week of gestation[10 122].

Power calculation

The difference in delay times that the study with the suggested sample size could detect was estimated for different possible values of standard deviation (SD) of delay time. The exact value of the SD for the study population was not known before the study was carried out, however. To get around this, a simulation method was used to estimate the SD of delay time. It was expected from existing literature that the delay, the study's main outcome of interest, was skewed to the right: a large proportion of women and their family members would react promptly to obtain care and have relatively short delay times, and only a small proportion of women would take exceptionally long times (i.e., long delay). Hence an exponential function ('rndexp' command in Stata) was used to simulate delay

[m] I thought that one year of fieldwork would be the maximum time I could spend during the course of PhD studies.

variables and to estimate possible values of SD of the distributions[n]. After converting the simulated delay times into the log scale, possible values of SD of log of the distributions were obtained and used to calculate the differences in mean log delay that the study would be able to detect for a 5% significance test and power of 90%[o].

The figures 3.1 show the results. , With the proposed sample size of 340 study participants, the study can detect the ratio of 1.4 for a 5% significance test and power of 90% if the SD of log delay was 1.5.

3.3.5. Tools

(a) Structured questionnaires

Two questionnaires were prepared, one for women and the other for husbands or other senior male family members. Wherever possible, standard questions were adapted and/or modified from survey questionnaires that have been proven adequate elsewhere (i.e., DHS questionnaires[124], Pakistan Reproductive Health and Family Planning Surveys [125], Medical Outcome Studies on social support [126] and Social Capital Questionnaire [127]). Questions for which there was no standard version available were developed with the assistance of a local research assistant. In particular, for information on the duration of time women and/or their family members took to make the decision to seek care, as well as the length of travel time taken to reach the study hospital, questions were written so as to reconstruct events and actions taken, in chronological order to the extent possible, starting with the onset of symptoms. In order to obtain other information, questions that

[n] However, because characteristics of delay distribution such as its shape and median value were largely unknown before the study, parameters used to simulate delay distributions were again based on guesswork.

[o] For example, a distribution with a median delay time of 1.8 hrs, 5th percentile of 10 minutes, 95th percentile 8 hours and 320 observations, had a SD of 2.8. After converting the distribution to the log scale, the log delay distribution had a SD of 1.3. Different distributions would produce SDs different from 1.3 but fairly close to 1.3. . The obtained values were converted back to the normal scale with an exponential function (i.e., the difference in mean log delay was converted into the ratio of the delay time in one group to the delay time in another group).

would be more easily answered by husbands were included in the 'husband's questionnaire' while questions which might be more specific to women were included in the 'woman's questionnaire'. For example, husbands were asked about expenditures in relation to obstetric complications and expenditures related to travel because experience in other low income settings had shown that husbands were able to report these more accurately than women [128]. Husbands were also asked questions relating to the location of their residence including the exact name of their village and questions relating to the timing of decision-making and travel time. Women were asked questions on their reproductive experience including previous births.

The main themes of the questionnaires were as follows.

Husband's questionnaire:

(1) Residence

The questions in this section related to the location of the woman's residence, the distance to the hospital and to a nearby clinic. The information provided in this section together with the map of the study were used to search manually for the physical location of the village (i.e., longitude and latitude) in a settlement database (discussed more in the GIS component section in the current chapter).

(2) Family structure

In this section, the size and the relationships of the people in the woman's household are asked.

(3) Economic characteristics

The questions in this section are related to the income level and the assets owned by the woman's household.

(4) Other background information

Husband's education, ethnicity and the level of exposure to information and its primary source.

(5) Community characteristics and social capital

The level of conflicts in the community, social cohesion and inclusion, collective action and cooperation, and social network.

(6) Circumstances at the onset of symptoms

The questions in this section were concerned with the timings of the onset of symptoms, actions taken and referral places. These questions serve to measure the primary outcomes of the study: (i) the duration of time from recognition of illness to decision to seek care, (ii) the duration of time from the decision to departure from home to seek care, and (iii) the duration of time from the departure point till the time of arrival in the study hospital.

Woman's questionnaire:

(1) Background information

This section included questions relating to age, education, work and exposure to information. The questions relating to exposure to information were intended to measure the extent to which women were exposed to the outside world.

(2) Reproduction

This section included questions related to the woman's experiences concerning her previous births.

(3) Healthcare during pregnancy

The questions in this section related to the woman's use of and attitude towards healthcare during pregnancy.

(4) Circumstances at the onset of symptom

Questions relating to the timing of the onset of symptoms were included in this section.

(5) Woman's status

The questions in this section were related to the conduct of the woman's marriage and wedding ceremony, and the woman's relationship with her birth family.

(6) Woman's social support
The questions in this section related to the type and the amount of social support the woman had.

The questionnaires were translated into Farsi by one person and back-translated into English by another person so that the original and translated instruments could be compared and the points of divergence could be corrected (see Appendix 1).

(b) Data extraction forms

In order to facilitate extraction of data from medical records, 'data extraction forms' were prepared. The information extracted from medical records were; type of complications, physical conditions at admission (including vital signs), status of foetus at admission (e.g., presence or absence of foetal heart beats), whether labour had started or the woman was postpartum when admitted, vital status of neonates, mode of delivery, pre-existing medical conditions, time and date at admission and treatment received before and on admission. (See Appendix 2)

3.4. Implementation

3.4.1. Field work organization

(a) My role and the roles of WVA and WVJ

I raised the research question and developed the research proposal during the first year of my registration as a PhD student at LSHTM. During this period, with a financial assistance from the Infectious Disease Epidemiology Unit of LSHTM, I visited a bilateral aid agency and several NGOs in Afghanistan, including World Vision International - Afghanistan (WVA) in Herat, in order to identify a collaborating partner and a study site. A number of factors contributed to my

decision to pursue the possibility of conducting the current study with WVA in Herat, among which close rapport established from my previous working relationship with them was probably the most important. In addition, the relatively stable security condition of Herat City, in comparison to southern and eastern parts of the country, and presence of a large maternity hospital there with comprehensive EmOC capacities were other determining factors. Furthermore, WVA was supporting a midwifery education program at the Institute of Health Science in Herat Regional Hospital and had a good working relationship with the maternity ward of the Hospital which also contributed to my decision to pursue a possibility with WVA further.

After the visit, my study proposal was accepted by WVA and submitted to World Vision Japan (WVJ) who awarded the entire cost of the fieldwork to WVA. Therefore, WVA hosted the project and hence provided all the logistical and security support the project needed. In addition to my scientific role, I acted as the 'project manager', and my responsibility in relation to WVA was implementation and day-to-day management of the project in line with WVA policies and procedure, including security and financial policies. Financial management of the project was handled by the staff of the WVA Finance Team and overseen by the WVA Grant Manager.

(b) Ethical clearance

Ethical approval was obtained from the ethical committees of LSHTM and of the Ministry of Public Health in Afghanistan before the fieldwork was started. At the time of the study, there was no proper ethical committee at the regional Department of Public Health, so the study was discussed with the regional head of the Department of Public Health, and clearance from the ethical committee of the Ministry of Public Health was reported to her before the beginning of the field work.

(c) Recruitment and training of staff

Three junior doctors were recruited from the maternity ward staff to work as Research Doctors (RDs) during the entire study period, with the RDs alternating responsibility for the research every three days in order to cover the 365 days including weekends and public holidays. In addition, 10–15 midwives and junior doctors ('associate midwives/doctors') were also appointed each month from the pool of midwives and junior doctors who had agreed to cooperate with the team in the maternity ward. Their roles were to assist the RDs, whenever they worked on night shift, in the busy maternity ward. Two female interviewers, who were a nurse-anaesthetist and a junior doctor by occupation, a coordinator assistant who also worked as a male interviewer, and a part-time male interviewer were also employed. Both of the male staff were recent medical graduates.

The main responsibility of the RDs was to identify systematically on a daily basis those women who met the inclusion criteria. An interactive workshop was first organized to explain near-miss definitions, eligibility criteria and the completion of the data extraction form. Most of the training that followed was conducted in the ward with real admission records as women were admitted. Although the importance of extracting the information relating to women's physical condition at the time of admission rather than post-admission was discussed during the initial workshop, it needed constant reinforcement during the second phase of the training before the study began. In addition, poor quality of medical records (i.e., missing information) was noticed during this period, and the research team discussed with all the members of the maternity ward the usefulness and importance of improving records for quality of care and research purposes.

The training of the interviewers was mainly focused on familiarizing them with the questionnaires and the procedure to conduct the interview. Each question was explained so the interviewers understood what the question was intended to ask. The importance of obtaining consent and maintaining confidentiality were stressed, and the interviewers were also sensitized to the emotional discomfort the interviews might bring to the interviewees.

(d) Pre-testing of the questionnaires

A pre-test of the questionnaires was conducted with 15 near-miss women and 16 husbands or other male members of the family of near-miss women. In addition, inter-observer reliability test was carried out in order to increase reliability of measure as two female interviewers and two male interviewers conducted interviews. Disagreements between the two female interviewers were mostly related to ambiguity of wording of the questions and not necessarily related to different interpretations of responses by the two interviewers. Questions were modified or rephrased and staff were re-trained in the use of the revised questionnaire after the pre-test.

3.4.2. Recruitment of eligible women

Women were recruited on a daily basis at Herat Regional Hospital during the study period. Recruitment was 'retrospective' in the sense that daily case identification procedures and recruitment of participants were done only after the occurrence of a near-miss event. If a woman suspected to have a near-miss condition arrived at, or was transferred to, the study hospital, a midwife or a junior doctor associated with the study was instructed to attach a label to her medical record and put a mark by her name on the hospital registration book, after vital signs were measured and physical and laboratory examinations completed at admission. Since the maternity ward operated 24 hours a day, 7 days a week, this procedure was continued without interruption every day throughout the study period. Three times a day, at 8 am, 12 pm and also at 5 pm, the RD on duty selected the marked medical records from all records of women who had been admitted in the hospital since the last time the RD had checked the records. She determined if the woman met one or more of the near-miss conditions at admission by examining the woman, checking the records against the criteria and discussing with the duty doctors or duty midwives if necessary.

The procedure was piloted before the survey was carried out. During the period of piloting, it became clear that women who were admitted in hypovolaemic shock

that did not require a major operation would not stay in the hospital very long. Some of them discharged themselves after several hours from admission. It was agreed that when the women with suspected hypovolaemic shock were admitted after the RD left for the day at 5.30 pm, the associate midwife/doctor on night duty would try to talk the women into staying in the hospital until the next morning, or inform the study team immediately after diagnosis.

3.4.3. Interviews

After the RD on duty identified an eligible woman and registered her in a registration book, the woman was asked for consent to participate in the study by a female interviewer as soon as she was well enough to do so. A female interviewer conducted an interview with the woman by her bedside in the ward after she recovered from illness using the structured questionnaire. The project obtained partitions to secure privacy for the study participants during interviews. A male interviewer asked the woman's husband (or senior male relatives who accompanied the women) for consent to participate in the study as soon as the man was located and became available after the woman's admission. After consent had been obtained from him, the male interviewer had an interview session with the husband at the waiting area outside the maternity ward.

If the woman did not recover and passed away in the hospital and her family members wished to leave the hospital quickly, then the interviewers or the RD asked for the location of their residence and consent to take part in an interview. If they lived in a relatively secure area, a female and a male interviewer visited their residence after a mourning period was over (usually after 40 days) to conduct interviews with them. If they lived in a relatively insecure area, or the road to their residence was presumably insecure, a representative of the study team asked the family for consent to participate immediately in the study and organized for the interviews to take place in the hospital before their departure.

3.4.4. Use of health personnel as interviewers

It is not always recommended to use healthcare professionals as interviewers in health research depending on the research question asked. Because they are accustomed to reaching a diagnosis in order to choose an appropriate form of management during a short period of time [129], it has been suggested that they may over-interpret the words of study participants during an interview. These possible over-interpretations in particular can become an issue in qualitative or quantitative research where the objective is to understand lay people's understanding of health or illness as opposed to that of health professionals [130], and the reasons why they are deciding on a particular form of health care. There is also a need to consider the effects on the interviewee's response itself because interactions are often influenced by the perceived role of the interviewer or the interviewer's social status in various ways. For example, Richards et al. (2000) reported differing levels of willingness to talk about specific topics between respondents interviewed by a doctor and those interviewed by a social scientist, without suggesting which one is a better interviewer [131]. Reventlow et al. (2005) also suggested that the higher position that the study participants ascribed to the medical doctor influenced the process of data collection [132]. A study conducted by a GP and qualitative researcher concluded that she had better rapport with interviewees when she disclosed her medical qualification and suggested that the data quality could suffer when there was no good rapport and trust between her and her interviewees [133]. Another study suggested that respondents try to create smooth and friendly interactions with interviewers by conforming to the expected hierarchy defined by the education status of the interviewer and the respondent and provide answers that the respondent believes are expected from their inferior education status [134].

Although I recognized various effects of having medical interviewers the literature appears to indicate that there is no perfect choice. In adition, itwas difficult to employ lay interviewers who were not associated with the Ministry of Public Health in this particular context. Many of the hospital doctors and midwives,

particularly junior doctors, were not paid by the Ministry of Public Health[P] despite the fact that they were assigned many night shifts and were usually listed as the first-call doctors in the rotation schedule. In the planning stage of the study, concerns were expressed by the local staff members of the hosting organization that hiring and paying lay interviewers incentives might create conflicts with the staff members of the hospital, which would in turn negatively influence the working relationships with the hosting organization and the quality of the study.

Moreover, employing male lay interviewers for the husbands' interviews may have created even greater difficulties given the context of the study site. Many of the young female medical graduates chose to work in the maternity ward, and their family members seemed to be supportive of their choice because in the maternity ward the female doctors had very limited contact with men, except for contact with male doctors who would make occasional visits from other wards for consultation purposes. Even patients' male relatives were not allowed inside the ward, in order to protect the women's space. Had we brought in male lay interviewers, they would not have been well accepted by the staff members of the hospital and it would have been difficult for the team to gain cooperation from the ward. Given this situation, hiring health workers was the most practical solution. Most male doctors would be accepted by the ward staff because of the credence given to the title 'doctor'. In addition, the focus of the questionnaire was not on diagnosis and treatment but on behavioural patterns, and therefore it was decided that the over-interpretation of responses which could have been an important source of bias or measurement error was unlikely to be a phenomenon of crucial importance in this study.

Nevertheless a potential limitation of employing health staff as interviewers related to the large social class difference between the interviewers and most of the study participants as discussed earlier. In order to help mitigate these differences, I asked the female interviewers to take their uniforms off when conducting

[P] Hence, they were often called 'volunteer doctors'.

interviews. In theory, I believed this would help, however, in practice it did not have the intended benefits, as many of the women who were recruited for the study stayed on the ward for long enough to know who the staff of the ward [q] were. Despite this, the general rapport with the study participants was usually very good. Many women seemed to appreciate the fact that the hospital staff were taking the time to listen to their stories because, more often than not in the maternity ward, a patient's relatives would have had to make a concerted effort to seek out a nurse or doctor in order to receive the service which they were entitled to receive.

3.5. GIS component

A Geographic Information System (GIS) is a computer-based system that acquires, stores, analyses and displays data that is linked to location. It usually includes a number of components but central to the system are a spatial database describing the geography of surface features of the Earth and an attribute database describing the characteristics or qualities of these features. There are two types of map representation techniques used in a GIS; vector and raster systems. With vector systems, the boundaries or the course of the features are defined by a series of points that, when joined with straight lines, form the graphic representation of that feature. With raster systems, the study area is subdivided into a mesh of grid cells (or 'pixels'). In each pixel is recorded a numeric value that represents the condition or attribute of the earth's surface at that point. In this study, a raster GIS (Idrisi) was used to obtain the shortest travel times from the study participants' villages to the hospital.

[q] For example, a woman with acute heart disease was admitted to the maternity ward and was later transferred to the internal ward. She had a Foley catheter during her hospitalization, but when she was about to be discharged, the internal ward doctor (male) asked a staff member from the maternity ward (female) to come and remove the Foley catheter. As the interview had to be conducted quickly before the woman was discharged, one of the interviewers who was a nurse-anaesthetist agreed to go to the internal ward for an interview and to remove the Foley catheter at the same time. The interviewer told me after the interview that the woman really liked her, and that the family even invited her to sit for tea and some sweets. I also observed an interview conducted by the junior doctor who was still in doctor's uniform. The rapport seemed very good. The interviewer was very attentive to the woman and listened very carefully to all the problems the woman had, from her medical problems to more personal problems at home. At the end of the interview, she asked the interviewer for her phone number so she could invite the interviewer to a party as a guest at the woman's residence.

The model was designed to simulate shortest travel times from study participants' villages to the study hospital with the transportation means best suited to the topography of the local environment. For this purpose, Idrisi's cost function module was used. As inputs, files of geographical features of the land that would act as friction (or impedance or obstacles) to travellers and associated friction value[r] for each feature of the land were necessary. Idrisi's cost module then outputs an image file of *cost distance* in which each pixel expresses the relative 'cost distance' of travelling from the source (the hospital) to the point.

3.5.1. Data collection

Particular geographical features would act as important sources of friction to travellers and hence their spatial data were collected from the various sources specified below. Spatial data on (a) rivers/lakes, (b) land cover and (c) roads [s] were found in AIMS's website (http://www.aims.org.af/ssroots.aspx?seckeyt=295). In order to obtain data on (d) slope, a digital representation of surface topography or terrain, or a digital elevation model (DEM) was necessary. For this purpose, the SRTM data found in (http://www2.jpl.nasa.gov/srtm/) was used.

In addition, Idrisi's cost function module required spatial data on (e) the source (the study hospital) and (f) the destinations (the residence of each study participant). Information relating to the location of the woman's village was obtained during the male interview, and the coordinates of each village were manually obtained from a settlement database provided by AIMS (http://www.aims.org.af/sroots.aspx?seckeys=76&seckeyo=44&seckeyz=37) after the interview was completed. The longitude and latitude of the study hospital were identified with a GPS handset (eTrex®).

[r] For example, if a friction value is ten in a particular cell, it means that it takes ten times the cost (or time in this particular study) of crossing the baseline cell to cross the particular cell.
[s] A section of the road that from Herat city to Karukh has been renovated in recent years, and the classification of the section was manually changed to 'primary' (AFG23637).

3.5.2. Processing of spatial data

The original files from AIMS contained spatial data of the entire nation which were in shape files (i.e., vector files developed by ESRI). The data of the study area was cropped out for each attribute, and was imported into Idrisi where each of the files were converted into a raster format. The coordinates of the villages as provided by AIMS and the coordinates of the hospital were both given in longitude and latitude, and hence were converted into equivalent values in the UTM coordinate system, from which shape files and then raster files were prepared.

3.5.3. Modelling method

Each of the spatial data files in a raster format was then used to create the cost surface for each of the geographical attributes in Idrisi, with each cell of the raster grid being assigned a friction value that represented a possible travel speed to cross the grid of the corresponding geographical feature.

All the cost surfaces of different geographical features were then combined into a single cost surface in which each grid took the minimum friction from all the friction values of the same grid. The cost function was applied on the cost surface in Idrisi to obtain the pathways which cost the least friction (or shortest time in this study) to travellers.

3.5.4. Validation

For the validation of the model, travel times to 12 major villages in the study area were obtained by interviewing experienced drivers working for the hosting organization ('referral values'), with these values then being compared to the simulation results. Friction values were readjusted after comparison with the referral values where necessary, and new cost surfaces created until the simulation results became as close to the referral values as possible. To determine which model generated the most suitable results, the least square method was used.

Ideally, several locations should have been visited by the field research team, and the actual travel times from the village to the hospital measured. However, the benefits of such field trips were weighed against the costs and it was decided that trips by the field research team would not be essential. Additionally, it was not possible to provide the field research team with appropriate life insurance cover due to a limited budget, and this was regarded as essential in light of the security climate of the study site.

3.6. Statistical analysis

3.6.1. Data processing

Data from men's questionnaires, women's questionnaires and clinical data extraction forms were checked as they were collected, and they were double-entered into respective databases in Epi-Data. The three databases and the dataset of the modelled travel times for all the study participants were imported into Stata 10.0 where they were merged.

Processing of prayer time

The male questionnaire included questions related to the timings of illness recognition and care-seeking. As the questionnaire allowed respondents to give the timings of events in reference to calls to prayer instead of the times according to the 12-hour or 24-hour clock, it was necessary to convert the answers into 24-hour clock times. In order to do this, I used the midpoint of the intervals covered by the stated prayer time (Table 3.2). I then used this value to fill in the corresponding missing value in the database. That is, if recognition of illness was made in Time 1, before *Namaz-e Sob,* then the midpoint 02:00 hours was used as the recognition time.

Table 3.2: Muslim prayer times and their corresponding 24-hour clock times used in the study

No	Answers in the questionnaire	Beginning of the time span	End of the time span
1	Before *Namaz-e Sob* [t]	00:00	04:00
2	Between *Namaz-e Sob* and *Namaz-e Pishin*	04:00	13:00
3	*Namaz-e Pishin* and *Namaz-e Digar*	13:00	18:30
4	*Namaz-e Digar* and *Namaz-e Sham*	18:30	19.20
5	*Namaz-e Sham* and *Namaz-e Khuftan*	19.20	21:00
6	*Namaz-e Khuftan* and midnight	21:00	24:00

Indicators of the delays (Primary outcomes)

The Figure 3.2 describes and defines the categories of care-seeking and travel delays used in the study in a schematic way. In order to quantify the decision delay and the departure delay, the differences of two times were taken. For example, to obtain the duration of decision delay, I took the difference between the time the decision to seek care was made and the time illness was recognized. To obtain the duration of departure delay I took the difference between the time families left home and the time the decision to seek care was made.

The above method of obtaining the delay times was not straightforward in some cases. If the participants answered the questions relating to the timings of illness recognition and the subsequent actions with reference to prayer times and the two consecutive actions (e.g. recognition and decision) were taken during the same period, the delay time obtained by the above method would be technically zero. It was necessary to avoid this outcome because ultimately the delay times would be converted into a log scale (discussed later). To get around this problem, the censoring method was used. That is, if the two actions were taken during the same period, then I took the entire time period (from the beginning to the end of the period) as the duration for the delay in question and I assigned a value of -1 to a flag variable to indicate that the delay time for the woman was left-censored. I thus

[t] The prayer itself lasts for a fraction of an hour normally which starts around 4 am.

knew that the true value of the delay time was less than the entire duration of the time span. For example, if the answers to 'when was the woman's illness recognized?' and 'when was the decision to seek care made?' were both in time interval '3' of the same day, then the duration of the decision delay was given by

(18.5 - 13) = 5.5,

given that all the subsequent actions (i.e., leaving home and arriving in the hospital) were not made before the end of the period (i.e., 18:30 hours). However, if the next action had been taken before the end of the period (in this example 18:30), then the timing of that action defined the boundary of the delay period.

If the delay time was 0 hours where, for example, the family said that it made the decision immediately after recognition of illness without wasting time, I changed the value to 5 minutes (or 0.08333 hour) and the corresponding flag variable was also changed to -1 to indicate that the true value was less than 0.08333. If the delay times were not censored, then 0 was assigned to the respective flag variables.

For the travel delay, the duration was calculated in a similar way as above by taking the difference between the time of departure and the time of arrival in the hospital ('self-reported travel time'). The ratio of the self-reported travel time to the GIS-modelled travel time was then used as the indicator of the travel delay. The ratio would express the degree of departure from the modelled travel time for each woman. The ratio would be larger than one for those who took longer than the expected travel time and would be less than one for those who spent less time than expected, which was very unlikely in practice. A ratio equal to one implied that the woman took exactly the same amount of time to travel to the hospital as the model had predicted.

3.6.2. Data analyses

Since the delay variables were not normally distributed but skewed to the right, I converted the values into a log scale using the natural logarithm before performing

analysis. This was necessary in order to meet the normal distribution assumption necessary to use linear regression techniques.

Analyses of the primary outcomes (delays)

For the analyses of the durations of decision delay and departure delay, which were both continuous variables, censored normal regression techniques (in Stata, cnreg) were used and the coefficients of the linear models β_1 and β_0 were obtained: β_0 is the intercept (the value of Y_{log} when $X_i = 0$, that is, the value of Y_{log} for the baseline group) and β_i is the slope of the line. The coefficient described the difference in log of delay times between the exposed group and the unexposed group of the risk factor.

$$Y_{log} = \sum \beta_i X_i + \beta_0 \qquad i=1, 2, 3...$$

For the travel delay, which was expressed by log of the ratio of the self-reported travel time to the modelled travel time, normal regression techniques were used to obtain the coefficients of the linear model.

The results were converted back to the normal scale using the exponential function, which converts the additions in the linear models into multiplications.

$$Y = EXP(B_1 X_1) \times EXP(B_2 X_2) \times ... \times EXP(\beta_0)$$

Hence, in the final presentations found in chapters 5, 6 and 7, the results are presented in terms of the ratio of the duration of delay experienced by the exposed group to that experienced by the baseline group. Each of the adjusted ratios indicates that the risk factor in question increases the duration of delay by that ratio relative to the baseline.

Analyses of the secondary outcome (the vital status of the foetus)

In order to investigate the effects of the delays on the vital status of the foetus at admission, logistic regression models were used. In the first instance, bivariable

analyses were conducted and potential confounders were identified. Multivariable logistic regression models were then used to control for the confounding effects.

Presence of interactions will be investigated in each of the analyses of delays and in the analysis of foetal death. Not all possible interactions will be examined but attention will be paid to those interactions that are thought *a priori* to be worth investigating [136], on the basis of existing literature and our conceptual frameworks.

Table 3.1: Criteria of severe obstetric complications

Impending rupture of uterus	Severe abdominal pain, abdominal tenderness, clinical diagnosis of CPD or abnormal presentation AND - Uterine sign of obstruction (Bandl's ring)
Rupture of uterus	Clinical diagnosis of rupture of uterus
Eclampsia	Woman should have 1 AND 2 AND 3 1. Diastolic BP >= 90 mmHg 2. Convulsion 3. Urine protein of 2+ on dipstick OR Convulsions or coma with or without high blood pressure in the absence of other causes of convulsions or coma
Severe pre-eclampsia	Woman should have 1 AND 2 AND two or more of the conditions listed in 3. 1. Diastolic BP > 110 mmHg 2. Urine protein / albumin level of 3 + or more on dipstick 3. Two conditions from below: - Oliguria reported by patient - Epigastric pain, RUQ pain, abdominal tenderness or severe heart burn - Blurred vision - Generalized oedema, pulmonary oedema - Headache
Haemorrhage	Women meeting one or more of the following 1. Vaginal, intra-abdominal or concealed bleeding requiring an IV therapy of 2000 cc or more of fluids given within one hour, or through 2 or more IV lines 2. Vaginal, intra-abdominal or concealed bleeding requiring acute transfusion of 2 or more bags of blood (or 1000cc) 3. Vaginal, intra-abdominal or concealed bleeding with an episode of shock with a systolic BP < 90 mmHg and a fast, weak pulse rate >= 100/min or impalpable pulse 4. Blood loss requiring emergency hysterectomy

Sepsis	Woman should have temperature > 38 °C or <36 °C which is not explained by an extra-genital infection, and abdominal pain PLUS two or more from below: 1. Tender uterus 2. Purulent, foul smelling vaginal discharge 3. Tachycardia (Heart rate >100 beats/min) 4. Tachypnea (Respiratory rate > 24 / min) 5. Pallor or cold sweating skin 6. Acute alteration of mental status characterized by confusion or restlessness 7. Episode of oliguria reported by the patient OR Shock defined as systolic blood pressure < 90 mmHg AND fast, weak pulse (>100 / min) or impalpable pulse
Severe maternal anaemia	Haemoglobin level < 7g /dl PLUS two or more of the followings: - Dyspnoea - Diagnosed to have haemolysis as evidenced by worsening pallor and jaundice - Requiring blood transfusion of two or more units of blood
Acute heart disease	Woman meeting one or more of the following: 1. Clinical diagnosis necessitating intravenous furosemide 2. Clinical diagnosis necessitating intravenous digoxine 3. Cardiogenic shock defined as systolic blood pressure < 90 mmHg AND fast, weak pulse of PR> 100 beats/minute or impalpable pulse

Figure 3.1: Ratio of delay times the study can detect as a function of standard deviation of log of delay time

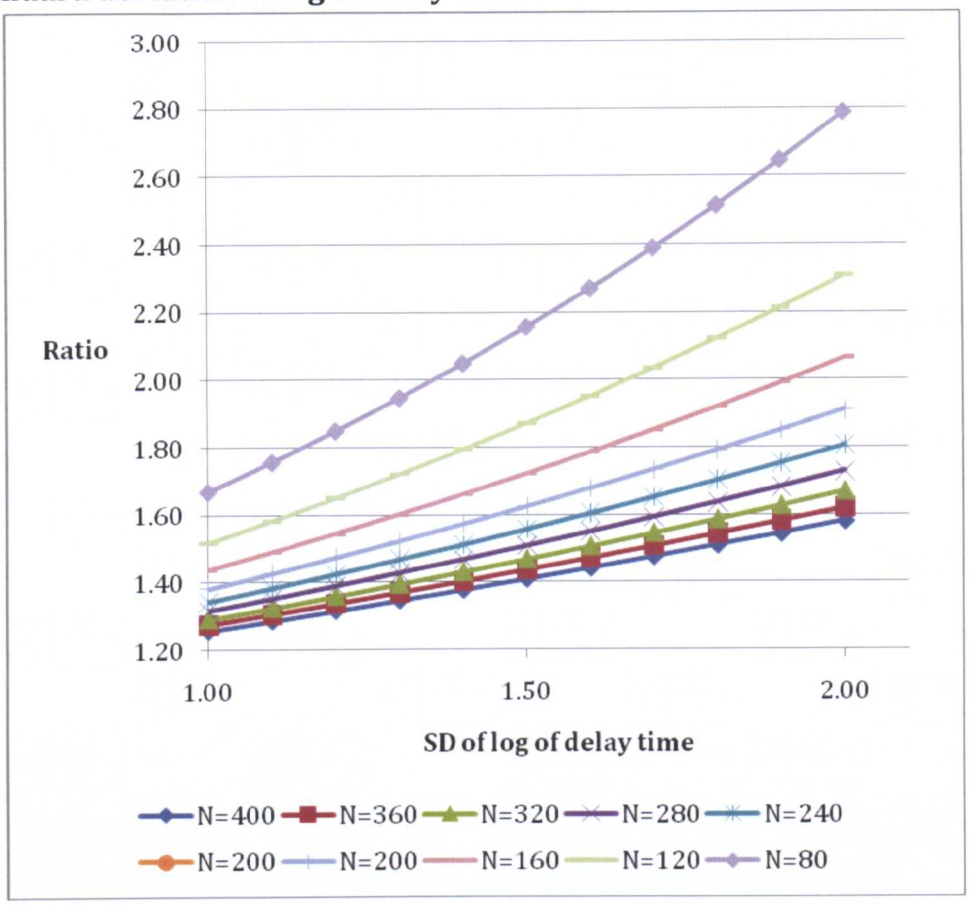
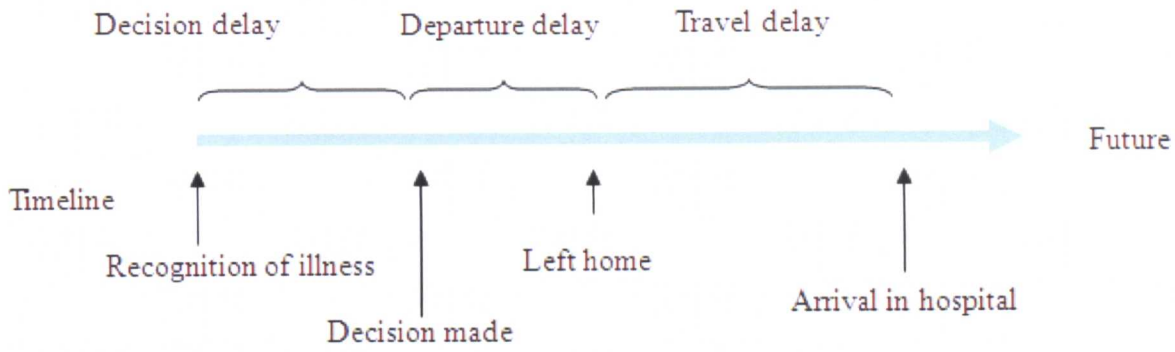


Figure 3.2: Diagram showing the three types of delay



4. Description of the sample

This chapter is mostly concerned with the size and characteristics of the sample and its overall representativeness of the population of women with complications. After a brief description of the achieved sample size and the morbidity and survival status of the recruited women and their babies, the chapter first assesses whether any bias was introduced during data collection due to non-response. It then describes the distinctive features of the sample by comparing the sample with other populations in Afghanistan as well as comparing the characteristics between morbidity groups within the sample. The scope of the comparison is limited, however, because population-based data of women with obstetric complications, with which the sample should be compared, is not available.

4.1. Recruitment of eligible women with severe obstetric complications

Among 13,927 women who were admitted to the maternity ward of Herat Regional Hospital during the 12-month study period from 1 February 2007 to 31 January 2008, 2226 women had signs of obstetric complications and were further investigated to determine whether they met the study criteria. After further examinations and questioning, a total of 472 women were found to satisfy the inclusion criteria for the study. Of these 472 women, 35 died in the hospital before discharge (Figure 4.1).

Two women were not enrolled into the study because they had life-threatening complications after the customary 42 days postpartum period for maternal death and morbidity. There was also a very young teenager who arrived at the hospital in a life-threatening condition. Since this teenager was unmarried, she was considered a 'criminal'[u] case and processed differently from other patients by the administration.

[u] Since it is against the Islamic law to have premarital or extramarital sex, and Afghans, both male and female, seem to consider all women who have had premarital or extramarital sex to have consented to it, without questioning a possibility of a rape, the young girl was treated as a 'criminal' case. In this case, no staff member of the hospital challenged the view that the case was a criminal one, partly for fear of being judged themselves as deviating from the norm. If the sex was forced upon a woman by someone of higher social class with political or economic power, it is very difficult or impossible for the woman in a weaker position, like this young girl, to prove that sex was not consensual.

It was not possible, for ethical and security reasons, to conduct interviews with her and her family members (particularly male family members[v]). After this incident, the study criteria were modified to include married women only, but in fact no other unmarried woman was admitted with severe obstetric complication after this incident.

(a) Morbidity profile of the women

The majority of the women were recruited because they had experienced a life-threatening obstetric complication associated with a severe haemorrhage (40%). The next most frequently occurring complications were severe hypertensive disorders (35%) and severe obstruction (17%). Just 7% of women were classified in the severe infection group. Eclampsia was the most common diagnosis (23%). The next most common diagnoses were post-partum haemorrhage (12 %), followed by severe pre-eclampsia (12%) and abortion-related haemorrhage (11%).

(b) Stages in pregnancy and pregnancy outcomes

The gestational age of the women's pregnancies ranged from 1 month up to 20 days postpartum, but mostly centred around the time of delivery: A total of 296 women (63%) were in the late pregnancy period (i.e., the 22nd gestational week or later), with smaller proportions of women in the postpartum and early pregnancy periods (23% and 15% respectively). Among the 296 women who had a potentially viable foetus (i.e., the 22nd gestational week or later), a sizable proportion (36%) arrived at the hospital with the foetus already dead (Figure 4.2). As for maternal survival, the case fatality ratio was highest among women with eclampsia (14%) followed by women with severe infection (9%) (Table 4.1).

[v] The young lady was accompanied only by her mother because the father had died some time before. The young lady, who was in convulsion, was first taken to the internal ward of the hospital because her mother claimed that she hadn't known that the young girl was pregnant. When the mother found out that her daughter was having a pregnancy-induced hypertensive disorder, she pleaded with the doctors in the maternity ward not to report it to any authority and said that she could not inform male family members because she feared that her daughter might be killed for bringing a shame to the family. In this circumstance, I was not able to ask her family members to participate in the study.

4.2. Non-response

Overall, the non-response rate was low: 21 pairs of female and male interviews (4.4% of the total) and 40 unpaired interviews (28 female and 12 male interviews) could not be conducted, which represents a 12.9% non-response rate.

(a) Non-response from both the woman and her husband

Both the woman and the man from the 21 couples could not be interviewed for two main reasons. For nine of these couples, the woman died and the research team could not contact her family before they left the hospital. A further ten interview pairs were not conducted because the women were admitted during the night, on Fridays or public holidays, and quickly discharged themselves before the interviewer's return to the hospital. In the majority of these cases, the women were admitted for severe haemorrhage (6/10). In addition, none of these women had major operations which would have required them to stay hospitalized for long periods. The security condition of Herat City affected only one interview pair, for which both male and female interviewers could not travel to the hospital. The team also withdrew a female interview after the woman's husband did not consent and threatened a team member.

(b) Non-response from either the woman or her husband

Non-response from women only

The main reason for non-response from women was related to maternal death cases (15/28) or late afternoon and night admission (8/28). The remaining interviews were not conducted because the women left the hospital without meeting the interviewers at discharge despite being hospitalized for several days. In general, interviews with the husbands of these women were conducted as part of the normal procedure upon admission of their wives, while it was sometimes difficult to assess when the women had recovered sufficiently to be interviewed.

Non-response from men only

Men's interviews were not conducted either because of lack of consent or, more frequently, because they could not be located in the maternity ward compound. In

general, the research team encountered greater difficulties in securing the location and interviews of men living in Herat City. Some women from the city were only accompanied by female relatives. In addition, husbands who lived in Herat City tended not to stay for long hours in the hospital, merely attending to pay for their wives' care or for short visits.

4.3. Women with a complete pair of interviews compared with women with only one or no interview

There was no significant difference in the basic demographic characteristics that could be obtained from the medical records between the women with a complete set of interviews and those who were missing either one or both interviews (Table 4.2). No difference in the vital status of foetus at admission was observed. However, there were significant differences in the proportions of stillbirth and maternal death between the two groups (Table 4.2), with most of the stillbirths among non-interviewed women (12/21) associated with maternal death cases. Some complication types appeared to suffer a higher non-response due to higher case fatality ratios (i.e., eclampsia and sepsis) or short durations of hospitalization (i.e., haemorrhage during early pregnancy and PPH), but there was no significant difference in the distribution patterns of morbidity between the two groups (p=0.166) (Table 4.3).

4.4. Comparison of the study participants with other populations in Afghanistan

(a) Demographic characteristics

The average age of the study participants was 27.7 years, with one-third of the sample being 20 years old or younger. A recent assessment conducted in another large urban Afghan maternity hospital reported that the average age of women admitted there was 31 years, which is slightly older than our sample (Table 4.4). A sizable proportion of our sample (29%) were pregnant for the first time, but the

proportion of the sample who were pregnant for the fifth time or greater was also large (46%) (not shown).

The education level of the study participants was low. Only 13% of women had ever gone to school, which is much lower than all the women admitted to the other large urban maternity hospital[137]. The proportion of literate women was even lower, at 10%, which may be slightly lower than the estimated national rate of 14%[84]. The education level of husbands was also low, as two-thirds of the husbands were illiterate.

Overall, the ethnic profile of the study participants was similar to the ethnic profile of Herat Province, with the majority of the participants being Tajik (63%), followed by Pashtun (30%) and Hazara (4%). Those from the city of Herat, a subset of the sample, had a slightly larger proportion of Hazara (8%) and a smaller proportion of Pashtun (15%) than those from rural Herat province.

(b) Healthcare utilization

Uptake of antenatal care (ANC) during pregnancy was high among the sample (71%) with the majority of ANC users having made multiple visits to the ANC unit. Half of the women who had ANC reported that they had sought ANC because they had had a health problem during pregnancy. Those women who attended ANC to obtain care for the illness did so later in their pregnancy than those who sought ANC for preventive reasons (the first ANC visit at 5.9 months vs. 3.8 months). The use of a skilled birth attendant for childbirth in the preceding five-year period was slightly lower than the estimate for Herat province (Table 4.4).

4.5. Morbidity characteristics

Eclampsia and severe pre-eclampsia

Women diagnosed with eclampsia were much younger (average age 21 years) than women with other types of complications (average age 30 years) and were more often in their first pregnancy. They also reported less contraceptive use. Women

with severe pre-eclampsia showed a different profile than women with eclampsia. They were more likely to live in town than women with eclampsia and women with other complications. They were also less poor than the rest of the sample. Hence, healthcare access and utilization patterns by women with pre-eclampsia were also distinct. Uptake of ANC and planned utilization of delivery care service by women with severe pre-eclampsia was higher than the rest of the sample. A large proportion of women with severe pre-eclampsia also had multiple prenatal consultations, the average number of ANC consultations being four, as opposed to 1.7 times for women with eclampsia (not shown). Women with pre-eclampsia had better access to the first point of care and to the hospital than women with eclampsia and the rest of the women and more frequently reported presence of health personnel in their communities.

Rupture of uterus and impending rupture of uterus

Women with rupture of uterus and impending rupture of uterus were older and more often multigravidae than the rest of the women. The proportion of educated women was low for both morbidity groups but it was particularly low for women with impending rupture.

Haemorrhage

The proportion of women from urban areas was slightly higher for women with haemorrhage in early pregnancy than for the rest of the women. They were also from richer groups than the other women, as measured by asset ownership. The proportion of women with this complication who were married to their first cousin was high in comparison with the rest of the women. The characteristics of women with APH were nearly comparable with the rest of the women, except that they were older and more often multigravidae. Utilization of delivery care was lower among women with PPH than the rest of the women: the proportion of women who had had their last delivery assisted by skilled birth attendants (not shown) and those who had planned to have institutional delivery this time were low.

Severe infection

A large proportion of women with severe infection were from rural areas and from the poorest socio-economic class. Hence, the proportion of educated women was slightly lower than for the rest of the women. Healthcare access and utilization was limited for women in this morbidity group: the proportion of those who answered that there was either a doctor or midwife in their community was lower than the rest of the women, and reported costs of transportation to the first point of care and to the hospital were high. ANC attendance was slightly lower than for the rest of the women.

4.6. Summary

This chapter described the characteristics of the study sample. There were no significant differences between the interview-responders and the non-responders in terms of basic demographic variables, but differences existed in terms of survival of the mothers and the babies. Assessing the sample's representativeness of the population of women with obstetric complications was hampered by lack of population-based data of women with obstetric complications. However, if the near-miss criteria were able to identify the women who would have died without treatment or intervention, as intended, it is likely that the sample represented the population to some extent. Differences in social and demographic characteristics observed across complication types suggest the predisposing factors for one complication type may be distinctively different from the predisposing factors for another.

Overall, limited available information on other women in Afghanistan suggests that the sample may be slightly less educated. The uptake of antenatal care is higher among the sample, however. This is because the sample represents women who became ill during pregnancy. The proportion of women whose previous childbirths were attended by a skilled attendant was not particularly high, which indicates that the sample is not significantly different in terms of healthcare utilization and care-seeking behaviours from the general population of pregnant women.

Figure 4.1: Study profile

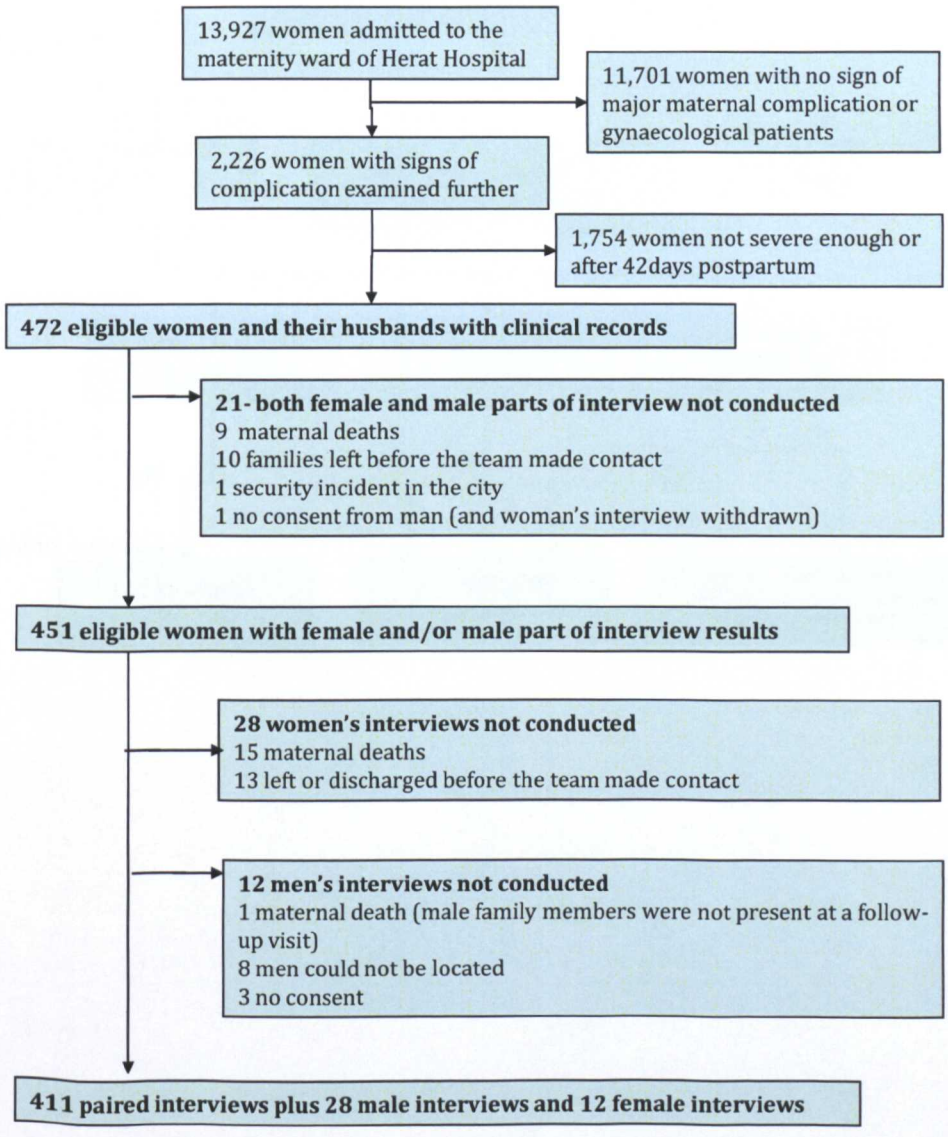
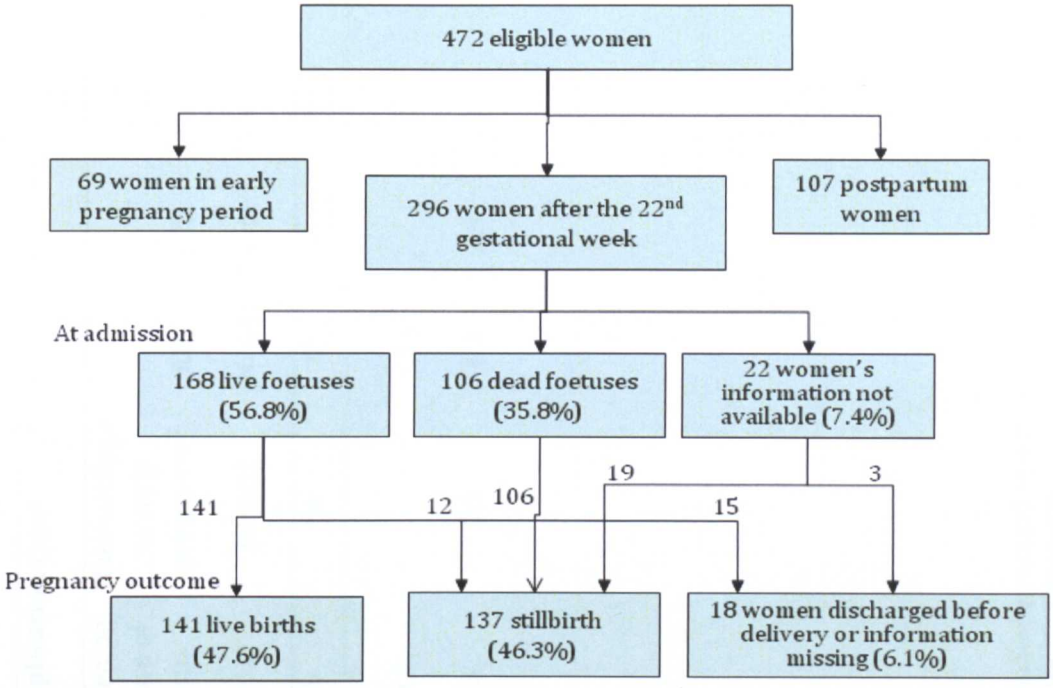


Figure 4.2: Pregnancy profile of eligible women[w]



[w] The number of stillbirths includes those foetuses that belonged to maternal death cases and were never delivered.

Table 4.1: Pregnancy outcomes by complication types

	Complication type										
	All women (N=472)	Eclampsia (N=108)	Severe pre-eclampsia (N=57)	Rupture of uterus (N=38)	Impending rupture of uterus (N=42)	Haemorrhage in early pregnancy (N=69)	APH (N=64)	PPH (N=56)	Severe infection (N=32)	Other (N=6)	
	%	%	%	%	%	%	%	%	%	%	p-value
Foetal death[x] at admission	35.8	16.3	0.0	84.2	40.5	-	64.1	-	-	25.0	<0.001
% of maternal deaths	7.4	14.0[y]	5.3	7.9	4.8	2.9	6.3	3.6	9.1	16.7	0.156

[x] The proportion of foetal deaths among the potentially viable foetuses (in view of advanced gestational week or after 22nd gestational week).
[y] One woman with eclampsia was referred outside the country and is not included in the calculation here.

Table 4.2: Characteristics of women who had completed both male and female interviews and those who did not complete either one or both interviews

	Both interviewed (N=411)	One or both missing (N=60)[z]	
	%	%	p-value
Demographic characteristics			
Women aged <= 20	29.4	31.7	0.507
Primigravidae	29.1	31.7	0.948
Urban population	23.8	26.8	0.630 [aa]
Pregnancy profile			
% of foetal death at admission	38.4	40.6	0.811
% of stillbirth [bb]	47.2	65.6	0.049
% of maternal death	3.1	45.7	<0.001

P-values are the probabilities of the observed differences occurring under the null hypothesis that there is no difference between those interviewed and those lost to follow-up.

[z] *Information on age and gravidity for one woman is missing.*
[aa] *Information on area of residence is missing for four people from those lost to follow-up.*
[bb] *The proportion of foetuses that died in utero or during labour after the 22nd gestational week, including those that were never delivered due to maternal death.*

Table 4.3: Reasons for non-response, and proportions of non-response according to women's complication types

Diagnosis and reasons	Women with both interviews		Women with incomplete interviews		
	N	%	N	%	p-value
Eclampsia	90	21.8	18	29.5	
Maternal death			11		
Left the hospital/discharged before interview			4		
Couldn't find men			1		
No consent			2		
Severe pre-eclampsia	50	12.1	7	11.5	
Maternal death			3		
Left the hospital/discharged before interview			2		
Couldn't find men			1		
No consent			1		
Rupture of uterus	35	8.5	3	4.9	
Maternal death			2		
Left the hospital/discharged before interview			0		
Couldn't find men			1		
Impending rupture of uterus	38	9.2	4	6.6	
Maternal death			1		
Left the hospital/discharged before interview			2		
Couldn't find men			1		
Haemorrhage during early pregnancy	60	14.6	9	14.8	
Maternal death			0		
Left the hospital/discharged before interview			6		
Couldn't find men			1		
No consent			1		
Security problem in the city			1		
APH	59	14.3	5	8.2	
Maternal death			2		
Left the hospital/discharged before interview			2		
Couldn't find men			1		
PPH	48	11.9	7	11.5	
Maternal death			2		
Left the hospital/discharged before interview			4		
Couldn't find men			1		
Severe infection	28	6.8	5	8.2	
Maternal death			3		
Left the hospital/discharged before interview			1		
Couldn't find men			1		
Other (heart disease and anaemia)	3	0.7	3	4.9	
Maternal death			1		
Left the hospital/discharged before interview			2		
Total	411	100.0	61	100.0	0.166

P-value is the probability of the observed difference occurring in the distribution of complication type under the null hypothesis that there is no difference between those who participated in the study and those who did not.

Table 4.4: Characteristics of the sample and those of other populations in Afghanistan

	Study participants [95% CI]	Estimate for Herat Province	Estimate for the entire country	Other populations in Afghanistan	Source
Average age	27.6 [26.9–28.4]			31 (all admissions in a large maternity hospital in Kabul)	Khorrami et al. 2008[137]
Urban population	24.2% [20.3–28.1]		22–30%		UN
Educated women	13.0% [9.8–16.3]			32.1% (women who gave birth in last two years from household survey in Balkh province), 36% (all admissions in a large maternity hospital in Kabul)[137]	Hadi et al. 2007[138]
Literate women	9.5% [6.7–12.3]		14%[84] 9–18%	6% (women who have given birth at least once and live within 90 minutes from health facilities)[83]	MICS 2003 [84], Mayhew et al. 2008 [83] and UNDP
Literate men	33.8% [29.3–39.3]		43%		MICS 2003[84]
Household with radio	64.8% [60.4–69.3]	72%	67%		MICS 2003[84]
Antenatal care	71.4% [66.7–76.1]		32% [5]	44% (women who gave birth last two years from household survey in Balkh province) [138]	Azfar 2009[5] and Hadi et al. 2007[138]
Use of skilled attendant	18.8% [14.1–23.5]	25% [84]	14% in 2003[84] 19% in 2006	13% (women who have given birth at least once and live within 90 minutes from health facilities) [83]	MICS 2003[84], Mayhew et al. 2008[83] and Azfar 2009[5]
Know a method to delay pregnancy	55.6% [50.8–60.4]	60%[83]	28%[83]		MICS 2003 [83]

Table 4.5: Characteristics of study participants by complication types

		Complication type									
	All women (N=472)	Eclampsia (N=108)	Severe pre-eclampsia (N=57)	Rupture of uterus (N=38)	Impending upture of uterus (N=42)	Bleeding in early pregnancy (N=69)	APH (N=64)	PPH (N=56)	Severe infection (N=32)	Other (N=6)	
	%	%	%	%	%	%	%	%	%	%	p-value
Age <= 20	29.7 (25.5-33.8)	70.4 (61.6-79.1)	30.2 (17.6-42.1)	5.3 (-2.2-12.7)	14.3 (3.2-25.3)	14.5 (6.0-23.0)	7.8 (1.1-14.6)	18.5 (8.9-30.4)	32.3 (14.8-49.7)	33.3 (-20.9-87.5)	< 0.001
Education	13 (9.8-16.3)	19.4 (11.2-27.5)	25 (12.8-37.2)	8.3 (-1.2-17.8)	2.6 (-2.6-7.8)	14.5 (5.5-23.5)	11.9 (3.4-20.4)	6.9 (-0.8-12.8)	3.6 (-3.8-10.9)	0	0.013
Urban	24.2 (20.3-28.1)	24.3 (16.0-32.6)	49.1 (35.7-62.5)	15.8 (3.6-27.9)	9.5 (0.3-18.8)	31.8 (20.3-43.4)	25.0 (14.1-35.9)	14.3 (4.8-23.7)	9.7 (-1.3-20.1)	20.0 (-35.5-75.5)	< 0.001
Poorest quartile	29.9 (25.6-34.2)	30.4 (21.6-39.5)	13.7 (4.0-23.5)	34.3 (17.7-50.8)	32.5 (17.3-47.7)	15.9 (6.6-25.2)	30 (18.1-41.9)	32.1 (19.1-45.1)	65.5 (47.1-83.9)	80.0 (24.5-135.5)	< 0.001
First-cousin marriage	41.0 (36.3-45.7)	41.3 (31.1-51.6)	33.3 (19.9-46.7)	44.4 (27.4-61.5)	33.3 (17.9-48.8)	57.6 (44.6-70.6)	39.0 (26.2-51.8)	34.0 (20.4-47.6)	46.4 (26.7-66.1)	0	0.125
Money at disposal	27.8 (23.5-32.2)	36.9 (26.4-47.4)	42.3 (28.4-56.2)	11.1 (0.3-21.9)	21.1 (7.5-34.6)	23 (12.1-33.8)	21.1 (10.1-32.0)	32.7 (19.0-46.3)	19.2 (3.0-35.5)	33.3 (-1.1-177.8)	0.019
Primigravidae	29.4 (25.3-33.6)	68.5 (59.6-77.4)	47.4 (34.0-60.7)	2.6 (-2.7-8.0)	14.3 (3.2-25.3)	10.1 (2.8-17.5)	4.7 (-0.6-10.0)	10.7 (2.4-19.1)	35.5 (17.6-53.3)	50.0 (-7.5-107.5)	< 0.001
History of stillbirth	15.4 (11.3-19.6)	6.9 (-2.9-16.7)	19.2 (3.0-35.5)	40 (22.9-57.1)	24.2 (8.8-39.7)	7.3 (1.9-14.4)	8.9 (1.2-16.6)	11.1 (1.6-20.7)	15.8 (-2.3-33.8)	-	0.001
Ever used contraceptive	26.8 (22.5-31.1)	7.5 (2.1-13.0)	32.7 (19.5-45.9)	22.2 (8.0-36.5)	28.2 (13.4-43.0)	38.3 (25.7-51.0)	40.7 (27.8-53.6)	36.7 (22.7-50.7)	14.8 (0.5-29.1)	0	<0.001
ANC	71.4 (66.7-76.1)	61.3 (51.2-71.4)	90.4 (82.1-98.7)	83.8 (70.5-96.1)	74.4 (60.0-88.7)	N/A	76.3 (65.1-87.5)	68.0 (54.6-81.4)	46.4 (26.7-66.1)	66.7 (-76.8-210.0)	< 0.001
Planned delivery in a health facility	29.2 (24.5-34.0)	28.0 (18.7-37.2)	63.5 (49.9-77.0)	31.4 (15.2-47.6)	20.5 (7.3-33.8)	N/A	25.4 (14.0-36.9)	12.0 (2.7-21.3)	17.9 (2.7-33.0)	33.3 (-1.1-176.8)	<0.001
Health personnel in community	49.8 (45.0-54.5)	49.5 (39.6-59.4)	68.0 (54.6-81.4)	48.6 (31.1-66.0)	50.0 (33.8-66.2)	56.5 (43.8-69.1)	55.0 (42.0-68.0)	38.5 (24.8-52.1)	17.2 (2.6-31.9)	40.0 (-28.0-108.0)	0.003
Access to car in community	87.8 (84.7-90.9)	94.1 (89.4-98.7)	92.0 (84.2-99.8)	85.7 (73.5-97.9)	90.0 (80.3-99.7)	88.7 (80.6-96.8)	91.7 (84.4-98.9)	86.5 (76.9-96.1)	51.7 (32.3-71.0)	80.0 (24.4-135.5)	<0.001
Spent > 500 Afs to 1st place	23.3 (19.2-27.3)	25.8 (16.9-34.6)	6.3 (-0.9-13.4)	30.0 (12.6-47.4)	27.5 (13.0-42.0)	8.2 (1.1-15.3)	13.8 (4.6-22.9)	40.8 (26.6-55.1)	42.9 (23.3-62.4)	60.0 (-8.0-128.0)	<0.001
Spent > 1200 Afs to hospital	22.6 (18.6-26.5)	22.8 (14.5-31.1)	6.0 (-0.8-12.8)	35.3 (18.4-52.2)	20.0 (7.0-33.0)	14.5 (5.5-23.5)	20.3 (9.8-30.9)	18.0 (7.0-29.0)	62.0 (43.3-80.9)	60.0 (-8.0-128.0)	<0.001

5. From recognition of illness to decision to seek care

This chapter presents the results of data analyses to identify the determinants of the duration of time between recognition of illness and decision to seek care ('decision delay'). It starts by introducing the conceptual framework for this analytical theme. After presenting the average decision delay time by complication types, results of crude regression analyses are presented separately for each complication type. Informed by the way in which each of the determinants interacts with the complication types, as well as the symptomatic nature of each complication type, complication sub-groups are later defined. Multivariable regression analyses are finally carried out for each of the complication sub-groups in order to obtain the net effects of the determinants of the decision delay.

5.1. Conceptual framework

The conceptual framework (Figure 5.1) includes eight themes that influence the decision to seek care, and each of the themes is explained in detail below.

Area of residence: Area of residence (whether living in rural or urban areas) and remoteness (how far one lives from the provincial centre[cc]) were included in the analysis as the most distal determinants. People living in urban areas are likely to be sensitized to healthcare needs, in particular for women during pregnancy. In addition, area of residence and remoteness are systematically related to other determinants of decision delay: the further away one lives from the provincial centre, the poorer the level of development is in terms of availability of schools and employment opportunities. Women's economic and educational opportunities in particular are likely to be very limited in rural areas, which has implications for the timing of initiation of childbearing, the number of children and women's status. Each of these important determinants is discussed one by one below.

[cc] Travel times from the village of residence to the hospital were measured (which will be discussed in more in detail in chapter 7) and categorized into four groups.

Community characteristics: Having health personnel in the community was included in the conceptual framework. People who live in a community with access to health personnel are likely to have received information regarding pregnancy-related complications and have a better understanding of the urgent need for medical attention, which would help them to make the decision to seek care quickly. Having a vehicle in one's community was also included because distance and travel time to a health facility are likely to be perceived differently for people with no access to a vehicle than for people with access to a vehicle, and this perception can delay the decision to seek care.

Access to healthcare: As discussed in Chapter 2, access to healthcare services can influence the decision to seek care greatly because long distances and long travel times can operate as disincentives to seek care[45]. As longer distances usually entail higher transportation costs, the self-reported travel time to reach the first point of care, as well as the amount of money the family spent to reach it, were used to approximate accessibility to healthcare.

Education: The fourth important element is the level of education of the woman and her husband. The utilization of maternal health services often increases with increasing levels of female education [139-142]. We anticipated that the decision making time, once the illness has been recognized, could be influenced by the woman's education level through several possible mechanisms of influence. Because education may provide feelings of self-worth and self-confidence, educated women are able to act more assertively with senior members of their marital family to demand their healthcare needs are met [2]. Educated women are also able to articulate their healthcare needs better. Schooling may also increase a woman's receptivity to new health-related information and increase her understanding of the utility of modern healthcare. Education may reduce the power differential between providers and clients and lower a woman's reluctance to seek care [143]. The husband's education level is also associated with higher utilization of maternal health services [144]. As some studies suggest, an educated husband may be more

aware of the urgency of the situation [12] and more aware of the medical needs associated with pregnancy-related illness.

Household economic status: Household economic status is likely to be a key factor determining the decision to seek care in an emergency, as maternal health service utilization is usually higher among those of higher socio-economic strata, as found in many studies [83 140 143-144], including the studies presented in Chapter 2. The level of income or financial resources available to a household directly dictates the ability to pay for care and transportation to health facilities for its members who are sick, and lack of financial resources can delay the decision to seek care [145]. More subtly, the poor can also be deterred from seeking healthcare because of the social class difference that exists between healthcare providers and themselves, and disrespectful treatment they may receive from the healthcare providers [146]. In this analysis, household economic status was measured by two indicators. The 'asset-based economic status' is a summary variable which incorporated household assets owned by the household, type of toilet used by the household, and size of land owned. For each and every item, a score between 0 and 1 was assigned, which was one minus the proportion of households that own the item. For example, a value of 0.9 was assigned to those who answered that they owned a specific item if the item was owned by 10% of households. For each woman, scores from all the household assets were added up. Each woman was grouped into a quartile depending on the final score, which represents the level of economic status of her household. Other methods of constructing an index of household economic status by assigning a different weight to each indicator (e.g., using PCA or MCA) are possible. However, it can be argued that the results are fairly similar and that they each have disadvantages [147]. For example, PCA and MCA methods are fairly complex because indices produced by PCA and MCA methods are mathematical constructs, and it is not easy to understand what each of the assigned weights means. In contrast, the inverse proportion weighting method is a clear method for constructing an index, and weights assigned by this method have intuitive meanings. Inverse proportion weights are also appealing because they are easy to

apply to binary variables while PCA asumes variables to be continuous and their distributions to be normal. The scale from poorest to least poor was used in order to reflect the poverty level of an average or median household in the sample. Another variable used as an indicator of economic status was the household head's 'occupation group', which measures their likely command of financial resources as well as the social standing that the family has obtained.

Woman's status in the household: A woman's status within the household is another important element. In other South Asian countries where society is characterized by strong patriarchy with clearly demarcated gender rules, the power to make decisions regarding a woman's healthcare needs is usually located in an authoritative figure quite far removed from the woman herself, such as a senior male or female member of the household [148-149]. The more important the status a woman has achieved, the more likely it is that the woman herself will participate in the decision-making processes or that she will find ways to influence or negotiate with the decision-making persons in the household. There has been much debate over how to measure a woman's status in the context of woman's seclusion[150]. The use of proxy indicators such as education and employment to measure women's status has been questioned [151-152]. In this study, the following indicators, which are often found in gender-studies literature, were chosen to describe a woman's status in the household; access to social support[153], and having money at her disposal [152]. A woman's social support is represented by the extent of contact she has with her birth family and relatives outside of her usual home[dd], and the quality of the relationship with her marital family. These are important in patriarchal societies [153-154], as the fact that a woman can keep close relationships with her birth family and relatives is an indication that she is given respect by the husband and his

[dd] A study subject was assigned 'strong' for the variable 'relationship with birth family and relatives outside the usual home' if she answered that she had visited her relatives in the last three months and that she feels free to contact her birth family, 'moderate' if she answered that 'she feels free to contact birth family' and that 'she did not visit birth family in the last three months' OR if she answered that 'she feels limited or sometimes limited to contact birth family' and that 'she visited her relatives in the last three months', and 'weak' if she answered that 'she feels limited in contacting birth family' and that 'she did not visit relatives in the last three months'.

family [154]. Whether the woman has money at her disposal is important in itself, in that the money could enable the woman to pay for the care herself. It is also important in a more symbolic way: being trusted with money (in a context where women rarely go out to work to earn money) can mean that the woman is perceived as an 'adult' and an important member of the family, and that she is cared for and valued by her husband and other family members [154].

Gravidity: The final distal determinant is gravidity. Women in their first pregnancy and their husbands may not have as much knowledge of pregnancy and pregnancy-related illness as multigravidae. Lack of knowledge may delay the decision to seek care. Multigravidae may also delay seeking care because past uneventful pregnancies provide them with a sense of security that this pregnancy will also go smoothly. Gravidity, which is closely related to the woman's age, also influences her status in the household and vice versa. In traditional farming societies where patrilocal residence is the norm, a newly married woman lives with her husband's family. It is the most senior members of the marital home, usually her in-laws, who assume leadership and have control over the family's resources until the death of the household head, when his son and his wife succeed to this role. On the other hand, a woman's status in the household influences gravidity because a woman who has a low status initiates childbearing relatively early. However, only gravidity, and not the woman's age, was used in the current analyses because of their co-linearity, and the following two considerations. Some aspects of older women's greater 'autonomy' could be related to the respect gained from childbearing [155], which is measured by gravidity in the current analysis. Secondly, the phenomenon of older women's greater 'autonomy', such as freedom of movement, as opposed to young women's limited 'autonomy' could be related to the degree of men's desire to control unmarried women's chastity to uphold the family honour [156]. Since the study participants are all married pregnant women, this particular phenomenon is not important.

Attitude and practice regarding healthcare use: Lastly, the attitude toward and practice regarding healthcare use is the proximate determinant of decision delay in our conceptual

framework. Those who have had favourable attitudes and practices during pregnancy are likely to make the decision to seek care quickly at the onset of illness symptoms. Three indicators – uptake of antenatal care, having a birth plan as to the location of delivery and visiting a *mullah* for healing of illness after the onset of symptoms – were used to measure women's attitude and practice regarding healthcare during pregnancy. A woman who had antenatal care during pregnancy will have increased knowledge regarding pregnancy-related illness and treatment possibilities for the illness. A woman may make the plan to use a health facility because she understands the risks associated with childbirth and has confidence in the quality of available obstetric care. On the contrary, a woman may seek healing from a local religious leader or mosque leader (i.e., a *mullah*) because she (or her family) believes that the cause of her illness may relate to evil spirits or 'god's will', or that her illness is not serious enough to require more expensive professional medical care. In addition, a mullah is a person of authority in the village, usually educated or perceived as knowledgeable, whose opinion is respected.

5.2. Average decision-making time by complication types

There were large differences in the self-reported time span between recognition of illness and decision to seek care across the complication types. Women with PPH and APH had the shortest time span, of just half an hour. The time spans for other complication types ranged from about 1 hour for eclampsia to approximately 4.5 hours for women with impending rupture of uterus, and to over half a day for women with infection (Table 5.2).

5.3. Bivariable analyses

Each complication type has distinctive symptoms, and women and their carers may react to them differently according to the nature of the symptoms. In addition, the time it takes to develop to a fatal stage differs across complication types [13]. In the light of this, the effect of certain determinants may be more pronounced in certain complication types than others. Therefore, interaction between a determinant and complication types (or effect modification by complication types) may exist, causing more delays in women with some complication types than those with other

complications. In the following analysis, the effect of each determinant is examined separately by complication types. This is done in order to assess whether it is appropriate to pool all complication types together in case of the absence of effect modifications, or whether it is more sensible to present the results separately for women in different types of complication in case of the presence of effect modifications.

5.3.1. Bivariable analysis stratified by complication types

(a) Area of residence

Residing in a rural area had an adverse effect on (increased) decision delay for women with PPH, rupture of uterus and, to a lesser degree, severe pre-eclampsia. The indicator of remoteness was also positively associated with the decision delay for women with PPH, pre-eclampsia and rupture of uterus.

(b) Community characteristics

Only for women with APH and severe pre-eclampsia was the difference in the delay time statistically significant. Among women with APH, those with access to a midwife had almost no delay, whilst their counterparts with no access to a midwife had a 1-hour delay (crude ratio = 5.9, 95%CI=1.2–29.0, p=0.029). Similarly among women with severe pre-eclampsia, those with access to a midwife had just a half-hour delay whilst their counterparts with no access had a 5-hour delay (crude ratio=9.3, 95%CI=1.6–53.6, p=0.014). Having access to a doctor was weaker in predicting the delay time than access to a midwife. Access to a car was poor in predicting decision delay.

(c) Access to health care

The cost of transportation to the first place of care was not particularly good as a predictor of decision delay. An exception was found in women with eclampsia: families who did not have to pay for transportation took roughly half an hour to

decide to seek care, whilst those who spent more than 500 Afs took nearly 4 hours to do so (ratio=7.6, CI=1.9–31.3, p = 0.005).

Travel time to the place of care had an effect on decision delay in women with bleeding in early pregnancy, with the delay time increased by seven times (CI=1.3-38.0, p=0.026) for those who travelled greater than 1.25 hours compared with the baseline group. Evidence of association was weak for women with rupture of uterus and pre-eclampsia (Table 5.3a).

(d) Education

The husband's level of education had an effect on the decision delay only for women with eclampsia (ratio = 4.4, 95%CI = 1.4–13.9, p=0.014). The woman's education had no effect on the decision delay across all complication types.

(e) Household economic status

Asset ownership significantly influenced the decision time for women with eclampsia and pre-eclampsia. While those women with eclampsia and severe pre-eclampsia from the highest economic strata spent just a fraction of an hour to make the decision (20 minutes for eclampsia and 40 minutes for severe pre-eclampsia), their counterparts from the two lower strata spent roughly 2.5–3 hours and up to 9 hours, respectively, to make the decision (Table 5.3a). For women with PPH and APH, evidence of an association was slightly weaker (Table 5.3a).

The occupation group of the husband was associated with the decision delay only for women with hypertensive disorders, increasing the duration of delay if the husband worked as a labourer in comparison with husbands who were in business (baseline) (Table 5.3a).

(f) Woman's status in household

Once more, the analyses revealed a varied picture depending on the complication type and particular aspects of women's status. No significant and meaningful association was found between the delay and any of the woman's status variables

among women with eclampsia, PPH or APH. In contrast, the woman's weak relationship with her birth family and relatives was associated with a long decision delay for women with severe pre-eclampsia and for women with rupture of uterus. Those with a 'weak relationship with the birth family and relatives' had a delay that lasted more than one whole day for pre-eclampsia and 6 hours for rupture of uterus, while their counterparts who had the 'strongest relationship with the birth family' had a delay of less than an hour for both complication types (crude ratio = 37.2, 95%CI=5.6–247, p<0.001 and crude ratio = 15.1, 95%CI=2.6–86.9, p=0.003).

Weak evidence only was found of association between a woman's access to money and the duration of the decision delay for women with severe pre-eclampsia and women with bleeding in early pregnancy (Table 5.3b).

(g) Gravidity

The inverse trends observed between gravidity and delay in table 5.3c reached a statistically significant level among women with impending rupture of uterus onlywith primigravidae having a nine-times longer delay than women with six or more pregnancies (95% CI = 2.6–40.6, p=0.004).

(h) Attitudes and practices regarding health care use

Both lack of ANC and lack of plan to deliver in a health facility increased the decision- making time significantly in women with complication types that occur during the late pregnancy period (after the 22nd gestational week and before childbirth). These two determinants had no effect on delay time for women with early pregnancy or postpartum complications (i.e., PPH, bleeding in early pregnancy and severe infection).

For example, among women with eclampsia, those with no ANC visit indicated nearly a 2-hour delay whilst those who had four or more ANC visits reported almost no delay (crude ratio = 26.7, 95%CI=4.5–156.7, p<0.001). Furthermore, a low number of ANC consultations (i.e., one to three visits) was equivalent to not receiving ANC at all (Table 5.3c). As for women with rupture of the uterus and

impending rupture of the uterus ('dystocia'), whilst the baseline group (i.e., those with four or more ANC visits) delayed between 50 minutes and 100 minutes, their counterparts with no ANC delayed over 12 hours (Table 5.3c).

Planning a health facility delivery also reduced the duration of decision delay significantly for women with late pregnancy complications. Among women with APH, the decision was made almost immediately after recognition of illness if the woman had planned to deliver in a health facility, but if she had not made such plans, the delay was nearly 1 hour (crude ratio = 10.6, 95%CI=2.0–56.4, p=0.006). Similarly for women with eclampsia, the delay time was less than half an hour for those with a birth plan and 1.5 hours for those without a plan (crude ratio =3.5, 95%CI=1.0–12.4, p=0.055). Lack of a birth plan prolonged the delay duration greatly for women who suffered pre-eclampsia and rupture of uterus (Table 5.3c).

There was a strong negative association between visit to a *mullah* and delay duration for women with eclampsia only: those who visited a *mullah* took nearly 3 hours to make the decision to seek care, compared with half an hour for those who did not (crude ratio = 5.2, 95%CI=1.8–15.0, p=0.003). The number of subjects in the exposed group (i.e., those who visited a *mullah*) was too small to reach statistical significance for women with PPH, bleeding in early pregnancy, and severe dystocia.

Summary

The above bivariable analyses have revealed that there are interactions between the complication types and certain determinants. Firstly, the woman's status in the household, according to our indicators, was very poor in predicting the delay time for women with eclampsia, APH and PPH, all of which develop to a serious condition rather quickly [13], or have very clear or dramatic symptoms (i.e., massive bleeding or convulsion). However, the woman's status was predictive of the decision-making time for women with pre-eclampsia and rupture of uterus, and to a lesser degree, for women with severe infection and bleeding in the early pregnancy period. All of these complication types either have longer periods

before developing into a fatal condition (i.e., rupture of uterus, infection[13]), or manifest themselves with symptoms that can be easily overlooked, such as high blood pressure in severe pre-eclampsia [22].

Similarly, long travel times to the place of care were predictive of the decision-making delay in women with pre-eclampsia, rupture of uterus, infection and bleeding in early pregnancy, but were poor in predicting the delay in the complication types that had clear symptoms.

Secondly, as highlighted in the earlier section, the effects of health care utilization were clearly visible for women with the complication types that occur later in pregnancy before childbirth but they were not so visible for women in the postpartum or very early pregnancy period.

In the light of the above observations, it was decided that the complication types should be grouped into three categories in order to calculate the summary estimate for the duration of decision delay for each determinant. In addition to the two groups that were based on the characteristics of symptoms and illness, a third group was created for women after the 22nd gestational week before delivery of baby, because the effect of the delays on foetal status at admission among women in this stage of pregnancy will be assessed in a later chapter.

Table 5.1: Grouping of complication types used in the analyses of decision delay

Groups	Women included
Group 1 – Fast-developing illness and complication with clear and dramatic symptoms	This group includes complication types with clear symptoms such as convulsion or massive bleeding or complication types that develop into a fatal condition rather quickly. Women with eclampsia, APH and PPH are in this group. Women with bleeding in the early pregnancy period have been excluded[ee].

[ee] Uptake of ANC and planned delivery in health facilities, which are among the important predictors of delay, was not a meaningful measurement of attitude and practice of healthcare utilization among

Group 2 – Slow-developing illness and complication with less dramatic symptoms	This group includes women with pre-eclampsia, rupture of uterus and impending rupture of uterus ('dystocia'), and severe infection.
Group 3 – Women between 22nd gestational week and delivery of baby.	This group includes women with the complication types that occur after 22nd gestational week before childbirth. Women with eclampsia, severe pre-eclampsia, APH and dystocia are included.

5.3.2. Bivariable analysis stratified by the three complication sub-groups

This section describes briefly the patterns of association between the decision delay and its determinants examined separately for each of the three sub-groups.

(a) Group 1

In group 1, household economic status (based on assets possessed) had the largest effect on the decision delay, increasing the duration by over seven times for the poorest in comparison with the baseline group (the least poor). Women's practices and attitudes regarding healthcare during pregnancy (measured by uptake of ANC, having planned to deliver in a health facility, and a visit to a *mullah*) also had large effects on the decision delay, increasing the duration of the decision delay by four to six times. There was evidence for association between the delay and the education level of the husband, a phenomenon that was not observed in either group 2 or group 3. The effect of access to care varied depending on the indicator chosen: travel time to the first place of care had no effect on the decision delay, whilst transportation cost to the first place of care was associated with the decision delay, but only when these costs were high and compared with no transportation cost. Lack of access to a midwife increased the duration by nearly three times. The woman's status in the household had no effect on the decision delay. No crude

women with bleeding in early pregnancy because many of them had not known that they were pregnant. In addition, the time to reach the fatal status may be slightly longer in women with abortion, suggesting that the symptoms are not perceived to be so dramatic.

association was found between gravidity and the decision delay (Tables 5.4a and 5.4b).

(b) Group 2

The largest associations in this group were observed for the strength of a woman's relationship with her birth family, as well as health care use and socio-economic status. Those in a weak relationship with the birth family had an almost eight times longer decision delay than those in a strong relationship. Both lack of ANC and lack of plan for health facility delivery increased the delay time by five times in comparison with those with four or more ANC visits or those with the plan for health facility delivery respectively. Access to the first place of care had little effect on the decision delay: the effect of the transportation cost was nil, and travel time of over half an hour up to 1.25 hours increased the decision delay by three times in comparison with those who travelled less than half an hour; however, there was no significant difference from baseline for women who travelled over 1.25 hours. Access to a midwife also had an effect on the decision delay: the duration of the decision delay was increased by nearly three times for women without access to a midwife in comparison with those having access. Once again, there was no crude effect of gravidity on the decision delay (Tables 5.5a and 5.5b).

(c) Group 3

Indicators of healthcare use had a very large effect on the decision delay: women with no ANC had a seven-times longer decision delay than those with four or more ANC visits, and those with no plan for health facility delivery had a five-times longer delay than those who had the plan. Household economic status also had a very large effect: those in the poorest quartile had a delay more than five times longer than those in the least poor quartile. The husband's occupation was predictive of the duration of delay: those working in agriculture had a delay almost six times longer and those working as labourers had a delay five times longer than those in the business sector. Having access to a midwife in the community was also associated with the duration of the decision delay: those without access to a

midwife had a delay three times longer than those with access to a midwife. In terms of access to the first place of care, access measured by the transportation cost had only a very weak association. The woman's relationship with her birth family and relatives outside the usual home was also associated with the decision delay. Women with a more limited relationship with their birth family had a delay three times longer than the baseline group. Once again, gravidity had no crude effect on the duration of the decision making time (Tables 5.6a and 5.6b).

5.4. Multivariable analyses

In the following sections, multivariable analyses are conducted separately in each complication sub-group to understand the net effect of each determinant on the duration of decision delay. The hierarchical approach [157] is taken along with a forward selection procedure [135] to build the multivariable model. The simplest model has just complication types as the explanatory variable and the variable remains in the model throughout the model-building process in order to adjust for the differences in characteristics across the complication types. After the indicator of remoteness is entered into the model (the most distal determinant in our conceptual framework), other distal determinants are entered one by one. Likelihood ratio tests with the threshold of p=0.1 are used to decide whether the additional variable improves the model. The order in which each of the distal determinants is entered into the model follows the flows shown in the conceptual framework. For example, the education level is entered into the model before the household socio-economic status, which precedes the indicators of woman's status in the household. In this way, it is possible to assess the effect of each determinant in the presence of its confounders and observe the magnitude of the remaining effects of the confounders that is not mediated through the mediating factor [157]. Proximate determinants are then entered into the model in the final phase. A determinant that does not show any evidence of association (p >=0.1) at this stage is further assessed by the likelihood ratio test comparing the models with and without the determinant. The variable is dropped in the final model, if the result of

the likelihood ratio test shows that it does not improve the model significantly (p>=0.1).

In the next three sub-sections, the model-building process is explained for each complication sub-group, which is illustrated in turn in Tables 5.7, 5.8 and 5.9.

5.4.1. Group 1 – Complication type with dramatic symptoms

Model building

The indicator of remoteness (model 1), access to a midwife (model 2), transportation cost to the first place of care (model 3), and asset-based household socio-economic status (model 4) were entered one after another in the first stage. Access to a car, husband's education and occupation group were not entered into the model at this stage, as the likelihood ratio tests showed that they were not significant factors in the model to explain the decision delay. The weak evidence of association between living in the most remote area and the decision delay disappeared in model 2, suggesting that the effect of remoteness on the decision delay might be explained by not having access to a midwife.

In the second phase, a woman's uptake of ANC (model 5) and the variable indicating whether the woman went to a *mullah* (model 6) were entered as they both improved the model significantly. Not having planned to deliver in a health facility was not selected as the likelihood ratio test indicated that this variable would not improve the model. Comparing model 4 with model 5, it can be seen that the effect of socio-economic status was mediated through uptake of ANC but the effect of household socio-economic status still remained in model 5. Cost of transportation to the first place of care, access to a midwife and remoteness, whose effects were mediated through other determinants and which lost their association with the decision delay in model 6, were dropped in the final model because of the results of likelihood ratios tests. In this final model, socio-economic status and use of ANC remained the most important determinants of delay duration: those in the poorest strata experienced a delay 5.6 times longer than those in the least poor

strata (95%CI= 1.9-16.4, p=0.002). Women with no ANC had a delay 3.4 times longer than those who had four or more ANC visits (95%CI=1.0-11.1 with p=0.048). In addition, women who resorted to a *mullah* took three times longer to make the decision than those who did not (95%CI=1.1-8.0, p=0.028).

5.4.2. Group 2 - Complication type with less dramatic symptoms

Model building

The multivariable model was developed by following the same procedure that was explained for Group 1. Access to the first place of care measured by the self-reported travel time, access to a midwife in the community and husband's occupation group were not entered into the model because the results of the likelihood ratio tests indicated that they did not significantly improve the model. In the final model[ff], two determinants were found important: (1) A woman's weak relationship with her birth family had the largest effect[gg], increasing the delay by 6.4 times in comparison to those in a strong relationship (95%CI=2.7-15.3, p<0.001). (2) Lack of a birth plan also increased the decision delay by 2.7 times in comparison with women with a birth plan (95%CI=1.2-5.9, p=0.013). There was weak evidence to suggest that primigravidity, which may be an indicator of the woman's low status as well as lack of knowledge in pregnancy-related illness, was associated with the delay increasing the duration by 2.2 times (95%CI=0.9-5.2, p=0.075). Most of the effect of ANC was also mediated through the plan to use a health facility for delivery. Living just outside of the city centre was associated with longer decision delay.

[ff] The effect of asset-based household socio-economic status was completely mediated through other determinants in the final model but remained in the model because the results of the likelihood ratio test comparing the models with and without it indicated that it is an important factor.

[gg] As discussed in 5.1, the relationship with birth family was measured in the following way. A study subject was assigned 'strong' for the variable 'relationship with birth family and relatives outside the usual home' if she answered that 'she feels free to contact her birth family' and that 'she had visited her relatives in the last three months'; 'moderate' if she answered that 'she feels free to contact birth family' and that 'she did not visit birth family in the last three months' OR if she answered that 'she feels limited or sometimes limited to contact birth family' and that 'she visited her relatives in the last three months', and 'weak' if she answered that 'she feels limited in contacting birth family' and that 'she did not visit relatives in the last three months'.

5.4.3. Group 3 – All women post-22nd gestational week before childbirth

Model building

Following the usual procedure, the model was built by adding relevant variables. Occupation group of husband was not entered into the model because asset-based household economic status, which is related to husband's occupation group, improved the model better. The association found between remote areas and the decision delay disappeared after socio-economic status was entered into the model (model 3), suggesting that the delay experienced by those living in more remote areas could be explained by their poverty. The effect of uptake of ANC was partly mediated through the plan to deliver in a health facility, but it remained strong in model 7. Since the effect of remoteness was completely mediated by other factors, the variable was dropped from the final model. In the final model, not having ANC during pregnancy was associated with a delay 4.6 times longer in comparison with those who had four or more ANC visits (94%CI=1.7–12.2, p=0.003). Not having access to a midwife was found to increase the delay by 2.2 times in comparison with those who did have access to a midwife (95% CI=1.1–4.5, p=0.035). A visit to a *mullah* before leaving to obtain care was also associated with a longer decision delay (adjusted ratio=3.2, 95%CI=1.2–8.5, p=0.018). There was weak evidence to suggest that women in a weak relationship with their birth family also experienced a longer decision delay than their counterparts who enjoyed a strong relationship. Weak evidence of association was also found between no plan to use a health facility for delivery and the decision delay.

5.5. Summary

This chapter presented the determinants of the duration of time from recognition of illness to decision to obtain care. The average duration of the decision-making time differed considerably between different complication types, ranging from half an hour to over half a day, and the distribution pattern is similar to the pattern of time to fatality by complication types [13]. Results of bivariable analyses stratified by complication types showed patterns indicative of interactions between

complication types and certain determinants. Three sub-groups were defined on the basis of these patterns and multivariable analyses were carried out for each of the three sub-groups.

For group 1, which was characterized by complication types with acute symptoms and included women with eclampsia, APH and PPH, socio-economic status had the largest effect on the duration of the decision delay. Other important determinants included uptake of ANC and whether the woman visited a *mullah* before leaving for the hospital.

Group 2, which was characterized by complication types with slow-developing symptoms that could be easily overlooked, included women with severe pre-eclampsia, severe dystocia, and infection. The most important determinants of increased decision delay in this group were a weak relationship with birth family, and lack of plan to deliver in a health facility.

For group 3, which included women with complication types that develop after the 22nd gestational week before childbirth, healthcare during pregnancy and access to a midwife were the most important determinants.

In short, the duration of decision delay was greatly influenced by the woman's status in the household for slowly developing complication types, while for acute illness it was determined by the household socio-economic status, and for complication types that occur in late pregnancy, by access to a midwife. Across all types of complications, a woman's attitude and practice regarding healthcare during pregnancy was an important determinant of the duration of decision delay.

Figure 5.1: Conceptual framework to explain determinants of decision delay

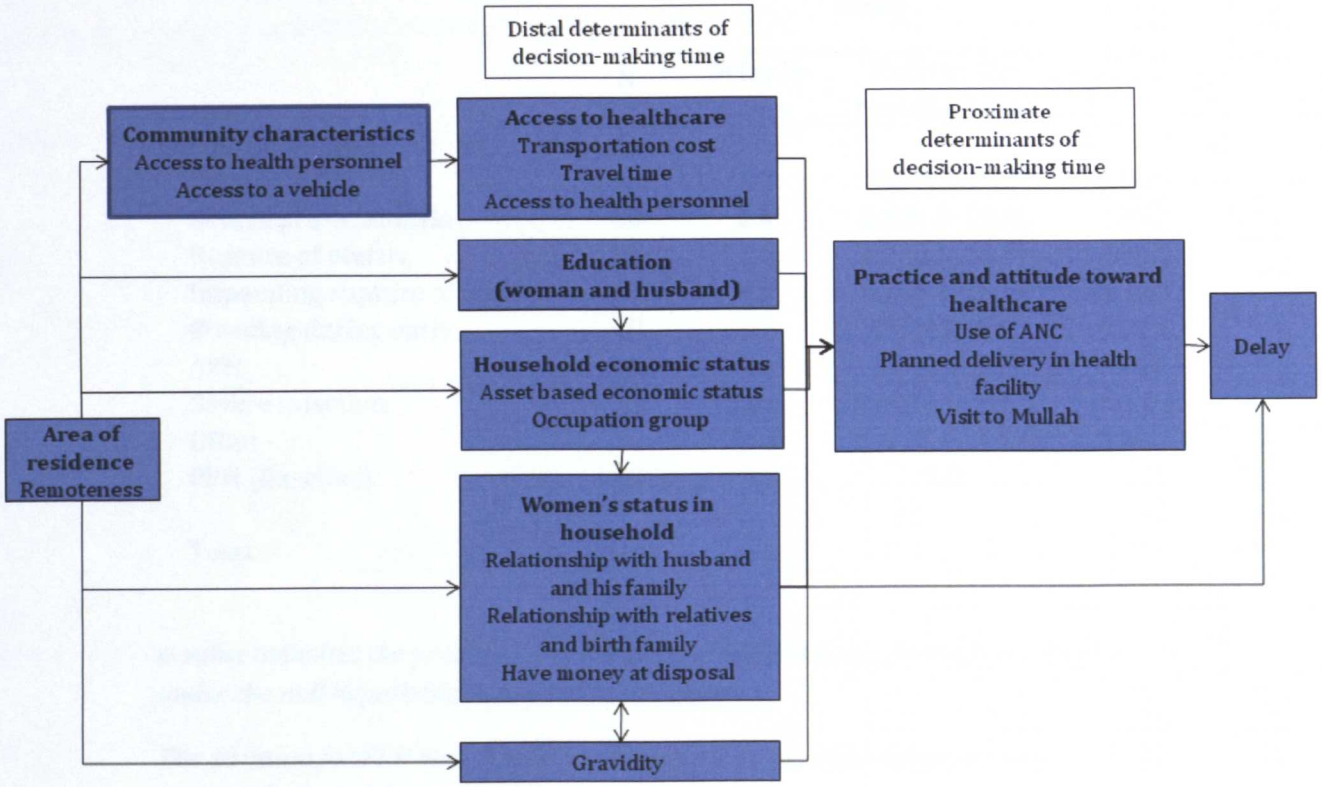


Table 5.2: Results of censored normal regression model predicting the average durations of decision delay by complication types

	Delay			
	N	Delay in hours	Ratio to the baseline delay	p-value
Complication type				
Eclampsia	98	1.2	2.5 [1.0-6.2]	0.047
Severe pre-eclampsia	50	2.4	5.3 [1.9-14.8]	0.002
Rupture of uterus	32	2.9	6.2 [2.0-19.7]	0.002
Impending rupture of uterus	39	4.5	9.7 [3.3-28.7]	<0.001
Bleeding during early	60	1.3	2.8 [1.0-7.4]	0.042
APH	61	0.6	1.2 [0.5-3.3]	0.688
Severe infection	28	16.4	35.6 [10.9-116.4]	<0.001
Other	5	15.9	34.4 [3.4-348.7]	0.003
PPH (Baseline)	48	0.5	1.0	-
Total	421			-

p-value indicates the probability of the observed difference occurring from that of PPH under the null hypothesis that there is no difference.

The duration for PPH was chosen to be the baseline duration because women with PPH had the shortest delay.

Table 5.3a: Results of series of bivariable censored normal regression models predicting the duration of decision-making time according to women's characteristics

	Bleeding during early pregnancy				APH				Pre-eclampsia			
		Delay	Ratio to the baseline delay			Delay	Ratio to the baseline delay			Delay	Ratio to the baseline delay	
	N	in hours	[95%CI]	p-value	N	in	[95% CI]	p-value	N	in hours	[95% CI]	p-value
Area of residence												
Rural	42	1.4	1.5 [0.3-8.2]	0.607	46	0.7	2.9 [0.5-16.7]	0.223	27	4.5	4.2 [0.8-21.6]	0.080
Baseline (Urban)	18	0.9	1.0		15	0.2	1.0		23	1.1	1.0	
Remoteness												
Remotest	11	2.2	3.8 [0.4-35.0]	0.142	15	0.2	0.6 [0.1-4.7]	0.986	5	14.2	27.4 [1.9-399.6]	0.016
2nd remotest	11	3.2	5.6 [0.6-50.4]	0.204	15	1.2	4.2 [0.6-29.3]	0.614	10	2.9	5.6 [0.7-46.1]	0.105
3rd remotest	20	1	1.7 [0.3-11.5]	0.446	13	1.7	6.1 [0.8-45.1]	0.049	16	6.4	12.4 [2.9-77.9]	0.008
Baseline (least)	18	0.6	1.0		18	0.3	1.0		19	0.5	1.0	
Community characteristics												
Have access to midwife in community												
No	39	1.2	1.8 [0.4-9.7]	0.462	39	1	5.9 [0.4-9.7]	0.029	24	4.9	9.3 [1.6-53.6]	0.014
Baseline (yes)	17	0.7	1.0		18	0.2	1.0		20	0.5	1.0	
Have access to doctor in community												
No	27	1.5	1.7 [0.4-7.9]	0.464	25	0.7	2.1 [0.5-10.0]	0.339	17	6.3	5.0 [0.9-28.2]	0.069
Baseline (yes)	32	0.9	1.0		33	0.3	1.0		32	1.3	1.0	
Have access to car in community												
No	6	3.8	4.0 [0.4-45.2]	0.257	5	0.4	0.7 [0.1-11.3]	0.807	3	26	14.1 [0.5-413.8]	0.122
Baseline (yes)	53	1	1.0		55	0.5	1.0		46	1.9	1.0	
Access to health care												
Cost of transportation to the first place												
> 500 Afs	5	5.5	3.0 [0.1-60.9]	0.473	14	0.1	0.2 [0.0-1.5]	0.115	3	0.6	0.4 [0.0-17.0]	0.647
<=500 Afs	19	1.5	0.8 [0.1-6.8]	0.851	14	0.9	1.6 [0.2-11.5]	0.618	8	8.6	5.9 [0.5-75.5]	0.164
<=100 Afs	23	0.5	0.3 [0.0-2.1]	0.209	8	0.8	1.4 [0.1-13.7]	0.781	20	1.7	1.1 [0.2-8.2]	0.892
Baseline (didn't pay)	12	1.9	1.0		22	0.6	1.0		16	1.5	1.0	
Self-reported travel time to the first place of care												
>=1.25 hours	15	5.4	7.0 [1.3-38.0]	0.026	19	0.9	2.6 [0.3-22.0]	0.373	14	3.8	4.7 [0.8-27.0]	0.085
< 1.25 hours	14	0.5	0.7 [0.1-4.0]	0.672	10	0.8	2.4 [0.4-13.9]	0.324	9	11.5	14.2 [1.9-105.8]	0.011
baseline (<0.5 hour)	28	0.8	1.0		29	0.3	1.0		23	0.8	1.0	

p-value indicates the probability of the observed difference occurring from that of the baseline group under the null hypothesis that there is no difference.

Table 5.3a: Results of series of bivariable censored normal regression models predicting the duration of decision-making time according to women's characteristics

	Eclampsia				Impending rupture of uterus				Rupture of uterus			
		Dela	Ratio to the baseline delay			Delay	Ratio to the baseline delay			Delay	Ratio to the baseline	
	N	in hours	[95%CI]	p-value	N	in hours	[95% CI]	p-value	N	in hours	[95% CI]	p-value
Area of residence												
Rural	75	1.1	1.1 [0.3-4.0]	0.882	36	4.7	1.2 [0.2-8.8]	0.847	28	4.6	41.9 [3.6-480.5]	0.004
Baseline (Urban)	23	1	1.0		3	3.9	1.0		4	0.1	1.0	
Remoteness												
Remotest	24	1.9	1.4 [0.3-6.1]	0.629	10	4.4	0.5 [0.1-2.7]	0.429	10	8.7	10.1 [1.2-89.2]	0.038
2nd remotest	29	1	0.8 [0.2-3.1]	0.706	17	3.9	0.5 [0.1-2.0]	0.292	12	2.2	2.5 [0.3-20.8]	0.377
3rd remotest	14	0.4	0.3 [0.0-1.8]	0.182	5	4.3	0.6 [0.1-3.4]	0.478	2	4.5	5.2 [0.2-168.8]	0.339
Baseline (least)	31	1.3	1.0		7	8.4	1.0		7	0.9	1.0	
Community characteristics												
Have access to midwife in community												
No	60	1.2	1.5 [0.5-4.6]	0.524	25	1.2	1.9 [0.4-9.7]	0.462	20	1.2	1.9 [0.4-9.7]	0.462
Baseline (yes)	35	0.8	1.0		11	0.7	1.0		11	0.7	1.0	
Have access to doctor in community												
No	56	1.3	1.4 [0.5-4.4]	0.547	21	4.5	0.9 [0.3-2.7]	0.866	18	3.5	1.6 [0.3-8.6]	0.547
Baseline (yes)	41	0.9	1.0		18	4.9	1.0		13	2.2	1.0	
Have access to car in community												
No	5	2.8	2.8 [0.2-31.1]	0.409	4	11	2.6 [0.5-14.5]	0.270	5	4.4	1.6 [0.2-14.6]	0.659
Baseline (yes)	92	1	1.0		35	4.2	1.0		27	2.7	1.0	
Access to health care												
Cost of transportation to the first												
> 500 Afs	24	3.7	7.6 [1.9-31.3]	0.005	11	3.3	0.5 [0.1-2.2]	0.334	9	9.7	6.2 [0.6-62.1]	0.117
<=500 Afs	20	0.8	1.6 [0.3-7.4]	0.547	11	5.7	0.8 [0.2-3.8]	0.804	10	3.3	2.1 [0.2-20.4]	0.508
<=100 Afs	15	1.2	2.5 [0.5-12.9]	0.277	9	3.9	0.6 [0.1-2.8]	0.479	3	0.2	0.1 [0.0-3.3]	0.195
Baseline (didn't pay)	35	0.5	1.0		8	6.9	1.0		6	1.6	1.0	
Self-reported travel time to the first place of care												
>=1.25 hours	26	0.8	0.7 [0.1-2.9]	0.954	14	2.8	0.4 [0.1-1.3]	0.136	10	7.1	4.9 [0.8-30.7]	0.086
< 1.25 hours	19	1.3	1.0 [0.3-3.9]	0.567	7	5.7	0.8 [0.2-3.6]	0.798	5	3.2	2.2 [0.2-22.5]	0.495
baseline (<0.5 hour)	44	1.3	1.0		17	6.8	1.0		15	1.5	1.0	

p-value indicates the probability of the observed difference occurring from that of the baseline group under the null hypothesis that there is no difference.

Table 5.3a: Results of series of bivariable censored normal regression models predicting the duration of decision-making time according to women's characteristics

	PPH				Infection			
		Delay	Ratio to the baseline delay			Delay	Ratio to the baseline delay	
	N	in hour	[95%CI]	p-value	N	in hours	[95% CI]	p-value
Area of residence								
Rural	42	0.7	42.7 [2.5-736.9]	0.011	26	20.7	4.7 [0.5-40.7]	0.155
Baseline (Urban)	6	0	1.0		3	4.4	1.0	
Remoteness								
Remotest	7	0.6	5.8 [0.4-86.7]	0.842	3	22.1	2.7 [0.2-34.9]	0.438
2nd remotest	13	0.5	4.4 [0.4-44.9]	0.083	4	5.4	0.7 [0.1-7.1]	0.694
3rd remotest	16	0.7	6.5 [0.7-61.2]	0.026	17	27.2	3.3 [0.5-21.6]	0.232
Baseline (least)	11	0.1	1.0		4	8.2	1.0	
Community characteristics								
Have access to midwife in community								
No	35	0.6	4.4 [0.4-9.7]	0.127	25	16.4	0.6 [0.4-9.7]	0.584
Baseline (yes)	12	0.1	1.0		3	29.8	1.0	
Have access to doctor in community								
No	30	0.7	4.0 [0.8-21.2]	0.102	23	16.4	0.7 [0.1-4.2]	0.689
Baseline (yes)	16	0.2	1.0		5	23.4	1.0	
Have access to car in community								
No	7	0.4	1.0 [0.1-9.8]	0.987	13	32.6	3.2 [0.9-11.6]	0.081
Baseline (yes)	40	0.4	1.0		15	10.3	1.0	
Access to health care								
Cost of transportation to the first place								
> 500 Afs	20	1.1	2.8 [0.4-19.1]	0.285	12	16.1	1.1 [0.2-5.3]	0.864
<=500 Afs	12	0.4	1.1 [0.1-9.1]	0.929	5	18.7	1.0 [0.1-6.9]	0.986
<=100 Afs	3	0			1	20.6	4.8 [0.1-	0.384
Baseline (didn't pay)		0.4	1.0		10		1.0	
Self-reported travel time to the first place of care								
>=1.25 hours	13	0.3	1.0 [0.5-23.2]	0.999	15	26.8	1.6 [0.5-5.1]	0.456
< 1.25 hours	13	1.1	3.6 [0.2-6.7]	0.179	3	27.4	1.6 [0.3-9.9]	0.609
baseline (<0.5 hour)	22	0.3	1.0		8	17.3	1.0	

p-value indicates the probability of the observed difference occurring from that of the baseline group under the null hypothesis that there is no difference.

Table 5.3b: Results of series of bivariable censored normal regression models predicting the duration of decision-making time according to women's characteristics

	Bleeding during early pregnancy				APH				Pre-eclampsia			
		Delay	Ratio to the baseline delay			Delay	Ratio to the baseline delay			Delay	Ratio to the baseline delay	
	N	in hours	[95% CI]	p-value	N	in	[95% CI]	p-value	N	in hours	[95% CI]	p-value
Education												
Education of husband												
No	36	1.1	1.1 [0.2-5.1]	0.914	40	0.5	1.1 [0.2-5.3]	0.944	23	4.7	3.9 [0.8-20.1]	0.104
Baseline (yes)	23	1.1	1.0		20	0.5	1.0		27	1.2	1.0	
Education of women												
No	49	0.9	0.3 [0.0-3.0]	0.313	52	0.4	0.6 [0.1-6.2]	0.669	37	3	2.5 [0.4-17.2]	0.343
Baseline (Yes)	8	2.8	1.0		7	0.7	1.0		12	1.2	1.0	
Household economic status												
Asset-based household economic status												
Poorest	10	2.2	3.2 [0.3-29.6]	0.299	18	1.1	8.1 [0.9-70.6]	0.057	6	4	5.6 [0.5-66.7]	0.171
2nd poorest	12	4.3	6.3 [0.8-51.2]	0.082	12	0.5	3.8 [0.4-39.5]	0.266	10	9.1	12.7 [1.7-96.5]	0.015
3rd poorest	19	0.7	1.0 [0.2-6.7]	0.971	18	0.6	4.3 [0.5-36.3]	0.182	10	6.9	9.6 [1.3-72.7]	0.029
Baseline (least poor)	19	0.7	1.0		12	0.1	1.0		24	0.7	1.0	
Occupation groups of husband												
Agriculture	22	1.7	2.0 [0.2-18.4]	0.522	20	0.9	4.7 [0.6-35.6]	0.132	11	4.1	6.8 [0.6-72.9]	0.109
Labourer	6	0.3	0.4 [0.2-17.1]	0.499	23	0.5	2.4 [0.3-16.8]	0.379	19	6	10.1 [1.2-83.8]	0.032
Government/teacher	22	1.5	1.9 [0.0-7.4]	0.565	2	6	3.0 [0.5-1768]	0.098	5	1.9	3.2 [0.2-60.7]	0.432
Other	0				2	0.1	0.4 [0.0-29.4]	0.635	4	0.1	0.2 [0.0-11.1]	0.450
Baseline (Business)	10	0.8	1.0		13	0.2	1.0		11	0.6	1.0	
Women's status												
Women's relationship with birth family and relatives												
Weak	10	2.7	3.1 [0.3-20.0]	0.325	18	0.3	0.6 [0.1-4.8]	0.665	10	34.2	37.2 [5.6-247.4]	<0.001
Moderately close	28	0.7	0.8 [0.1-4.8]	0.804	17	0.5	1.0 [0.1-7.5]	0.97	17	1.8	1.9 [0.4-10.2]	0.427
Baseline (Strong)	17	0.9	1.0		21	0.5	1.0		22	0.9	1.0	
Relationship with husband and his family												
Not so close	19	0.7	0.4 [0.1-3.0]	0.39	20	0.5	2.9 [0.4-18.7]	0.267	13	5	1.2 [0.2-9.4]	0.850
Moderately close	19	0.7	0.4 [0.1-2.8]	0.363	20	1.1	6.4 [1.0-40.6]	0.051	18	0.8	0.2 [0.0-1.3]	0.085
Very close	17	1.7	1.0		17	0.2	1.0		18	4.1	1.0	
Have money at disposal												
No	44	1.4	5.4 [0.8-37.0]	0.083	45	0.5	1.8 [0.3-12.6]	0.541	28	4.6	4.7 [0.9-24.5]	0.068
Baseline (yes)	12	0.3	1.0		12	0.3	1.0		21	1	1.0	

Table 5.3b: Results of series of bivariable censored normal regression models predicting the duration of decision-making time according to women's characteristics

	Eclampsia				Impending rupture of uterus				Rupture of uterus			
		Delay	Ratio to the baseline delay			Delay	Ratio to the baseline delay			Delay	Ratio to the baseline delay	
	N	in hours	[95% CI]	p-value	N	in hours	[95% CI]	p-value	N	in hours	[95% CI]	p-value
Education												
Education of husband												
No	66	1.8	4.4 [1.4-13.9]	0.014	28	3.9	0.5 [0.2-1.7]	0.259	25	2.5	0.5 [0.1-3.1]	0.405
Baseline	32	0.4	1.0		11	7.5	1.0		7	5.5	1.0	
Education of women												
No	69	1.1	1.0 [0.2-3.6]	0.956	36	4.6	1.5 [0.1-47.9]	0.806	30	2.7	0.3 [0.0-7.0]	0.414
Baseline (Yes)	17	1	1.0		1	3	1.0		2	10.3	1.0	
Household economic status												
Asset-based household economic status												
Poorest	29	2.4	7.4 [1.8-29.9]	0.005	12	2.3	0.6 [0.1-2.6]	0.452	12	3.4	6.6 [0.4-114.9]	0.187
2nd poorest	17	3.2	10.2 [2.0-50.6]	0.005	11	11.6	2.8 [0.6-13.4]	0.183	9	6.2	12.1 [0.6-230.2]	0.093
3rd poorest	26	0.9	2.8 [0.7-12.0]	0.153	10	4.3	1.1 [0.2-5.1]	0.954	8	2.1	4.2 [0.2-82.8]	0.336
Baseline (least poor)	26	0.3	1.0		6	4.1	1.0		3	0.5	1.0	
Occupation groups of husband												
Agriculture	36	1.6	14.8 [2.6-85.3]	0.003	20	4.6	3.5 [0.2-27.0]	0.223	10	6.3	5.7 [0.4-76.4]	0.182
Labourer	37	2.1	19.5 [3.4-111.7]	0.001	4	7.2	5.4 [0.4-66.5]	0.178	0			
Government/teacher	5	0.2	1.9 [0.1-30.4]	0.641	10	5.9	4.5 [0.5-39.4]	0.167	15	2	1.8 [0.2-21.7]	0.626
Other	7	1.5	13.6 [1.2-153.5]	0.036	2	4.4	3.4 [0.2-66.0]	0.416	3	6.3	5.7 [0.2-158.1]	0.296
Baseline (Business)	13	0.1	1.0		3	1.3	1.0		4	1.1	1.0	
Women's status												
Women's relationship with birth family and relatives												
Weak	21	1.6	1.9 [0.4-8.8]	0.398	12	6.5	2.4 [0.6-10.3]	0.227	12	6	15.1 [2.6-86.9]	0.003
Moderately close	26	0.7	0.8 [0.2-3.5]	0.787	15	3.9	1.5 [0.4-5.8]	0.587	10	6.7	16.7 [2.7-102.7]	0.004
Baseline (Strong)	31	0.8	1.0		9	2.7	1.0		9	0.4	1.0	
Relationship with husband and his family												
Not so close	30	1.6	3.1 [0.6-15.4]	0.163	12	4.1	0.7 [0.2-2.7]	0.569	19	2	0.4 [0.1-3.2]	0.366
Moderately close	28	0.8	1.4 [0.3-7.3]	0.658	13	3.1	0.5 [0.1-2.0]	0.336	7	4.9	0.9 [0.1-11.2]	0.959
Very close	19	0.5	1.0		11	6.1	1.0		6	5.2	1.0	
Have money at disposal												
No	48	0.7	0.5 [0.1-1.7]	0.249	28	4.3	1.1 [0.3-4.4]	0.851	29	3	1.1 [0.1-16.3]	0.972
Baseline (yes)	30	1.5	1.0		8	3.8	1.0		3	2.8	1.0	

Table 5.3b: Results of series of bivariable censored normal regression models predicting the duration of decision-making time according to women's characteristics

	PPH				Infection			
		Delay	Ratio to the baseline delay			Delay	Ratio to the baseline delay	
	N	in hour	[95% CI]	p-value	N	in hour	[95% CI]	p-value
Education								
Education of husband								
No	27	0.7	2.7 [0.5-13.4]	0.227	23	22.7	1.1 [0.3-4.9]	0.885
Baseline	21	0.3	1.0		4	20.5	1.0	
Education of women								
No	42	0.5	8.4 [0.2-316.5]	0.244	25	14.6	0.2 [0.0-7.1]	0.351
Baseline (Yes)	3	0.1	1.0		1	77.5	1.0	
Household economic status								
Asset-based household economic status								
Poorest	15	0.6	7.7 [0.8-72.6]	0.073	18	20	0.5 [0.0-5.7]	0.534
2nd poorest	13	0.8	9.6 [1.0-96.8]	0.054	3	36.6	0.9 [0.0-18.5]	0.914
3rd poorest	10	0.8	9.7 [0.9-108.2]	0.066	5	5.1	0.1 [0.0-2.0]	0.134
Baseline (least poor)	10	0.1	1.0		2	43.1	1.0	
Occupation groups of husband								
Agriculture	19	0.5	1.0 [0.1-13.9]	0.998	15	24.3	1.7 [0.2-15.6]	0.643
Labourer	3	0			1	0		
Government/teacher	18	0.8	1.7 [0.1-24.4]	0.677	9	13.7	0.9 [0.1-9.9]	0.957
Other	3	0.3	0.7 [0.0-31.3]	0.841	0	-	-	
Baseline (Business)	5	0.5	1.0		3	14.6	1.0	
Women's status								
Women's relationship with birth family and relatives								
Weak	10	0.1	0.1 [0.0-0.5]	0.014	7	14.5	1.9 [0.3-13.3]	0.491
Moderately close	22	0.3	0.2 [0.0-0.5]	0.054	12	27.2	3.6 [0.6-20.2]	0.138
Baseline (Strong)	13	2	1.0		6	7.6	1.0	
Relationship with husband and his family								
Not so close	14	0.4	0.9 [0.1-8.2]	0.931	16	23.4	4.9 [0.8-3.05]	0.086
Moderately close	19	0.4	0.9 [0.1-7.0]	0.915	4	19.8	4.2 [0.4-43.8]	0.223
Very close	12	0.5	1.0		5	4.9	1.0	
Have money at disposal								
No	31	0.4	0.4 [0.1-2.4]	0.323	19	18.7	1.0 [0.2-6.1]	0.965
Baseline (yes)	13	0.9	1.0		5	18	1.0	

Table 5.3c: Results of series of bivariable censored normal regression models predicting the duration of decision-making time according to women's characteristics

	Bleeding during early pregnancy				APH				Pre-eclampsia			
		Delay	Ratio to the baseline delay			Delay	Ratio to the baseline delay			Delay	Ratio to the baseline	
	N	in hours	[95% CI]	p-value	N	in hours	[95% CI]	p-value	N	in hours	[95% CI]	p-value
Gravidity												
Number of pregnancies												
Primigravidae	5	3.4	6.3 [0.4-102.8]	0.195	3	2.5	8.0 [0.3-221.7]	0.215	25	1.8	0.4 [0.1-2.5]	0.332
2-5	3	1.9	3.5 [0.7-16.9]	0.111	19	1.1	3.5 [0.7-17.8]	0.124	6	0.7	0.2 [0.0-2.6]	0.188
Baseline (6 or more)	2	0.5	1.0		39	0.3	1.0		19	4.3	1.0	
Healthcare												
ANC												
0			n/a		14	0.8	5.3 [0.7-43.1]	0.117	5	4.1	2.1 [0.1-35.6]	0.593
1-3 times			n/a		28	0.7	4.3 [0.7-26.3]	0.109	15	2.7	1.4 [0.2-9.3]	0.729
Baseline (>4 times)					17	0.2	1.0		29	1.9	1.0	
Planned institutional delivery												
No			n/a		44	0.9	10.6 [2.0-56.4]	0.006	18	9.4	8.5 [1.7-41.8]	0.010
Baseline (yes)					15	0.1	1.0		31	1.1	1.0	
Saw mullah before coming to hospital												
Yes	3	4.4	3.9 [0.1-125.9]	0.438	3	0.5	0.9 [0.0-28.0]	0.932	48	2.5	n/a	
Baseline (no)	5	1.1	1.0		58	0.5	1.0		0		n/a	

p-value indicates the probability of the observed difference occurring from that of the baseline group under the null hypothesis that there is no difference.

Table 5.3c: Results of series of bivariable censored normal regression models predicting the duration of decision-making time according to women's characteristics

	Eclampsia				Impending rupture of uterus				Rupture of uterus			
		Delay	Ratio to the baseline delay			Delay	Ratio to the baseline delay			Delay	Ratio to the baseline	
	N	in hours	[95% CI]	p-value	N	in hours	[95% CI]	p-value	N	in hours	[95% CI]	p-value
Gravidity												
Number of pregnancies												
Primigravidae	69	1.2	1.3 [0.2-9.0]	0.783	5	28	9.2 [2.6-40.6]	0.004	1	15	9.0 [0.1-805.9]	0.325
2-5	20	1.0	1.2 [0.1-10.4]	0.884	14	4.6	1.5 [2.6-4.3]	0.426	16	4.6	2.8 [0.6-13.5]	0.196
Baseline (6 or more)	9	0.9	1.0		20	3	1.0		15	1.7	1.0	
Healthcare												
ANC												
0	34	1.8	26.7 [4.5-156.7]	<0.001	8	12.3	7.3 [1.4-37.32]	0.019	6	13.6	15.2 [1.7-135.5]	0.017
1-3 times	39	1.6	22.8 [4.0-130.0]	0.001	22	4.3	2.5 [0.6-10.0]	0.180	17	3.3	3.7 [0.7-20.8]	0.134
Baseline (>4 times)	13	0.1	1.0		7	1.7	1.0		9	0.9	1.0	
Planned institutional delivery												
No	63	1.5	3.5 [1.0-12.4]	0.055	22	4.6	1.1 [0.3-4.2]	0.930	22	6.1	12.6 [2.6-61.8]	0.003
Baseline (yes)	23	0.4	1.0		9	4.3	1.0		9	0.5	1.0	
Saw mullah before coming to hospital												
Yes	46	2.7	5.2 [1.8-15.0]	0.003	3	11	2.5 [0.4-18.2]	0.343	4	4	1.7 [0.1-22.6]	0.671
Baseline (no)	47	0.5	1.0		36	4.3	1.0		25	2.4	10	

p-value indicates the probability of the observed difference occurring from that of the baseline group under the null hypothesis that there is no difference.

Table 5.3c: Results of series of bivariable censored normal regression models predicting the duration of decision-making time according to women's characteristics

	PPH				Infection			
		Delay	Ratio to the baseline delay			Delay	Ratio to the baseline delay	
	N	in hours	[95% CI]	p-value	N	in hours	[95% CI]	p-value
Gravidity								
Number of pregnancies								
Primigravidae	6	1	2.5 [0.2-28.7]	0.441	11	29.6	2.9 [0.6-14.7]	0.191
2-5	14	0.4	0.9 [0.1-5.5]	0.918	10	14.9	1.5 [0.3-7.6]	0.647
Baseline (6 or more)	28	0.4	1.0		8	10.2	1.0	
Healthcare								
ANC								
0	15	0.9	0.3 [0.0-4.1]	0.364	14	21.8	3.2 [0.5-21.7]	0.225
1-3 times	25	0.2	0.1 [0.0-0.8]	0.032	7	13.8	2.0 [0.2-17.0]	0.506
Baseline (>4 times)	5	2.9	1.0		5	6.9	1.0	
Planned institutional delivery								
No	42	0.4	0.6 [0.0-19.2]	0.781	21	19.3	3.3 [0.5-20.5]	0.196
Baseline (yes)	3	0.7	1.0		5	5.9	1.0	
Saw mullah before coming to hospital								
Yes	4	1.5	4.2 [0.3-68.4]	0.306	3	10.4	0.4 [0.1-2.4]	0.318
Baseline (no)	40	0.4	1.0		24	24.5	1.0	

p-value indicates the probability of the observed difference occurring from that of the baseline group under the null hypothesis that there is no difference.

Table 5.4a: Results of series of censored normal regression models predicting the duration of decision-making time according to women's characteristics (Group 1 – Complication types with dramatic symptoms)

	N	Ratio to the baseline delay [95% CI]	p-value
Area of residence			
Rural	163	2.4 [0.9-6.3]	0.069
Baseline (Urban)	44	1.0	
Remoteness			
Remotest	44	2.8 [1.0-8.2]	0.061
2nd remotest	57	1.7 [0.6-4.6]	0.333
3rd remotest	45	0.8 [0.3-2.6]	0.765
Baseline (least)	60	1.0	
Community characteristics			
Have access to midwife			
No	134	2.7 [1.2-6.2]	0.021
Baseline (yes)	65	1.0	
Have access to doctor			
No	111	2.0 [0.9-4.5]	0.083
Baseline (yes)	90	1.0	
Access to car in community			
No	17	1.3 [0.3-5.2]	0.743
Baseline (yes)	187	1.0	
Access to health care			
Cost of transportation to the first place			
> 500 Afs	52	4.4 [1.6-12.2]	0.005
<=500 Afs	46	1.6 [0.6-4.6]	0.386
<=100 Afs	32	0.6 [0.2-2.0]	0.389
Baseline (didn't pay)	66	1.0	
Reported travel time to the first place of care			
>=1.25 hours	58	1.3 [0.5-3.3]	0.543
< 1.25 hours	42	1.5 [0.6-4.3]	0.408
baseline (<0.5 hour)	95	1.0	
Education			
Education of husband			
No	133	2.6 [1.2-5.8]	0.02
Baseline	73	1.0	
Education of women			
No	163	1.1 [0.4-3.5]	0.837
Baseline (Yes)	27	1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

Table 5.4b: Results of series of censored normal regression models predicting the duration of decision-making time according to women's characteristics (Group 1 – Complication types with dramatic symptoms)

	N	Ratio to the baseline delay [95% CI]	p-value
Household economic status			
Asset-based household economic status			
Poorest	62	7.6 [2.7-21.5]	<0.001
2nd poorest	42	7.4 [2.4-23.0]	0.001
3rd poorest	54	4.1 [1.4-12.0]	0.009
Baseline (least poor)	48	1.0	
Occupation groups of husband			
Agriculture	75	5.5 [1.7-18.0]	0.005
Labourer	78	5.9 [1.8-12.2]	0.003
Government/teacher	10	1.1 [0.1-8.7]	0.917
Other	12	3.1 [0.5-19.8]	0.228
Baseline (Business)	31	1.0	
Woman's status			
Relationship with birth family and relatives			
Weak	49	0.6 [0.2-1.9]	0.411
Moderate	65	0.6 [0.2-1.6]	0.313
Baseline (strong)	65	1.0	
Relationship with husband and his family			
Not so close	64	2.3 [0.8-6.7]	0.119
Moderately close	67	2.1 [0.7-5.9]	0.178
Baseline (Very close)	48	1.0	
Have money at disposal			
No	124	0.6 [0.3-1.6]	0.326
Baseline (yes)	55	1.0	
Gravidity			
Number of pregnancies			
Primigravidae	78	2.3 [0.7-7.6]	0.166
2-5	53	1.9 [0.7-5.2]	0.227
Baseline (6 or more)	76	1.0	
Healthcare			
ANC			
0	63	6.2 [1.9-20.2]	0.002
1-3 times	92	3.6 [1.2-10.7]	0.025
Baseline (>4 times)	35	1.0	
Planned institutional delivery			
No	149	4.5 [1.7-11.8]	0.003
Baseline (yes)	41	1.0	
Saw mullah before coming to hospital			
Yes	145	4.3 [1.6-11.5]	0.003
Baseline (no)	53	1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

Table 5.5a: Results of series of censored normal regression models predicting the duration of decision-making time according to women's characteristics (Group 2 – Complication types with less dramatic symptoms)

	N	Ratio to the baseline delay [95% CI]	p-value
Area of residence			
Rural	117	5.0 [2.0-12.5]	0.001
Baseline (Urban)	33	1.0	
Remoteness			
Remotest	42	5.3 [1.9-14.6]	0.002
2nd remotest	43	2.0 [0.8-5.4]	0.158
3rd remotest	26	4.5 [1.5-13.3]	0.007
Baseline (least)	37	1.0	
Community characteristics			
Have access to midwife in community			
No	94	2.8 [1.3-6.4]	0.012
Baseline (yes)	45	1.0	
Have access to doctor in community			
No	79	1.7 [0.8-3.6]	0.173
Baseline (yes)	68	1.0	
Have access to car in community			
No	25	3.2 [1.2-8.9]	0.024
Baseline (yes)	123	1.0	
Access to health care			
Cost of transportation to the first place of care			
> 500 Afs	35	1.7 [0.6-4.8]	0.343
<=500 Afs	34	2.1 [0.7-5.9]	0.166
<=100 Afs	33	0.9 [0.3-2.6]	0.797
Baseline (didn't pay)	40	1.0	
Travel time to the first place of care			
>=1.25 hours	54	1.9 [0.9-4.1]	0.107
< 1.25 hours	24	3.1 [1.2-8.1]	0.024
baseline (<0.5 hour)	63	1.0	
Education			
Education of husband			
No	99	1.2 [0.6-2.6]	0.648
Baseline	49	1.0	
Education of women			
No	128	1.4 [0.4-4.9]	0.568
Baseline (Yes)	16	1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

Table 5.5b: Results of series of censored normal regression models predicting the duration of decision-making time according to women's characteristics (Group 2 – Complication types with less dramatic symptoms)

	N	Ratio to the baseline delay [95% CI]	p-value
Household economic status			
Asset-based economic status			
Poorest	48	2.8 [1.0-8.0]	0.057
2nd poorest	33	7.3 [2.5-21.2]	<0.001
3rd poorest	33	2.7 [1.0-7.9]	0.062
Baseline (least poor)	35	1.0	
Occupation groups of husband			
Agriculture	56	4.4 [1.4-13.5]	0.011
Labourer	53	3.7 [1.2-11.3]	0.022
Government/teacher	10	2.5 [0.5-13.1]	0.283
Other	9	1.6 [0.3-9.6]	0.582
Baseline (Business)	21	1.0	
Woman's status			
Relationship with birth family and relatives			
Weak	41	7.8 [3.2-19.2]	<0.001
Moderate	54	3.5 [1.5-8.1]	0.004
Baseline (strong)	46	1.0	
Relationship with husband and his family			
Not so close	60	0.9 [0.4-2.2]	0.805
Moderately close	42	0.5 [0.2-1.3]	0.161
Very close	40	1.0	
Have money at disposal			
No	104	2.1 [0.9-4.9]	0.106
Baseline (yes)	37	1.0	
Gravidity			
Number of pregnancies			
Primigravidae	42	1.7 [0.7-4.3]	0.259
2-5	46	1.2 [0.5-2.7]	0.725
Baseline (6 or more)	62	1.0	
Healthcare			
ANC			
0	33	4.8 [1.7-13.6]	0.004
1-3 times	61	2.0 [0.9-4.9]	0.112
Baseline (>4 times)	50	1.0	
Planned institutional delivery			
No	90	5.0 [2.3-11.0]	<0.001
Baseline (yes)	53	1.0	
Saw mullah before coming to			
Yes	10	1.3 [0.3-5.1]	0.753
Baseline (no)	133	1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

Table 5.6a: Results of series of censored normal regression models predicting the duration of decision-making time according to women's characteristics (Group 3 – All women after 22 gestational weeks before childbirth)

	N	Ratio to the baseline delay [95% CI]	p-value
Area of residence			
Rural	201	2.8 [1.3-6.1]	0.007
Baseline (Urban)	65	1.0	
Remoteness			
Remotest	56	3.3 [1.3-8.0]	0.010
2nd remotest	80	1.8 [0.8-4.1]	0.171
3rd remotest	50	1.4 [0.6-3.6]	0.464
Baseline (least)	79	1.0	
Have access to midwife in community			
No	161	3.1 [1.6-6.2]	0.001
Baseline (yes)	88	1.0	
Have access to doctor in community			
No	128	1.6 [0.9-3.1]	0.134
Baseline (yes)	132	1.0	
Have access to car in community			
No	20	2.0 [0.6-6.4]	0.262
Baseline (yes)	243	1.0	
Access to health care			
Cost of transportation to the first place of care			
> 500 Afs	51	2.4 [0.9-6.3]	0.065
<=500 Afs	60	1.8 [0.7-4.3]	0.221
<=100 Afs	59	0.7 [0.3-1.8]	0.488
Baseline (didn't pay)	82	1.0	
Travel time to the first place of care			
>=1.25 hours	77	1.5 [0.7-3.2]	0.280
< 1.25 hours	49	2.0 [0.8-4.6]	0.122
baseline (<0.5 hour)	121	1.0	
Education			
Education of husband			
No	173	1.7 [0.9-3.4]	0.119
Baseline	92	1.0	
Education of women			
No	213	1.1 [0.4-2.6]	0.888
Baseline (Yes)	39	1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

Table 5.6b: Results of series of censored normal regression models predicting the duration of decision-making time according to women's characteristics (Group 3 — All women after 22 gestational weeks before childbirth)

	N	Ratio to the baseline delay [95% CI]	p-value
Household economic status			
Asset-based household economic status			
Poorest	73	5.1 [2.1-12.2]	<0.001
2nd poorest	55	8.0 [3.2-20.1]	<0.001
3rd poorest	60	3.8 [1.6-9.0]	0.003
Baseline (least poor)	67	1.0	
Occupation groups of husband			
Agriculture	90	5.7 [2.2-15.1]	<0.001
Labourer	99	5.4 [2.1-13.9]	<0.001
Government/teacher	15	3.6 [0.8-16.1]	0.097
Other	18	2.9 [0.7-12.0]	0.150
Baseline (Business)	43	1.0	
Woman's status			
Relationship with birth family and relatives			
Weak	69	3.1 [1.4-7.1]	0.007
Moderate	80	1.7 [0.8-3.7]	0.208
Baseline (strong)	91	1.0	
Relationship with husband and his family			
Not so close	89	1.3 [0.6-3.1]	0.496
Moderately close	84	1.0 [0.4-2.3]	0.992
Very close	69	1.0	
Have money at disposal			
No	169	1.2 [0.6-2.5]	0.676
Baseline (yes)	73	1.0	
Gravidity			
Number of pregnancies			
Primigravidae	93	1.6 [0.6-4.0]	0.310
2-5	74	1.7 [0.8-3.8]	0.189
Baseline (6 or more)	99	1.0	
Healthcare			
ANC			
0	63	7.1 [2.9-17.6]	<0.001
1-3 times	114	4.0 [1.8-8.8]	0.001
Baseline (>4 times)	75	1.0	
Planned institutional delivery			
No	168	5.1 [2.5-10.2]	<0.001
Baseline (yes)	83	1.0	
Saw mullah before coming to			
Yes	48	3.5 [1.4-9.0]	0.009
Baseline (no)	209	1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

Table 5.7: Results of multivariable censored normal regression models predicting the duration of decision-making time for women in Group 1

	Model 1		Model 2		Model 3		Model 4	
	AR [95% CI]	p-value	AR [95% CI]	p-value	AR [95% CI]	p-value	AR [95% CI]	p-value
Remoteness								
Most remote	2.8 [1.0-8.2]	0.061	2.4 [0.8-7.2]	0.104	1.5 [0.4-5.1]	0.540	2.2 [0.7-6.4]	0.156
2nd most remote	1.7 [0.6-4.6]	0.333	1.2 [0.4-3.4]	0.729	0.7 [0.2-2.1]	0.488	1.1 [0.4-3.0]	0.891
3rd most remote	0.8 [0.3-2.6]	0.765	0.7 [0.2-2.1]	0.494	0.4 [0.1-1.5]	0.197	0.6 [0.2-2.0]	0.463
Baseline (least)	1.0		1.0		1.0		1.0	
Access to midwife in community								
No			2.8 [1.2-6.7]	0.017	2.4 [0.9-5.9]	0.069	1.6 [0.6-4.1]	0.377
Baseline (yes)			1.0		1.0		1.0	
Cost of transportation to the first place of care								
> 500 Afs					3.6 [1.2-10.5]	0.019	2.5 [0.8-7.4]	0.100
<=500 Afs					1.4 [0.4-4.3]	0.559	1.0 [0.3-3.2]	0.949
<=100 Afs					0.7 [0.2-2.5]	0.555	0.4 [0.1-1.5]	0.169
Baseline (didn't pay)					1.0		1.0	
Asset-based household economic status								
Poorest							4.1 [0.9-17.6]	0.061
2nd poorest							6.4 [1.6-26.2]	0.010
3rd poorest							4.5 [1.3-15.7]	0.018
Baseline (least poor)							1.0	

Table 5.7: Results of multivariable censored normal regression models predicting the duration of decision-making time for women in Group 1

	Model 5		Model 6		Final	
	AR [95% CI]	p-value	AR [95% CI]	p-value	AR [95% CI]	p-value
Remoteness						
Most remote	0.8 [0.2-3.3]	0.73	0.7 [0.2-3.0]	0.638		
2nd most remote	0.4 [0.1-1.6]	0.199	0.4 [0.1-1.5]	0.189		
3rd most remote	0.4 [0.1-1.5]	0.164	0.5 [0.1-1.8]	0.263		
Baseline (least)	1.0		1.0			
Access to midwife						
No	2.0 [0.7-5.4]	0.178	2.3 [0.8-6.4]	0.109		
Baseline (yes)	1.0		1.0			
Cost of transportation to the first						
> 500 Afs	1.3 [0.4-4.1]	0.643	1.0 [0.3-3.3]	0.997		
<=500 Afs	0.6 [0.2-2.1]	0.453	0.7 [0.2-2.2]	0.520		
<=100 Afs	0.4 [0.1-1.7]	0.22	0.5 [0.1-1.8]	0.266		
Baseline (didn't pay)	1.0		1.0			
Asset-based						
Poorest	3.8 [0.9-16.8]	0.074	3.9 [0.9-17.2]	0.073	5.6 [1.9-16.4]	0.002
2nd poorest	5.5 [1.3-23.2]	0.022	3.6 [0.8-15.6]	0.085	3.7 [1.1-12.2]	0.032
3rd poorest	3.8 [1.1-13.4]	0.036	3.2 [0.9-11.1]	0.070	3.0 [1.1-8.7]	0.039
Baseline (least poor)	1.0		1.0		1.0	
ANC						
0	3.8 [1.1-12.9]	0.031	3.7 [1.1-13.0]	0.038	3.4 [1.0-11.1]	0.048
1-3 visits	2.7 [0.9-8.1]	0.08	2.8 [0.9-8.6]	0.072	2.5 [0.9-7.5]	0.091
Baseline (4 or more)	1.0		1.0		1.0	
Visited Mullah						
Visited *mullah*			3.0 [1.1-8.4]	0.039	3.0 [1.1-8.0]	0.028
Baseline (did not)			1.0		1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

Table 5.8: Results of multivariable censored normal regression models predicting the duration of decision-making time for women in Group 2

	Model 1		Model 2		Model 3		Model 4	
	AR [95% CI]	p-value	AR [95% CI]	p-value	AR [95% CI]	p-value	AR [95% CI]	p-value
Remoteness								
Most remote	5.3 [1.9-14.6]	0.002	5.1 [1.9-14.4]	0.003	3.0 [0.9-10.1]	0.076	2.5 [0.8-8.2]	0.132
2nd most remote	2.0 [0.8-5.4]	0.158	1.9 [0.7-5.0]	0.213	1.4 [0.5-4.3]	0.560	1.3 [0.4-3.8]	0.670
3rd most remote	4.5 [1.5-13.3]	0.007	4.2 [1.4-12.7]	0.011	3.3 [1.1-10.0]	0.038	2.7 [0.9-8.0]	0.069
Baseline (least)	1.0		1.0		1.0		1.0	
Access to a car in community								
No			2.7 [1.0-7.6]	0.061	2.5 [0.9-6.8]	0.083	1.4 [0.6-3.1]	0.451
Baseline (yes)			1.0		1.0		1.0	
Asset-based household economic status								
Poorest					1.6 [0.4-5.8]	0.476	0.9 [0.2-3.4]	0.860
2nd poorest					4.3 [1.3-14.3]	0.016	3.2 [0.9-10.7]	0.061
3rd poorest					2.1 [0.7-6.4]	0.180	1.4 [0.5-4.3]	0.509
Baseline (least poor)					1.0		1.0	
Woman's status in the household								
Weak							7.1 [2.8-17.5]	<0.001
Moderate							3.0 [1.3-6.9]	0.008
Baseline (strong)							1.0	

Table 5.8: Results of multivariable censored normal regression models predicting the duration of decision-making time for women in Group 2

	Model 5		Model 6		Model 7		Final model	
	AR [95% CI]	p-value	AR [95% CI]	p-value	AR [95% CI]	p-value	AR [95% CI]	p-value
Remoteness								
Most remote	2.5 [0.8-8.2]	0.119	2.4 [0.7-7.5]	0.143	2.1 [0.7-6.4]	0.213	2.0 [0.7-6.2]	0.226
2nd most remote	1.3 [0.5-3.9]	0.604	1.1 [0.4-3.2]	0.836	1.0 [0.3-2.8]	0.978	0.9 [0.3-2.6]	0.908
3rd most remote	3.2 [1.1-9.5]	0.032	3.2 [1.1-9.3]	0.029	3.0 [1.0-8.3]	0.04	2.8 [1.0-7.7]	0.048
Baseline (least)	1.0		1.0		1.0		1.0	
Access to a car in community								
No	1.9 [0.7-5.2]	0.212	1.2 [0.4-3.5]	0.693	1.2 [0.4-3.4]	0.768		
Baseline (yes)	1.0		1.0		1.0			
Asset-based household economic status								
Poorest	1.2 [0.3-4.4]	0.748	0.9 [0.2-3.2]	0.854	0.7 [0.2-2.5]	0.573	0.7 [0.2-2.4]	0.528
2nd poorest	3.7 [1.2-11.7]	0.026	3.3 [1.1-10.2]	0.038	2.5 [0.8-7.6]	0.119	2.4 [0.8-7.3]	0.126
3rd poorest	1.8 [0.6-5.4]	0.255	1.6 [0.6-4.5]	0.394	1.3 [0.5-3.8]	0.577	1.3 [0.5-3.6]	0.625
Baseline (least	1.0		1.0		1.0		1.0	
Woman's relationship with birth family and relatives								
Weak	6.5 [2.6-16.2]	<0.001	6.4 [2.6-15.8]	<0.001	6.2 [2.5-15.0]	<0.001	6.4 [2.7-15.3]	<0.001
Moderate	2.6 [1.1-5.8]	0.025	2.3 [1.0-5.1]	0.05	2.4 [1.1-5.3]	0.034	2.5 [1.1-5.5]	0.025
Baseline (strong)	1.0		1.0		1.0		1.0	
Gravidity								
Primigravidae	2.5 [1.0-6.1]	0.052	2.6 [1.0-6.3]	0.04	2.3 [1.0-5.6]	0.063	2.2 [0.9-5.2]	0.075
2-5 pregnancies	1.6 [0.7-3.6]	0.238	1.5 [0.7-3.3]	0.279	1.4 [0.6-3.0]	0.419	1.3 [0.6-2.9]	0.452
Baseline (6 or more)	1.0		1.0		1.0		1.0	
ANC								
0			3.5 [1.2-10.1]	0.019	2.6 [0.9-7.7]	0.078	2.7 [1.0-7.4]	0.056
1-3 visits			1.3 [0.6-2.9]	0.494	1.2 [0.5-2.6]	0.697	1.2 [0.5-2.5]	0.727
Baseline (4 or more)			1.0		1.0		1.0	
Planned to deliver in a health facility								
Did not plan					2.5 [1.1-5.7]	0.023	2.7 [1.2-5.9]	0.013
Baseline (planned)					1.0		1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

Table 5.9: Results of multivariable censored normal regression models predicting the duration of decision-making time for women in Group 3

	Model 1		Model 2		Model 3		Model 4	
	AR [95% CI]	p-value	AR [95% CI]	p-value	AR [95% CI]	p-value	AR [95% CI]	p-value
Remoteness								
Most remote	3.3 [1.3-8.0]	0.010	3.4 [1.3-8.4]	0.010	1.9 [0.6-5.4]	0.244	1.9 [0.6-5.7]	0.241
2nd most remote	1.8 [0.8-4.1]	0.171	1.5 [0.6-3.6]	0.350	0.9 [0.3-2.4]	0.857	0.7 [0.3-2.0]	0.545
3rd most remote	1.4 [0.6-3.6]	0.464	1.2 [0.5-3.1]	0.729	0.8 [0.3-2.2]	0.639	0.8 [0.3-2.2]	0.647
Baseline (least)	1.0		1.0		1.0		1.0	
Access to midwife in community								
No			2.9 [1.5-5.8]	0.002	2.0 [1.0-4.3]	0.057	2.4 [1.1-5.2]	0.026
Baseline (yes)			1.0		1.0		1.0	
Asset-based household economic status								
Poorest					2.9 [0.9-9.6]	0.084	2.4 [0.7-8.4]	0.171
2nd poorest					5.4 [1.8-16.7]	0.003	4.8 [1.5-15.8]	0.010
3rd poorest					2.9 [1.1-7.7]	0.035	2.4 [0.9-6.7]	0.085
Baseline (least poor)					1.0		1.0	
Woman's relationship with birth family and relatives								
Weak							2.3 [1.0-5.2]	0.055
Moderate							1.6 [0.7-3.5]	0.258
Baseline (strong)							1.0	

Table 5.9: Results of multivariable censored normal regression models predicting the duration of decision-making time for women in Group 3

	Model 5		Model 6		Model 7		Final model	
	AR [95% CI]	p-value	AR [95% CI]	p-value	AR [95% CI]	p-value	AR [95% CI]	p-value
Remoteness								
Most remote	1.8 [0.6-5.3]	0.272	1.9 [0.7-5.5]	0.214	1.6 [0.6-4.7]	0.359		
2nd most remote	0.7 [0.3-1.9]	0.483	0.9 [0.3-2.4]	0.816	0.8 [0.3-2.0]	0.588		
3rd most remote	0.9 [0.3-2.3]	0.752	0.9 [0.4-2.5]	0.911	0.9 [0.3-2.4]	0.846		
Baseline (least remote)	1.0		1.0		1.0			
Access to midwife in community								
No	2.3 [1.1-5.0]	0.026	2.5 [1.2-5.3]	0.015	2.3 [1.1-4.8]	0.027	2.2 [1.1-4.5]	0.035
Baseline (yes)	1.0		1.0		1.0		1.0	
Asset-based household economic status								
Poorest	1.6 [0.5-5.7]	0.435	1.5 [0.4-5.2]	0.501	1.5 [0.4-5.0]	0.534	1.6 [0.6-4.6]	0.382
2nd poorest	4.2 [1.3-13.3]	0.015	2.9 [0.9-9.2]	0.067	2.6 [0.8-8.1]	0.106	2.7 [0.9-7.7]	0.063
3rd poorest	2.3 [0.9-6.2]	0.094	2.0 [0.8-5.2]	0.164	1.8 [0.7-4.7]	0.229	1.8 [0.7-4.4]	0.219
Baseline (least poor)	1.0		1.0		1.0		1.0	
Woman's relationship with birth family and relatives								
Weak	1.8 [0.8-4.2]	0.142	2.0 [0.9-4.4]	0.088	1.9 [0.9-4.3]	0.102	2.0 [0.9-4.4]	0.088
Moderate	1.2 [0.6-2.7]	0.592	1.8 [0.8-4.0]	0.146	1.8 [0.8-3.9]	0.156	1.8 [0.8-4.0]	0.138
Baseline (strong)	1.0		1.0		1.0		1.0	
ANC								
0	5.5 [2.1-14.5]	0.001	5.2 [2.0-13.5]	0.001	4.3 [1.6-11.5]	0.004	4.6 [1.7-12.2]	0.003
1-3 visits	3.4 [1.5-7.5]	0.003	2.9 [1.3-6.3]	0.01	2.6 [1.1-5.7]	0.023	2.6 [1.1-5.8]	0.022
Baseline (4 or more visits)	1.0		1.0		1.0		1.0	
Visited mullah								
Visited *mullah*			3.3 [1.2-8.7]	0.018	3.4 [1.3-9.1]	0.013	3.2 [1.2-8.5]	0.018
Baseline (did not visit *mullah*)			1.0		1.0		1.0	
Planned to use a health facility for delivery								
Did not plan to use a health facility for delivery					2.0 [0.9-4.2]	0.087	2.0 [0.9-4.2]	0.077
Baseline (planned)					1.0		1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

6. From decision to seek care to departure for healthcare facility

This chapter presents the determinants of the duration of time from decision to seek care until departure from home to obtain care ('departure delay'). The conceptual framework used for this analytic theme will be discussed first, and will be followed by the results of the bivariable and multivariable analyses.

6.1. Conceptual framework

In the model proposed by Thaddeus and Maine (1994) [45], the delay between decision and departure was not discussed separately, but was part of the delay associated with 'identifying and reaching medical facility'. In their model, physical accessibility to health facilities was identified as the main factor affecting this delay. In the conceptual framework used in this chapter (Figure 6.1), travel time and transportation cost to the first place of care were also considered as proximate determinants.

A second important category of proximate determinant of the departure delay is the ability of the husband or other male members of the family to call upon for help in order to arrange transportation or to prepare money. Particularly in the study setting, where a large proportion of the rural population do not have a regular income flow, social capital, or especially social networks of trust, plays an important role when preparing cash for travel and health care. There are various definitions of social capital that are used across different disciplines. For example, social capital has been described as 'the features of social structures which act as resources for individuals and facilitate collective action' [158], and 'the volume of social capital possessed by a given agent depends on the size of network connections he can effectively mobilize and on the volume of the capital possessed in his own right by each of those to whom he is connected' [159]. This study conceptualized social capital as the values of one's interpersonal relationships that

are characterized by the norm of reciprocity, mutual dependence and obligation. The mechanism of influence is that individuals who are more deeply socially connected are more successful at uniting with the members in their social networks to achieve individual or common goals (i.e., to take the women to the hospital) because they can mobilize both financial and physical resources (e.g. transportation). For example, Gray et al. [160] suggest that strong social capital can confer direct access to a car to those in isolated rural communities, by means of lift-giving [160]. Another example comes from a study from the Ivory Coast, which suggests that individuals with greater social capital received financial assistance from the network of people to whom they were connected [161]. The following variables were included in the analysis: the number of people from whom the husband can borrow a small amount of money that would be enough to pay for expenses for the entire household for one week, the number of people the husband declares that he can rely on in case of a long-term crisis such as harvest failure or job loss, and self-reported participation in community activities in the last 12 months.

Other background factors that are thought to be associated with both departure delay and the two proximate determinants were also included in the conceptual framework as distal determinants in order to control for their confounding effects. Season of the year was added in the conceptual framework as a distal determinant in order to capture the great seasonal variation of road conditions in the study site, as some areas in western Afghanistan are cut off by the snow during the winter months.

Access to a vehicle in the community directly affects the travel time and the transportation cost to the first place of care. Those who do not have access to a vehicle in their own community may have to send someone to fetch a vehicle from another community, which delays the woman's departure.

Access to health personnel in the community was included in the conceptual framework as a distal determinant because health personnel are able to direct the

woman and the family to the appropriate place to go, which helps them leave for the destination more quickly. Also people living in a community with health personnel may be sensitized to the urgency of the situation. Access to health personnel may also mean that the family is familiar with the location of a nearby health facility.

Household socio-economic status is positively associated with social capital[162-164], and those from high socio-economic status can also prepare for travel to obtain care much more quickly, due to having greater financial resources than their poorer counterparts, hence household socio-economic status potentially confounds the relationship between departure delay and social capital. Similarly, husband's education is a potential confounder[165] because education may also lead to greater social networks of trust, as educated men are likely to be respected and trusted within the community. Also, educated husbands are likely to be more aware of the urgency of the woman's illness and may act more quickly in case of an emergency. In this current analysis, only husband's education and social capital were considered important determinants. The woman's status or education was not taken into account because the women are ill and the majority of them are heavily pregnant. Hence, it is most likely to be other members of the family who arrange the travel. In addition, in Afghan society, where women's seclusion is highly valued, women rarely go outside on their own, and it is a cause of shame for the family to let female relatives travel on their own, particularly in more conservative rural areas. In such cultural contexts, the woman's resources whether financial or social will not play an important role in arranging transport for a journey.

Finally, area of residence was included in the current conceptual framework because it is systematically related to other determinants, as discussed in the previous chapter.

6.2. Average decision-to-departure delay time by complication types

Compared to the decision-making delay, the differences in durations of decision-to-departure delay across complication types were small. The delay was approximately one hour for all the complication types except for women with severe infection, who had a nearly 4-hour delay (p<0.001) (Table 6.1).

6.3. Bivariable analyses

In this section, the crude effect of each determinant is examined separately for each complication type in order to discern patterns of influence of the determinants across all the complication types. Where effect modification is plausible, interaction terms are entered into the regression models, and likelihood ratio tests are used to determine whether the model with interaction terms is better than the model without them. Statistics are pooled together when there is no effect modification (last columns in Table 6.2a, and 6.2b).

(a) Access to healthcare facilities

Cost of transportation to the first point of care

Table 6.2a shows a longer delay for increasing transportation costs for all complication types. However, for women with haemorrhage in early pregnancy, pre-eclampsiaand PPH no statistically significant trend was observed. .

Since there was no strong evidence of effect modification by complication type (p=0.176), the pooled ratios were obtained, which indicate that those who spent more than 500 Afs to reach the first point of care reported a three-times longer delay than those who did not spend any money to get there (95% CI =1.9–4.6, p<0.001). Those who spent between 100 Afs and 500 Afs also reported slightly longer delay than those who did not spend any money (pooled ratio to the baseline=1.6, 95% CI = 1.0–2.4, p=0.043).

Travel time to the first point of care

The average delay time from decision to departure was longer for those who later travelled more than 1.25 hours (1 hour and 15 minutes) to the first point of care than those who travelled less than half an hour to reach it. This occurred for all complication types except that the difference in delay duration did not reach a statistically significant level for women with severe pre-eclampsia, infection and PPH. Pooled statistics suggest that women who had to travel for more than 1.25 hours had three times longer decision-to-departure delay than those who reached the first point of care within half an hour (95% CI = 2.1–4.2, p<0.001).

(b) Husband's social capital

Size of husband's social network

The number of people from whom the husband can borrow a small amount of money did not appear to predict the duration of departure delay. Pooled statistics (p-value for effect modification = 0.247) showed no evidence of an association.

There was also no apparent association between the number of people the husband can rely on in case of long-term emergency and the duration of departure delay, except there was weak evidence of association found in women with eclampsia. Since there was no evidence of effect modification (p=0.660), the statistics were pooled together across the complication types. Evidence was found for an association between having no one to rely on in case of long-term crisis and a delay, increased by 1.8 times in comparison with those who have five or more people to rely on (95% CI=1.0–3.3, p=0.047).

Participation in community activities in the last 12 months

The differences in delay duration between women whose husband did not participate in community activities and those whose husband did participate were not noticeable. However, after pooling (p-value for effect modification = 0.557), there was evidence for association between longer duration of departure delay and husband not having participated in community activities in the last 12 months (pooled ratio to the baseline = 1.6, 95% CI=1.1–2.2, p=0.010).

(c) Season

There was no strong evidence of association between season of admission and departure delay, except for women with haemorrhage in early pregnancy (for winter, in reference to spring, ratio = 11.3, 95% CI=2.9–44.5, p=0.001) for summer, ratio =3.7, 95%CI=1.2–11.8, p=0.025for autumn, ratio =3.8, 95%CI=1.2–12.5, p=0.028). After pooling (p-value for effect modification=0.204) there was some evidence to suggest that women who had complications during summer and winter had longer delays than those who had complications in spring (pooled ratio=1.5, 95%CI=1.0–2.4, p=0.065 for winter and pooled ratio=1.5, 95%CI=1.0–2.4, p=0.064 for summer).

(d) Access to a car in the community

The difference observed in delay time between those with access to a car and those without in table 6.2a reached a statistically significant level only in women with eclampsia. After pooling the ratio across complication type, the difference became significantly large, with the delay increased by a factor of 2.3 for those without access to a car (95%CI=1.4–3.8, p=0.001).

(e) Access to health personnel

Access to a doctor

The differences in delay times observed in table 6.2a between women with and without access to a doctor were statistical significant among women with APH and eclampsia only (ratio=4.2, p<0.001 and ratio=2.6, p=0.002 respectively). Since there was no strong evidence for effect modification (p=0.325), the statistics were pooled together. The pooled ratio indicates that those without access to a doctor took 2.3 times longer, after the decision to obtain care was made, before departure from home than those with access to a doctor (95% CI = 1.7–3.2, p<0.001).

Access to a midwife

The effect of having access to a midwife on departure delay was similar but slightly smaller than the effect of having access to a doctor, with the pooled ratio to the baseline equal to 1.7 (95% CI =1.2–2.4, p=0.005).

(f) Socio-economic status

Household socio-economic status

Household socio-economic status was predictive of the duration of departure delay as there was an association between lower socio-economic status and longer delay, with varying degrees of association and trends for all complication types, except for women with bleeding during early pregnancy and infection. For example, compared with the least poor, those in the poorest quartile had a delay 12.8 times longer for women with rupture of uterus, 5.7 times for women with APH, 3.8 times for women with impending rupture of uterus, 3.7 times for women with PPH, and 2.4 times for women with eclampsia. The pooled ratio across complication types shows the duration of departure delay was increased by 3.1 times for women from the poorest quartile compared with those in the least poor quartile (95% CI=2.0–4.7, p<0.001).

Occupation group

Women from farming families were more prone to delay in departure than women whose husbands were engaged in business (chosen as baseline) across most complication types, except for women with pre-eclampsia and PPH. After pooling across complication types, there was strong evidence for a delay of double the time for women from farming families in comparison with women married to businessmen (95% CI =1.3–3.4, p=0.002).

(g) Husband's education

The difference in departure delay between women married to an uneducated man and those married to an educated man reached statistical significance only for women who suffered eclampsia (ratio=2.0, 95%CI=1.0–3.8, p=0.039). After pooling across the complication types, there was strong evidence for a 1.6-times longer

delay in departure from home for women married to uneducated men (95% CI=1.1-2.2, p=0.009).

(h) Area of residence

Area of residence (urban vs. rural)

In table 6.2b, the differences in delay time between women who live in rural areas and those who live in the urban area was statistically significant in women with APH, rupture of uterus and eclampsia. The pooled statistics indicate that the duration of departure delay was 1.8 times longer for women who lived in rural areas (95%CI=1.1-2.3, p=0.018).

Remoteness

There was evidence for a positive association between increased remoteness and longer delay duration for most complication types, except that for women with severe pre-eclampsia and PPH, there was no statistically significant difference. After pooling across complications, there was a strong evidence for a threefold longer delay for women coming from the most remote area (95% CI =2.0-4.7, p<0.001).

6.4. Multivariable analyses

Because of lack of evidence for interactions of complication types with the determinants, multivariable analysis was conducted on the entire sample of women, and the determinants of greater importance were identified. Selection of the variables was mainly based on the conceptual framework (Figure 6.1). The model building was carried out in two phases using a hierarchical approach[157] with a forward-fitting approach. First, the simplest model had complication types[hh] only and the distal determinants associated with the departure delay were entered into the model one by one. These were followed by the proximate determinants in a second phase to obtain the final model. Likelihood ratio tests were used to

[hh] In the earlier section, it was concluded that complication type is not an effect modifier but the variable is an important confounder.

determine whether additional variables improved the model. When there was more than one variable by a determinant category, the one that improved the model better than the others was entered first, followed by others if they still improved the model. Finally, the determinant whose effect was mediated through other determinants completely was dropped from the final model if the result of the likelihood ratio test comparing the model with the variable and the one without indicated there was no difference between the two models. Factors that were not discussed in Thaddeus and Maine's model were carefully examined because the type of delay examined in this chapter was a modification from Thaddeus and Maine's second delay, and a more exploratory approach was deemed necessary.

Model building

Remoteness of the woman's residence was first entered into the model with complication type (model 1), followed by season of admission (model 2), asset-based socio-economic status of household (model 3), and access to a doctor (model 4). Comparing model 2 with model 3, the effect of living in a remote area was partly explained by poor socio-economic status. In the next phase, the travel time to the first place of care (model 5), the cost of transportation to the first place of care (model 6), and the number of people the husband can rely on in case of long-term emergency (model 7), were entered one after another. The relationship between the poorest quartile and delay in departure was reduced and it was no longer significant in model 5, which suggests that poor women live in areas where access to healthcare facilities is difficult.

In the final model, physical access to first place of care was found to be a very important determinant of the departure delay. Women who travelled for more than 1 hour 15 minutes to a first point of care had a 2.2 times longer departure delay than those who could reach a first point of care within half an hour (95% CI = 1.5–3.2, $p<0.001$). Women whose initial transportation costs were greater than 500 Afs also had a 1.8 times longer departure delay than those who did not spend any money to travel to the first place of care (95%CI=1.1–2.7, $p=0.013$). The size of

social network was also found to be important: those who had no one to rely on in case of long-term crisis took 1.8 times longer to prepare to leave home after the decision was made (95%CI=1.1–3.1, p=0.032) in comparison with someone who had five or more people. Lack of access to a doctor in the community also significantly increased the departure delay, by a ratio of 1.7 (95% CI=1.2–2.4, p=0.001). It was also found that women who had complications in summer and in winter experienced a longer departure delay than those who had complications in spring time (adjusted ratio = 1.6, 95%CI=1.0–2.4, p=0.030 and adjusted ratio =1.5, 95%CI=1.0–2.2. p=0.060 respectively).

6.5. Summary

This chapter presents the determinants of the duration between the time a decision to seek care was reached and the time women departed from their home to obtain care. While Thaddeus and Maine (1994) did not examine this particular time interval separately from the second delay, we postulated that calculating the duration of this delay had programmatic relevance, in particular if there were differences in determinants when compared with the other delays examined in this thesis. The average duration of the departure delay was shorter than the decision delay, and was similar across most complication types, except for severe infection which had a slightly longer average delay duration. The strong relationship between access to care, whether in the community or outside the community, and the duration of delay was probably the most striking finding in this chapter. There were statistically significant differences in the duration of delay according to accessibility of first place of care, indicating that the anticipation of a long journey was a deterrent for seeking help quickly. Lack of access to a doctor in the community was also significantly associated with increased delay. With respect to social capital, there was evidence of an association between having no one to rely on in case of long-term emergency and increased departure delay. Finally, seasonal variation in departure delay was also observed.

Figure 6.1: Conceptual framework to explain determinants of departure delay

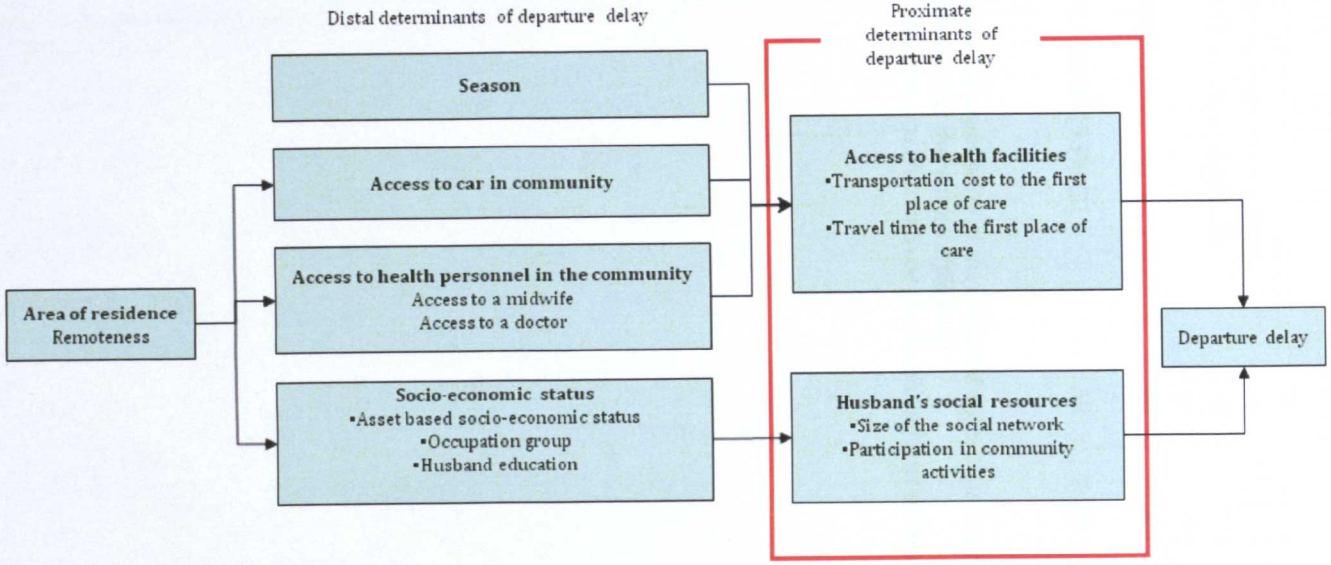


Table 6.1: Results of the censored regression model predicting the average duration of departure delay according to complication types

	Delay			
	N	in hour	ratio to the baseline [95%CI]	p-value
Type of complication				
Eclampsia	98	0.9	1.1 [0.7-1.9]	0.612
Pre-eclampsia	45	0.8	1.0[0.6-1.9]	0.952
Rupture of uterus	34	1.2	1.6[0.8-3.1]	0.199
Impending rupture of uterus	39	1.8	2.3 [1.2-4.3]	0.014
Bleeding in early pregnancy	59	1.4	1.7 [1.0-3.1]	0.064
PPH	48	0.9	1.2 [0.7-2.2]	0.565
Infection	28	4.1	5.3 [2.5-11.1]	<0.001
Baseline (APH) [95% CI]	59	0.8[0.5-1.2]		

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.
The duration for APH was chosen to be the baseline duration because women with APH had the shortest delay.

Table 6.2a: Results of series of bivariable censored regression models predicting the duration of departure delay according to women's characteristics

	Bleeding in early pregnancy				APH				Pre-eclampsia			
	N	delay	Ratio [95% CI]	p-value	N	delay	Ratio [95% CI]	p-value	N	delay	Ratio [95% CI]	p-value
Access to health care facilities												
Transportation cost to the first place of care												
> 500 Afs	5	3.3	2.3 [0.4-12.6]	0.327	8	1.4	2.6 [0.9-7.5]	0.078	3	0.2	0.4 [0.0-4.1]	0.412
<=500 Afs	18	1.2	0.8 [0.2-2.8]	0.743	13	1.7	3.2 [1.3-7.8]	0.014	8	0.7	1.3 [0.3-7.1]	0.727
<=100 Afs	23	1.1	0.7 [0.2-2.4]	0.608	14	0.5	1.0 [0.4-2.4]	0.949	18	1.3	2.6 [0.7-9.7]	0.142
Baseline (didn't pay)	12	1.4	1.0		22	0.5	1.0		16	0.5	1.0	
Travel time to the first place of care												
> 1.25 hour	14	3.8	3.7 [1.5-9.5]	0.007	18	1.5	3.3 [1.6-6.8]	0.042	12	0.9	1.6 [0.5-5.0]	0.425
<= 1.25 hour	14	0.6	0.6 [0.3-1.6]	0.303	10	1.1	2.4 [1.0-5.7]	0.002	9	1.1	2.0 [0.6-6.9]	0.250
Baseline (<= 0.5 hour)	28	1.0	1.0		29	0.4	1.0		23	0.5	1.0	
Indicators of husband's social capital												
Number of people husband can borrow small money from												
0	3	0.5	0.3 [0.0-1.9]	0.177	3	1.6	3.3 [0.6-17.0]	0.158	3	2.0	4.2 [0.4-47.5]	0.236
1-2	15	1.3	0.7 [0.2-2.1]	0.510	28	0.8	1.6 [0.7-3.7]	0.259	9	1.0	2.2 [0.4-11.1]	0.344
3-4	20	1.2	0.7 [0.2-1.9]	0.429	12	1.2	2.5 [0.9-6.9]	0.070	18	0.9	1.8 [0.5-7.0]	0.383
baseline (> 5)	18	1.9	1.0		16	0.5	1.0		15	0.5	1.0	
Number of people husband can rely on in case of a long term emergency												
0	30	1.6	0.4 [0.1-2.4]	0.336	30	0.9	2.0 [0.6-6.3]	0.242	18	1.0	0.7 [0.1-4.2]	0.705
1-2	19	1.0	0.3 [0.1-1.6]	0.155	15	0.8	1.7 [0.5-6.1]	0.386	19	0.6	0.4 [0.1-2.44]	0.322
3-4	3	0.4	0.1 [0.0-1.3]	0.077	7	1.0	2.3 [0.5-9.8]	0.259	3	0.3	0.2 [0.0-3.0]	0.233
Baseline (>5)	4	3.7	1.0		7	0.4	1.0		6	1.4	1.0	
Participated in community activities in last 12 months												
No	40	1.4	0.9 [0.4-2.4]	0.893	40	1.0	1.9 [0.9-4.1]	0.088	26	1.3	3.3 [1.0-10.2]	0.043
Baseline (yes)	17	1.5	1.0		19	0.5	1.0		19	0.4	1.0	
Season												
Summer	21	1.4	3.7 [1.2-11.8]	0.025	12	1.0	1.7 [0.6-4.3]	0.277	11	1.1	2.2 [0.5-9.3]	0.278
Autumn	17	1.5	3.8 [1.2-12.5]	0.028	17	0.8	1.4 [0.6-3.3]	0.486	10	0.7	1.4 [0.3-6.6]	0.638
Winter	9	4.3	11.3 [2.9-44.5]	0.001	9	1.3	2.3 [0.8-6.6]	0.130	8	1.4	2.8 [0.6-13.9]	0.122
Baseline (Spring)	12	0.4	1.0		22	0.6	1.0		18	0.5	1.0	
Access to a car in community												
No	6	2.7	2.3 [0.6-9.2]	0.250	5	1.6	2.2 [0.6-7.7]	0.220	3	0.8	1.0 [0.1-10.1]	0.973
Baseline (yes)	52	1.2	1.0		54	0.7	1.0		43	0.8	1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

Table 6.2a (cont'd): Results of series of bivariable censored regression models predicting the duration of departure delay according to women's characteristics

	Eclampsia				Impending rupture				Rupture of uterus			
	N	delay	Ratio[95% CI]	p-value	N	Delay	Ratio[95% CI]	p-value	N	Delay	Ratio[95% CI]	p-value
Access to health care facilities												
Transportation cost to the first place of care												
> 500 Afs	25	1.9	2.4 [1.1-5.0]	0.024	11	5.2	4.9 [1.4-17.1]	0.015	9	2.9	6.4 [1.2-34.9]	0.033
<=500 Afs	20	1	1.2 [0.5-2.7]	0.640	11	1.2	1.1 [0.3-3.9]	0.871	10	1.4	3.0 [0.6-15.5]	0.182
<=100 Afs	15	0.3	0.4 [0.1-0.9]	0.024	9	1.2	1.1 [0.3-4.2]	0.861	3	0.7	1.5 [0.2-15.5]	0.708
Baseline (didn't pay)	35	0.8	1.0		9	1.1	1.0		8	0.5	1.0	
Travel time to the first place of care												
> 1.25 hour	25	1.8	3.1 [1.6-6.2]	0.002	14	3.9	3.6 [1.3-10.1]	0.015	10	4.9	5.9 [2.0-17.7]	0.002
<= 1.25 hour	20	0.9	1.5 [0.7-3.2]	0.316	7	1.4	1.3 [0.4-4.7]	0.673	6	0.6	0.7 [0.2-2.7]	0.630
Baseline (<= 0.5 hour)	46	0.6	1.0		18	1.1	1.0		16	0.8	1.0	
Indicators of husband's social capital												
Number of people husband can borrow small money												
0	3	0.6	0.6 [0.1-4.0]	0.599	1	5.5	2.4 [0.1-53.7]	0.562	1	0.5	0.6 [0.0-22.0]	0.784
1-2	34	0.9	1.0 [0.4-2.4]	0.958	12	2.2	1.0 [0.3-3.3]	0.960	9	2.1	2.5 [0.4-14.3]	0.281
3-4	40	0.9	1.0 [0.4-2.3]	0.982	15	1.1	0.5 [0.2-1.6]	0.231	17	1.1	1.4 [0.3-6.5]	0.652
baseline (> 5)	21	0.9	1.0		12	2.3	1.0		7	0.8	1.0	
Number of people husband can rely on in case of a long term emergency												
0	51	1	3.0 [0.9-10.0]	0.076	16	2.2	1.1 [0.2-7.0]	0.935	20	1.5	3.1 [0.4-21.7]	0.244
1-2	39	0.9	2.7 [0.8-9.4]	0.107	18	1.7	0.8 [0.1-5.1]	0.813	6	1.3	2.8 [0.3-26.3]	0.368
3-4	0				3	0.6	0.3 [0.0-3.0]	0.273	4	1.0	2.1 [0.2-24.9]	0.537
Baseline (>5)	8	0.3	1.0		3	2.1	1.0		4	0.5	1.0	
Participated in community activities in last 12 months												
No	64	1	1.3 [0.7-2.6]	0.408	26	1.7	1.0 [0.4-2.7]	0.949	23	1.4	1.6 [0.4-6.2]	0.493
Baseline (yes)	33	0.8	1.0		14	1.8	1.0		10	0.9	1.0	
Season												
Summer	19	1.2	1.3 [0.5-3.9]	0.579	5	0.9	0.8 [0.2-3.6]	0.798	6	2.1	0.8 [0.1-5.1]	0.781
Autumn	30	0.9	1.0 [0.4-2.6]	0.975	8	2.5	2.2 [0.6-7.5]	0.219	6	0.9	0.3 [0.0-2.1]	0.227
Winter	35	0.8	0.9 [0.4-2.4]	0.863	11	3.4	3.0 [1.0-9.4]	0.056	16	0.8	0.3 [0.1-1.4]	0.127
Baseline (Spring)	15	0.9	1.0	-	16	1.1	1.0		6	2.7	1.0	
Access to a car in community												
No	5	3.6	4.3 [1.1-16.9]	0.036	4	1.3	0.7 [0.1-3.8]	0.706	5	1.7	1.5 [0.3-8.6]	0.634
Baseline (yes)	93	0.8	1.0		36	1.8	1.0		29	1.1	1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

Table 6.2a (cont'd): Results of series of bivariable censored regression models predicting the duration of departure delay according to women's characteristics

	PPH				Infection					Pooled		
	N	delay	Ratio[95% CI]	p-value	delay	N	delay	Ratio[95% CI]	p-value	N	Ratio [95% CI]	p-value
Access to health care facilities												
Transportation cost to the first place of care												
> 500 Afs	20	1.3	2.0 [0.7-5.6]	0.206	1.6	12	8.6	8.0 [1.3-49.0]	0.027	97	3.0 [1.9-4.6]	<0.001
<=500 Afs	12	1	1.5 [0.5-4.8]	0.491	0.8	6	5.3	4.9 [0.6-40.2]	0.135	100	1.6 [1.0-2.4]	0.043
<=100 Afs	3	1.1	1.8 [0.3-10.0]	0.516	0.6					85	1.0 [0.7-1.7]	0.861
Baseline (didn't pay)	9	0.7	1.0		0.5	8	1.1	1.0		119	1.0	
Travel time to the first place of care												
> 1.25 hour	13	1.3	1.5 [0.6-3.8]	0.352	2	15	7.5	4.2 [0.7-25.9]	0.12	127	3.0 [2.1-4.2]	<0.001
<= 1.25 hour	13	0.9	1.0 [0.41-2.5]	0.982	0.8	3	3.5	1.9 [0.1-29.1]	0.62	82	1.3 [0.9-1.9]	0.185
Baseline (<= 0.5 hour)	22	0.9	1.0		0.7	7	1.8	1.0		189	1.0	
Indicators of husband's social capital												
Number of people husband can borrow small money												
0	3	1	2.1 [0.4-12.6]	0.392	1	3	3.5	33.8 [0.8-1362.7]	0.061	20	1.3 [0.6-2.8]	0.522
1-2	21	1.2	2.5 [0.9-7.0]	0.074	1.1	14	6	58.1 [2.8-1220.9]	0.011	145	1.5 [1.0-2.3]	0.062
3-4	13	1.1	2.3 [0.8-6.9]	0.143	0.9	8	4.7	44.8 [1.9-1066.5]	0.021	145	1.2 [0.8-1.9]	0.332
baseline (> 5)	9	0.5	1.0		0.7	2	0.1	1.0		100	1.0	
Number of people husband can rely on in case of a long term emergency												
0	27	1.2	7.3 [0.6-93.1]	0.123	1.1	19	4.7	9.4 [0.1-639.7]	0.285	214	1.8 [1.0-3.3]	0.047
1-2	18	0.8	4.7 [0.4-61.8]	0.229	0.8	7	3	6.1 [0.1-500.0]	0.408	142	1.3 [0.7-2.4]	0.361
3-4	1	0.5	3. [0.1-102.9]	0.534	0.6					21	0.9 [0.4-2.2]	0.881
Baseline (>5)	1	0.2	1.0		0.6	1	0.5	1.0		35	1.0	
Participated in community activities in last 12 months												
No	28	1.2	1.7 [0.8-3.7]	0.190	1.2	25	4	1.8 [0.1-39.9]	0.707	275	1.6 [1.1-2.2]	0.010
Baseline (yes)	18	0.7	1.0		0.7	2	2.2	1.0		134	1.0	
Seasonal factor												
Summer	8	0.9	1.0 [0.3-3.1]	0.976	1.1	5	3	0.5 [0.1-6.0]	0.602	88	1.5 [1.0-2.44]	0.064
Autumn	13	1	1.1 [0.4-2.8]	0.893	0.9	8	1.8	0.3 [0.01-3.0]	0.306	111	1.3 [0.8-2.0]	0.288
Winter	11	0.9	1.0 [0.4-2.8]	0.995	1.1	6	6.9	1.3 [0.1-12.2]	0.841	108	1.5 [1.0-2.4]	0.065
Baseline (Spring)	16	0.9	1.0		0.7	8	5.5	1.0		113	1.0	
Access to a car in community												
No	7	1.9	2.2 [0.8-6.3]	0.139	1.9	13	7.6	3.8 [0.8-18.9]	0.097	49	2.3 [1.4-3.8]	0.001
Baseline (yes)	40	0.9	1.0		0.8	14	2	1.0		365	1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

Table 6.2b: Results of series of bivariable censored regression models predicting the duration of departure delay according to women's characteristics

	Bleeding in early pregnancy				APH				Pre-eclampsia			
	N	delay	Ratio[95% CI]	p-value	N	delay	Ratio[95% CI]	p-value	N	delay	Ratio [95% CI]	p-value
Access to health personnel												
Presence of doctor in community												
No	27	1.4	1.1 [0.4-2.6]	0.869	24	1.8	4.2 [2.2-7.9]	<0.001	16	1.1	1.7 [0.5-5.8]	0.368
Baseline (there is)	31	1.3	1.0		33	0.4	1.0		30	0.6	1.0	
Presence of midwife in community												
No	38	1.4	0.9 [0.4-2.4]	0.869	38	1.1	2.6 [1.2-5.5]	0.015	22	0.8	1.0 [0.3-3.3]	0.939
Baseline (there is)	17	1.5	1.0		18	0.4	1.0		18	0.8	1.0	
Indicators of household socio-economic status												
Asset-based economic status												
Poorest	10	1.5	1.1 [0.3-3.9]	0.899	17	1.3	5.7 [2.3-14.4]	<0.001	6	0.2	0.4 [0.1-2.2]	0.262
2nd poorest	12	1.9	1.4 [0.4-4.5]	0.619	12	0.9	3.9 [1.5-10.4]	0.007	8	1	1.9 [0.4-8.4]	0.388
3rd poorest	18	1	0.7 [0.2-2.0]	0.473	18	1	4.4 [1.8-10.7]	0.002	10	2.6	4.6 [1.3-17.3]	0.023
Baseline (least poor)	19	1.4	1.0		12	0.2	1.0		23	0.6	1.0	
Occupation groups of husband												
Agriculture	22	1.9	2.4 [0.7-8.0]	0.164	19	1.8	3.6 [1.6-8.3]	0.003	9	0.7	0.8 [0.1-4.7]	0.777
Labour	21	1.1	1.4 [0.4-4.8]	0.589	23	0.7	1.4 [0.6-3.2]	0.393	19	0.7	0.8 [0.2-3.3]	0.697
Government/teacher	6	1.7	2.1 [0.4-10.8]	0.373	2	0.1	0.2 [0.0-1.2]	0.081	5	1.1	1.2 [0.2-9.5]	0.844
Other	0				2	0.1	0.3 [0.0-1.8]	0.175	3	1.1	1.3 [0.1-14.9]	0.846
Baseline (Business)	10	0.8	1.0		13	0.5	1.0		11	0.9	1.0	
Education of husband												
No	35	1.6	1.5 [0.6-3.7]	0.343	39	1	1.8 [0.9-3.8]	0.120	22	0.7	0.8 [0.3-2.4]	0.671
Baseline (yes)	23	1	1.0		20	0.5	1.0		25	0.9	1.0	
Area of residence												
Urban vs. rural												
Rural	41	1.4	1.2 [0.5-3.0]	0.748	45	1	2.4 [1.1-5.2]	0.030	25	0.6	0.5 [0.2-1.6]	0.234
Baseline (urban)	18	1.2	1.0		15	0.4	1.0		22	1.1	1.0	
Remoteness												
Most remote	11	2.8	3.5 [1.1-11.8]	0.040	12	1.6	3.1 [1.2-8.1]	0.021	4	1.4	1.6 [0.2-13.7]	0.653
2nd remotest	11	1	1.3 [0.4-4.3]	0.682	15	0.5	1.1 [0.4-2.7]	0.911	10	0.3	0.4 [0.1-1.6]	0.165
3rd remotest	19	1.8	2.3 [0.8-6.4]	0.116	15	1.1	2.1 [0.9-5.2]	0.096	15	1.1	1.3 [0.4-4.8]	0.672
Baseline (least remote)	18	0.8	1.0		18	0.5	1.0		18	0.8	1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

Table 6.2b (cont'd): Results of series of bivariable censored regression models predicting the duration of departure delay according to women's characteristics

	Eclampsia				Impending rupture of uterus				Rupture of uterus			
	N	delay	Ratio[95% CI]	p-value	N	Delay	Ratio [95% CI]	p-value	N	Delay	Ratio[95% CI]	p-value
Access to health personnel												
Presence of doctor in community												
No	58	1.3	2.6 [1.4-4.8]	0.002	22	2.3	1.8 [0.7-4.8]	0.218	18	1.9	2.7 [0.8-8.7]	0.092
Baseline (there is)	40	0.5	1.0		18	1.3	1.0		15	0.7	1.0	
Presence of midwife in community												
No	62	1.1	1.9 [1.0-3.7]	0.045	25	1.9	1.3 [0.4-3.7]	0.657	20	1.8	2.9 [0.9-9.9]	0.086
Baseline (there is)	34	0.6	1.0		12	1.5	1.0		12	0.6	1.0	
Indicators of household socio-economic status												
Asset-based economic status												
Poorest	29	1.3	2.4 [1.1-5.5]	0.032	13	4.8	3.8 [1.0-14.3]	0.047	12	2.3	12.8 [1.9-85.5]	0.010
2nd poorest	18	0.8	1.5 [0.6-3.8]	0.379	11	1.3	1.1 [0.3-4.1]	0.939	9	1.5	8.6 [1.2-61.1]	0.034
3rd poorest	26	1	1.9[0.8-4.3]	0.134	10	0.8	0.6 [0.2-2.6]	0.512	9	1	5.4 [0.8-38.8]	0.088
Baseline (least poor)	26	0.5	1.0		6	1.3	1.0		4	0.2	1.0	
Occupation groups of husband												
Agriculture	35	1.4	3.2 [1.3-7.9]	0.013	20	4.7	2.4 [0.2-8.6]	0.695	20	2.4	4.6 [0.8-24.9]	0.079
Labour	36	1	2.1 [0.9-5.3]	0.098	11	0.9	0.5 [0.1-3.2]	0.428	15	1.3	2.5 [0.5-12.4]	0.255
Government/teacher	5	0.4	0.8 [0.2-3.8]	0.810	4	1.7	0.9 [0.1-8.0]	0.896	1	0		
Other	8	0.5	1.1 [0.3-4.0]	0.894	2	0.7	0.4 [0.0-5.3]	0.452	3	1.1	2.1 [0.2-21.0]	0.502
Baseline (Business)	15	0.5	1.0		3	1.9	1.0		5	0.5	1.0	
Education of husband												
No	66	1.1	2.0 [1.0-3.8]	0.039	29	2.2	2.4 [0.8-6.9]	0.098	25	1.4	1.7 [0.5-6.6]	0.414
Baseline (yes)	33	0.6	1.0		11	0.9	1.0		9	0.8	1.0	
Area of residence												
Urban vs. rural												
Rural	75	1.1	2.2 [1.1-4.4]	0.032		1.7	0.7 [0.1-4.2]	0.660		6.3	1.6 [1.2-31.9]	0.027
Baseline (urban)	24	0.5	1.0			2.5	1.0			0.2	1.0	
Remoteness												
Most remote	24	1.4	2.5 [1.1-5.7]	0.097	11	3	2.8 [06-11.9]	0.161	10	2.8	6.7 [1.1-25.2]	0.016
2nd remotest	23	0.9	1.7 [0.8-3.5]	0.183	17	1.6	2.2 [0.4-5.8]	0.279	12	1.2	1.6 [0.3-7.3]	0.143
3rd remotest	27	1.2	2.2 [0.9-5.7]	0.025	5	1.5	2.3 [0.2-8.3]	0.301	3	1.3	3.0 [1.1-31.5]	0.304
Baseline (least remote)	25	0.6	1.0		7	1.1	1.0		8	0.4	1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

Table 6.2b (cont'd): Results of series of bivariable censored regression models predicting the duration of departure delay according to women's characteristics

	PPH				Infection				Pooled		
	N	delay	Ratio [95% CI]	p-value	N	delay	Ratio[95% CI]	p-value	N	Ratio [95% CI]	p-value
Access to health personnel											
Presence of doctor in community											
No	30	1.2	1.8 [0.8-4.0]	0.161	23	5	6.6 [0.6-69.4]	0.11	221	2.3 [1.7-3.2]	<0.001
Baseline (there is)	16	0.7	1.0		4	0.8	1.0		189	1.0	
Presence of midwife in community											
No	35	1.1	1.4 [0.6-3.4]	0.458	25	4.1	3.2 [0.1-117.4]	0.520	270	1.7 [1.2-2.4]	0.005
Baseline (there is)	12	0.8	1.0		2	1.3	1.0		126	1.0	
Indicators of household socio-economic status											
Asset-based economic status											
Poorest	15	2.2	3.7 [1.4-9.5]	0.009	18	3.6	13.1 [0.3-599.0]	0.177	124	3.1 [2.0-4.7]	<0.001
2nd poorest	13	0.6	1.0 [0.4-2.5]	0.923	36	2.9	10.4 [0.1-754.9]	0.269	86	1.8 [1.1-2.8]	0.014
3rd poorest	10	0.8	1.4 [0.5-3.9]	0.528	5	0.5	1.9 [0.0-110.9]	0.745	106	1.7 [1.1-2.6]	0.016
Baseline (least poor)	10	0.6	1.0		1	0.5	1.0		102	1.0	
Occupation groups of husband											
Agriculture	19	0.7	0.7 [0.2-2.3]	0.507	16	5.1	1.2 [0.1-23.7]	0.894	152	2.1 [1.3-3.4]	0.002
Labour	18	1.6	1.5 [0.4-5.2]	0.505	8	1.4	0.3 [0.0-7.4]	0.465	152	1.4 [0.9-2.2]	0.157
Government/teacher	3	1.4	1.4 [0.2-7.9]	0.721	1				27	1.3 [0.6-2.7]	0.452
Other	3	0.8	0.8 [0.0-1.0]	0.053	0				22	0.9 [0.4-1.9	0.753
Baseline (Business)	5	1	1.0		2	4.2	1.0		65	1.0	
Education of husband											
No	27	1	1.2 [0.6-2.6]	0.611	23	4.7	2.6 [0.2-33.5]	0.454	269	1.6 [1.1-2.2]	0.009
Baseline (yes)	21	0.9	1.0		3	1.8	1.0		147	1.0	
Area of residence											
Urban vs. rural											
Rural	42	1	1.1 [0.3-3.4]	0.91	25	4.6	9.2 [0.5-175.1]	0.133	324	1.6 [1.1-2.3]	0.018
Baseline (urban)	6	0.9	1.0		2	0.5	1.0		96	1.0	
Remoteness											
Most remote	7	1.8	1.5 [0.5-4.8]	0.493	16	7.1	7.9 [0.7-89.9]	0.094	97	3.0 [2.0-4.7]	<0.001
2nd remotest	13	0.5	0.7 [0.2-1.1]	0.075	5	1.8	2.0 [0.1-35.5]	0.620	114	1.2 [0.8-1.7]	0.505
3rd remotest	16	0.9	0.8 [0.3-2.0]	0.572	3	2.8	3.1 [0.1-70.5]	0.471	90	1.9 [1.2-2.8]	0.005
Baseline (least remote)	11	1.2	1.0		3	0.9	1.0		116	1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

Table 6.3 : Results of multivariable censored normal regression models predicting the duration of departure delay

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Ratio [95%CI]	p-value	Ratio [95%CI]	p-value	Ratio [95%CI]	p-value	Ratio [95%CI]	p-value	Ratio [95%CI]	p-value
Complication type										
Bleeding in early pregnancy	1.5 [0.8-2.7]	0.186	1.4 [0.8-2.6]	0.258	1.6 [0.9-2.8]	0.130	1.8 [1.0-3.2]	0.062	1.5 [0.8-2.6]	0.166
APH	0.9 [0.5-1.6]	0.654	0.9 [0.5-1.6]	0.705	0.9 [0.5-1.6]	0.714	1.1 [0.6-1.9]	0.845	0.9 [0.5-1.6]	0.752
Pre-eclampsia	1.0 [0.5-1.9]	0.966	1.0 [0.5-1.9]	0.985	1.2 [0.6-2.2]	0.627	1.4 [0.7-2.6]	0.341	1.1 [0.6-2.0]	0.789
Eclampsia	1.0 [0.6-1.8]	0.931	0.9 [0.5-1.6]	0.829	1.0 [0.6-1.7]	0.997	1.0 [0.6-1.8]	0.887	1.0 [0.6-1.7]	0.999
Impending rupture of uterus	1.9 [1.0-3.7]	0.056	1.9 [1.0-3.7]	0.051	2.0 [1.1-3.8]	0.034	2.3 [1.2-4.3]	0.014	2.2 [1.2-4.0]	0.011
Rupture of uterus	1.3 [0.7-2.7]	0.415	1.2 [0.6-2.4]	0.590	1.2 [0.6-2.4]	0.563	1.4 [0.7-2.8]	0.349	1.6 [0.8-3.0]	0.184
Infection	3.3 [1.5-7.1]	0.002	3.2 [1.5-6.9]	0.002	2.9 [1.4-6.1]	0.005	2.8 [1.3-5.8]	0.008	3.0 [1.5-6.0]	0.003
Baseline (PPH)	1.0		1.0		1.0		1.0		1.0	
Remoteness										
Most remote	3.0 [2.0-4.7]	<0.001	3.1 [2.0-4.8]	<0.001	1.9 [1.2-3.1]	0.011	1.7 [1.0-2.8]	0.035	1.2 [0.7-2.0]	0.500
2nd remote	1.1 [0.8-1.7]	0.505	1.2 [0.8-1.8]	0.430	0.8 [0.5-1.3]	0.346	0.7 [0.4-1.1]	0.107	0.6 [0.4-0.9]	0.012
3rd remote	1.9 [1.2-2.8]	0.005	1.9 [1.3-3.0]	0.003	1.7 [1.1-2.7]	0.019	1.5 [1.0-2.4]	0.059	1.4 [0.9-2.1]	0.174
Baseline (least)	1.0		1.0		1.0		1.0		1.0	
Season										
Summer			1.5 [1.0-2.4]	0.053	1.5 [1.0-2.4]	0.049	1.5 [1.0-2.3]	0.067	1.7 [1.1-2.6]	0.013
Autumn			1.3 [0.9-2.0]	0.179	1.2 [0.8-1.8]	0.360	1.2 [0.8-1.8]	0.351	1.3 [0.9-1.9]	0.187
Winter			1.7 [1.1-2.6]	0.018	1.6 [1.1-2.5]	0.020	1.7 [1.1-2.7]	0.010	1.6 [1.0-2.3]	0.029
Baseline (Spring)			1.0		1.0		1.0		1.0	
Asset-based socio-economic status										
Poorest					2.7 [1.6-4.5]	<0.001	2.0 [1.2-3.5]	0.010	1.5 [0.9-2.6]	0.101
2nd poorest					1.6 [1.0-2.6]	0.062	1.3 [0.8-2.1]	0.355	1.2 [0.7-1.9]	0.546
3rd poorest					1.5 [1.0-2.4]	0.058	1.4 [0.9-2.1]	0.170	1.2 [0.8-1.9]	0.320
Baseline (least)					1.0		1.0		1.0	
Access to a doctor										
No access to a doctor							2.0 [1.4-2.8]	<0.001	1.7 [1.2-2.4]	0.002
Baseline (yes)							1.0		1.0	
Travel time to the first place of care										
>1.25 hour									2.5 [1.7-3.7]	<0.001
<= 1.25 hour									1.1 [0.7-1.5]	0.777
Baseline (<= 0.5hr)									1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

Table 6.3 (continued): Results of multivariable censored normal regression models predicting the duration of departure delay

	Model 6		Model 7		Final model	
	Ratio	p-value	Ratio [95%CI]	p-value	Ratio [95%CI]	p-value
Complication type						
Bleeding in early pregnancy	1.6 [0.9-2.9]	0.124	1.7 [0.9-3.0]	0.091	1.7 [0.9-3.0]	0.084
APH	1.0 [0.6-1.8]	0.944	1.1 [0.6-2.0]	0.729	1.1 [0.6-2.0]	0.716
Pre-eclampsia	1.2 [0.6-2.1]	0.659	1.3 [0.7-2.3]	0.477	1.3 [0.7-2.3]	0.473
Eclampsia	1.1 [0.6-1.8]	0.824	1.0 [0.6-1.8]	0.854	1.1 [0.6-1.8]	0.822
Impending rupture	2.3 [1.2-4.3]	0.008	2.5 [1.4-4.6]	0.003	2.5 [1.3-4.6]	0.004
Rupture of uterus	1.7 [0.8-3.3]	0.139	1.8 [0.9-3.6]	0.083	1.8 [0.9-3.6]	0.087
Infection	3.1 [1.5-6.2]	0.002	2.9 [1.5-5.9]	0.003	3.1 [1.5-6.1]	0.002
Baseline (PPH)	1.0		1.0		1.0	
Remoteness						
Most remote	1.2 [0.7-2.1]	0.483	1.2 [0.7-2.1]	0.431	1.2 [0.8-2.0]	0.385
2nd remote	0.6 [0.4-0.9]	0.028	0.6 [0.4-1.0]	0.035	0.6 [0.4-0.9]	0.020
3rd remote	1.4 [0.9-2.2]	0.188	1.3 [0.8-2.1]	0.221	1.3 [0.8-2.0]	0.239
Baseline (least)	1.0		1.0		1.0	
Season						
Summer	1.6 [1.0-2.4]	0.032	1.6 [1.1-2.5]	0.027	1.6 [1.0-2.4]	0.030
Autumn	1.3 [0.9-1.9]	0.230	1.2 [0.8-1.8]	0.297	1.2 [0.8-1.8]	0.281
Winter	1.5 [1.0-2.3]	0.045	1.5 [1.0-2.2]	0.058	1.5 [1.0-2.2]	0.060
Baseline (Spring)	1.0		1.0		1.0	
Asset-based socio-economic status						
Poorest	1.4 [0.8-2.3]	0.263	1.1 [0.6-1.9]	0.766		
2nd poorest	1.1 [0.6-1.8]	0.783	0.9 [0.5-1.4]	0.564		
3rd poorest	1.2 [0.8-1.8]	0.504	1.0 [0.7-1.6]	0.914		
Baseline (least)	1.0		1.0			
Access to a doctor						
No access to a doctor	1.6 [1.1-2.3]	0.007	1.7 [1.2-2.4]	0.001	1.7 [1.2-2.4]	0.001
Baseline (yes)	1.0		1.0		1.0	
Travel time to the first place of care						
> 1.25 hour	2.1 [1.4-3.2]	<0.001	2.1 [1.4-3.2]	<0.001	2.2 [1.5-3.2]	<0.001
<= 1.25 hour	1.0 [0.6-1.4]	0.811	0.9 [0.6-1.4]	0.767	0.9 [0.6-1.4]	0.754
Baseline (<= 0.5hr)	1.0		1.0		1.0	
Transportation cost to the first place of care						
>500 Afs	1.7 [1.1-2.7]	0.018	1.8 [1.1-2.8]	0.016	1.8 [1.1-2.7]	0.013
<=500 Afs	1.2 [0.8-1.9]	0.315	1.3 [0.8-1.9]	0.297	1.3 [0.8-1.9]	0.280
<=100 Afs	1.1 [0.7-1.7]	0.799	1.0 [0.6-1.6]	0.963	1.0 [0.6-1.6]	0.997
Baseline (didn't pay)	1.0		1.0		1.0	
The number of people the husband can rely on in case of long term						
No one			1.8 [1.0-3.1]	0.041	1.8 [1.1-3.1]	0.032
1-2			1.4 [0.8-2.4]	0.253	1.4 [0.8-2.5]	0.220
3-4			1.0 [0.4-2.1]	0.935	1.0 [0.5-2.2]	0.994
Baseline (5 or more)			1.0		1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

7. From departure from home to arrival at the hospital

This chapter addresses the 'travel delay' that women with obstetric complications may face in travelling from home to the hospital. In this chapter, the delay is conceptualized as excess over or variation from the time it normally takes to travel to the study hospital with the most suitable means of transportation locally available (or 'baseline travel time'). A spatial predictive model is designed in the GIS to generate the baseline travel times to the hospital. Relative variation in the self-reported travel times compared with the baseline travel times is then analysed to identify the factors that explain large degrees of variation from the baseline travel times (or 'delay').

The chapter has three sections. After presenting the conceptual framework, the chapter describes the development of the spatial model in the GIS. The final section discusses the results of regression analyses to identify the characteristics of women that are associated with the travel delay.

7.1. Conceptual framework

In Thaddeus and Maine's model, the second delay is only affected by physical and financial accessibility to health facilities. This is represented by factors such as distance and costs, multiple referrals due to inadequate capacity to treat serious cases in lower-level healthcare facilities, and availability of public transportation. The social and cultural factors that affect access to and the use of transport technologies are missing from their discussions.

One of the important factors examined in this chapter is the class hierarchy in rural society that may determine an individual's access to and use of various services, including transportation. Those with greater social, economic or political power in the rural community often have a greater command over the transportation business and services. In contrast, the powerless in rural communities face difficulties in accessing and using the transportation services. For example, provision of new transportation services is often determined by the needs of merchants or businessmen and those in the ruling class because it

is profitability that drives the decisions of commercial vehicle owners and the transportation authority concerning newly serviced routes [166-167], and the needs of the rural poor concerning day-to-day mobility are often not addressed [168]. In addition, because of low demand for transportation services in rural villages, fair competition does not usually develop and the service does not improve [169]. Consequently, travellers from rural villages distant from a main road may be charged higher rates for transport than on roads that have more competition [169], making it more difficult for the rural poor to travel on motor vehicles.

Furthermore, the class hierarchy can directly influence the access to transportation. A study in India indicated that poor men and women, such as those in a low caste, were restricted from the use of existing transportation services because they encountered harassment by the transportation authority [167]. These phenomena can directly affect women's access to health facilities [148]. Many factors are assumed to influence the rural class hierarchy, such as gender, caste, ethnic or tribal groups, and financial status. In the current analytical framework, asset-based household socio-economic status, husband's occupation group, landownership, and husband's education were explored as proxies for class hierarchy to determine whether any similar patterns in access to the transportation system exist among the study participants (Figure 7.1).

Second, as was discussed in chapter 6, social network and solidarity improve access to healthcare [161 170]. Particularly when the travel entails a long distance, families with greater social capital are able to overcome financial and logistical barriers to accessing health facilities more easily, and the travel delays may be reduced. To measure the size and strength of individual's social capital, the three indicators used in chapter 6[ii], and another variable indicating the number of times the husband has travelled to the city of Herat in the last 12 months, were used in the current analysis [127].

[ii] (1) The number of people the husband indicated that he could turn to who would be willing to provide a small amount of money that would be enough to pay for expenses for the household for one week, (2) The number of people the husband identified that he could rely on if he faced a long-term emergency such as harvest failure or job loss, and (3) Whether or not the husband or anyone in the household had participated in any communal activities in which people came together to do some work for the benefit of the community in the past 12 months.

The number of referrals was included in the analytical framework as a proximate determinant of the travel delay as well as a potential effect modifier. It is a proximate determinant because those who bypassed a lower-level health facility would take a shorter time than those who were referred to the hospital from a lower-level health facility. It is also a potential effect modifier because those travelling beyond the first place of care, which may be located within easy reach of their residence, may face a whole new set of challenges in arranging the means of transportation to reach the hospital than those who were able to access the hospital directly.

In our analytical framework, we included those factors that were thought to be associated with the size, effectiveness or quality of social capital as distal determinants. For example, the type of household (extended family or nuclear family) was included. In Afghanistan, as in other countries in South Asia, 'the patriarchal extended family is the central social unit' [171]and the society is based on the institutionalized relationships of mutual dependency among the patriarchal kin. Members of the patriarchal kinship network help each other during hard times, emotionally or materially, and such assistance is particularly important because the society lacks formal welfare institutions. In such social contexts, relatively strong ties within the kin and a greater kinship network provide better access to various material resources. Therefore, people living with their extended family members are strongly connected to each other. In addition, our analytical framework includes a variable indicating whether the woman's birth family lives nearby, because the woman's birth family can be an important source of support around the time of childbirth.

A binary variable, which indicates either the period ranging from December to February or other time of the year (March to November), was included in the analytical framework as a distal determinant as well as a potential effect modifier. It is a determinant of travel delay because travel during the winter months may take longer than at other times of year due to the roads being badly damaged by rains and obstructed by snow falls. It is also a potential effect modifier because during the winter months, when there are expected to be

more difficulties in travelling to the hospital, interactions with social and financial resources are likely.

7.2. Model development

In order to operationalize a measure of the delay, it was necessary to calculate the baseline travel time to the hospital for each of the villages in which the study participants lived, as this would in turn make it possible to calculate the excess delay. The baseline travel times were generated by modelling instead of measuring actual times by travelling to all these difference locations, because of the logistical and security problems associated with travel in the study area.

Two different modelling processes were used to build a model to generate the baseline travel times to the hospital. The first modelling process took the Earth as a two-dimensional surface – in other words, it assumed a flat surface across the study area. The second process included the effects of topography on the travel times.

7.2.1 Cost surface model with flat surface assumption

(a) Model 1

Parameter estimates

Naismith's rule, which is a rule of thumb created by William W. Naismith, a Scottish mountaineer, to estimate the time it takes to walk a route, was used to obtain rough estimates of travel speeds on the land surfaces that are suitable for pedestrians only. The general rule is 1 hour for every 3 miles (5km) forwards. Travel speeds on land surfaces where it is presumably possible to travel by vehicle were estimated from observation of and discussions with local drivers. The travel speeds in km per hour were then converted into friction values (Appendix 3.1), which are expressed in relation to the baseline speed (80 km per hour) for flat primary roads.

Cartographic Model

Two raster data files were prepared, one showing the type of land use and another showing the type of roads. The friction value was then 'assigned' to each pixel of the two raster image files according to its surface type to generate

two raster data images showing the cost (or friction) to move across each pixel. The two images were then 'overlaid' so that the cost surface image for the road took precedence over the one for land use (i.e., for any given pixel the minimum estimated cost was used). The 'cost' module in Idrisi (Clark Labs) was then applied to obtain the image showing travel 'costs' to the hospital, which was then 'scaled' to the appropriate unit (in minutes) (Appendix 3.2).

Results

The column for Model 1 in Table 7.1 shows the results for the 12 validation points produced by the above model. Travel times to areas near Herat City, where the land surfaces are relatively flat and the roads are well-paved (primary and secondary roads), were fairly well captured by the current model. As expected, travel times to (2) Qala-i-Naw, (6) Shahrak, (7) Dara Takht and (12) Chartaq, Jawand were significantly underestimated. All of these places lie in mountainous areas (Figure 7.2) where the tracks are uneven and irregular. Examinations of the results and the surface gradients around those locations confirm the importance of taking the topography (and more specifically, slope) into account in determining the travel times.

7.2.2 Cost surface models with the effects of slope

In order to model the effects of inclination of the tracks and roads on the travel speeds, a raster data layer representing the slope gradient in each pixel of the study area was incorporated into the basic friction models described previously. Gradients of the surface were categorized into several groups so that appropriate friction values might be assigned to each pixel of the surface according to the gradient group and the surface type to which it belongs. Two different models are considered below. They differ in the number of gradient categories, with more refined friction values being used in the latter model ('Model 3') which includes ten gradient groups.

(a) Model 2

Parameter estimates

In this model, gradients of the slope surface were categorized into three groups: (1) up to 15 degrees, (2) 15–25 degrees and (3) greater than 25 degrees. Herat

City, where the study hospital is located, lies in Hari Rud River Basin, so it was assumed that all the women in the study travelled from higher altitudes to this lower altitude. Hence Naismith's rules modified for descent (rather than for ascent) were used to estimate the travel speeds for pedestrians. The rule is 1 hour for every 3 miles (5km) forward minus 10 minutes for every 1000 feet (300 m) of descent for gentle descent or plus 10 minutes for every 1000 feet of descent for steep descent (12 degrees or more).

Land surfaces with a gradient greater than 25 degrees were assigned a very large friction value (nearly a barrier), so that travelling would be avoided there. The friction values assigned to the land surfaces with gradients between 15 and 25 degrees were slightly larger than those assigned to the land surfaces with gradients of 0–15 degrees in order to model the slowing effects of the gradients on pedestrians.

Similarly, three types of road surfaces were each subdivided into three groups according to the degree of inclination, and larger friction values were assigned to the surface groups with greater inclinations (Appendix 3.1).

Cartographic model

Map operations similar to the ones shown earlier were performed, except that this time the raster data file of slope gradients was used to generate the raster files of land cover and of road type of three different slope levels. This was done so that the different friction values could be assigned according to the steepness of the slopes (Appendix 3.3).

Results

The travel time to Qalay-i-Naw improved from the previous model, and with the adjustment in the current model, the travel times to most locations were well captured. However, the travel times to Jawand and Shahrak, which are accessed by roads passing through the mountains, were still underestimated (Table 7.1). Further examinations of the slope gradients around the two locations and discussions with the local drivers who had travelled to those locations suggested that further adjustment and refinement would be needed,

particularly on the tracks in the mountain areas where the slope gradients are steep.

(b) Model 3

Parameter estimates

The gradient was further divided into nine classes using a 5-degree increment in order to assign a more refined friction value to each of the gradient groups. Naismith's rules for descent were again applied to obtain the walking speeds for pedestrians, and these values were used for the secondary roads and tracks that are too steep for vehicles to drive as well as other type of surfaces (such as of bare soil and rangeland) where only pedestrians are permitted. A very large value (barrier) was assigned to surface types that vehicles cannot negotiate and that have very steep inclination. Friction values for land surfaces suitable for travel by vehicles were adjusted so that travel speeds would slow down gradually as the slope becomes steeper (Appendices 3.4-3.6).

Cartographic models

The same principle as the one used in Model 2 was applied.

The model was run several times. After each iteration with a set of parameters, changes in the model results for the 12 validation points and the road types along the pathways to the validation points were examined, and a new set of parameters was tried in an attempt to improve the estimates to the validation points (Appendices 3.4-3.6).

Results

The most appropriate set of model parameters was selected such that the sum of squares of differences between the predicted values from the model and the travel times reported by the NGO drivers (or 'sum of squared residuals') was the smallest. Surveying the sums of squared residuals in Table 7.1, it was decided that the parameters used for model 3-3 would produce the best baseline data. The data file of the baseline travel times that were generated from the model 3-3 were exported into Stata where it was merged with the master dataset for analyses.

7.3. Determinants of the travel delay

After the new variable, which is the ratio of the self-reported travel time to the baseline travel time, was created and converted into log scales, normal linear regression techniques were used for the analysis. The analyses were restricted to certain women only. First, the women included in the current analysis are those from rural areas only. Urban women are excluded because baseline travel times for the women from Herat City could not be obtained for lack of accurate geographical data[ii]. Secondly, an additional 39 women, who were initially sent back to their homes from lower-level health facilities by health professionals, are also not included. This was because the added delay caused by the decisions of the health workers is not immediately relevant to our analytical framework (which focuses on women's health-care seeking behaviour) and would introduce unnecessary noise into the analyses. The total number of women who satisfied the criteria for the current analysis is 263.

In the following section, the modelled travel times and the self-reported travel times are described briefly according to complication types. Bivariable analyses are then conducted for separate groups of women depending on their referral status (referred vs. not referred) and the season of admission (winter vs. other seasons) in order to understand whether these variables were effect modifiers. Likelihood ratios tests were conducted, comparing the model with the interaction term with each of the determinants and with the one without the interaction term, to determine whether there is evidence for an effect modification. When there is strong evidence for an effect modification by either of the two factors and pooling of the statistics does not seem sensible, the interaction terms are included in the multivariable analysis that follows.

7.4. Description of the travel delay by complication types

The entire sample lived within a radius equivalent to a 12-hour journey time from the study hospital, with the mean theoretical travel time roughly 2 hours

[ii] Because detailed addresses of urban women's residence could not be obtained from interviews with their husbands, the baseline travel time would have been the same for all women from Herat city, which would increase the noise in the analyses.

(Table 7.2). There were, however, large variations when the sample was examined by complication types. Women with PPH and APH lived relatively close to the hospital. All the women with PPH lived within a 3-hour travelling distance and all the women with APH within a 5-hour travelling distance from the hospital. On the other hand, some women with rupture and impending rupture of uterus and severe infection came from areas more than a 10-hour travelling distance from the hospital.

The self-reported travel times ranged from just 15 minutes to more than three days. The variation of self-reported times across complication types was not as prominent as the variation of the theoretical travel times.

The ratio of the self-reported travel time to the modelled travel time (the indicator of the travel delay used in the current chapter) ranged from less than one to nearly 40 but the majority (92%) had the ratio greater than one, suggesting that women took longer than the model predicted.

7.5. Bivariable analyses

7.5.1. Stratified by the season of admission

(a) Transportation means

Interestingly, we could not find any strong evidence of an association between travel delays and means of transportation to the first place of care, although women who used 'intermediate means'[kk] appeared to delay slightly more.

(b) Position in the social hierarchy

The variables measuring position in the social hierarchy do not appear to have an association with travel delay. There was some evidence to suggest that husband's education and asset-based socio-economic status have an effect on the travel delay for women admitted in the non-winter months only. However, there was no evidence of effect modifications (p-value =0.241 and p-value =0.206), suggesting that the effects of husband's education or asset-ownership

[kk] 'Intermediate means' in this study included bicycles, motorcycles and rickshaws.

are the same regardless of the season. There was no effect of landownership (Table 7.3a).

(c) Husband's social capital

There was some evidence of an association between travel delay and some of the variables measuring social capital, but the associations were mostly concentrated during the non-winter months, when travelling is easier. For example, a clear dose-response relationship existed between the travel delay and the number of travels made by the husband to the city of Herat in the last 12 months among women admitted during the non-winter months. An exception was found in the variable 'husband's participation in community activities', which was associated with travel delay in all seasons. There was however no evidence of effect modification by any of the variables concerned.

(d) The number of referrals

Women referred from other health facilities took much longer to reach the hospital than those who bypassed lower-level health facilities, independently of the season of admission. The self-reported travel time was 3.5–4.6 times greater than the modelled travel time for referred women and about two times greater for self-referred women (Table 7.3a).

(e) Household type

The effect of household type was only present in women admitted during the winter months (p-value for effect modification =0.077). Among those admitted during the winter months, the self-reported travel time for women living in a nuclear household was 4.5 times greater than the modelled travel time, while for women living with extended family members the reported travel time was just 2.9 times greater than the modelled travel time (ratio to the baseline =1.5, 95%CI=1.0–2.3, p=0.038). Having the birth family near the woman's residence did not have any effect on travel delay (Table 7.3b).

(f) Access to a car in the community

Lack of access to a car in the community does not appear to have an effect on the travel delay among women admitted during winter but seems to increase the delay significantly among women admitted during other seasons. If

admitted outside winter, the self-reported travel time to the hospital for women without access to a car was 3.8 times greater than the modelled travel time compared with just 2.6 times greater for women with access to a car (ratio=1.5, 95%CI=1.0–2.1, p=0.033). There was weak evidence to suggest the presence of an effect modification (p-value =0.106)[II].

7.5.2 Stratified by the number of referrals

(a) Transportation means

The effect of the means of transportation actually used was negligible (Table 7.4a).

(b) Position in the social hierarchy

No strong evidence was found to suggest a dose-response relationship between the travel delay and the social class (Table 7.4a).

(c) Husband's social capital

Different indicators of husband's social capital had a small effect on the delay for both referred and self-referred women (Table 7.4a). Among women who were referred from other facilities, husband's non-participation in community activities increased the travel delay by 1.5 times (p=0.005): Women took 3.0 times longer than the modelled travel time if their husband participated in community activities, and 4.4 times longer than the modelled travel time if their husband did not participate in community activities. Among those who bypassed lower-level health facilities, the number of people from whom the husband could borrow a small amount of money had some effect on the travel delay. Those who said there was no one from whom they could borrow a small amount of money had a greater travel delay. There was no evidence for interactions with either factor, however.

(d) Household types

There was weak evidence to suggest that women living in a nuclear household had a greater travel delay than those living with extended family members

[II] Because the power of a test for an effect modification is known to be weak, p=0.106 was interpreted as 'weak evidence'.

among referred women only, but the evidence of effect modification was insignificant (p-value for effect modification = 0.187).

Having the woman's birth family close to her residence had an effect on the travel delay among women who came to the hospital after being referred from other facilities only (p-value for effect modification = 0.054). Among women referred from other facilities, the self-reported travel time to the hospital was 4.9 times greater than the modelled travel time if their birth family did not live nearby. If their birth family lived nearby, their reported travel time was 3.6 times greater than the model prediction (ratio =1.4., 95%CI=1.0–1.9, p=0.029).

(e) Access to a car in the community

Having access to a car in the community had no effect on the travel delay.

Summary

There was some evidence to suggest that the factors responsible for the travel delay during the winter months and those responsible for the travel delay during the non-winter months were different. Access to a car in the community was an important determinant of the travel delay for women admitted during the non-winter months. The interaction is plausible because, during the winter months, when the snow covers the roads, a traveller would not be able to utilize a motor vehicle whether or not he or she had access to one.

The effect of the household type was only prominent in women admitted during the winter months. The interaction is plausible because in winter, when movement is difficult, women residing with extended family may have assistance from more family members.

The results of analyses stratified by the type of referral showed that the effect of having the woman's birth family living nearby was modified by the type of referral. The interaction is perhaps plausible because having the woman's mother close to herself is likely to have an important role to play in Afghanistan. In a study conducted in a country similar to Afghanistan women who had moved to their own mother's house before childbirth had a decreased risk of

maternal death[12]. No other determinants were found to interact with the referral type.

7.6. Multivariable analyses

In the light of the evidence of effect modifications in the above stratified analyses, three interaction terms[mm] are created and introduced in the following multivariable analysis. Guided by the conceptual framework (Figure 7.1), an approach similar to the hierarchical approach[157] with a forward selection procedure is used to obtain the final multivariable model. At the initial stage, the model has just 'remoteness' as the explanatory variable. In the next instance, an additional variable with a significant effect on the delay is entered into the model. Likelihood ratio tests with the threshold of p=0.1 are used to decide which variable takes precedence over the other variables in the same hierarchical level and to decide whether the variable improves the model.

Model-building

After season of admission and complication types were entered into the model, access to a car was assessed. While access to a car alone did not improve the model, the interaction term between access to a car and the season proved to be an important factor from the result of the likelihood ratio test. The variable indicating the number of referrals greatly improved the model (model 4). The effects of the family type and the proximity of birth family were not significant enough to be entered into the model alone, but the interaction term between the proximity of birth family and the number of referrals was (model 5). This suggests that the delay experienced by those who visited one other facility AND did not have their birth family living nearby was even greater than those who visited one other facility AND had their birth family living nearby[nn]. In the next stage, variables indicating the position of the social hierarchy were assessed. The likelihood ratios test indicated that asset ownership improved the model.

[mm] Three interaction terms are (winter*access to a car), (winter*nuclear household) and (number of referral)*(proximity of birth family's residence).
[nn] E.g., in order to obtain the delay for those with two referrals and having the birth family not living nearby, 2.2 x 0.8 is multiplied by the interaction term, which is 1.5.

As no other social hierarchy variable improved the model further, the variables indicating the strength and the amount of husband's social capital were assessed. Only the husband's participation in community activities improved the model slightly.

In the final model, complication types were re-categorized into just two groups on the basis of similarity of the adjusted ratios, in order to increase the power of statistical tests. The final model suggests that the delay is largely determined by the number of referrals and access to a vehicle in the community. Other factors also explain the travel delay to some extent. For example, those in the lowest socio-economic status experienced a greater degree of travel delay than those who were in the least poor household (ratio = 1.5, 95%CI=1.1–2.1, p=0.018). The interaction between the proximity of birth family and the number of referrals remained significant: only among those who visited other facilities before the study hospital (women with referral) not having their birth family living nearby increase travel delays further, by 1.6–2.1 times. Women with ante-partum and intrapartum complications and women with infection delayed 1.4 times more than women with PPH or haemorrhage in early pregnancy (p=0.002). Only weak evidence of association was observed to suggest that husband's nonparticipation in community activities increased travel delay slightly (p=0.095). There was weak evidence of an interaction between lack of access to a car in the community and winter season.

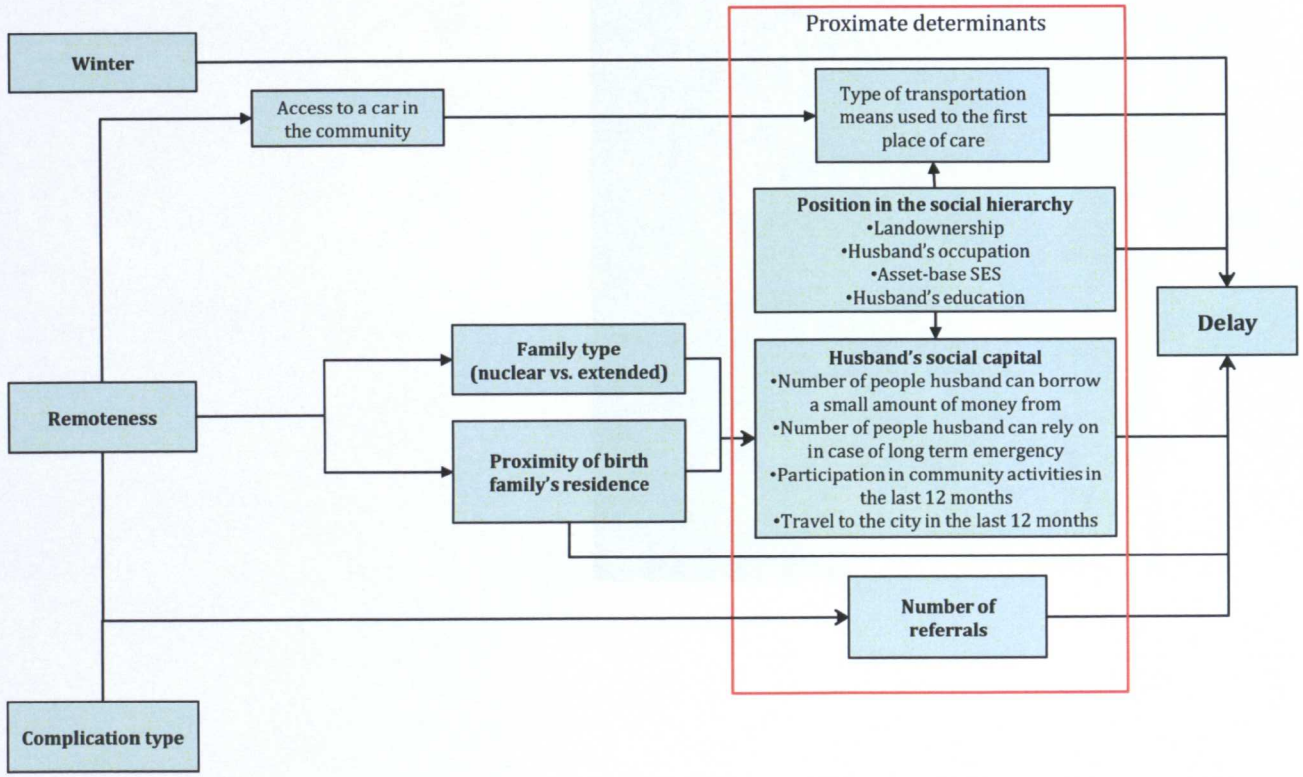
7.7. Summary

This chapter first sought to calculate the theoretical travel time to the hospital from the village of residence of each of the study participants, using the spatial data in the GIS. The travel times modelled in the raster GIS that took into account geographical features of the earth surface differed from travel times estimated by straight line distance (see figures 7.4). It was found that the entire sample lived within a 12-hour journey radius from the study hospital, though women with PPH and APH lived closer to the hospital.

By comparing the theoretical travel times with the self-reported travel times, we discovered that the majority of women (91%) delayed because they appeared to have taken longer than the theoretical travel time to reach the hospital.

Data were further analysed to identify the determinants of large degrees of departure from the theoretical travel times. Although the duration of the travel delay was largely determined by the number of referrals before reaching the study hospital and access to a vehicle in the community, other factors which had not been documented in Thaddeus and Maine's model were found to be important in this study. Low socio-economic status plays an important role in explaining longer travel delay durations. Physical isolation from the woman's birth family when women were referred from lower-level health facilities explained increased travel time. In comparison to PPH and haemorrhage in early pregnancy, women with antepartum and intrapartum complications seem to have longer travel delays. Women with severe infection also had travel delays as long as those of antepartum or intrapartum women. The effect of husband's social capital was smaller than we anticipated. Despite the sharp contrast between summer and winter time in Afghanistan, the seasons played little role in explaining travel delays: the interaction between winter and lack of access to a vehicle in the community suggests that lack of access to a vehicle in the community does not increase travel delay in winter as much as it does at other times of the year, although evidence was rather weak and the association could be by chance.

Figure 7.1: Conceptual framework for determinants of travel delay



A. Hirose, 2010

Figure 7.2: Villages used for validation, on an elevation contour map

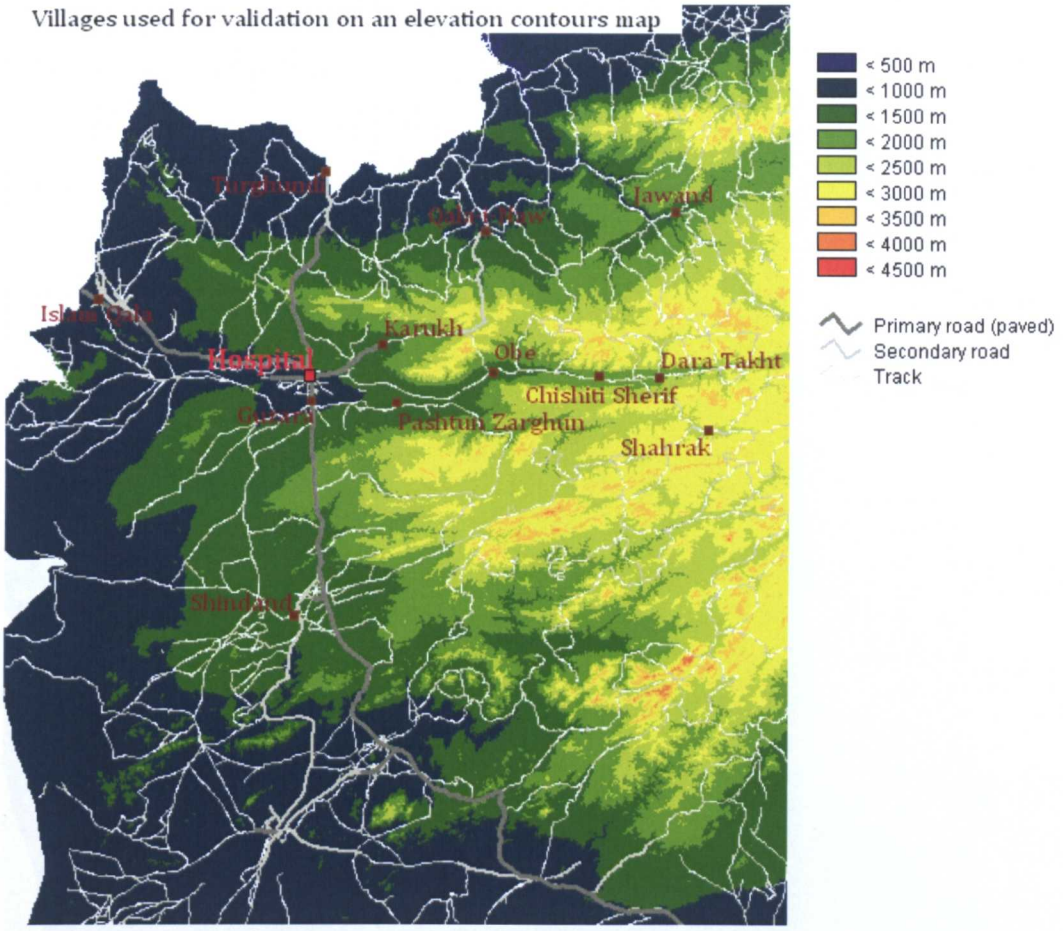


Figure 7.3: Villages used for validation on a topographic map with slope gradients

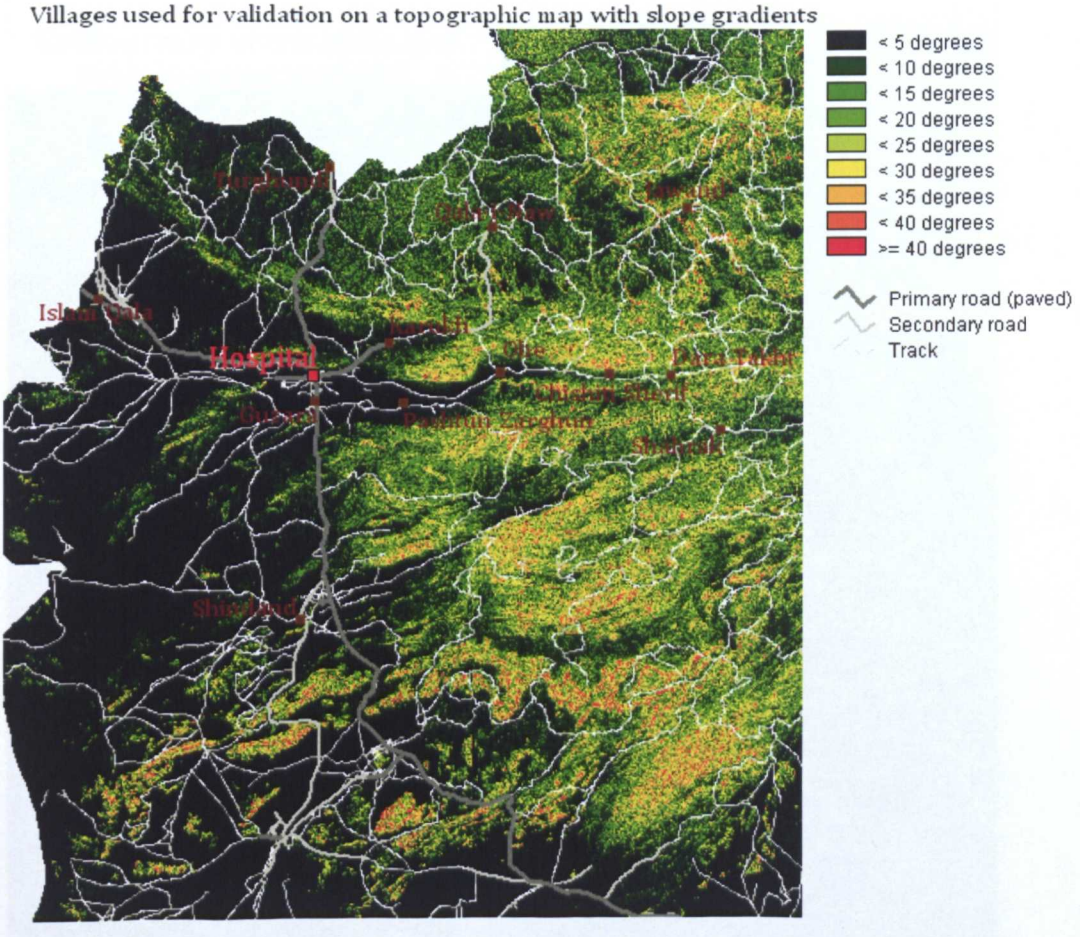


Figure 7.4 a: Illustration of theoretical travel times – area reached within two hours

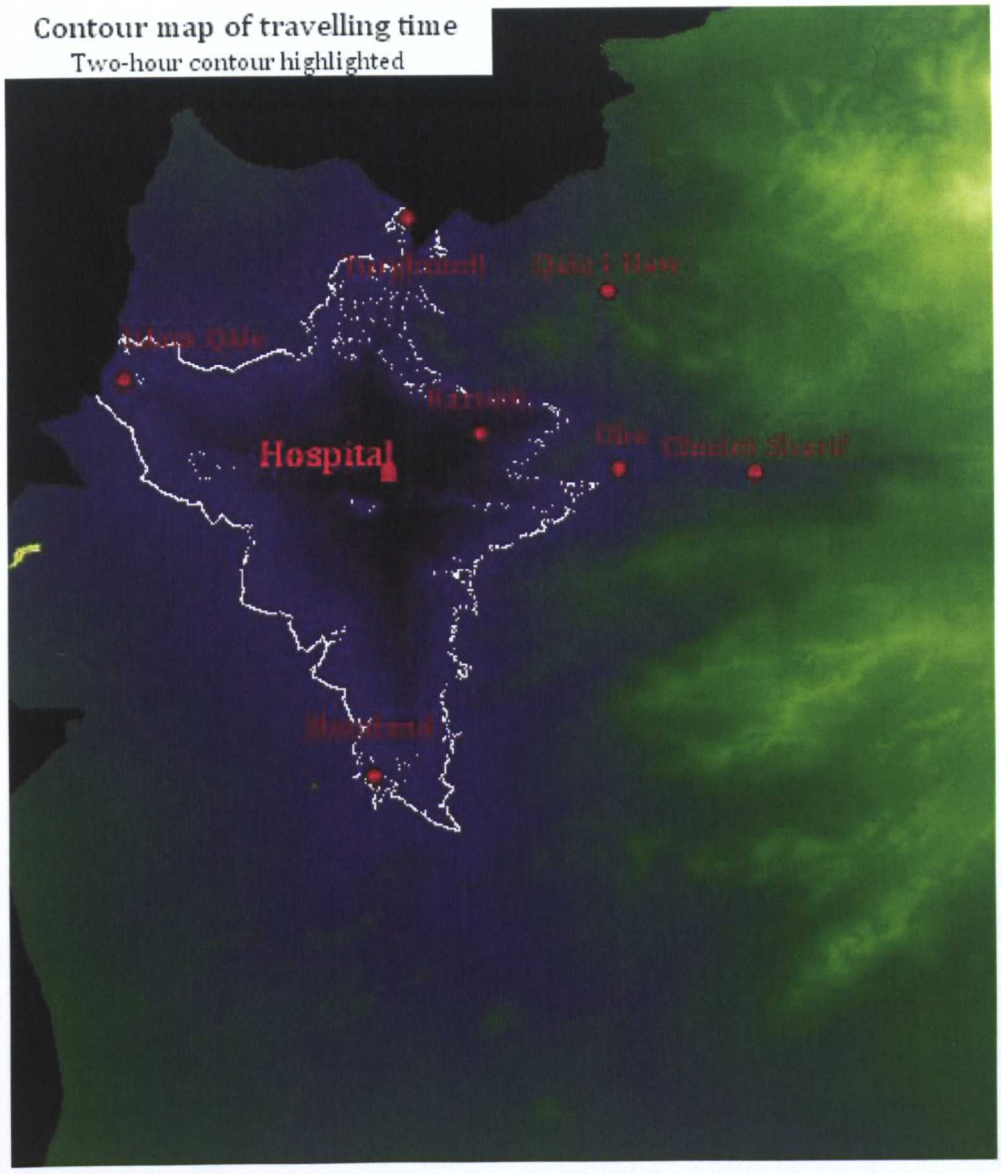


Figure 7.4 b: Illustration of theoretical travel times – area reached within five hours

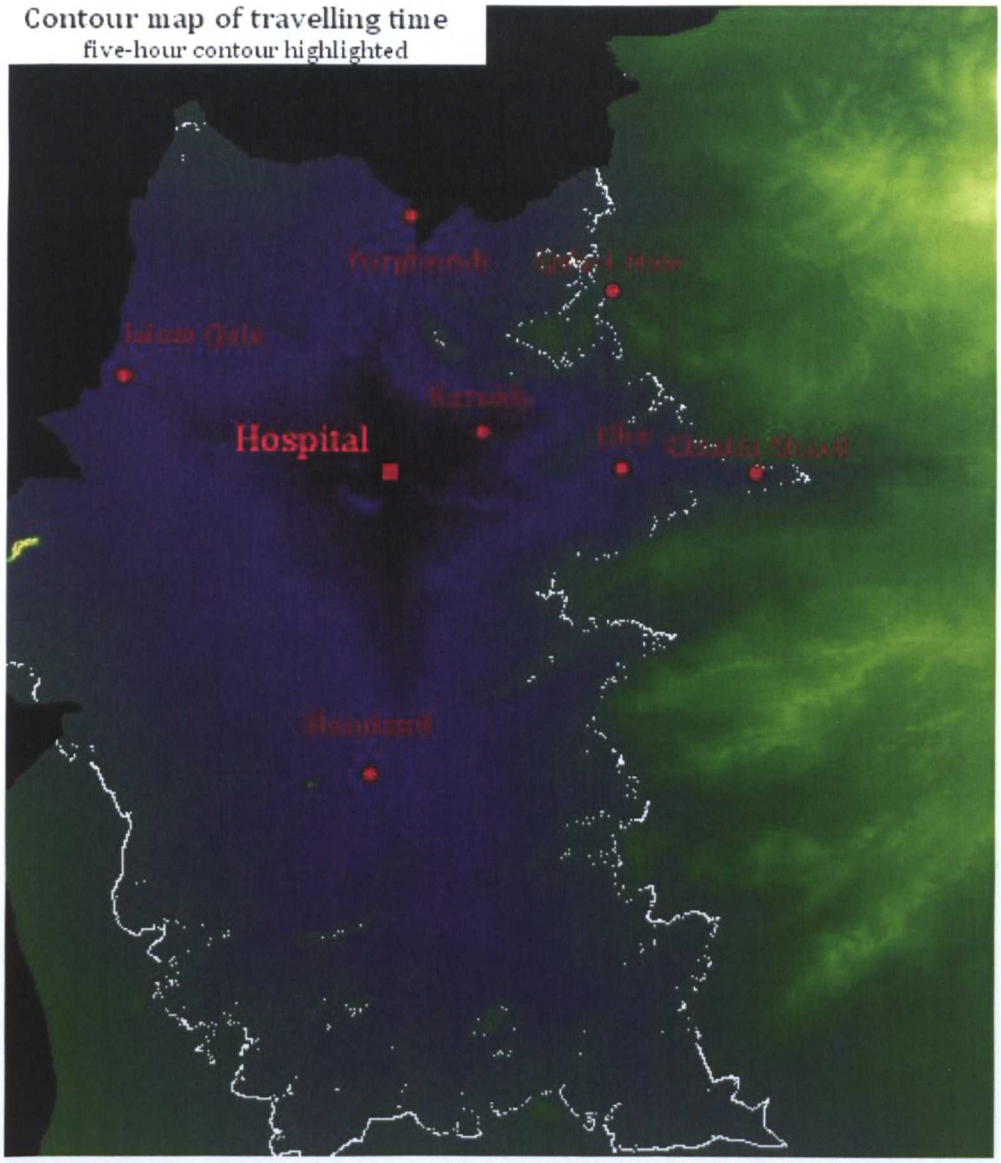


Figure 7.4 c: Illustration of theoretical travel times – area reached within eight and twelve hours

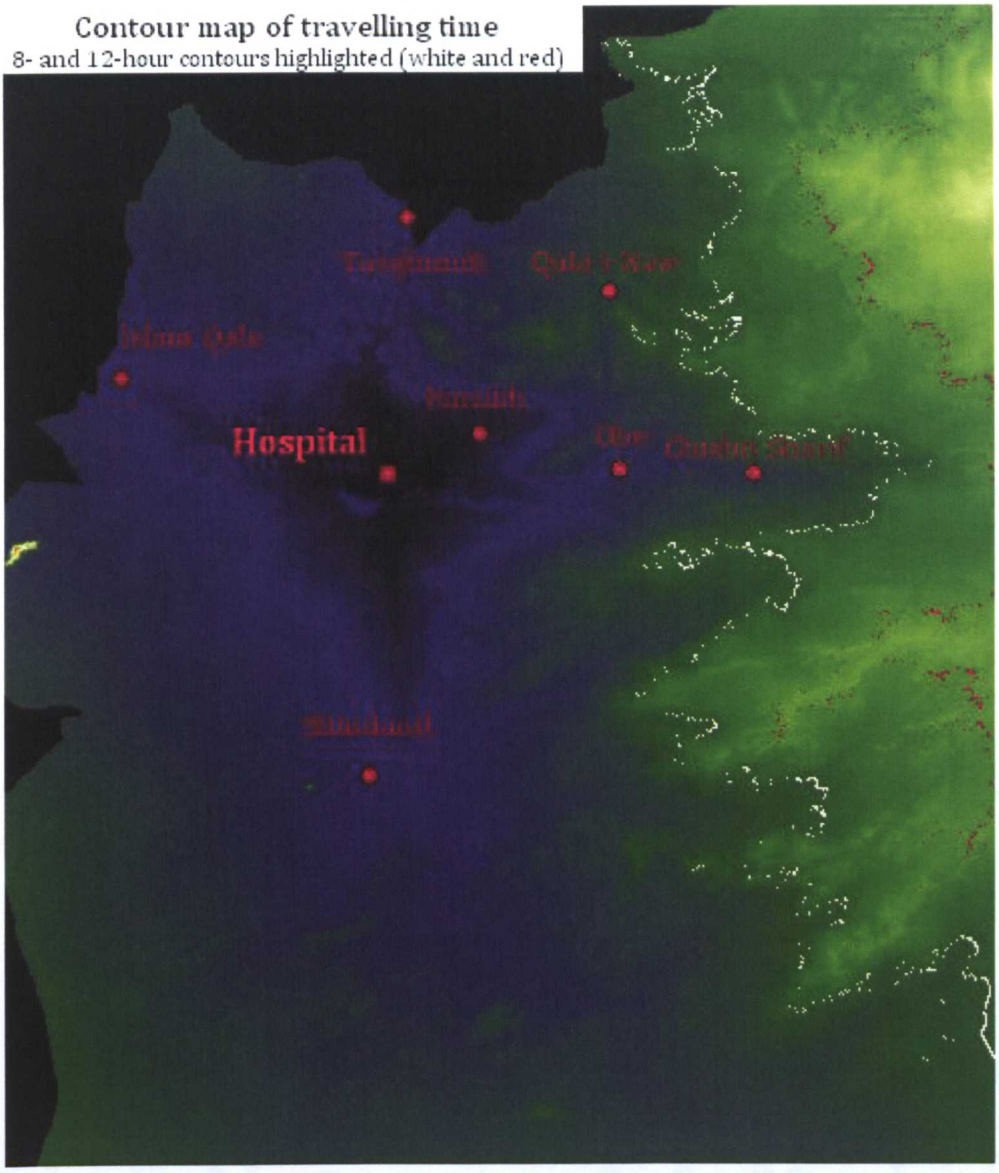


Table 7.1: Results of model validation

	Village	Major features of the roads	Reference (in minutes) [1]	Model 1	Model 2	Model 3-1	Model 3-2	Model 3-3
1	Guzara	Paved road	15	19	17	19	19	18
2	Qala-I-Naw	All types of the roads passing through mountains	240-300	173	262	302	318	307
3	Karukh	Paved road	30-40	33	33	34	33	33
4	Turghundi	Mostly paved road but not so smooth. .	120	104	107	115	107	103
5	Islam Qala	Paved road only	90-100	96	96	96	96	96
6	Shahrak	In the mountains	540-600	351	395	495	548	540
7	Dara-Takht	Track	360	292	300	330	343	340
8	Shindand	Paved roads	100-120	119	117	122	119	116
9	Chishiti Sherif	Track	270	237	242	253	261	251
10	Obe	Tracks, lies in a relatively flat area	150-180	165	162	165	165	156
11	Pashtun Zarghun	Tracks, lies in a relatively flat area	90	112	106	112	112	106
12	Chartaq, Jawand	All types of roads passing through mountains	720	371	545	671	707	755
		Sum of squared residuals				7250	3591	2821

1. *Travel times reported by experienced NGO drivers*

Table 7.2: Distribution of self-reported and modelled travel time statistics according to the type of complication

		Modelled travel time in hours				Self-reported travel time in hours				Ratio of the self-reported travel time to the modelled travel time			
	N	Min.	Median	Mean	Max	Min	Median	Mean	Max	Min	Median	Mean	Max
Eclampsia	66	0.2	1.6	1.8	8.1	0.3	4.5	6.7	29.0	0.6	2.7	4.3	39.5
Severe pre-eclampsia	19	0.1	1.0	1.8	7.9	0.3	2.5	9.9	79.0	0.5	4.2	5.1	18.1
Rupture of uterus	21	0.1	1.6	1.9	9.4	0.5	4.5	7.9	33.0	1.0	3.0	4.5	26.0
Impending rupture of uterus	33	0.2	1.5	1.9	10.3	0.3	5.0	7.9	30.0	0.7	2.9	4.3	24.9
Bleeding during early pregnancy	28	0.1	0.8	1.9	10.3	0.5	2.0	7.1	49.0	0.3	2.4	5.1	30.1
APH	37	0.1	1.6	1.5	4.7	0.5	4.0	5.4	23.0	1.1	3.0	4.7	25.3
PPH	42	0.2	0.9	1.1	2.9	0.5	1.6	2.7	20.0	0.5	2.0	2.8	19.6
Infection	14	0.2	2.8	3.9	11.9	0.5	21.3	22.4	59.0	1.1	5.1	5.8	16.7
Other	3	2.1	4.6	4.0	5.2	2.0	15.0	14.7	27.0	1.0	3.3	3.1	5.2
Total	263	0.1	1.3	1.9	11.9	0.3	3.5	7.3	79.0	0.5	2.6	4.3	39.5

Table 7.3a: Results of regression models predicting the travel delay stratified by the season of admission

	Winter months				Other times of year			
	N	Delay	Ratio to the baseline [95%CI]	p-value	N	Delay	Ratio to the baseline	p-value
First transportation means								
Walk	3	3.8	1.6 [0.5-5.8]	0.437	10	2.6	1.0 [0.7-3.1]	0.921
Intermediate means	1	8	3.5 [0.5-24.1]	0.202	12	4.5	1.8 [0.9-3.7]	0.084
Public motorized transport	53	3.7	1.6 [0.8-3.5]	0.209	156	2.6	1.0 [0.6-1.8]	0.919
Baseline (Private vehicle)	6	2.3	1.0		13	2.5	1.0	
Position in the social hierarchy								
Household socio-economic status								
Poorest	26	3.6	1.7 [0.9-3.1]	0.111	70	3.2	1.5 [1.0-2.2]	0.067
2nd poorest	17	3.6	1.7 [0.8-3.3]	0.138	52	2.6	1.2 [0.8-1.8]	0.422
3rd poorest	16	5	2.3 [1.2-4.6]	0.016	53	2.5	1.2 [0.8-1.7]	0.511
Baseline (Least poor)	10	2.2	1.0		23	2.2	1.0	
Husband's occupation								
Agriculture	32	3.9	1.7 [0.8-3.6]	0.175	88	2.9	1.1 [0.7-1.6]	0.736
Government employees	5	2.3	1.0 [0.3-2.8]	0.979	5	1.2	0.4 [0.2-1.1]	0.074
Labourer	2	4.2	1.8 [0.8-4.1]	0.136	75	2.5	0.9 [0.6-1.4]	0.756
Other	5	2.9	1.2 [0.4-3.5]	0.676	10	3.4	1.3 [0.7-2.4]	0.457
Baseline (Business)	6	2.3	1.0		20	2.7	1.0	
Land owning family								
No	11	3.4	1.0 [0.5-1.7]	0.882	27	2.7	1.0 [0.7-1.4]	0.995
Baseline (Yes)	57	3.6	1.0		170	2.7	1.0	
Husband's education								
No education	50	3.7	1.0 [0.7-1.7]	0.850	128	3.1	1.4 [1.1-1.8]	0.006
Some education	19	3.5	1.0		69	2.2	1.0	
Husband's social capital								
Number of people husband can borrow small amount of money								
0	4	3.5	0.8 [0.3-2.3]	0.617	9	5.1	2.2 [1.2-4.0]	0.009
1-2 people	25	3.4	0.7 [0.3-1.6]	0.411	74	2.9	1.3 [0.9-1.7]	0.122
3-4 people	33	3.6	0.8 [0.4-1.6]	0.528	62	2.6	1.2 [0.8-1.6]	0.385
Baseline (5 or more)	7	4.6	1.0		47	2.3	1.0	
Number of people husband can rely on in case of long term emergency								
0	37	4	0.5 [0.2-1.2]	0.127	103	3	1.4 [0.9-2.4]	0.161
1-2 people	27	2.8	0.4 [0.1-0.9]	0.026	64	2.5	1.2 [0.7-2.0]	0.506
3-4 people	1	3.5	0.4 [0.1-2.9]	0.387	13	2.4	1.2 [0.6-2.2]	0.682
Baseline (5 or more)	4	7.9	1.0		12	2.1	1.0	
Participated in community activities in the last 12								
No	53	4.2	1.9 [1.1-3.0]	0.013	122	3	1.4 [1.1-1.8]	0.013
Yes	15	2.2	1.0		70	2.2	1.0	
Travelled to the city in the last 12 months								
None	15	3.4	0.9 [0.5-1.6]	0.771	28	3.5	1.6 [1.1-2.4]	0.012
1-4 times	13	3.5	0.9 [0.5-1.7]	0.807	40	3.3	1.5 [1.1-2.1]	0.008
5 or more times	7	2.7	0.7 [0.3-1.7]	0.446	34	2.8	1.3 [0.9-1.9]	0.119
Baseline group (almost every day)	28	3.7	1.0		75	2.1	1.0	
Number of referrals								
Two referrals or more	2	4.5	2.6 [0.9-5.2]	0.088	24	4.6	2.6 [1.8-3.8]	<0.001
One referral	45	4.6	2.0 [1.3-3.3]	0.001	91	3.5	2.0 [1.6-2.5]	<0.001
Baseline (Self referred)	22	2.1	1.0		84	1.8	1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

Table 7.3b: Results of regression models predicting the travel delay stratified by the season of admission

	Winter months				Other times of the year			
	N	Delay	Ratio to the baseline [95%CI]	p-value	N	Delay	Ratio to the baseline [95%CI]	p-value
Household type								
Nuclear household								
Nuclear	34	4.5	1.5 [1.0-2.3]	0.038	108	2.7	1.0 [0.8-1.3]	0.921
Extended	35	2.9			90	2.7	1.0	
Birth family lives nearby								
No	16	2.9	0.8 [0.5-1.3]	0.291	45	3.1	1.2 [0.9-1.6]	0.225
Yes	44	3.7	1.0		137	2.6	1.0	
Community characteristics								
Community has a car								
No	11	3.2	0.9 [0.5-1.5]	0.618	28	3.8	1.5 [1.0-2.1]	0.033
Baseline (Yes)	58	3.7	1.0		166	2.6	1.0	
Remoteness								
One minute increase in		3.6	1.0[1.0-1.0]	0.924		2.6	1.0 [1.0-1.0]	0.533
Baseline		3.6				2.6		
Complication type								
Eclampsia	20	3.2	1.7 [0.8-3.6]	0.163	46	2.9	1.5 [1.1-2.2]	0.021
Severe pre-eclampsia	5	5.1	2.8 [1.0-7.3]	0.042	14	2.4	1.3 [0.8-2.1]	0.371
Rupture of uterus	10	3.7	2.0 [0.9-4.6]	0.102	11	2.9	2.9 [0.9-2.7]	0.137
Impending rupture	9	2	1.1 [0.5-2.5]	0.865	24	3.6	1.9 [1.2-2.9]	0.005
Bleeding in early pregnancy	5	5.5	3.0 [1.1-7.9]	0.029	23	2.5	1.3 [0.8-2.0]	0.231
APH	7	5.9	3.2 [1.3-7.7]	0.013	30	3	1.6 [1.0-2.4]	0.031
Infection	6	7	3.8 [1.5-9.5]	0.006	8	3.5	1.9 [1.0-3.5]	0.060
Other	1	5.2	2.8 [0.5-	0.242	2	1.8	0.9 [0.3-3.1]	0.907
Baseline (PPH)	6	1.9			36	1.9	1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

Table 7.4a: Results of regression models predicting the travel delay stratified by the type of referral

	Self-referred				Referred by health facilities			
	N	Delay	Ratio to the baseline [95%CI]	p-value	N	Delay	Ratio to the baseline [95%CI]	p-value
First transportation means								
Walk	1	3.3	2.7 [0.5-14.7]	0.249	10	2.8	0.9 [0.5-1.7]	0.763
Intermediate means	3	2.7	2.2 [0.7-6.9]	0.164	10	5.5	1.8 [0.9-3.3]	0.076
Public motorized transport	94	1.8	1.5 [0.7-3.1]	0.246	112	4	1.3 [0.8-2.0]	0.230
Private motorized transport	5	1.2	1.0		14	3.1	1.0	
Position in the social hierarchy								
Household socio-economic status								
Poorest	25	2.2	1.3 [0.8-2.2]	0.358	68	3.8	1.3 [0.9-2.1]	0.178
2nd poorest	25	1.7	1.0 [0.6-1.6]	0.907	42	3.8	1.3 [0.8-2.1]	0.209
3rd poorest	37	1.8	1.0 [0.6-1.6]	0.835	32	5.1	1.8 [1.1-2.9]	0.015
Least poor	18	1.7	1.0		15	2.8	1.0	
Husband's occupation								
Agriculture	32	1.7	0.9 [0.5-1.5]	0.681	84	4	1.1 [0.7-1.7]	0.682
Government employees	5	1.1	0.6 [0.2-1.3]	0.169	4	3.1	0.8 [0.4-2.0]	0.707
Labourer	49	1.9	1.0 [0.7-1.7]	0.854	47	4.2	1.1 [0.7-1.9]	0.576
Other	6	3.2	1.7 [0.8-3.7]	0.147	9	3.2	0.9 [0.5-1.7]	0.736
Business/service	13	1.9	1.0		13	3.6	1.0	
Land owning family								
No	21	2.1	1.2 [0.8-1.7]	0.402	16	4.4	1.1 [0.8-1.7]	0.530
Yes	84	1.8	1.0		139	3.9	1.0	
Husband's education								
No education	60	2.1	1.3 [1.0-1.7]	0.097	114	4.1	1.1 [0.8-1.4]	0.502
Baseline (yes)	45	1.6	1.0		42	3.7	1.0	
Husband's social capital								
Number of people husband can borrow small amount of money from								
0	4	3.9	2.3 [1.0-5.1]	0.049	9	4.8	1.4 [0.8-2.5]	0.247
1-2 people	38	1.8	1.0 [0.7-1.5]	0.910	59	4.3	1.3 [0.9-1.8]	0.204
3-4 people	34	1.9	1.1 [0.7-1.6]	0.628	59	3.8	1.1 [0.8-1.6]	0.543
Baseline (5 or more)	24	1.7	1.0		29	3.4	1.0	
Number of people husband can rely on in case of long term emergency								
0	49	1.9	1.6 [0.8-3.3]	0.176	91	4.4	1.0 [0.6-1.6]	0.940
1-2 people	39	1.9	1.7 [0.8-3.4]	0.158	52	3.2	0.7 [0.4-1.2]	0.202
3-4 people	8	1.8	1.6 [0.7-3.7]	0.294	6	3.7	0.8 [0.4-1.8]	0.638
Baseline (5 or more)	5	1.2	1.0		11	4.5	1.0	
Participated in community activities in the last 12 months								
No	58	2	1.2 [0.9-1.6]	0.259	113	4.4	1.5 [1.1-1.9]	0.005
Baseline (Yes)	42	1.7	1.0		42	3	1.0	
Travelled to the city In the last 12 months								
None	5	2.3	1.3 [0.6-2.6]	0.490	34	3.7	0.8 [0.6-1.3]	0.208
1-4 times	9	1.2	0.7 [0.4-1.2]	0.180	48	4	0.9 [0.6-1.3]	0.377
5 or more times	11	2.4	1.4 [0.8-2.2]	0.220	25	3	0.6 [0.4-1.0]	0.028
Baseline (almost everyday)	67	1.8	1.0		36	4.7	1.0	
Number of referrals								
Two referrals or more					24	4.6	1.2 [0.9-1.7]	0.278
One referral					133	3.8	1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

Table 7.4b: Results of regression analyses predicting the travel delay stratified by the type of referral

	Self-referral				Referred by health facilities			
	N	Delay	Ratio to the baseline [95%CI]	p-value	N	Delay	Ratio to the baseline [95%CI]	p-value
Household type								
Nuclear household								
Nuclear	59	1.8	1.0 [0.7-1.3]	0.908	82	4.4	1.3 [1.0-1.6]	0.052
Baseline (Extended)	46	1.9	1.0		75	3.5	1.0	
Birth family lives nearby								
No	26	1.6	0.8 [0.5-1.2]	0.289	34	4.9	1.4 [1.0-1.9]	0.029
Baseline (Yes)	67	2	1.0		110	3.6	1.0	
Community characteristics								
Community has a car								
No	13	2.2	1.2 [0.9-2.2]	0.345	22	4.8	1.3 [0.9-1.8]	0.209
Yes	89	1.8	1.0		134	3.8	1.0	
Winter								
Yes	21	2.1	1.2 [0.8-1.7]	0.363	48	4.6	1.2 [1.0-1.6]	0.110
No	85	1.8	1.0		109	3.7	1.0	
Remoteness								
One minute increase in travel		2.1	1.0 [1.0-1.0]	0.055		4.4	1.0 [1.0-1.0]	0.094
Baseline		2.1	1.0			4.4	1.0	
Complication types								
Eclampsia	24	2.2	1.5 [1.0-2.3]	0.067	42	3.6	1.3 [0.9-2.0]	0.180
Severe pre-eclampsia	10	1.5	1.0 [0.6-1.8]	0.954	9	6.2	2.3 [1.3-4.3]	0.007
Rupture of uterus	6	2.3	1.6 [0.8-3.1]	0.212	15	3.8	1.4 [0.8-2.4]	0.196
Impending rupture	12	2.1	1.4 [0.8-2.5]	0.185	21	3.8	1.4 [0.9-2.3]	0.165
Bleeding in early pregnancy	11	1.3	0.9 [0.5-1.6]	0.757	17	4.7	1.7 [1.1-2.9]	0.031
APH	14	2.5	1.7 [1.0-2.9]	0.038	23	4	1.5 [0.9-2.4]	0.087
Infection	3	2	1.4 [0.5-3.5]	0.497	11	6	2.2 [1.3-4.0]	0.007
Other	2	1.8	1.2 [0.4-3.7]	0.736	1	5.2	1.9 [0.4-9.1]	0.395
PPH	24	1.5	1.0		18	2.7	1.0	

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference

Table 7.5: Results of multivariable regression models predicting the ratios of the travel delay experienced by women of different characteristics to the travel delay experienced by the baseline groups.

	Model 1		Model 2		Model 3		Model 4	
	Adj. ratio	p-value	Adj. ratio	p-value	Adj. ratio	p-value	Adj. ratio	p-value
Remoteness	1.0 [0.9-1.1]	0.475	0.9 [0.8-1.0]	0.222	0.9 [0.8-1.0]	0.243	0.7 [0.7-0.8]	<0.001
Season								
Winter	1.4 [1.1-1.7]	0.012	1.3 [1.0-1.6]	0.043	1.4 [1.1-1.8]	0.009	1.3 [1.0-1.6]	0.038
Complication types (baseline= PPH)								
Eclampsia			1.5 [1.1-2.2]	0.009	1.6 [1.1-2.2]	0.006	1.4 [1.0-1.8]	0.027
Severe pre-eclampsia			1.5 [1.0-2.4]	0.074	1.4 [0.9-2.2]	0.157	1.4 [0.9-2.1]	0.087
Rupture of uterus			1.6 [1.0-2.6]	0.032	1.6 [1.0-2.5]	0.035	1.4 [0.9-2.0]	0.093
Impending rupture of uterus			1.6 [1.1-2.3]	0.018	1.6 [1.1-2.4]	0.014	1.4 [1.0-2.0]	0.041
Bleeding during early pregnancy			1.5 [1.0-2.2]	0.048	1.5 [1.0-2.2]	0.014	1.2 [0.9-1.8]	0.238
APH			1.8 [1.2-2.6]	0.002	1.8 [1.2-2.6]	0.002	1.6 [1.1-2.2]	0.006
Severe infection			2.4 [1.5-4.1]	0.001	2.4 [1.4-4.1]	0.001	1.9 [1.2-3.0]	0.009
Have access to a vehicle in the community(baseline = yes)								
No					1.5 [1.1-2.2]	0.025	1.5 [1.1-2.1]	0.010
Winter * access to car in the community								
Winter and no access to a car					0.5 [0.3-0.9]	0.032	0.6 [0.4-1.1]	0.115
Number of health facilities visited (baseline=study hospital only)								
3 or more							3.3 [2.3-4.8]	<0.001
2							2.5 [2.1-3.1]	<0.001
Birth family lives nearby(baseline = yes)								
No								
Birth family lives nearby * Number of health facilities(baseline = Yes and study hospital)								
No * 3 or more								
No * 2								
Asset-based socio-economic status (baseline = least poor)								
Poorest								
3rd poorest								
2nd poorest								
Husband's participation in community activities(baseline = yes)								
No								
Travel delay for the baseline			2.2	<0.001	2.1	<0.001	2.5	<0.001

p-value indicates the probability of the observed difference occurring from that of baseline group under the null hypothesis that there is no difference.

Table 7.5: Results of the multivariable regression models predicting the ratios of the travel delay experienced by women of different characteristics to the travel delay experienced by the baseline groups.

	Model 5		Model 6		Model 7		Final	
	Adj. ratio	p-value	Adj. ratio	p-value	Adj. ratio	p-value	Adj. ratio	p-value
Remoteness	0.7 [0.7-0.8]	<0.001	0.7 [0.6-0.8]	<0.001	0.7 [0.6-0.8]	<0.001	0.7 [0.6-0.8]	<0.001
Season								
Winter	1.2 [0.9-1.5]	0.151	1.2 [1.0-1.5]	0.122	1.2 [0.9-1.5]	0.159	1.2 [0.9-1.5]	0.140
Complication types (baseline= PPH)								
Eclampsia	1.4 [1.0-1.9]	0.030	1.4 [1.0-1.9]	0.037	1.4 [1.0-1.9]	0.038		
Severe pre-eclampsia	1.4 [1.0-2.2]	0.082	1.5 [1.0-2.2]	0.070	1.4 [0.9-2.2]	0.087		
Rupture of uterus	1.5 [1.0-2.2]	0.062	1.5 [1.0-2.2]	0.062	1.5 [1.0-2.2]	0.050		
Impending rupture of uterus	1.4 [1.0-2.0]	0.051	1.4 [1.0-2.0]	0.061	1.4 [1.0-2.0]	0.078		
Bleeding in early pregnancy	1.2 [0.8-1.7]	0.452	1.4 [0.8-1.7]	0.380	1.1 [0.8-1.6]	0.503		
APH	1.7 [1.2-2.3]	0.003	1.6 [1.2-2.3]	0.004	1.6 [1.1-2.2]	0.006		
Severe infection	1.8 [1.1-2.9]	0.016	1.7 [1.0-2.7]	0.032	1.7 [1.0-2.7]	0.039		
Complication types (baseline= PPH & bleeding in early pregnancy)								
All other types							1.4 [1.1-1.7]	0.002
Have access to a vehicle in the community(baseline = yes)								
No	1.5 [1.1-2.2]	0.011	1.5 [1.1-2.1]	0.019	1.5 [1.0-2.1]	0.026	1.6 [1.1-2.2]	0.007
Winter * lack of access to car								
Winter and no access to a car	0.6 [0.3-1.1]	0.098	0.6 [0.3-1.1]	0.123	0.6 [0.3-1.1]	0.107	0.6 [0.3-1.1]	0.077
Number of health facilities visited (baseline=study hospital only)								
3 or more	2.8 [1.8-4.2]	<0.001	2.8 [1.9-4.3]	<0.001	2.8 [1.8-4.3]	<0.001	2.7 [1.8-4.1]	<0.001
2	2.2 [1.7-2.9]	<0.001	2.2 [1.7-2.9]	<0.001	2.2 [1.7-2.8]	<0.001	2.2 [1.7-2.8]	<0.001
Birth family lives nearby(baseline = yes)								
No	0.8 [0.6-1.2]	0.341	0.8 [0.6-1.1]	0.247	0.8 [0.6-1.1]	0.214	0.8 [0.6-1.1]	0.144
Birth family lives nearby * Number of health facilities(baseline = Yes and study hospital								
No * 3 or more	2.2 [0.9-5.2]	0.068	2.2 [0.9-5.1]	0.069	2.1 [0.9-5.0]	0.081	2.1 [0.9-5.0]	0.072
No * 2	1.5 [0.9-2.3]	0.083	1.5 [1.0-2.4]	0.072	1.5 [1.0-2.4]	0.058	1.6 [1.0-2.4]	0.042
Asset-based socio-economic status (baseline = least poor)								
Poorest			1.5 [1.1-2.1]	0.010	1.5 [1.1-2.1]	0.024	1.5 [1.1-2.1]	0.018
3rd poorest			1.3 [0.9-1.8]	0.100	1.3 [1.0-1.8]	0.097	1.3 [1.0-1.8]	0.086
2nd poorest			1.5 [1.1-2.1]	0.011	1.5 [1.1-2.1]	0.010	1.5 [1.1-2.1]	0.007
Husband's participation in community activities(baseline = yes)								
No					1.2 [1.0-1.5]	0.113	1.2 [1.0-1.5]	0.095
Travel delay for the baseline	2.7	<0.001	2.1	<0.001	2.0	0.002	2.0	0.001

8. The vital status of the foetus at admission

This final chapter on results analyses the vital status of the foetus at admission. It seeks to understand the relative importance of delays in seeking care in relation to other known determinants of foetal death. The conceptual framework is presented first. The crude associations between each determinant and foetal death are then described. A multivariable logistic regression model is finally used to identify determinants that are important influences on the vital status of foetus at admission after controlling for confounding effects.

The analysis of the current theme is limited to a subset of the sample. Only women who would be expected to have a viable foetus in view of their advanced gestational week (22nd week or later) at the time of admission are included (N=296). In terms of complication types, the sample comprises women with APH, severe pre-eclampsia[oo], eclampsia, impending rupture of uterus and rupture of uterus. Women who had complications in the postpartum period (i.e., PPH and postpartum infection) are excluded because at the onset of the complication their foetuses had already been delivered and delays in seeking care for the obstetric complications would not have any causal effect on their vital status.

8.1. Conceptual framework

Due to lack of a standardized classification system that is suitable for low income countries, and lack of data related to stillbirth particularly in low income countries, there is some uncertainty about the medical causes and risk factors of stillbirths [172]. Broadly speaking, intrauterine foetal death can be classified into; deaths due to foetal growth restrictions, congenital abnormalities, infection[172-176], and asphyxia or hypoxia, although up to 60% of intrauterine foetal deaths can be categorized as 'unexplained' [175 177] due to lack of information or no identified specific medical condition.

In the following section, each determinant, which is a characteristic associated with foetal death but not obviously a clinical cause or explanation, is presented

[oo] Since there was no woman with pre-eclampsia who had a dead foetus at the time of admission, women with severe pre-eclampsia were completely dropped from analyses when data were stratified by complication types.

and justified in relation to the mechanisms that lead to the clinical factors responsible for death. I will start with those that are on the left-hand side of the conceptual framework (Figure 8.1) and are more distal, and then move to those that are on the right and are more proximate. Maternal nutritional status, which is an important determinant of foetal death[172], is not measured in the study but is included in the conceptual framework because some distal determinants are thought to be associated with maternal nutritional status.

Socio-economic status

Socio-economic disadvantage is one of the most important determinants for stillbirth in developing countries[172] as it relates to utilization of healthcare services. Stillbirths, particularly those related to the intrapartum period, may be preventable with appropriate intrapartum care [177-178]. Therefore, women in low socio-economic class who have more difficulty accessing intrapartum care, both physically and financially, have elevated risk of stillbirth. There are also numerous other pathways of influence, because socio-economic disadvantage is systematically associated with some of the other important but more immediate determinants of stillbirth. For example, it is associated with maternal nutritional status (often assessed using the extremes of Body Mass Index or 'BMI')[179], which is a determinant for foetal death [172 180]. It is also associated with extremes of maternal age and underutilization of healthcare during pregnancy (discussed below). The education status of both the woman and her husband are included in the forthcoming analysis as indicators of the household socio-economic status, because maternal illiteracy or low education status, which are also an important aspects of socio-economic disadvantage, are found to be associated with stillbirth[181-183].

Woman's status in the household

Indicators of a woman's status in the household have been shown to be associated with the woman's malnutrition [184-185], which in turn is associated with a higher risk of stillbirth, as discussed earlier [172 180]. For example, Hindin (2000) showed that women who have no say in household decision making regarding the purchase of a household item or their work outside the home had an

increased risk of chronic energy deficiency. In another example, Ackerson et al. (2008) showed evidence of associations of domestic violence with anaemia and low BMI [185]. An additional pathway of influence on stillbirth of a woman's position in the household is through the use of preventive or curative health services. Women with a low position in their household may not have the financial and social resources to enable them to seek care [149]. I will use the three variables that are indicative of a woman's status in the household that were used in previous chapters: (1) the woman's relationship with her birth family and relatives outside the usual home; (2) the woman's relationship with the husband and his family, and (3) whether the woman has money at her disposal.

Other distal determinants

In the previous three chapters, the effects of access to a car, access to health services, household type, social capital and proximity of the woman's birth family on delays in care seeking were shown. They are therefore included in the conceptual framework, without further detailed explanations in this section, but with the acknowledgement that the evidence of some of these effects was weak.

Maternal reproductive factors (age and parity)

Parity and maternal age are somewhat correlated but the mechanisms of their influence on stillbirth are quite different. Nulliparity is associated with foetal death because hypertensive disorder, which is an important risk factor for foetal death (discussed below), is more common among nulliparous women [186]. Grandmultiparity, on the other hand, is found to be associated with gestational diabetes[187-189], which in turn may result in macrosomia (i.e., big baby)[22 190] and carries a high risk of obstructed labour[172 190]. Poorly controlled diabetes also carries a high risk of congenital abnormalities [172 191]. Advanced maternal age is found to be associated with foetal death [172 192-195] due to congenital abnormalities associated with chromosomal damage [194 196] in older women. Some studies also suggest that older women's higher risk of foetal death is due to the disorders associated with uteroplacental underperfusion (i.e., decreased level of uteroplacental blood flow), or the 'failure of the uterine vasculature (i.e. the blood vessels in uterus) in older women to adapt sufficiently to the increased

hemodynamic (i.e. blood circulation) demands of pregnancy' [197-198 pp]. In the current analysis, parity categorized into three groups (nullipara, multipara (1–4) and grand multipara) and maternal age categorized into four groups (<=18, 18-25, 26-35, 35+) are used. The cut-off ages of 18 and 35 were chosen because in their systematic review, 'Maternal age and risk of stillbirth', Huang et al. (2008) reported that 35 or older was the most commonly used definition for old maternal age [192]. In addition, Lawn et al. (2009) stated that pregnancy at young age (<18) as well as at an advanced maternal age (>35) was the risk factor of stillbirth[172].

Obstetric complications

Obstructed labour, which may result from cephalopelvic disproportion or abnormal presentation, is known as an important underlying cause of foetal deaths because of associated asphyxia, trauma or infection during the difficult labour[199-201]. Similarly, hypertensive disorders during pregnancy such as pre-eclampsia and eclampsia are important causes of foetal deaths [174 199 201] because of uteroplacental insufficiency, which could lead to poor foetal growth and hypoxia (or deprivation of adequate oxygen supply). Oligohydramnios (deficiency of amniotic fluid), which is also associated with hypertensive disorders, may also result in abnormal compression during labour and may further result in foetal hypoxia[22]. Antepartum haemorrhage associated with abruptio placentae, and placenta praevia is a major cause of foetal deaths because of limited supply of oxygen and blood to the foetus [199-200]. I will use the types of complications that were used in previous chapters in the forthcoming analysis: APH, pre-eclampsia, eclampsia, impending rupture of uterus and rupture of uterus.

Poor obstetric history

A number of studies reported an association between prior stillbirth and elevated risk for subsequent foetal death [202-207] although the mechanism of causality is largely still unclear [205-206]. Persistent maternal diseases (e.g.

[pp] Among other things, uterine blood flow, plasma volume, and red blood cell mass increase during pregnancy.

diabetes) or recurrent foetal conditions (e.g. congenital abnormalities or foetal hydrops[qq]) explain some of the recurrence of stillbirth in subsequent pregnancies. A higher risk of malpresentation subsequent to a stillbirth has also been reported[205], which may lead to a higher risk of stillbirth. In the current analysis, the history of having a stillborn baby is used.

Illness control and prevention during pregnancy and childbirth

Lack of adequate ANC has been found to be associated with foetal death in both developed and developing countries [183 207-209]. ANC provides the opportunity to prevent or detect and treat diseases and medical conditions that are associated with foetal death, such as diabetes, hypertension, anaemia, infection and malnutrition. It can also be speculated that women who do not attend ANC are less careful about their overall health behaviours during pregnancy. The association between uptake of ANC and foetal death could also be explained by confounding factors, such as domestic violence, which could prevent some women from obtaining ANC and also could lead to intrauterine death[210]. In the current analysis, both uptake of ANC and whether delivery was planned in a health facility are included.

Delays

Both descriptive and analytical studies have examined the influence of delays on perinatal death or survival in low income countries [211-212]. For example, a perinatal audit conducted in Tanzania implied that a first and a second delay were among the important causes of perinatal deaths. A facility-based study was conducted in Nigeria to identify non-medical factors contributing to stillbirth. It reported that all three of the delay types suggested by Thaddeus and Maine[45] occurred more frequently among stillborn babies than among the surviving controls [212]. In a developed-country setting, a facility-based study, focussing more specifically on the third delay, indicated that many stillbirths that were judged 'preventable' had experienced delays in the management of foetal heart rate tracing abnormalities [213], suggesting that the timeliness of care is an important determinant of survival. In the forthcoming analysis, two types of

[qq] Oedema of the entire body of the newborn often due to haemolytic disease of the newborn.

delays are considered: the first is the duration of the time between recognition of illness and decision to seek care and the second is the duration of the time between the decision and arrival in the study hospital. The first delay is categorised into four groups of less than 0.5 hours, 0.5–3 hours, 3–10 hours and over 10 hours, and the second delay into less than 2 hours, 2–5 hours, 5–12 hours and over 12 hours.

8.2. Bivariable analysis

Results of the crude analyses are presented in Table 8.1, and are discussed in more detail below. Among the total of 296 women who were eligible to enter the analyses in view of their gestational age, 106 women had a dead foetus, and 168 had a live foetus at admission. The high proportion of dead foetus in itself is an indication of the very close relationship between maternal and perinatal morbidity. The information regarding the vital status of the foetus was not available for 22 women.

(1) Remoteness

There was a clear dose-response relationship between foetal mortality prevalence and the extent to which the woman's residence was remote (p=0.011 or p=0.003 for the test for linear trend). The mortality prevalence among foetuses of women from the most remote quartile was 53%, compared with just 26% for foetuses of women from the least remote quartile (within 20 minutes travelling distance from the hospital).

(2) Socio-economic status

The foetal mortality prevalence increased as the socio-economic status decreased. While the mortality prevalence was just 20% among those of the least poor quartile, the prevalence in the two middle quartiles was 38% and 40%, and it was 44% among women of the poorest quartile (p=0.065). Both the woman's and her husband's education showed weak evidence of association with the mortality prevalence of the foetus: the prevalence was 30% among women with an educated husband, while it was higher at 39% among women with an uneducated husband (OR=1.7, p=0.066). The mortality prevalence of the foetus

was just 21% amongst educated mothers whilst it was 39% amongst uneducated mothers (OR=2.4, p=0.030).

(3) Woman's status in the household

The strongest evidence of association was found for the variable measuring women's financial autonomy (e.g. 'having money at her disposal'). Foetal mortality prevalence was only 18% among women who answered that they had money at their disposal, but reached 44% among women who answered negatively (OR=3.9, p<0.001). Women who reported a weak relationship with their birth family and relatives were 2.4 times more likely to experience a foetal death than women with a strong relationship (p=0.009). Foetal death was also 1.9 times more likely among women who were not close to their husband and husband's family members (p=0.060).

(4) Other distal determinants

Access to a car

There was no evidence of association between access to a car in the community and foetal mortality.

Access to health facilities

There was no evidence of association between access to a healthcare facility and foetal mortality.

Household type

Foetal mortality prevalence was higher among women who lived in a nuclear family household (41%) than among women in extended family households (29%) (OR=1.7, p=0.044).

Husband's social capital

There was no clear evidence of association between husband's social capital and foetal mortality.

Proximity of woman's birth family

There was weak evidence of association between proximity of woman's birth family's residence and foetal mortality prevalence. Foetal mortality was 48% among women who answered that their birth family live far away compared with

33% among women who answered that their birth family lives close to them (OR=1.73, p=0.073).

(5) Maternal reproductive factors (age and parity)

There was very strong evidence of an association between parity and the foetal mortality prevalence. The prevalence was very high among the foetuses of grand multipara women (50%) while it was just 16% among those of nulliparous women (p<0.001).

With respect to maternal age, foetal mortality prevalence was the highest for women aged 26–35, as nearly half (46%) of their foetuses had negative foetal heart rate on admission, and was lowest among women aged 18 or less (18%) (p=0.019).

(6) Complication types

The risk of foetal death differed greatly according to maternal complication types (p<0.001). While all the women with pre-eclampsia had a live foetus upon admission to the hospital, a large majority of women with rupture of uterus (84%) had a dead foetus at admission. Foetal mortality prevalence was also high at 64% among women with diagnosis of APH.

(7) Poor obstetric history

The difference in the mortality prevalence between those with and without a history of stillbirth (53% and 45%) did not reach statistical significance (p=0.559) partly because of lack of power associated with the small number of the women who had been pregnant before (N=175).

(8) Illness prevention and control

There was no evidence of an association between uptake of ANC and foetal mortality. However, the foetal mortality prevalence was lower for mothers who had planned a health facility delivery (27%) compared with mothers without such a plan (41%) (OR=2.0, p=0.020).

(9) Delays

The effects of delays on foetal mortality prevalence were uneven and could not be explained by linearity. The prevalence was higher for those with a 0.5- to 3-

hour decision delay than those with less than a half-hour delay (OR=2.0, p=0.081), but an increasing trend could not be seen in women with a 3-10 hour delay and those with a decision delay greater than 10 hours. The prevalence seems to increase as the travel delay increases, but the risk drops for women with a travel delay greater than 12 hours.

8.3. Multivariable analyses

As in previous chapters, an hierarchical approach[157] building on the conceptual framework is used to obtain the final multivariable model that explains the vital status of the foetus at admission. The order in which the variables in the same hierarchical level are entered into the model was determined by the results of likelihood ratio tests, with the variable of a stronger association entered into the model first. The threshold of p=0.1 is used to decide whether the variable is entered into the model or not. Variables that have lost evidence of associations at the final stage are assessed to decide whether to drop the variables or keep them in the final model by using likelihood ratio test, comparing the models with and without the variables one by one. Interactions were not investigated for this analytical theme because existing knowledge do not support that investigations of interactions are imperative.

Model-building

Remoteness was first entered in the model. It was followed by women's access to money, because the result of the likelihood ratio test indicated that it fitted the dataset best amongst the distal determinants. Socio-economic status variables were not entered because the results of likelihood ratio tests comparing the model with and without socio-economic status did not indicate that the variables fit the dataset significantly better. Household type and proximity of the woman's birth family were then entered into the model one after another.

Proximate determinants were also assessed for their goodness-of-fit. Parity was entered into the model (model 5 in Table 8.2) first as it improved the previous model significantly better. In model 5, the evidence for an association between household type and the vital status of the foetus was reduced, suggesting that the

higher odds of foetal death among pregnant women in nuclear households could be explained by their multiparity, as older couples tend to live in nuclear households. In the next instance, a woman's parity lost its association with the foetal death after the complication type was entered into the model (model 6), probably because most women with rupture of uterus, which had higher odds of foetal death, were multiparous. Since the history of stillbirth (p=0.639) or uptake of ANC (p=0.643) did not improve the model, the decision delay and the travel delay were entered into the model[rr]. The result of the likelihood ratio test comparing the model with and without the travel delay did not indicate that the variable was an important determinant (model 8). In the final model, household type and parity were dropped. It was found that the risk of the decision delay on foetal death did not increase linearly as the delay became greater. The largest effect on the vital status was from a decision delay of 0.5–3 hours, with the OR = 5.6, and the OR decreased as the delay increased. The OR was 4.6 for a 3–10 hour delay and it was not significantly greater than one for women who had a 10-hour or longer delay. It was also found that, in addition to complication types which explained most of the foetal death, the women who did not have money at their disposal had increased likelihood of foetal death compared with those who had money at their disposal (OR=3.1, 95%CI=1.2–8.2, p=0.023). The location of the woman's birth family also mattered. Those women who said that their birth family do not live nearby had an increased likelihood of foetal death compared with those who said their birth family lived nearby (OR=2.6, 95%CI=1.0–6.5, p=0.043).

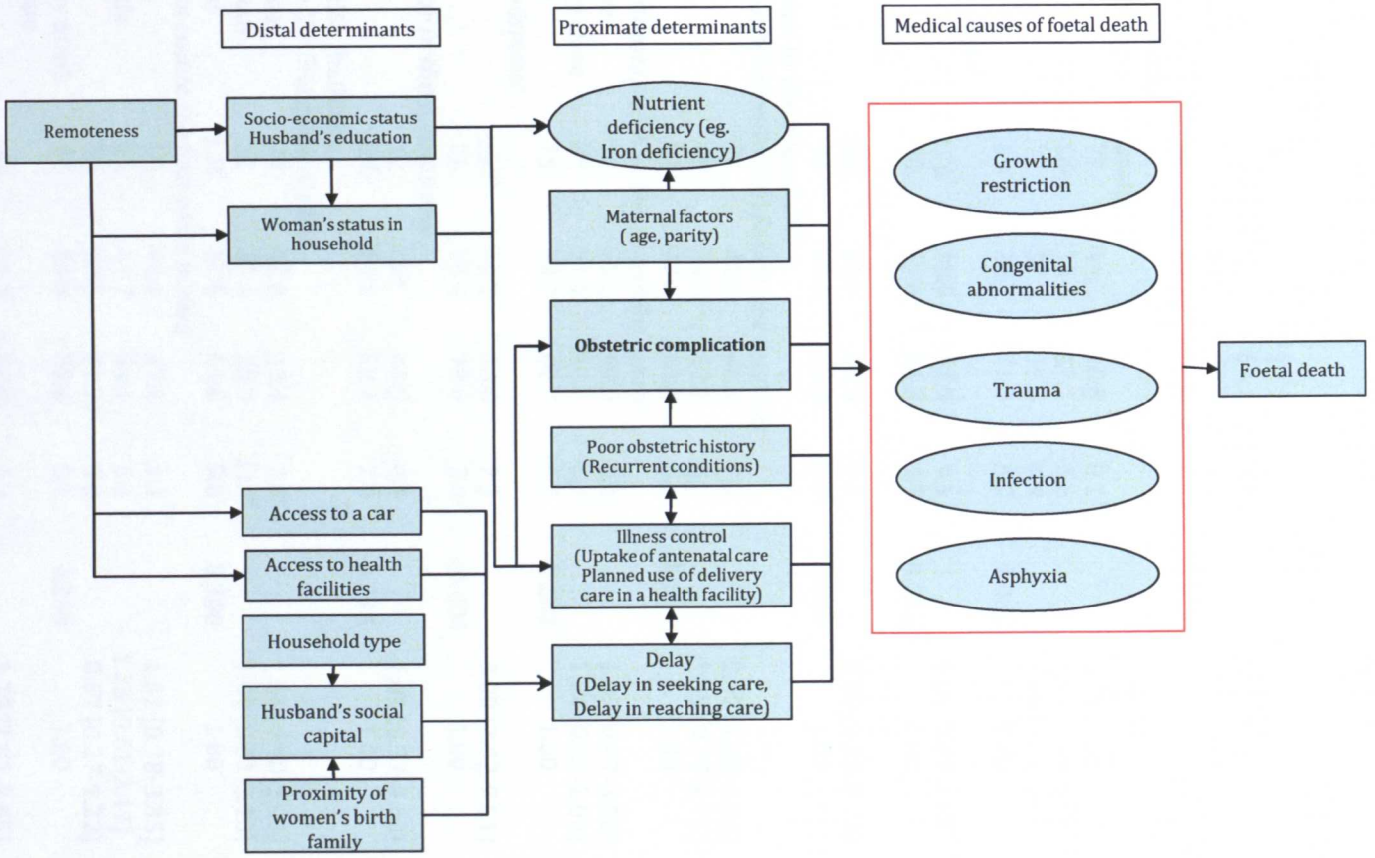
8.4. Summary

The analysis in this chapter was conducted in order to assess the relative importance of the first and second delays in comparison with other known determinants of foetal death. While the complication types determined the

[rr] Obstetric complications are presumably very closely associated with foetal deaths, and it could be argued that complication type was the most proximate determinant and should be entered into the model last. However, the decision to enter delay variables last was taken because what determined survival of foetuses among women of a same complication group was postulated to be duration of delay before obtaining care, and as we have seen in a previous chapter, delay durations are determined greatly by types of complications. Complication types were therefore argued to be hierarchically below delay durations.

mortality risk of the foetus at admission to a large extent, it was also found that the decision delay was among the important determinants in the final multivariable model. In the multivariable model, the association between decision delay and foetal death became disentangled and clearer because of adjustments by complication types. For example, women with APH, who tend to have a short decision delay (chapter 5), had a relatively high risk of foetal death, while women with impending rupture of uterus, who had a long decision delay on average, had a low risk of foetal death. Stratification by complication types helped to demonstrate the effect of decision delay on foetal death. Other factors that were found to be important in the final model included whether the woman had money at her disposal and whether the woman's birth family lived close to her. The travel delay, which had some effect in the crude analysis, was not an important factor in the final multivariable model after controlling for other factors.

Figure 8.1 Conceptual framework to explain determinants of vital status of foetus at admission



A. Hirose, 2010

Table 8.1: Proportions of live and dead foetuses at admission and odds ratios for foetal death according to women's characteristics

	Vital status of the foetus at admission						
		FHR -	FHR +	missing		FHR -	
	N	%	%	%	p-value	OR	p-value
In total							
All women	296	35.8	56.8	7.4			
Distal determinants							
Remoteness							
Most remote	61	52.5	37.7	9.8		3.59 [1.76-7.64]	<0.001
2nd remotest	85	36.5	54.1	9.4		1.74 [0.90-3.35]	0.097
3rd remotest	54	29.6	66.7	3.7		1.15 [0.54-2.44]	0.720
Least remote	92	26.1	67.4	6.5	0.011	1.00	
Socio-economic status							
Household socio-economic status							
Poorest	77	44.2	46.8	9.1		3.31 [1.55-7.04]	0.002
2nd poorest	56	39.3	57.1	3.6		2.41 [1.08-5.38]	0.032
3rd poorest	72	37.5	55.6	6.9		2.36 [1.10-5.10]	0.028
Least poor	69	20.3	71.0	8.7	0.065	1.00	
Husband's education							
No	176	38.6	52.3	9.1		1.66 [0.97-2.84]	0.066
Yes	98	29.6	66.3	4.1	0.055	1.00	
Woman's education							
No	226	38.9	54.0	7.1		2.40 [1.09-5.32]	0.030
Yes	42	21.4	71.4	7.1	0.086	1.00	
Woman's status in the household							
Woman's relationship with birth family and relatives							
Weak	76	46.1	46.1	7.9		2.37 [1.24-4.54]	0.009
Moderate	82	36.6	59.8	3.7		1.45 [0.77-2.75]	0.254
Strong	97	27.8	66.0	6.2	0.087	1.00	
Woman's relationship with husband and his family							
Not so close	93	45.2	49.5	5.4		1.87 [0.97-3.58]	0.060
Moderately close	88	31.8	62.5	5.7		1.04 [0.53-2.04]	0.909
Very close	75	30.7	62.7	6.7	0.283	1.00	
Money at her disposal							
No	181	44.2	48.6	7.2		3.90 [2.02-7.51]	<0.001
Yes	76	18.4	79.0	2.6	<0.001	1.00	
Access to a car in the community							
No	22	50	45.5	4.6		1.89 [0.77-4.63]	0.165
Yes	250	34.0	58.4	7.6	0.314	1.00	
Access to health facilities							
Travel time to the first place of care							
> =1.25 hour	79	43.0	49.4	7.6		1.64 [0.90-2.97]	0.105
0.5-1.25 hour	51	31.4	56.9	11.8		1.04 [0.51-2.13]	0.923
<= 0.5 hour	125	32.8	61.6	5.6	0.300	1.00	
Transportation cost to the first place of care							
> 500 Afs	53	43.4	47.2	9.4		1.62 [0.78-3.35]	0.195
100-500 Afs	61	37.7	54.1	8.2		1.23 [0.61-2.47]	0.569
< 100 Afs	60	23.3	71.7	5.0		0.57 [0.27-1.22]	0.148
Did not pay at all	87	33.3	58.6	8.1	0.269	1.00	
Household type							
Nuclear	144	41.0	52.8	6.3		1.70 [1.01-2.85]	0.044
Extended	130	28.5	62.3	9.2	0.085	1.00	
Husband's social capital							
Husband participated in community activities							
No	176	36.0	54.9	9.1		1.21 [0.71-2.07]	0.485
Yes	98	34.0	62.8	3.2	0.150	1.00	

Table 8.1 (continued): Proportions of live and dead foetuses at admission and odds ratios for foetal death according to women's characteristics

	Vital status of the foetus at admissio						
		FHR -	FHR +	missing		FHR -	
	N	%	%	%	p-value	OR	p-value
The number of people husband can borrow a small amount of money from							
none	14	35.7	64.3	0.0		1.50 [0.44-5.13]	0.515
1-2	89	44.9	47.2	7.9		2.58 [1.28-5.21]	0.008
3-4	100	34.0	58.0	8.0		1.59 [0.79-3.19]	0.196
5 or more	68	25.0	67.7	7.4	0.202	1.00	
The number of people husband can rely on in case of long term crisis							
none	127	44.9	48.8	6.3		1.94 [0.81-4.64]	0.136
1-2	98	24.5	68.4	7.1		0.76 [0.30-1.90]	0.552
3-4	17	35.3	47.1	17.7		1.58 [0.42-5.94]	0.496
5 or more	30	30.0	63.3	6.7	0.034	1.00	
Proximity of woman's birth family							
does not live nearby	59	47.5	49.2	3.4		1.73 [0.95-3.15]	0.073
lives nearby	203	33.0	59.1	7.9	0.092	1.00	
Proximate determinants							
Maternal factors							
Parity							
Nulliparous	94	16.0	46.6	7.5		1.00	
1-4	81	44.4	45.7	9.9		4.67 [2.27-9.61]	<0.001
Grand multipara	90	50.0	46.7	3.3	<0.001	5.14 [2.56-10.33]	<0.001
Maternal age							
< =18	49	18.4	69.4	12.2		1.00	
18-25	87	29.9	64.4	5.8		1.75 [0.74-4.18]	0.205
26-35	108	46.3	46.3	7.4		3.78 [1.64-8.69]	0.002
> 35	52	40.4	53.9	5.8	0.019	2.83 [1.12-7.16]	0.028
Complication type							
Eclampsia	92	16.3	77.8	10.9		1.00	
Severe pre-eclampsi	56	0.0	96.4	3.6		-	
Rupture of uterus	38	84.2	10.5	5.3		35.73 [10.97-116.36]	<0.001
Impending rupture	42	40.5	57.1	2.4		3.16 [1.37-7.30]	0.007
APH	64	64.1	26.6	9.4		10.77 [4.86-23.87]	<0.001
Heart disease	4	25.0	50.0	25.0	<0.001	2.23 [0.19-26.27]	0.523
Poor obstetric history							
Yes	34	52.9	38.2	8.8		1.47 [0.67-3.24]	0.339
No	141	45.4	48.2	6.4	0.559	1.00	
Healthcare							
ANC							
None	67	37.3	53.7	9.0		1.53 [0.76-3.09]	0.233
1-3 times	121	39.7	52.1	8.3		1.68 [0.91-3.10]	0.223
4 or more	80	30.0	66.3	3.8	0.293	1.00	
Planned to delivery in health facility							
No	177	40.7	52.0	7.3		1.96 [1.11-3.44]	0.020
Yes	90	26.7	66.7	6.7	0.062	1.00	
Delays							
Decision delay							
> 10 hours	58	34.5	56.9	8.6		1.40 [0.67-2.93]	0.376
3-10 hours	74	39.2	52.7	8.1		1.71 [0.86-3.40]	0.124
0.5-3 hours	52	42.3	50.0	7.7		1.95 [0.92-4.13]	0.081
< 0.5 hour	82	28.1	64.6	7.3	0.693	1.00	
Departure+travel delay							
>=12 hours	57	29.8	61.4	8.8		1.21 [0.55-2.69]	0.633
5-12 hour	75	42.7	48.0	9.3		2.22 [1.08-4.59]	0.031
2-5 hour	68	36.8	54.4	8.8		1.69 [0.80-3.56]	0.168
< 2 hour	65	27.7	69.2	3.1	0.235	1.00	

Table 8.2: Results of multivariable logistic regression models assessing the associations between foetal death and selected characteristics of women

	Model 1			Model 2			Model 3			Model 4			Model 5		
	OR	p-value	[95%CI]	OR	p-value	[95%CI]	OR	p-value	[95%CI]	OR	p-value	[95%CI]	OR	p-value	[95%CI]
Remoteness (baseline=least)															
Most remote	3.59	<0.001	[1.76-7.34]	2.84	0.009	[1.30-6.21]	2.75	0.014	[1.23-6.15]	2.76	0.014	[1.22-6.21]	2.28	0.060	[0.94-5.41]
2nd remotest	1.74	0.097	[0.90-3.35]	1.32	0.447	[0.64-2.73]	1.32	0.456	[0.63-2.77]	1.19	0.647	[0.56-2.53]	1.07	0.869	[0.48-2.38]
3rd remotest	1.15	0.72	[0.54-2.44]	0.87	0.731	[0.38-1.96]	0.76	0.519	[0.33-1.76]	0.74	0.481	[0.32-1.72]	0.71	0.459	[0.29-1.74]
Have money at her disposal(Baseline=yes)															
No				3.73	<0.001	[1.91-7.32]	3.32	0.001	[1.68-6.56]	3.19	0.001	[1.61-6.34]	2.55	0.012	[1.23-5.30]
Household type(Baseline=extended)															
Nuclear							1.85	0.035	[1.04-3.29]	1.87	0.035	[1.04-3.35]	1.01	0.975	[0.51-1.99]
Birth family living nearby(Baseline = yes)															
No										1.81	0.075	[0.94-3.48]	1.57	0.214	[0.77-3.21]
Parity (baseline=Nulliparous)															
Multipara (1-4)													5.72	<0.001	[2.34-14.04]
Grand multipara													6.96	<0.001	[2.76-17.58]

Table 8.2 (continued): Results of multivariable logistic regression models assessing the associations between foetal death and selected characteristics of women

	Model 6			Model 7			Model 8			Final model		
	OR	p-value	[95%CI]	OR	p-value	[95%CI]	OR	p-value	[95%CI]	OR	p-value	[95%CI]
Remoteness (baseline = least remote)												
Most remote	2.59	0.093	[0.85-7.87]	2.40	0.138	[0.75-7.66]	5.12	0.066	[0.90-29.19]	2.62	0.099	[0.83-8.25]
2nd remotest	1.13	0.812	[0.41-3.17]	0.80	0.691	[0.27-2.37]	1.78	0.484	[0.35-8.93]	0.79	0.661	[0.27-2.30]
3rd remotest	1.15	0.824	[0.35-3.79]	1.07	0.915	[0.30-3.81]	1.50	0.602	[0.33-6.88]	1.10	0.884	[0.31-3.93]
Have money at her disposal (baseline =yes)												
No	2.24	0.093	[0.87-5.75]	2.88	0.038	[1.06-7.82]	2.62	0.097	[0.84-8.20]	3.09	0.023	[1.17-8.18]
Household type (baseline=extended)												
Nuclear	0.72	0.473	[0.29-1.78]	0.74	0.547	[0.28-1.97]	0.78	0.601	[0.25-2.20]			
Birth family living nearby (baseline=yes)												
No	1.99	0.146	[0.79-5.05]	2.49	0.068	[0.94-6.61]	3.37	0.040	[1.06-10.71]	2.59	0.043	[1.03-6.51]
Parity (baseline=Nulliparous)												
Multipara (1-4)	1.13	0.854	[0.30-4.23]	1.42	0.630	[0.34-5.99]	0.79	0.818	[0.11-5.64]			
Grand multipara	1.35	0.669	[0.34-5.36]	1.42	0.649	[0.31-6.39]	0.84	0.868	[0.11-6.43]			
Complication type (baseline = eclampsia)												
Rupture of uterus	55.95	<0.001	[10.82-289.30]	51.92	<0.001	[8.74-308.43]	158.38	<0.001	[14.11-1777]	52.19	<0.001	[11.63-234.18]
Impending rupture of	3.92	0.049	[1.00-15.34]	3.08	0.128	[0.72-13.09]	9.46	0.034	[1.18-78.73]	3.09	0.061	[0.95-10.08]
APH	21.32	<0.001	[5.40-84.08]	27.84	<0.001	[6.23-124.35]	73.14	<0.001	[8.73-613]	28.32	<0.001	[8.60-93.29]
Decision delay (baseline= <0.5 hour)												
> 10 hours				2.37	0.197	[0.64-8.81]	2.35	0.285	[0.49-11.22]	2.28	0.202	[0.64-8.11]
3-10 hours				4.23	0.020	[1.25-14.25]	3.46	0.072	[0.89-13.42]	4.56	0.012	[1.39-15.00]
0.5-3 hours				5.03	0.011	[1.45-17.42]	4.96	0.027	[1.20-20.52]	5.59	0.006	[1.63-19.21]
Departure+travel delay (baseline = <2 hours)												
>=12 hours							0.35	0.284	[0.05-2.39]			
5-12 hour							0.50	0.444	[0.08-2.96]			
2-5 hour							0.97	0.966	[0.19-4.85]			

9. Discussion

9.1. Summary of key findings

Delays in seeking care for obstetric complications cost lives of women. We conducted a study to understand why some women with life-threatening complications delay more than others in order to be able to identify programmatic options.

The findings of the study demonstrated the range and diversity of factors which influence delays. Particularly, they showed that:

- There is considerable variation in explanations between types of delays.
- Determinants of decision delay vary across complication types.
- Practice and attitude regarding healthcare influences decision delays across all the complication sub-groups. Socio-economic status, woman's relationship with the birth family, primigravidity, and access to a midwife are each associated with the decision delay for certain types of complications.
- Seasonality, difficulty in accessing healthcare providers, and lack of social capital influence the departure delay.
- Over-referrals, socio-economic status, access to a vehicle in the community, lack of social cohesion, and physical isolation from birth family influence the travel delay
- The decision delay is associated with an increased risk of foetal death but other factors are equally or more important.

In the following sections, each of these findings will be discussed in turn and compared to the published literature. Selected findings that need further warrant are discussed in light of the context of Afghanistan. The findings will be further discussed in light of strengths and limitations of the study. Programme implications and future research areas will finally be presented.

9.2. Interpretation of findings

9.2.1. Discussions of our findings in the context of previous findings

a. There is considerable variation in explanations between types of delay.
In this study, for each type of delay a different set of determinants were identified. While the decision delay was mainly explained by socio-economic /cultural factors and attitudes toward healthcare, the departure and the travel delays were largely explained by accessibility factors, and social capital. Thaddeus and Maine (1994) presented three major categories of factors that affect the first delay which are socioeconomic/cultural factors, accessibility factors and quality of care factors. They suggested accessibility factors as the main influence on the second delay [45]. Other studies that attempted to explain the first and the second delays using Thaddeus and Maine's framework also found different sets of determinants similar to those identified by Thaddeus and Maine (see Chapter 2). In addition to the list of variety of determinants that were identified by previous studies, this study highlighted the roles of social capital and social resources.

b. Determinants of the decision delay vary according to complication type.
The study showed clear effect modifications by complication types in relation to the decision delay. Thaddeus and Maine suggested in their review that illness characteristics such as perceived severity and perceived cause of illness could affect the care-seeking process [45] and that an interaction of illness characteristics with other factors involved in the decision would be very likely [45]. Although women in our study sample all experienced very severe obstetric complications, some illnesses are known to present more dramatic symptoms and develop more quickly to fatality. Hence, some complication types may be perceived to be milder or more severe than the others at the onset although they all eventually become life-threatening if left untreated. The different set of determinants that the study found for three types of complication groups can be explained by the different manifestations of symptoms at their onset, and indicates presence of effect modification by illness characteristics, as suggested in previous studies. The effect modifications on household economic status and

woman's position in the household were particularly prominent. When the symptoms of the complication were clear enough to reveal the urgency of the situation (i.e., convulsions or massive bleeding), the woman's poor position in the household did not influence the decision to seek care but the low socio-economic status of the household increased the decision delay. When the signs and symptoms were less obvious and perceived to be not so severe, however, the women who did not have a strong relationship with the birth family and other relatives waited longer than their counterparts who did have a strong relationship, before the decision to seek care was made. Their experience was independent of the socio-economic status of the household.

c. Practice and attitude regarding healthcare influences the decision delay across all the complication sub-groups.

This study found that uptake of ANC during pregnancy and having the plan to deliver in a health facility reduces the duration of the decision-making process to obtain emergency care when complications develop. Birth preparedness and complication readiness strategies have been developed as accompanying measures to promote the use of skilled birth attendance and emergency care and have been adopted in many countries with high MMR (e.g., the MotherCare Project, the CHANGE Project and the Home Base Life Saving Skills package). They encompass a range of behaviour change interventions such as community-based or clinic-based behaviour change communication activities, community and social mobilisation, and advocacy, with the aims of encouraging identification of a trained birth attendant before delivery, increasing knowledge of danger signs or of where to go for help, and promoting financial and logistical preparations in case of emergencies. Usefulness of the strategies has been questioned by some [50-51], and studies have been conducted to investigate whether women exposed to behaviour change interventions are more likely to use skilled birth attendance and to be prepared for childbirth and obstetric emergency [214-217]. Most of these studies with maternal health end points are not robust in design [218]. A before-after study reported that exposure to birth preparedness messages increased knowledge of danger signs and financial and logistical preparations but it did not increase use of skilled attendance [214]. On

the other hand, cluster-randomized control trials have shown that behaviour change interventions are associated with reductions of neonatal mortality [215-216]. However, evidence is almost non-existent that shows that exposure to the interventions aiming to increase the degree of preparedness for obstetric emergency through increased knowledge of danger signs or severity of illness leads to actual reduction of the first delay. The lack of evidence is partly due to difficulty in recruiting a large and appropriate sample to test the effectiveness of the target interventions. This study is neither a trial nor an intervention study, nevertheless the study findings seem to support that encouraging women to use delivery care in a health facility during their ANC visits may have a potential to equip women and care-takers for unpredictable obstetric emergencies thereby reducing the decision delay.

d. Seasonality, difficulty in accessing healthcare providers, and lack of social capital influenced the departure delay.

The women who had complications during the winter and summer months reported a longer delay duration between decision and departure than those who had complication during the spring months (chapter 6). Seasonality in the magnitude of maternal morbidity [219] and maternal mortality [95 219-222] has been reported in population-based and hospital-based studies conducted in low-income countries, mainly in Africa. While some of the associations between the seasons and maternal mortality can be explained by aetiological factors such as those related to the intensity of the exposure to malaria [222], contextual factors also seem to be involved [219]. For example, in a facility-based study in Burkina Faso, the season with the highest number of maternal deaths was the end of the dry season and coincided with seasons when household revenues exceeded expenditure and opportunity costs to seek care were low, and during the low transmission period of malaria [219]. The authors attributed the high peaks of institutional maternal deaths and complications during the dry season to the easier access, both physical and financial, to the health facility and suggested that there may be high levels of maternal mortality and complications which remain hidden in the population during the rainy season when the access is more difficult. On the other hand, in a hospital-based study in Malawi, the

season with increased number of maternal deaths coincided with the rainy and planting seasons when people need to prepare their farms [220]. The season also coincided with the time of the year when the number of deliveries in the hospital is low. The authors suggested that the women and the family members delayed in seeking care because they needed to prepare their farms or were unable to travel when they needed to due to the rains, resulting in the large number of maternal deaths observed during the period. Sometimes it can be difficult to disentangle clinical aetiology from contextual factors. In a population-based study in Senegal, the season with high maternal mortality coincided with the rainy season when malaria transmission is high, the population suffers from poor nutrition from intensive farming (though an association between nutritional deficiencies and the incidence or severity of obstetric complications has not been established clearly), and roads are impracticable [222]. All the above studies attempted to explain the seasonality of maternal mortality in African settings in one way or another via care-seeking behaviour pathways, though the designs of some of the studies are weak (in particular when hospital-based). The findings were not consistent, however, partly because the explanations were context-dependent, providing rather inconclusive evidence to explain the associations. This study adds to the previous studies' discussions by demonstrating seasonality in care-seeking behaviours, namely departure delay, for women who had life-threatening obstetric complication.

This study demonstrated that the less accessible the health facilities, the longer the duration of the departure delay. The reasons for the departure delay caused by the inaccessibility of health facilities could be numerous. For example, individuals who are unfamiliar with health facilities might ask neighbours, friends and relatives for advice to find out where to go to receive care. In addition, the further away one lives from a health facility, the more money is necessary to travel there and the more financial and logistical preparations might be necessary. There might be some concerns that the women might deliver in an uncomfortable or undignified situation on the way to the facility or a sense of dread associated with a long journey ahead. Previous studies

implicitly addressed the time it took women and their family members to prepare for departure after the decision to seek care was made (e.g., the duration of time to obtain transportation was measured in Killewo (2006) [105] or 'delay at home' due to lack of transportation was suggested as a reason for the 1st delay in Urassa (1997)[90]), but accessibility in particular was not addressed to be the reason for the delay before departure in their studies. On the other hand, Thaddeus and Maine (1994), who did not investigate this time interval separately from the so-called second delay, suggested that the second delay is influenced by the accessibility to health facilities because of the increased travel time to reach them. This study adds to the previous studies' findings that the so-called second delay could be further prolonged by inaccessibility to health facilities because of the increased time before departure from home.

Having no one that the husband could rely on when facing a long term crisis such as job loss or harvest failure was associated with increased departure delay. To the best of my knowledge, there is no published study in the maternal health field that quantified how various aspects of man's social capital affect the care-seeking patterns of women with obstetric complications in low-income countries. In the broader body of literature, however, there is qualitative evidence that suggest social resources are useful in facilitating access to health facilities. A qualitative study conducted among men and women in different wealth categories in Uganda found that "friends and relatives may give advice on which doctor or traditional healer to visit", which would help reduce the delay in identifying health facilities though the identified phenomenon did not seem to be universal because the access to social resources was limited to those who are able to give something back in return[223].

e. Over-referrals, socio-economic status, access to a vehicle in the community, lack of social cohesion, and physical isolation from birth family have an influence on travel delay.

This study found that the travel delay was determined by the number of health facilities visited. This finding lends support to previous studies. Seeking care at more than one medical facilities was suggested as the cause of the delay that led

to a maternal death in a case control study conducted in India[12] as well as in a qualitative study conducted in the Gambia [87]. Thaddeus and Maine also suggested in their review that reaching the nearest health facility that is not equipped to treat the condition or even to administer essential first aid would not be enough and increase the delay that could result in maternal death [45].

This study also found that the low household socio-economic status was associated with the travel delay. Some descriptive studies did not find that financial constraints were reasons for travel delays for maternal death cases probably because they found more immediate reasons that overrode financial constraints (e.g., [90 92]). On the other hand, Okonofua et al. (1992) suggested that women of low socio-economic status would be more severely affected by difficulties in transportation such as the absence of vehicles, irregular traffic, bad roads, high fares, and unfriendly drivers [107]. In their study, despite similarity in estimated travelled distances between maternal death cases and controls, the incidence of the travel delay was more among maternal death cases and the cases tended to be from lower socio-economic status than controls, suggesting a link between lower socio-economic status and the incidence of the travel delay. This study's finding strengthens their claim that women of low socio-economic status are affected more by difficulties in transportation but further research is needed to explore the relationship.

In all the studies reviewed in chapter 2, lack of transportation means was a main reason for the second delay, and this study also confirmed that lack of access to motorised vehicles was associated with delayed travel to the hospital.

The social resources of both woman and husband had some effect on the travel delay. First, the physical proximity of a woman's birth family was found to reduce the delay if the woman was being taken beyond first or second level health facilities. To the best of my knowledge, no study that addressed the travel delay has found that closeness of the woman's birth family's residence is important, particularly when the woman with obstetric complication is being taken beyond a first or second level health facility. Secondly, lack of social

cohesion was weakly associated with longer travel delay. The reason for the association can be explained by the result of the aforementioned study from Uganda [223]: travel delay can be reduced if friends or relatives offer to take the patients to health facilities [223].

f. The decision delay is associated with an increased risk of foetal death but other factors are equally or more important.

In our dataset, the delay in decision making was associated with foetal death while the travel time to the hospital (the so-called second delay) was not after controlling for its confounders. In a study conducted in a Nigerian hospital, Chigbu et al. (2009) reported that occurrences of all three types of delays were associated with stillbirth [212]. In a study conducted in India, Ganatra et al. (1998) showed that the delay in decision to seek care was associated with maternal death [12]. Furthermore, Ganatra et al (1998) and Okonofua et al. (1992) reported that maternal deaths resulted from longer travel time and greater distances travelled to reach health facilities [12 107]. Though the outcome measure of the studies by Ganatra et al. and Okonofu et al. was maternal deaths rather than foetal death, the findings of the three studies in relation to the second delay are not congruous to this study's finding. The disagreement in the finding related to the second delay may be partly explained by the analysis methods as the three studies did not control for potential confounders. As seen in Chapter 7, there were some variations in theoretical travel times and self reported travel time across the complication types. For example, women with a rupture of the uterus had long theoretical travel times and therefore long self-reported travel times, in addition to high risk of foetal death. Therefore, adjustment by the complication types reduced the effect of the travel time on foetal death. On the other hand, the effect of the decision delay was negatively confounded by the complication type and therefore, adjustment by complication type clarified the association between foetal death and the decision delay (see Chapter 8).

This study identified other risk factors for intrauterine foetal death for women with life-threatening obstetric complication. In our dataset, the complication type was the most important risk factor that determined mortality of the foetus.

Previous studies of near-miss cases in low income countries rarely reported the foetal outcomes. Population-based studies of pregnant women that investigated risk factors for perinatal mortality found that complications during labour were the most important risk factors, which is not at odds with our finding. Chalumeau et al. (2000) and Chalumeau et al. (2002) reported that the most important risk factors for perinatal death were a prolonged labour, a non-cephalic presentation, and the use of oxytocin [200 224].

In addition, a woman who claimed to have money at her disposal had a decreased risk of intrauterine foetal death in our dataset. Evidence of an association was also observed between proximity of a woman's birth family and a reduced risk of foetal death. An association between indirect measures of woman's status such as education and the risk of foetal loss was reported previously [182]. Other studies reported that being a victim of spousal violence, i.e., an extreme consequence of woman's poor position in her household, was associated with foetal death or perinatal death [146 210 225]. Although associations have not been reported previously between foetal deaths and direct measures of a woman's position in her household, particularly in relation to woman's financial autonomy, associations with child health and survival have been reported [226-227]: A mother with high financial autonomy is likely to influence household purchasing decisions and resource allocations to ensure adequate dietary intake for children. The same argument may be made to explain the reduced risk of foetal death among women with high financial autonomy in our dataset. Likewise, frequent contacts and financial and emotional supports from kinship relations have been reported to improve child health[228], which tentatively supports our finding in relation to the role of proximity of a woman's birth family. More research however is needed to understand ways in which a woman's position in her household reduces the risk of intrauterine foetal death.

9.2.2. Interpretations of findings in the context of Afghanistan

Woman's birth family

In this study, a woman's relationship with her birth family in terms of both the physical proximity and the strength of the relationship was found to be an

important determinant of the care-seeking pattern. The relationship between a woman's position in her household and the decision delay was expected prior to the study and included in the conceptual framework. However, the proximity of the woman's birth family's residence was not hypothesized to have an influence on the travel delay. The reason behind the relationship can be speculated from available literature and my own observations during the field work. It is evident from literature on women's status in the South Asian countries that closeness of a woman's natal home strengthens her position in the marital household because of increased access to various types of resources [153], including land ownership [229]. The way in which closeness to a woman's natal family affects her health during pregnancy was demonstrated by Ganatra et al. (1998): they showed that moving to a woman's natal home before childbirth was associated with a decreased risk of maternal death [12]. During the field work, I observed that women were often accompanied to the hospital and taken care of by their own mother because male relatives including the woman's husband were not allowed inside the maternity ward. One possible explanation that can be inferred is that the family members of the woman who sought care at a nearby health centre may have had to fetch the mother of the woman along the way to the study hospital, contributing to a delayed travel. Further qualitative research may be needed to fully understand how a woman's natal family plays a role in seeking care during obstetric emergency in Afghanistan.

Seasonality

The winter during the study period was the harshest winter in 30 years, particularly in December 2007 and January 2008 [230]. The roads in rural areas were closed down by the snow, and hundreds were said to have died during the period. While the delay during the winter period can be explained by the difficulty in travelling and was expected from the beginning of the study, the delay during the summer period was not initially expected. A phenomenon that I observed in the summer time was that everything slowed down because of the heat. The temperature went up as high as above 40 degree Celsius during the day when the sun was high. Local people avoided moving around in town and the drivers of the host NGO usually left for field missions very early in the

morning as soon as the sun came up to avoid the midday heat. There was a general sense of idleness everywhere during days of the summer. I expect it would be as difficult as in the winter time to mobilize resources and arrange the travel to the hospital from rural villages when the entire community stopped operating at the full capacity.

The phenomenon may be partly explained by the seasonality of farming and non-farming labour requirements. In order to earn some living some rural men may migrate to other regions when the labour need for farming is less intensive in their own village or when there are other opportunities outside their villages that are more attractive [229]. In absence of a husband or other senior member of the family, seeking care at a health facility beyond their home village can be troublesome.

There was another reason that might explain partly why people avoid travelling during the summer until the trip becomes absolutely necessary. There is usually an increased level of security incidents particularly in rural areas during summer simply because the winter in Afghanistan is too harsh even for anti-government forces to launch offensives. The offensives are mainly against foreign forces and allies, and the rural poor may not be affected directly. However, opportunistic robberies tend to increase, which may elevate fear of travel among the rural poor during summer.

Midwives in Afghanistan

We found evidence of an association between access to a midwife in the community and the duration of decision delay. Due to closure of midwifery schools during the Taliban regime, there was a lack of skilled birth attendants in Afghanistan: less than 500 midwives across the country in 2002[5 82]. In response to the urgent need for skilled birth attendants, the major donors (e.g., USAID, World Bank, and UN agencies) have invested in creating a cadre of midwives in a number of provinces [5]. Due to the large investment, nearly 2,000 newly trained midwives have been deployed to health facilities in different parts of the country as of 2009 [5]. Most of the midwives who are graduates of

one of the Institutes of Health Science have been deployed to hospitals at district or provincial levels while graduates of community midwife education programmes have been deployed to lower health facilities with outreach to the community. The study did not elucidate why access to a midwife influenced the decision-making process. Two plausible explanations are that midwives detect obstetric complications and refer women quickly, or communities with access to a midwife are more sensitised to the urgency of the situation. Nonetheless, the finding brings much hope to the safe motherhood community in Afghanistan as a number of newly trained midwives are expected to make visible changes in their community.

9.3. Strengths of the study

Design of the study

(1) Refinement of the theoretical framework

The study used the delay model proposed by Thaddeus and Maine as the framework to investigate the extent of, the reasons behind, and the effect of the delays before arrival in the EmOC facility. Though studies that used the framework to investigate non-medical factors leading to maternal death are numerous, this study advanced our understanding of the care-seeking delays in several important ways. First, the study clearly demonstrated that the determinants of the decision delay were different depending upon the symptomatic natures of the complication types. To the best of my knowledge, there had been no study that identified the determinants of the decision delay under different morbidity conditions, and this study was the first to document the important determinants of the delays among women who experienced obstetric emergency with and without dramatic symptoms.

Secondly, the conceptual model proposed by Thaddeus and Maine did not explicitly take into account the time necessary for the family of the woman to prepare for departure to obtain care. Other authors implied that women will often delay their departure (e.g., in Tanzania [90] and Bangladesh [105]) but these authors fail to distinguish the delay duration from the duration of the 1st or the

2nd delay as discussed earlier. This study was able to supplement Thaddeus and Maine's model by addressing the time necessary for the family to leave home to obtain care (the departure delay) and identifying the factors associated with a long departure delay.

Thirdly, this study was able to show the hierarchical relationship among the determinants. Previous studies of the delay showed the distribution of the delay factors among the study subjects (e.g., [90 92 105 231]) but studies of this kind would not inform us of the magnitude of the impact of each factor on the duration of the delay. This study demonstrated in detail how the delay durations were determined by an individual woman's exposure to each determinant and the relative importance of particular determinants on the duration of the delay.

(2) First study of near-miss women in Afghanistan

To date, the knowledge about severe obstetric complications in Afghanistan is severely limited. Studies conducted in Afghanistan in the recent past are mostly related to assessing the levels and the determinants of maternal deaths and use of maternal healthcare services among certain geographical populations [6 83 114 232]. This is the first study carried out in Afghanistan among women with severe obstetric complications. Furthermore, previous studies called for investigations into why women with complications came so late to the hospital in light of a considerable number of 'near-miss upon arrivals' identified through audit cycles or near-miss reviews in health facilities (e.g., [10-11 70 121]), yet, no in-depth study had been conducted that focused on a well-defined sample of 'near-miss upon arrival' to examine care-seeking delays. By encompassing near-miss women, this study recruited a larger sample size within a reasonable study period than was previously accomplished. This enhanced sample size allowed the conduct of multivariable analyses.

(3) Use of the GIS

This study was able to advance our knowledge related to the delay in reaching health facilities by using the spatial data in the GIS. Previously, Ganatra et al. (1998) and Okonofua et al. (1992) found that the travelled distance is not

necessarily an indication of the travel time [12 107] (also see chapter 2), which suggests that the topography, the road condition and possibly other social factors were responsible for the longer travel times of the maternal death cases. The time to reach a health facility may be better explained by the physical distance between the women and the healthcare facility, the topography of the area, availability and accessibility of transportation means, and other factors that affect the social distance between women and the health facility. The previous studies carried out in the field of maternal health were not able to credibly address the degree of the travel delay caused by socio-cultural barriers. This study was able to control for the effects of the physical barriers (i.e., the distance and the topography) in order to focus on the socio-cultural barriers that can cause the travel delay. This method allowed identification of the factors that were not highlighted in the review by Thaddeus and Maine, including the role of a woman's birth family when going beyond the first level (i.e., health centres) or the second level (i.e., district hospitals) health facilities.

(4) Hospital based survey at admission

A woman was recruited immediately after her admission into the hospital and the interview was conducted subsequently or as soon as she recovered. This particular study design helped to achieve the very low non-response rate and ensured to attain a representative sample of women with severe obstetric complications who utilise the hospital. Furthermore, although information gathering relied on the woman and her family's memory, the short recall period may have helped the study participants to recollect the timing of illness to some extent.

Survey methodology

A very detailed questionnaire was used to obtain information related to the delays and other information about the women. Particularly, the use of prayer times to allow the study participants to describe the timings of events in relation to the calls for Muslim prayers was helpful in that it facilitated the

collection of information from people who would otherwise be difficult to do so and therefore minimised missing data.

The intensive monitoring and the good teamwork of the local staff members also helped to minimise the non-response rate. The study hospital operated 24 hours a day and 7 days a week throughout the year, and emergency cases were brought in at any time. As it was very difficult for the study team to follow up women once they had been discharged from the hospital because of local security conditions, it was crucial for us to organize interviews with the women and the family members in the hospital before the women's discharge. As each member of the team understood the difficulty of visiting the women's household, the team members communicated among each other effectively when women were admitted outside the official working hours.

Though the limitation associated with employing medical doctors as interviewers were discussed earlier (chapter 3), there were also some positive effects. The gender and cultural norms of Afghanistan do not usually encourage men to discuss issues related to women's pregnancy with each other. The interviewers' credential as doctors reassured the male participants that the interview discussion about women's pregnancy was culturally acceptable to some extent and helped to create a socially acceptable environment that encouraged the male members of the women's families to openly discuss key issues with the interviewers.

Analytic strategy

Linear regression methods were not used by any previous study to model the association between the duration of the delays and its determinants. The chosen statistical technique is appropriate because the durations of delays are continuous and our sample is a random sample of women with severe obstetric complication on an admission basis. Confounding effects were controlled in multivariable regression models so that the most important determinants explaining the delays were identified.

Another methodological highlight related to the data analysis is that the bias in the dataset associated with the use of prayers times was controlled for by the censoring technique. The data obtained by using prayer times were biased as the durations of the delays were overestimated (chapter 3). However, the censored regression [233] in Stata allowed such data to be handled appropriately for regression analyses.

9.4. Limitations of the study

Selection bias

(1) Maternal deaths and near-miss in the community or on the way to the hospital

The study was unable to include women who had life-threatening complications but did not come to the study hospital. Some of them may have died at home, at lower-level health facilities, or on the way to the hospital. In chapter 7, we saw that the catchment areas measured by the theoretical travel times to the hospital differed by complication types, which suggests that some women, particularly those with PPH and perhaps also APH, may have passed away before reaching the hospital. At the time of the study, there was no other comprehensive EmOC facility in the province of Herat, and it is unlikely that women who needed a blood transfusion or a surgical intervention were treated elsewhere though the district hospitals were equipped to provide a first aid before a referral to the study hospital. Other women may have survived without treatment simply because of their good luck. They may have survived because the criteria of near-miss used in the study may not have been stringent enough to be certain that women who met the criteria would not survive in the community without medical treatment [117]. It is possible (but not certain) that those who died before reaching the hospital had longer decision delays or longer travel delays than those who reached the hospital and participated in the study. The study is not able to assess the extent to which the effect of each determinant of the delay is underestimated or overestimated because of the exclusion of those women. In addition, it is possible that there may be other

factors that prolonged the delays for those who did not reach the study hospital that the study was not able to detect.

Though the study design excluded women who died outside of the study hospital, it was not feasible to conduct the study in a different way because of the current security climate of the study area. For example, it would have been very difficult to conduct a community-based household survey to identify deaths of women during the study period because it became increasingly more difficult for me as a foreigner and for the local staff working for the foreign person to travel outside the city of Herat due to security concerns. It is also difficult to identify near-miss women who survived by luck without treatment with retrospective interview surveys because women's perceptions of severity are not sufficiently reliable to ascertain severity, and clinical assessment of severity is a necessity. While it is not impossible in theory to conduct a prospective study of pregnant women to identify near-miss cases and eventually to quantify delays among those who develop complications (with an ethical proviso explained later), such a study would be very difficult and expensive to organise in any setting because of the sample size requirements, and the needs for frequent or intrusive interactions with the participants.

Information bias

(1) Error associated with measurement of the delay

We do not know the exact timings of recognition of illness, decision to seek care, and departure from home to obtain care because of the retrospective nature of the study. Those who did not own a watch, particularly the impoverished and the rural population, may have given inaccurate information. However, it is not clear if those who did not own a watch would report delays that were consistently longer or shorter than those who did own a watch. The bias introduced by this deficit could have diluted the strength of effects observed. In addition, it would be impossible for ethical reasons to observe pregnant women from the time of onset of complication and record the timings of recognition of symptom, decision to seek care and departure from home to obtain care.

Another potential error associated with measurement of the delays arises from the difficulty to pinpoint the timing of symptom recognition for certain complication types which do not have clear symptoms. The study depended on the husband's recall of the timing of recognition of symptoms in order to obtain the estimate of the duration of decision delay, which could be highly subjective. In addition, there was no consistency in the first signs of symptom among the group of women diagnosed to have the same morbidity. For example, convulsion, blurred vision, and headache were mentioned as the first sign of illness for women diagnosed to have eclampsia. Lack of clear symptoms in certain complication types and difficulty in identifying the start of labour would have resulted in inaccurate estimate of the decision delay. Though the direction of the inaccuracy is not clear, it is most likely an underestimate. Those who are more aware of the pregnancy-related illness or those who would take more care about their own bodies may have recognized earlier signs of eclampsia than those who did not have much knowledge about pregnancy-related illness or those who paid less attention to the physical change during pregnancy. It is also possible that those who communicate more effectively with their family members were able to make their physical problems known to their family members sooner than those who have more difficulty communicating. This sort of bias could have distorted some associations, for example the associations between the decision delay and uptake of antenatal care or the association between the delay and the woman's position in the household.

(2) Spatial data

There are some inaccuracies in the geographical data, particularly with respect to the locations of certain settlements. AIMS, who provided the geographical data of settlements, acknowledged that many settlements had moved because of the war, tribal disputes and drought. AIMS was still in the process of correcting geographical location of the villages at the time of the study. Those settlements that have been affected by drought or conflicts may be poorer and more disadvantaged in many ways including access to various resources including access to health care facilities than the settlements that have not been affected.

It is also possible that the affected settlements may not have been so impoverished because they would not have been able to get out of the impoverished state and to move to a more fertile area or place with more gainful opportunities if residents had been so poor. This phenomenon may have led to incorrect estimates of theoretical travel times to the hospital for the residents of the affected settlements.

(3) Woman's intention

Women were asked whether they had had the intention to use delivery care at a health facility during the interviews which took place after they had sought care at the hospital in response to symptoms of obstetric complications. Switching of delivery places following unexpected life-threatening events is likely[234], and women who had not had the intention may have reported erroneously that they had had the intention. Because of the retrospective nature of the study, we may not have been able to capture a woman's actual intention, which again might have led to dilution of effects.

(4) Interviewer bias

In most cases, the male interviewers often knew what kind of complication the woman had before conducting the interview with the woman's male family member. The knowledge of complication type might have influenced their recording of the timings of onset of complications, decision, and departure from home to obtain care in a certain way. For example, it may have led the interviewers to underestimate the duration of the delays for certain complication types, if the interviewer had known how quickly the complication types could develop into the fatal stage, eliminating implausibly long delays; and vice versa. In order to reduce the effect of the bias, an attempt was made at the questionnaire development stage to reduce the effect of bias by writing the questions such that the interviewers would probe the timings of the events rather than the actual durations of delays. Though it is hoped that the kind of bias was not a major issue in the current study, once again, it may have led to an incorrect estimate of the true association.

The female interviewers most likely knew whether the woman had a live born baby or a stillborn baby before they interviewed the woman. They may have obtained the information by reading the medical records of the woman or witnessing the woman nursing the baby at the time of the interview. The woman herself might have even shared the information with the interviewer during the interview. If the interviewers had believed that the cause of pregnancy loss was due to the woman's unfavourable health seeking behaviour during pregnancy, they may have been inclined to interpret responses of the woman inaccurately. This would only have led to an overestimate of the strength of association between the death of the baby and unfavourable health seeking behaviour during pregnancy. However, in our data, the association between foetal death and lack of healthcare during pregnancy did not turn out to be an important factor, and therefore this phenomenon was not an issue in our study.

Validity of measure

To a great extent, the results of the analyses on the travel delay depended on how well the theoretical model reflected the real travel times by the local and whether any systematic error had been introduced in the model development. Given the limited number of locations obtained for validation purposes, it is possible that the travel times from certain areas such as locations only accessible by pedestrians may not have been modelled well. Furthermore, the method used for validation of the model was not optimal as discussed in chapter 3. Increasing the number of validation points and measuring travel times more rigorously would have enhanced model validity.

9.5. Programme implications for Afghanistan

Universal coverage of skilled birth attendance is difficult to achieve in Afghanistan at least in the foreseeable future. In the interim period, the EmOC strategies still have relevance. The findings of this study suggest that the safe motherhood programme effort with a focus on EmOC can be reinforced in the following ways:

(1) Renewed focus on uptake of antenatal care

Increasing promptness in seeking care and reaching health facilities in the event of emergency by removing obstacles to healthcare is one of the core aims of the SMI [2]. Various safe motherhood programmes have been developed and implemented in low income countries to promote behavioural change of women and their carer in this regard (i.e., Averting Maternal Death and Disability Program, ACCESS). To a certain extent, the finding of this study supports the idea that encouraging women to use health facilities for delivery during ANC consultations leads to changes in the health seeking behaviours of women and carers and increasing promptness in decision to seek care in the event of emergency. Because of its perceived limitation [30-31 235] and the recent strategic focuses on the universal coverage of skilled attendance and access to EmOC, ANC has been almost downplayed in recent years as a strategy to reduce maternal mortality. However, an antenatal contact with healthcare workers is important as it has a potential to reduce the delay in seeking care in the event of emergency. It helps to back up continuum of care by linking care during the antenatal period to obstetric care in the event of emergency. Although limited attention has been paid to the effectiveness of ANC in reduction of maternal mortality in recent years, it should be retained as a core component of Safe Motherhood Programmes and investments in birth preparedness messages delivered during ANC visits continued unless future intervention studies suggest otherwise.

(2) Empowerment of women

This study's findings underscore that women need to be empowered in order to reduce the burden of maternal morbidity and mortality in Afghanistan. Women's poor position in the household marked by isolation from their natal family could adversely affect their health seeking behaviours and eventually their own health and the health of their infants. As marriage is sometimes used as a way of ending feuds, cementing a political alliance between families, or increasing the family's prestige [236], a woman's position in her marital home can

vary depending on the context of her marriage[237], which in turn determines the amount of support she will have from her marital home. Improving women's position in the household is difficult as it is considered to be a private matter. Nonetheless, the importance of social support the woman receives particularly during the time of pregnancy and childbirth could be stressed more in the safe motherhood programmes for example through mass media campaigns. Furthermore, while the support the woman gains from her natal home is important, other ways to improve a woman's position via increased social resources should be explored. Empowering community-based women's groups successfully improved birth outcomes in Nepal [238]. Such community-based interventions may bring about promising changes in Afghanistan.

Education had no effect on care-seeking behaviours in this study most probably because women were unable to act at will in the emergency situation, or the level of education of the educated women in the sample were too low to be effective in influencing care-seeking behaviours for obstetric services [239]: less than 5% of the women in the study had 7 or more years of education. Nevertheless, education has the potential to liberate women from the cultural rules that have hindered them from living to their full capacities and to empower them in the long run. Due to the weak governance to implement 'modernizing' policies and the strict gender rules which are based on Pashtunwali, Afghan women have been deprived of basic human rights such as education and excluded from participating in employment and public affairs for many years[171]. Education also has the potential to liberate men from the same cultural rules that have not allowed them to have an alternative way of living in the tribal, patriarchal society. Universal education is critical in order for a change to take place in the society.

(3) Male involvement

Male involvement in reproductive health has been promoted since the International Conference on Population and Development held in Cairo in 1994. As the current status of Afghan women is poor and it will take some time before universal primary education is achieved in Afghanistan, male involvement in

safe motherhood is deemed crucial in the meantime. In the patriarchal Afghan society, educating men about the medical needs of pregnant women and the danger signs of obstetric complications is important because men often act as the gatekeeper to their female relatives' use of health care. The results of the present study also suggest that other avenues for male participation may be promising. The study presented some evidence that strength of men's social capital was associated with reduction of the so-called second delay. Though detailed studies to understand the mechanism of influence from men's social capital to the second delay are needed, the findings suggest that increasing the strength of intra-community relationships among men may have a positive overall effect on utilization of healthcare services for women and other members of their household by increasing access to health facilities.

(4) Distribution of health facilities

Although earlier on we presented some explanations for the increased departure delay of people who live far from health facilities, this is in some respect a counter-intuitive and slightly disturbing finding because it corroborates that a success of the EmOC strategy demands more from people who live far away from health facilities, to a certain extent. From the policy perspective, it would be preferable if women who lived far from the health facilities left home quickly in order to mitigate the travel delay caused by the physical inaccessibility to the health facilities. Furthermore, multi-referrals explained much of travel delay in our dataset. This finding suggests that reaching the nearest health facility may not mean that the woman gets treatment for her complication there which can cause a further delay. Expansion of health facilities in rural areas is crucial in order to ensure an equitable access for the rural population. Maternity waiting homes may be an option to be considered for women in remote areas.

(5) Quality of care in EmOC facilities

Though the study's object was not to assess the quality of obstetric care in the EmOC facility, a number of deficiencies in the quality of care of the study hospital were observed. As the very high case fatality ratios of certain

complications suggest (see Chapter 4), compared with other developing country hospital settings, certain cases such as eclampsia cases were not appropriately managed in the facility. For ethical reasons, the local research team made sure that essential medicine to treat obstetric complications were freely available in the hospital during the study period. In addition, various other organizations assisted in providing essential drugs to the study hospital. Nonetheless, there were difficulties in reaching those who were in need. First, there was an issue in storing the donated medicines and equipment in the hospital. All donations were stored in the pharmacy located inside the maternity ward. Every day, a junior doctor or midwives on the night shift would take out some supplies from the pharmacy to use for the rest of the day and the next morning before it closed at midday. These supplies were then stored in a cupboard with a lock. The other junior doctors and nurses on the night shift had no access to the cupboard and often they were not aware of what supplies were available. This practice was further reinforced because the majority of the doctors were so accustomed to telling the patients' families to go and purchase the medicines themselves after prescribing them that they seemed to have failed to even check availability of the free medicines. Criterion-based clinical audits [240] may help to improve practice and to ensure service quality.

9.6. Generalizability of the programme implications to other post-conflicts states

It is important to ask ourselves whether the above programme implications from the study conducted in post-conflict Afghanistan have any relevance to other post-conflict fragile states. In countries that have emerged or are emerging from conflicts, health care service facilities including EmOC facilities are severely damaged or downgraded for lack of equipments or personnel, the access to the facilities is reduced, and the number of health professionals is limited due to migration and deaths as well as lack of training during the period of conflict[241]. As a result, post-conflict states such as Sierra Leone, Sudan, Nepal, DRC and Angola all suffer a burden of maternal mortality [241-243] as great as Afghanistan.

Focus on uptake of antenatal care

In order to rapidly respond to immediate health care needs of the population and to help reconstruct the health care system, post-conflict countries including Cambodia, DRC, and Southern Sudan in addition to Afghanistan have provided basic health care services, usually by contracting to NGOs [244]. Although these countries may not have been able to provide a full range of services, maternal and newborn health care including antenatal care, delivery care and emergency obstetric care was one of the core components of the services delivered during the post-conflict recovery period in these countries [244]. Antenatal care in particular can be delivered with less difficulty because it does not require a high level of technical skills, in comparison to delivery of emergency obstetric care. Counselling on birth preparedness and complication readiness during antenatal visits can be provided by existing health staff without upgrading their skills substantially. Finally, because women have sufficient time during pregnancy to visit a clinic for antenatal care, travel disruptions associated with occasional insecurities in conflict areas may be avoided and less of an issue. Therefore, increasing coverage of ANC and encouraging women to use delivery care during ANC visits are feasible recommendations in these contexts.

Distribution of health facilities

Addressing the expansion or rehabilitation of health facilities in rural areas is crucial in post-conflict fragile countries. During initial stages of reconstruction periods, governments and donors may quickly respond to direct consequences of the conflicts such as physical damage on health facilities from armed conflicts. A potential pitfall in some cases is that donors may prefer rehabilitation of urban hospitals to restoration of a network of healthcare facilities in rural areas, because of remaining insecurities in certain geographical areas[245]. If the pattern of distribution of health care services is similar to the pattern of injustice that may have been present during conflicts, community members may lose confidence in new governments. In contrast, ensuring equitable access to health care services will provide a sense of belonging to a broad, inclusive group and give a sense of security[246]. It may help sustain peace and contribute to development of the nation [247], as MacQueen et al. (2000) suggested that the use of 'medical diplomacy' or health oriented superordinate goals is a possible way to building peace[246]. Although it is more costly and takes more time than delivery of antenatal interventions, stressing equitable access to health care service in post-

conflict countries is, therefore, politically judicious as. Benefits of expansion of health facilities are not limited to improving maternal health but also will extend to other illness and improving the health status of the entire population that are affected by conflicts.

Male involvement through participation in community development activities:

In the previous section, I suggested that strengthening intra-community relationships among men may have a positive effect on utilization of healthcare services in Afghanistan. I stressed the importance of male participation because senior male family members tend to be the main gatekeepers for a woman's healthcare needs in Afghanistan but in other cultural contexts, the role may be taken up by other members. This programme recommendation should be concerned with whoever are the gatekeepers, and it is a valid recommendation in other post-country fragile states [248]. During the time of conflicts, community trust and cohesion are destroyed, and restoring it is an important step toward a nation-building including rebuilding of the healthcare system [249-250]. Therefore, addressing social capital in post-conflict countries should be an integral part of development and peace processes and this integrated approach is likely to contribute to expansion of healthcare service utilization.

9.7 Future research areas

The diverse effects of a woman's access to her birth family once again raise a question as to relevance of a woman's 'autonomy' in the patriarchal context [154] particularly in relation to care-seeking when women develop life-threatening complications. By contrast, the study findings as well as my observation during the fieldwork suggest that a woman who is well connected with her birth family is well taken care of during obstetric emergency. Specifically, this study shows that social support from a woman's natal home is an important facilitator for reducing delay in accessing EmOC facilities. Previous studies explored relationships between direct measures of women's position and utilization of maternal healthcare services, and some aspects of women's position indicative of their autonomy [55] were found to be associated with increased utilization of skilled birth attendant or institutional delivery and antenatal care (e.g., [140 152]). However, further research may be needed to elucidate in detail how social

[55] Indicators such as 'not needing permission to visit friends' and 'working and having influence over use of earnings'.

support from female members in the community, whether from families or elsewhere, might impact care-seeking behaviour of women during obstetric emergency.

The relationships found between lower risk of foetal death and woman having money at her disposal and the proximity of woman's birth family were striking as these relationships remained strong even after controlling for other variables. Though I initially hypothesized that the effect of woman's position in the household would mediate through utilization of healthcare which would in turn affect mortality of the foetus, the hypothesized mechanism of influence could not be observed in the analysis. Though other possible explanations were provided in an earlier section, there may be other confounding factors that affect both the mortality of the foetus and woman's access to money which have not been measured in this study. Further research is necessary to understand these additional mechanisms of influence.

The perception of quality of care was one of the important determinants of the decision delay in the review by Theddaus and Maine. However this study was not able to explore its effect on the decision delay. It would have been inappropriate to include the questions related to quality of care in the questionnaires which were to be administered by the healthcare providers. In addition, the perception the women had held before they were treated or operated for their near-miss complications could not be obtained by the way the current study was designed. Since not enough has been understood about the way such perceptions influence care-seeking decisions in the event of emergency, other study designs would be needed.

The study was in some respects incomplete in that it did not address the third delay. Studies that focused on the third delay have been conducted in low-income countries in relation to maternal mortality and morbidity, and to some extent, perinatal mortality and morbidity (e.g., [85-86 211 251]). In order to accelerate the progress toward MDG-5, not only the access to obstetric care but

also its quality ought to be improved[252]. Research into the third delay in Afghanistan is necessary to improve the quality of obstetric care.

In the light of increased availability of spatial data and various GIS software, use of the GIS could be expanded in future research in the field of maternal health. In this study, the self-reported travel time and the self-reported transportation cost to the health facilities were used to assess the effect of accessibility to health facilities on the decision delay. Alternatively, the spatial data could be used to obtain the travelled distance and the travel time to the health facilities and to assess their effects on the decision delay.

More detailed studies will be needed to understand the mechanisms of influence of a husband's social capital on the second delay as there is no study that explored the effects of a husband's social capital in the field of maternal health in resource-poor settings. If future observational studies support beneficial effects of the husband's social capital, an intervention study assessing the effect of community participation in rural development projects may be a worthy undertaking.

Although explanations and implications of long departure delays of people who live far from health facilities were provided earlier, further qualitative work is needed to elucidate the specific reasons because of its important policy implications.

9.8. Conclusion

The thesis examined in detail the delay before arrival in the EmOC facility for women who reached the health facility in life-threatening conditions. Distinctive determinants have been identified for each type of delay and the magnitude of the effect of each determinant on the duration of the delay has been presented. One of the important findings is that antenatal care increases promptness to make the decision to seek care once obstetric complications develop. Having the plan to deliver in a health facility and presence of a midwife

also increase the promptness at the time of emergency especially for women with complications during antepartum and intrapartum periods. The risk of foetal death is low if the decision to seek care is made immediately after recognition of symptoms. However, the promising effectiveness of antenatal care and the planning of delivery in a health facility is slightly obscured by the Afghan women's poor position in the household. Their isolated position in the household adversely affects the experience of pregnancy-related complications in several ways. First, women who do not maintain a strong relationship with the birth family experience a long decision delay particularly when the complication is of a kind that develops slowly and, to a lesser extent, during antepartum and intrapartum periods. Second, women who are physically isolated from their birth family experience more difficulties in reaching the EmOC hospital. Third, women who do not have money at their own disposal and women who are physically isolated from their birth family had a higher risk of intrauterine foetal death. While improving the woman's status is important for reducing the burden of maternal mortality and morbidity in Afghanistan, it will take some time before the society accepts a change in women's social status, for example, by achieving universal primary education. In the meantime, male involvement in safe motherhood is crucial. The thesis has shown an association between the social capital linked to the husband and reduction of the second delay. Further research is needed to understand the mechanism of its influence.

The strength of the thesis is that the cross sectional survey of near-miss women allowed inclusion of a large number of study participants into the study. Because of this, unlike many of the previous studies in the field of maternal health that are mainly descriptive studies, it was possible to explain the relationship between the delays and various factors with regression models and to control for confounders using the multivariable regression technique. Moreover, this allowed the study to identify the determinants of the decision delay separately for different complication types. In addition, this study was able to assess the relative importance of each determinant of the three types of delays and the effect of each determinant on the duration of each of the three delays. The use of the GIS was another highlight of the study. By estimating the

theoretical travel times to the hospital using the spatial data in the GIS and comparing them to the self-reported travel times, the effects of the distance and the topography were removed from the self-reported delay times. This allowed the analysis to focus on identification of socio-cultural and other factors that operate as the inhibitors of travel to the health facility.

How best to deliver obstetric care to reduce maternal mortality has been a contentious issue. Though facility-based intrapartum care strategies have been recommended as the best-bet strategy recently, the findings of this study, which used the three delay model for EmOC strategies, have relevance in parts of the world where universal coverage of facility-based intrapartum care is a distant dream. Moreover, the study's findings highlighted the importance of antenatal care during pregnancy and the birth plan for reduction of decision delay, which in turn will improve foetal outcomes of severe obstetric complications. Although ANC has been downplayed in recent years as a strategy to reduce maternal mortality, it has great potential to strengthen the linkage to referral-level obstetric care in cases of obstetric emergency.

APPENDICES

HUSBAND'S QUESTIONNAIRE

Date of Interview ☐☐

Month ☐☐

Year ☐☐☐☐

Serial No. ☐☐☐☐

This questionnaire is to be answered by the woman's husband. In a special circumstance, other senior male relative who has accompanied her from home to the hospital may be interviewed.

IDENTIFICATION

1.	HOSPITAL ADMISSION NUMBER	
2.	RESPONDENT'S RELATION TO THE WOMAN 1. HUSBAND 2. BROTHER 3. FATHER 4. FATHER IN LAW 5. BROTHER IN LAW	
3	IF NOT HUSBAND, REASON WHY HE IS NOT PRESENT. (REPORT TO THE RESEARCHER)	
4	PATIENT'S ADDRESS PROVINCE DISTRICT SUB-DISTRICT/VILLAGE	
5	RESPONDENT'S AGE	

SECTION 1. RESIDENCE

No.	QUESTIONS AND FILTERS	CODING CATEGORIES	TO
1	Was the patient staying at the above address on the night before she left for the hospital? YES NO	 1 2	 CONTINUE REVISE THE
2	Do you know roughly what is the distance from the patient's address to this hospital?		
3	Ok, we would like to know where your village is located because there are so many villages of the same name. Can you tell us what is the name of nearby village and how far away it is from your village? NAME DISTANCE		
4	Where is the nearest clinic from the patient's address? Location		
5	And how long does it take to get to the clinic from the patient's address Distance TRANSPORTATION MEANS 1. CAR 2. WALK	 **1** **2**	

SECTION 2. FAMILY STRUCTURE

1. First, I would like some information about the people in your household (those who usually live with you and eat the same food).

No	QUESTIONS AND FILTERS	CODING CATEGORIES	TO
1	How many people in total live in the patient's home (including yourself)?		
2	Among them, how many are under 5?		
3	How many are over 5 and under 15?		
4	How many adults (over 15) live in your household?		
5	Make sure the sum of Q2, Q3 and Q4 equal the answer to Q1.		
6	Do you (or the woman's husband) have wives other than the one you (he) have brought to the hospital? YES ..... NO	 1 2	 CONTINUE GO TO 10
7	How many?		
8	Does she/do they all live with you? YES NO	 1 2	 GO TO 10 CONTINUE
9	How many do not live with you?		
10	Does anyone from your family other than you, your wife and your children live in your household? NO YES	 1 2	 STOP CONTINUE
11	Do you live with the following people? RESPONDENT'S MOTHER OR FATHER RESPONDENT'S MOTHER- OR FATHER-IN-LAW RESPONDENT'S BROTHER OR SISTER OTHER	 1 2 3 4	

SECTION 3. ECONOMIC CHARACTERISTICS

No	QUESTIONS AND FILTERS	CODING CATEGORIES	TO
1	What is the main source of drinking water for members of your household?		
	PIPED WATER		
	PIPED INTO RESIDENCE/YARD/PLOT	01	
	PUBLIC TAP	02	
	WELL IN RESIDENCE/YARD/PLOT		
	WELL	03	
	HAND PUMP	04	
	MOTOR PUMP	05	
	PUBLIC WELL		
	WELL	06	
	HAND PUMP	07	
	SURFACE WATER		
	SPRING/RIVER/STREAM	08	
	POND/LAKE	09	
	DAM	10	
	RAIN WATER	11	
	BOTTLED WATER	12	
	OTHER(SPECIFY) _____	13	
2	What kind of toilet facility does your household have?		
	FLUSH	1	
	BUCKET	2	
	PIT (SEPTIC TANK)	3	
	OTHER_____ (SPECIFY)	4	
	NO FACILITY	5	
3	Does your household have: (READ OUT)		
		YES / NO	
	ELECTRICITY	1 / 2	
	GAS	1 / 2	
	ELECTRIC HEATER	1 / 2	
	GAS HEATER	1 / 2	
	GEYZER-GAS/ELECTRIC/WOOD	1 / 2	
	VACUUM CLEANER	1 / 2	
	COOKING RANGE	1 / 2	
	DISH ANTENA/CABLE TV	1 / 2	
	RADIO/TAPE RECORDER	1 / 2	
	VCR/VCP	1 / 2	
	TELEVISION	1 / 2	
	TELEPHONE (landline)	1 / 2	
	CLOCK	1 / 2	
	WASHING MACHINE	1 / 2	
4	Does any member of your household own:		
	BICYCLE YES (WHO OWNS IT?)	1	
	NO	2	
	MOBILE PHONE YES (WHO OWNS IT?)	1	
	NO	2	
	WATCH YES (WHO OWNS IT?)	1	
	NO	2	
	MOTORCYCLE YES (WHO OWNS IT?)	1	
	NO	2	
	CAR/JEEP YES (WHO OWNS IT?)	1	
	NO	2	

No	QUESTIONS AND FILTERS	CODING CATEGORIES	TO
5	Is your house rented, rent-free or owned by a member of the household? OWNED MORTGAGED RENTED RENT FREE OTHER _____ (SPECIFY)	 1 2 3 4 5	
6	What is the house made of? PLASTERING BRICK/MUD WITHOUT PLASTERING PLASTIC TENT OTHER TENT (KUCHI TENT) OTHER		
7	Does the piece of land where the house is built belong to you or a member of the household? YES NO	 1 2	
8	Source of energy for cooking? NATURAL GAS CYLINDER GAS KEROSINE OIL WOOD COW-DUNG ELECTRICITY OTHER _____ (SPECIFY)	 1 2 3 4 5 6 7	
9	What is your occupation? AGRICULTURE SHOP-OWNER/BUSINESS/TRADING TEACHER/ENGINEER OTHER CIVIL SERVANT BLACKSMITH/CARPENTER OTHER	 1 2 3 4 5 6	 Continue Go to Q12 Go to Q12 Go to Q12 Go to Q12 Go to Q12
10	Do you work mainly on your own land or family land, or do you rent land, or do you work on someone else's land? HIS/FAMILY LAND RENTED LAND SOMEONE ELSE'S LAND	 1 2 3	 Continue GO to 12 Go to 12
11	How many jelib, of land do you own? (if answer was given in baswa or dong, please write which unit is used)		
12	How much money does the patient's family usually earn per month? (what is your monthly income?)		

SECTION 4. OTHER BACKGROUND INFORMATION ABOUT HUSBAND

No.	QUESTIONS AND FILTERS	CODING CATEGORIES	TO
1	How long have you been married to the patient? NUMBER OF YEARS.....		
2	What is your mother tongue (the main language you speak with your parents or your relatives)? FARSI..... UZBEK..... TURKMEN..... PUSHTO..... OTHER_____.....	 01 02 03 04 05	
3	What is your ethnic group? TAJIK..... PUSHTUN..... UZBEK..... TURKMEN..... HAZARA..... OTHER.....	 01 02 03 04 05 06	
4	What grade (in school) have you (the patient's husband) completed? NO SCHOOLING 1-3 4-6 7-9 10-12	 1 2 3 4 5	 GO to 6 Continue Continue Go to 6 Go to 6
5	Can you (the patient's husband) read and write a simple letter with YES..... NO.....	 1 2	
6	How many times in the last month have you read a newspaper or have you had anyone in your household read one to you?		
7	How often do you listen to a radio in a week? DAILY..... AT LEAST ONCE A WEEK..... ONCE IN A WHILE..... NEVER.....	 1 2 3 4	
8	How often do you watch television in a week? DAILY..... AT LEAST ONCE A WEEK..... ONCE IN A WHILE..... NEVER.....	 1 2 3 4	
9	What are the three most important sources of information about what the government is doing in your community(such as agricultural extension, workforce, family planning etc.)? RELATIVES, FRIENDS, AND NEIGHBORS BAZAAR RADIO TELEVISION COMMUNITY LEADERS NGOS BUSINESS OR WORK ASSOCIATION OTHER ASSOCIATIONS		
10	(If the respondent is from rural area,) how many times have you travelled to Herat city in the last 12 months (except for the trip you just made)? Enter the number of times. If no travel was made before this, enter 0.		

SECTION 5. COMMUNITY CHARACTERISTICS (WHERE PATIENT'S LIVE)

NOW, WE WOULD LIKE TO ASK YOU ABOUT YOUR VILLAGE/NEIGHBORHOOD.

No.	QUESTIONS AND FILTERS	CODING CATEGORIES	TO
1	What area do you (or the patient) live in?		
	URBAN (HEART CITY)	1	GO TO 3
	SEMI-URBAN	2	CONTINUE
	RURAL	3	CONTINUE
2	How many families live in your village (or the patient's village)?		

Assets(in patient's village)

3	Does anyone in your village(patient's village) /[if from urban] Does anyone in your neighbourhood own a car?		
	YES	1	CONTINUE
	NO	2	GO TO 5
	NOT SURE	3	GO TO 5
4	Do you yourself (or a member of the patient's family) have access to the car if you need it for an emergency (i.e., Can you get a ride from them for an emergency?)		
	CAN EASILY GET A RIDE	1	CONTINUE
	CAN GET A RIDE WITH SOME DIFFICULTY	2	CONTINUR
	SOMETIME	3	GO TO 6
	NO		
5	Do you have to pay for it?		
	YES	1	
	NO	2	
6	Does anyone in your village own a motorbike?		
	YES	1	CONTINUE
	NO	2	GO TO 9
	NOT SURE	3	GO TO 9
7	Do you yourself (or a member of the patient's family) have access to the motorbike if you need it for an emergency? (i.e., Will the owner let you borrow it or can you get a ride for an emergency?)		
	CAN EASILY GET A RIDE/BORROW IT	1	CONTINUE
	CAN GET A RIDE WITH SOME DIFFICULTY	2	CONTINUE
	SOMETIME	3	GO to 9
	NO		
8	Do you have to pay for it?		
	YES		
	NO		
9	Is there a doctor in your village (patient's village)		
	YES	1	
	NO	2	
	NOT SURE	3	
10	Is there a midwife (trained midwife) in your village (or patient's village)?		
	YES	1	
	NO	2	
	NOT SURE	3	
11	Is there a literate married woman in your village (or patient's village)?		
	YES	1	
	NO	2	
	NOT SURE	3	

Conflicts & Security in patient's village

12	[If the respondent is from rural area, then ask] In your opinion, will the village leader/elders in your village (or the patient's village) allow adult women to go		
		YES NO DK	
	RELATIVES HOUSE	1 2 3	
	CLINIC	1 2 3	
	BAZAAR	1 2 3	
	NEXT VILLAGE	1 2 3	

13	Do you feel comfortable letting your wife (or the patient) go to the following places without male escort?		
		YES NO DK	
	RELATIVES HOUSE	1 2 3	
	CLINIC	1 2 3	
	BAZAAR	1 2 3	
	NEXT VILLAGE	1 2 3	
14	In your opinion, do the village leader/elders (in patient's village) encourage all young girls to go to school?		
	YES, THEY ENCOURAGE THEM TO GO TO SCHOOL AND THERE IS NO PROBLEM IN MY VILLAGE.	1	
	YES, THEY ENCOURAGE, BUT THERE IS A LITTLE PROBLEM.	2	
	NO, THEY DON'T ENCOURAGE.	3	
	NOT SURE.	4	
15	How safe do you feel when walking in your neighbourhood (patient's village) alone after dark?		
	VERY SAFE	1	
	MODERATELY SAFE	2	
	NEITHER SAFE NOR UNSAFE	3	
	MODERATEL UNSAFE	4	
	VERY UNSAFE	5	
16	In your opinion, is your village/neighbourhood (patient's village) generally peaceful or marked by violence?		
	VERY PEACEFUL	1	
	MODERATELY PEACEFUL	2	
	NEITHER PEACEFUL NOR VIOLENT	3	
	MODERATELY VIOLENT	4	
	VERY VIOLENT	5	

Social cohesion and inclusion

18	You know, there are often differences in characteristics between people living in the same village or neighbourhood. For example, some are richer or more educated than other, some come from different ethnic groups, some may speak different language than you do. Thinking about the people living in your village or neighbourhood (patient's village), how would you describe them?		
[READ]	THERE ARE A LOT OF DIFFERENCES	1	Continue
	THERE ARE SOME DIFFERENCES	2	Continue
	THERE ARE NOT MUCH DIFFERENCE	3	Continue
	THERE IS NO DIFFERENCE.	4	Go to 22
19	Do these differences cause any problem?		
	YES	1	Continue
	NO	2	GO to 22
20	What differences most often cause problems?		
[READ]	DIFFERENCES IN EDUCATION	1	
	DIFFERENCES IN LANDHOLDING	2	
	DIFFERENCES IN WEALTH/MATERIAL POSESSION	3	
	DIFFERENCES BETWEEN LONG-TERM AND RECENT RESIDENTS	4	
	DIFFERENCES IN ETHINIC BACKGROUND	5	
	DIFFERENCES IN RELIGIOUS BELIEFS	6	
	DIFFERENCES IN FAMILY LINEAGE	7	
	OTHER DIFFERNCES (SPECIFY -)	8	
22	Are there groups of people in your village or neighbourhood who are prevented from or do not have access to any of the following?		
[READ]		YES NO	
	EDUCATION	1 2	
	HEALTH SERVICES/CLINICS	1 2	
	WATER	1 2	
	TRANSPORTATION	1 2	
23	Why are they not allowed to have access?		

	[READ]	BECAUSE THEY ARE POORER THAN OTHERS	1	
		BECAUSE OF THEIR OCCUPATION TYPE	2	
		BECAUSE THEY LACK EDUCATION	3	
		BECAUSE OF THEIR ETHNICITY	4	
		BECAUSE OF THEIR FAMILY LINEAGE	5	
		BECAUSE OF THEIR RELIGIOUS BELIEF	6	
		OTHER (		
24	Are there any community activities in which you (or your family members) are not allowed to participate?			
		YES (SPECIFY -	1	
		NO	2	
25	Why are you not allowed to participate?			
		BECAUSE I AM POOR		
		BECAUSE OF MY OCCUPATION TYPE		
		BECAUSE I DON'T HAVE EDUCATION		
		BECAUSE OF MY ETHNICITY		
		BECAUSE OF MY FAMILY LINEAGE		
		BECAUSE OF MY RELIGIOUS RELIEF		
		OTHER (		

Collective action and cooperation

26	In the past 12 months, did you or any one in your household participate in communal activities, in which people came together to do some work for the benefit of the community?			
		YES	1	
		NO	2	
27	For example, if there was a water supply problem in your village (the patient's village), how likely is it that people will cooperate to try to solve the problem?			
		VERY LIKELY	1	
		SOMEWHAT LIKELY	2	
		NEITHER LIKELY OR UNLIKELY	3	
		SOMEWHAT UNLIKELY	4	
		VERY UNLIKELY	5	

Networks (of patient's family. It is ok to ask these questions to people other than the husband)

28	If you suddenly needed a small amount of money [RURAL: enough to pay for expenses for your household for one weeks; URBAN: equal to about one week's wages], how many people beyond your immediate household (those who live with you) could you turn to who would be willing to provide this money?			
		0	1	Go to 31
		1-2 PEOPLE	2	Continue
		3-4 PEOPLE	3	Continue
		5 OR MORE	4	Continue
29	Are most of these people of similar, higher or lower economic status?			
		HIGHER	1	
		SIMILAR	2	
		LOWER	3	
30	Do these people include people outside of your *family lineage*?			
		YES	1	
		NO	2	
31	If you suddenly had to go away for a day or two, could you count on your neighbours to take care of your children?			
		DEFINITELY	1	
		PROBABLY	2	
		PROBABLY NOT	3	
		DEFINITELY NOT	4	
32	If your family suddenly faced a long-term emergency such as the death of a breadwinner or [RURAL: harvest failure or URBAN: job loss], how many people beyond your immediate household could your family turn to who would be willing to assist your family?			
		0	1	
		1-2 PEOPLE	2	
		3-4 PEOPLE	3	
		5 OR MORE	4	

SECTION 6. CIRCUMSTANCES AT THE ONSET OF SYMPTOM

Now, here are other questions we would like to ask you. You have brought your wife to the hospital because she was not well and needed to be seen by a doctor in this hospital, right? I would like to ask you when her illness was first recognized by you and your family members, how a decision to go to the hospital was made and when you have left home to seek care.

No.	QUESTIONS	CODING CATEGORIES	Go to
1	We would like to ask you when a member of your family first recognized the patient's illness/problem. . DATE: And what problem did she have at that time?		
2	Now, if we allow us to continue, we would like to ask what time of that day the family member recognized the patient's problem.		
	TIME:		
	IF RESPONDENT FINDS IT DIFFICULT TO ANSWER, READ AND CHECK THE MOST APPROPRIATE ONE: It was BEFORE *nawaz sobh* It was AFTER *namaz sobh* and BEFORE *namaz* It was AFTER *namaz pishin* and BEFORE *namaz* It was AFTER *namaz asr/namza digar* and BEFORE It was AFTER *namaz sham* and BEFORE *namaz* It was AFTER *namaz hoft*an and BEFORE MIDNIGHT	1 2 3 4 5 6	
3	Did the problem occur when the patient was at home or at clinic? 1 home 2 clinic (any other health facility)		
4-a	Who is the first person to recognize the patient's illness? Husband..... Mother in law..... Sister in law..... Mother..... Sister..... Other.....	1 2 3 4 5 6	
4-b	If the first person is NOT husband, then ask Where were you (husband) when she had the problem? Home Away from home working Away from home visiting friends or relatives Other	1 2 3 4	
5	Do you think the patient waited long before a male member found about the problem? YES SHE WAS WAITING. (HOW LONG?) NO, SHE DIDN'T WAIT TOO LONG. NOT SURE	1 2 3	
6	Did you consult for advice from any of the following people after you recognized that the patient is not well, (but before the patient left home? TBA Community health worker Community midwife Relatives (such as mother or mother in law) Neighbours Village/community leaders Private doctor		

No.	QUESTIONS	CODING CATEGORIES	Go to
7	When did your family decide to take the patient to this hospital (decision to seek ANY care) ? Date: Time:		
	IF RESPONDENT FINDS IT DIFFICULT TO ANSWER, READ AND CHECK THE MOST APPROPRIATE ONE: It was BEFORE *nawaz sobh* It was AFTER *namaz sobh* and BEFORE *namaz pishin* It was AFTER *namaz pishin* and BEFORE *namaz asr/namza digar* It was AFTER *namaz asr/namza digar* and BEFORE *namaz sham* It was AFTER *namaz sham* and BEFORE *namaz hoftan* It was AFTER *namaz hoft*an and BEFORE MIDNIGHT	1 2 3 4 5 6	
8	So, who made the decision that your wife needs to be transferred to a health facility (any care)? [Check all those involved] HUSBAND HIMSELF WOMAN HERSELF WOMEN'S MOTHER HUSBAND'S MOTHER WOMAN'S BROTHER WOMAN'S FATHER OTHER – SPECIFY If husband is not involved, then report to the researcher and assess whether husband or the other decision maker is the best informant for the following questions.		
9	At the time the decision was made (or when the patient illness/problem was recognized), how much money did you yourself have at home? (not including the money he borrowed from someone)		
10	Did you need to prepare/raise more money in order to bring your wife here? Yes No	1 2	Continue Go to 13
11	How did you raise money to pay for transportation, medicine, food etc? Enter the amount raised by each method.		
	METHOD USED TO RAISE MONEY	Amount raised by each method	
	1 USE, SELL OR PLEDGE ASSETS (LIVESTOCK, CROPS, LAND) 2 FOREGO ESSENTIAL FOOD CONSUMPTION 3 FOREGORE INVESTMENT IN OTHER ESSENTIAL AREAS (EG. EDUCATION, BUSINESS, OR FARMING INPUTS) 4 GIFTS, CHARITY OR BEGGING 5 DELAY PAYMENT 6 COMMUNITY FINANCING SCHEME OR LOAN FUND		

No.	QUESTIONS	CODING CATEGORIES	Go to
	7 BORROWED MONEY 8 COSTS COVERED BY NGO SCHEME 9 OTHER		If this method was used, continue. Else go to 12.
12	Who did you borrow money from? FRIENDS OR RELATIVES MONEY LENDER LANDLORD SHOPKEEPER CREDIT OTHER - SPECIFY	 1 2 3 4 5	
13	Before you and your wife were able to leave home, did someone go somewhere to call for transportation? YES NO		 Continue Go to 15
14	How far did the person have to travel to call for the first transportation means to carry your wife out of home? NAME OF THE PLACE VISITED: HOW FAR IN KM: HOW LONG DID IT TAKE YOU/THE PERSON? TRANSPORTATION MEANS OBTAINED.		
15	How difficult was it for you and your family to obtain the transportation to take your wife out of your home? VERY DIFFICULT A LITTLE DIFFICULT NOT SO DIFFICULT	 1 2 3	
16	When did the patient leave home? Date: Time:		
	IF RESPONDENT FINDS IT DIFFICULT TO ANSWER, READ AND CHECK THE MOST APPROPRIATE ONE: It was BEFORE *nawaz sobh* It was AFTER *namaz sobh* and BEFORE *namaz* It was AFTER *namaz pishin* and BEFORE *namaz* It was AFTER *namaz asr/namza digar* and It was AFTER *namaz sham* and BEFORE *namaz* It was AFTER *namaz hoft*an and BEFORE MIDNIGHT	1 2 3 4 5 6	
17	Who else has accompanied you and your wife to the hospital? Check all that applied. WOMAN'S SISTER WOMANS' MOTHER HUSBAND'S SISTER OR HUSBAND'S MOTHER OTHER SISTER IN LAW OTHER (SPECIFY -)	 1 2 3 4 5 6	
18	Did the patient go to mullah for tawaaz before arriving in this hospital? YES NO	 1 2	MAKE SURE THIS IS INCLUDED IN THE

19	Now I would like to ask you about the travel to the hospital. After your wife was taken out of your home, where did you go first?					
	Name of the place visited Address (or km from a major town)	What transportation means did you to get there?	What time did you arrive there?	What happened there?	How long did the family stay there? (time admitted until departure) and why did you leave there?	How much did you spend travelling there and at the location?
1st place		1. Walk/donkey 2. Bicycle 3. Rickshaw 4. Motorbike 5. Private car/jeep 6. Taxi 7. Public bus (mille bus) 8. Shared taxi 9. Flying coach 10. Ambulance 11. Other – specify		1. Refer (where to:) 2. Treatment (specify) 3. Examination 6. Obtained transportation 7. Other	How long Why did you leave there?	Travelling there At the location
2nd place		1. Walk/donkey 2. Bicycle 3. Rickshaw 4. Motorbike 5. Private car/jeep 6. Taxi 7. Public bus 8. Shared taxi 9. Flying coach 10. Ambulance 11. Other – specify		1. Refer (where to:) 2. Treatment (specify) 3.Examination 4. Obtained transportation 5. Other	How long Why did you leave there?	Travelling there At the location
3rd place		1. Walk/donkey 2. Bicycle 3. Rickshaw 4. Motorbike 5. Private car/jeep 6. Taxi 7. Public bus 8. Shared taxi 9. Flying coach 10. Ambulance 11. Other – specify		1.Refer (where to:) 2. Treatment (specify) 3.Examination 4. Obtained transportation 5. Other	How long Why did you leave there?	Tavelling there At the location

4th place		1. Walk/donkey 2. Bicycle 3. Rickshaw 4. Motorbike 5. Private car/jeep 6. Taxi 7. Public bus/ 8. Shared taxi 9. Flying coach 10. Ambulance 11. Other – specify		1.Refer (where to:) 2. Treatment (specify) 3.Examination 4. Obtained transportation 5. Other	How long Why did you leave there?	Travelling there At the location
5th place		1. Walk/donkey 2. Bicycle 3. Rickshaw 4. Motorbike 5. Private car/jeep 6. Taxi 7. Public bus 8. Shared taxi 9. Flying coach 10. Ambulance 11. Other – specify		1.Refer (where to:) 2. Treatment (specify) 3.Examination 4. Obtained transportation 5. Other	How long Why did you leave there?	Travelling there At the location
					Total amount spent	Afs

20	When you arrived at this hospital, how much money did you have with you?		
21	Now think about the travel from home to the hospital. In your opinion, who helped you most in travelling to the hospital? Or in other words, without whose help do you think that you may not have reached here? AMBULANCE AT DITRICT HOSPITAL/CLINIC OTHER TRANSPORTATION RELATIVES NEIGHBORS DAI OTHER - SPECIFY	 1 2 3 4 5 6	
22	Now, in your opinion, how difficult was the following? OBTAINING THE TRANSPORTATION DISTANCE ROAD CONDITION PREPARING MONEY PREPARING ACCOMODATION/FOOD IN HERAT	 1 2 3 1 2 3	1—VERY DIFFICULT 2 A LITTLE 3 NOT SO
23	Did you have enough money for her care in the hospital when you arrived here? (You did not have to raise/borrow more money after you have reached here.) YES NO	 1 2	 Go to 25 Continue
24	How did you pay for the care? THE HOSPITAL PROVIDED HELP WENT TO MONEY LENDER IN BAZAAR WENT TO RELATIVES/FRIENDS IN THE CITY WENT BACK TO MY VILLAGE AGAIN TO BRING MONEY. OTHER -	 1 2 3 4 5	
25	Now, think back about how your wife was during this pregnancy or even before she became pregnant. Do you think she had signs of illness that you did not recognize? YES NO		 continue stop
26	What signs of illness did she have?		

WOMAN'S QUESTIONNAIRE

Date of Interview:

Day ☐☐

Month ☐☐

Year ☐☐☐☐

ID No. ☐☐☐☐

This questionnaire is to be answered by the woman. If the woman has already passed away, a female relative such as mother, sister or mother-in-law who was attending her during her illness should be interviewed.

IDENTIFICATION

Sr.No		
1.	Hospital admission number	
2	Check if proxy informant is going to be interviewed	
3	Relationship to the patient Mother Mother in law Sister Sister in law Other	

SECTION 1: BACKGROUND INFORMATION

No.	QUESTIONS AND FILTERS	CODING CATEGORIES	TO
1	How old are you in completed years? AGE IN COMPLETED YEARS.....	☐	
2	How long have you been married to you current husband? (How long had she been married when the woman died?) NUMBER OF YEARS.....	☐	
3	What is your education? NO SCHOOLING 1 - 3 4 - 6 7 - 9 10 - 12 MORE	 1 2 3 4 5 6	 Continue Continue Continue GO to 5 GO to 5 GO to 5
4	Can you read and write a simple letter with understanding? YES..... NO.....	 1 2	
5	How many times in the last month have you read a newspaper or have you had anyone in your household read one to you? (Even an illiterate woman can ask someone to read newspaper,)		
6	How often do you listen to a radio in a week? DAILY..... AT LEAST ONCE A WEEK..... ONCE IN A WHILE..... NEVER.....	 1 2 3 4	
7	How often do you watch television in a week? DAILY..... AT LEAST ONCE A WEEK..... ONCE IN A WHILE..... NEVER.....	 1 2 3 4	
8	As you know, some women take up jobs for which they are paid in cash or kind. Were you doing some work <u>for money</u> when you found that you had become pregnant? Yes No	 1 2	 Continue Next section
9	What work did you do? TEACHING BIRTH ATTENDANT BUSINESS GOVERNMENT / NGO OFFICER CARPET WEAVING AND OTHER TYPE OF CRAFTS WORK CLEANING/SERVANT OTHER (.....)		
10	Do you do this work at home or away from home? HOME..... AWAY	 1 2	
11	Did you keep all the money, some or none of the money especially at your disposal? KEEP ALL THE MONEY..... KEEP SOME MONEY..... DOES NOT KEEP ANY MONEY.....	 1 2 3	

SECTION 2: REPRODUCTION

No.	QUESTIONS AND FILTERS	CODING CATEGORIES	TO
1	Now I would like to ask about all the births you have had. Have you ever given birth before this pregnancy (both live birth and stillbirth)? YES..... NO.....	 1 2	 Continue 16
2	Do you have any sons or daughters to whom you have given birth who are YES..... NO.....	 1 2	 Continue 5
3	How many sons live with you? And how many daughters live with you? **[IF NONE, RECORD "00"]** SONS..... DAUGHTERS.....	 [ ] [ ]	
4	Which year and which month of the year were they born? And who attended the birth?		Normal Vacuum Forceps C/S
	Child 1 — Month: — Year: — Highest qualification of the person who attended the birth: 1. Doctor 2. Midwife/nurse 3. TBA 4. Relative 5. Alone — Mode of delivery:		
	Child 2 — Month: — Year: — Highest qualification of the person who attended the birth: 1. Doctor 2. Midwife/nurse 3. TBA 4. Relative 5. Alone — Mode of delivery:		
	Child 3 — Month: — Year: — Highest qualification of the person who attended the birth: 1. Doctor 2. Midwife/nurse 3. TBA 4. Relative 5. Alone — Mode of delivery:		
	Child 4 — Month: — Year: — Highest qualification of the person who attended the birth: 1. Doctor 2. Midwife/nurse 3. TBA 4. Relative 5. Alone — Mode of delivery:		
	Child 5 — Month: — Year: — Highest qualification of the person who attended the birth: 1. Doctor 2. Midwife/nurse 3. TBA 4. Relative 5. Alone — Mode of delivery:		
	Child 6 — Month: — Year: — Highest qualification of the person who attended the birth: 1. Doctor 2. Midwife/nurse 3. TBA 4. Relative 5. Alone — Mode of delivery:		
	Child 7 — Month: — Year: — Highest qualification of the person who attended the birth: 1. Doctor 2. Midwife/nurse 3. TBA 4. Relative 5. Alone — Mode of delivery:		
	Child 8 — Month: — Year: — Highest qualification of the person who attended the birth: 1. Doctor 2. Midwife/nurse 3. TBA 4. Relative 5. Alone — Mode of delivery:		
	Child 9 — Month: — Year: — Highest qualification of the person who attended the birth: 1. Doctor 2. Midwife/nurse 3. TBA 4. Relative 5. Alone — Mode of delivery:		
5	Do you have any sons or daughters to whom you have given birth who are alive but do not live with you? (includes those who have married and do not live with the women) YES..... NO.....	 1 2	 Continue 8
6	How many sons are alive but do not live with you? And how many daughters are alive but do not live with you? SONS ELSEWHERE..... **[IF NONE, RECORD '00']** DAUGHTERS ELSEWHERE.....	 [ ] [ ]	
7	Which year and which month of the year were they born? And who attended the birth?		
	Child-away 1 — Month: — Year: — Highest qualification of the person who attended the birth: 1. Doctor 2. Midwife/nurse 3. TBA 4. Relative 5. Alone — Mode of delivery:		
	Child-away 2 — Month: — Year: — Highest qualification of the person who attended the birth: 1. Doctor 2. Midwife/nurse 3. TBA 4. Relative 5. Alone — Mode of delivery:		

No.	QUESTIONS AND FILTERS	CODING CATEGORIES	TO
8	Have you ever given birth to a boy or a girl who was born alive but later died? IF NO, ask again: Any baby who cried or showed any sign of life but only survived a few hours or days? YES ..... 1 NO 2		Continue 13
9	In all, how many sons have died? And how many daughters have died? SONS DEAD ..... **[IF NONE, RECORD '00']** DAUGHTERS DEAD		
10	Which year and which month of the year were they born? And who attended the birth?		

	Month	Year	Highest qualification of the person who attended the birth	Mode of delivery
Child-dead 1			1. Doctor 2. Midwife/nurse 3. TBA 4. Relative 5. Alone	
Child-dead 2			1. Doctor 2. Midwife/nurse 3. TBA 4. Relative 5. Alone	
Child-dead 3			1. Doctor 2. Midwife/nurse 3. TBA 4. Relative 5. Alone	

11	SUM ANSWERS TO 3, 6 AND 9 AND ENTER TOTAL TOTAL		
12	Just to make sure that I have this right: you have had in TOTAL___ live births during your life. Is that correct? **[IF NO, PROBE AND CORRECT]** YES ..... NO		
13	Have you ever experienced a pregnancy, which ended, as a stillbirth – that is the baby did not cry at birth? YES ..... 1 NO 2		16
14	How many of your pregnancies ended as stillbirth? NUMBER OF STILL BIRTHS		
15	Which year and which month of the year were they born? And who attended the birth?		

	Month	Year	Highest qualification of the person who attended the birth	Mode of delivery
Stillbirth 1			1. Doctor 2. Midwife/nurse 3. TBA 4. Relative 5. Alone	
Stillbirth 2			1. Doctor 2. Midwife/nurse 3. TBA 4. Relative 5. Alone	
Stillbirth 3			1. Doctor 2. Midwife/nurse 3. TBA 4. Relative 5. Alone	

16	Have you ever experienced a pregnancy, which ended in miscarriage or an abortion? YES ..... 1 NO 2		18
17	How many of your pregnancies ended as miscarriage or abortion? SPONTANEOUS ABORTION ..... INDUCED ABORTION ..... TOTAL		
18	SUM ANSWERS TO 14 AND 17 AND ENTER TOTAL TOTAL ..... IF NONE, RECORD "00" AND SKIP THE NEXT SECTION		

SECTION 3: HEALTH CARE DURING PREGNANCY

Now I would like to talk about your current pregnancy or the one you just finished.

	QUESTIONS AND FILTERS	CODING CATEGORY	TO
1	At the time you became pregnant, did you want to become pregnant then, did you want to wait until later, or did you not want to become pregnant at all?		
	WANTED TO BECOME PREGNANT THEN	1	
	WANTED TO BECOME PREGNANT LATER	2	
	DID NOT WANT TO BECOME PREGNANT AT ALL	3	
2	You know, there are methods that couples use to delay or avoid a pregnancy, such as pills, IUD, implants, sterilization, or condoms. Have you ever heard about them?		
	YES	1	Continue
	NO	2	Go to Q 5
3	Have you ever used any of the method or tried to delay getting pregnant?		
	YES	1	Continue
	NO	2	GO to Q5
4	What method have you used?		
	PILLS	1	
	IUD	2	
	IMPLANTS	3	
	FEMALE STERILIZATION	4	
	MALE STRILIZATION	5	
	CONDOMS	6	
	NON-MODERN METHODS	7	
5	During this pregnancy, did you see anyone for antenatal check-up (other than the people you saw on the way to come to the hospital today)?		
	YES	1	Go to 7
	NO	2	Continue
6	Was there any particular reason why you did not have a prenatal check-up?		
	HEALTH FACILTY TOO FAR	1	GO to 17
	COULD NOT AFFORD	2	GO to 17
	NO TRANSPORT	3	GO to 17
	HEALTHY / NO PROBLEM	4	GO to 17
	POOR SERVICE	5	GO to 17
	DID NOT KNOW WHERE TO GO	6	GO to 17
	OTHER (Specify)	7	GO to 17
	NO REASON	8	GO to 17
7	Whom did you see for antenatal check-up last time?		
	DOCTOR	1	
	NURSE	2	
	COMMUNITY MIDWIFE	3	
	TBA/DAI	4	
	CHW	5	
	OTHER _____ (SPECIFY)	6	
8	Where did you have antenatal check-up last time?		
	PUBLIC HEALTH FACILITY	1	
	PRIVATE DOCTOR CLINIC	2	
	TBA-HOME VISIT	3	
	CHW's	4	
	OTHER _____ (SPECIFY)	5 6	

	QUESTIONS AND FILTERS	CODING CATEGORY	TO
9	With whom did you go there last time? ALONE MOTHER MOTHER-IN-LAW SISTER/FRIEND SISTER-IN-LAW HUSBAND OTHER (specify.....)	 1 2 3 4 5 6 7	
10	How many months were you pregnant when you had first antenatal check-up? MONTHS..... Don't Know.....	 98	
11	For your first antenatal check-up, why did you go? HAD A PROBLEM..... TO CONFIRM PREGNANCY (to confirm that I am pregnant)..... TO RECEIVE TETANUS TOXIOD..... TO BOOK FOR DELIVERY..... I was TOLD TO ATTEND antenatal check-up..... TO CHECK PREGNANCY IS FINE (to check the baby is growing well)..... TO CHECK SEX OF THE PREGNANCY..... OTHER _____..... (SPECIFY)	 1 2 3 4 5 6 7 8	 Continue Go to 13 Go to 13 Go to 13 Go to 13 Go to 13 Go to 13 Go to 13
12	What problem did you have? VAGINAL BLEEDING/SPOTTING..... CONVULSIONS..... HIGH FEVER..... SEVERE/PERSISTENT VOMITTING..... COLOURED/SMELLING DISCHARGE..... HEADACHE..... BACKACHE..... WEAKNESS..... ABDOMEN PAIN..... ACIDITY..... OTHER _____..... (SPECIFY)	 01 02 03 04 05 06 07 08 09 10 11	 Continue
13	How many times did you have antenatal check-up during this pregnancy? NUMBER OF TIMES.....	 ☐☐	
14	During any of your visits, did anyone advise you to go to the hospital or health centre for delivery? YES..... NO.....	 1 2	
15	Did you ever have your blood pressure taken during this pregnancy? YES..... NO.....		 Continue GO to 17
16	Were you told your blood pressure was high? YES..... NO.....		
17	WHEN YOU FOUND OUT THAT YOU WERE PREGNANT THIS TIME, did you plan to deliver in a hospital or health centre?		

	QUESTIONS AND FILTERS	CODING CATEGORY	TO
	YES NO	1 2	
18	Did you suffer any of the following problems during the pregnancy before you were taken to the hospital this time? BLEEDING SWELLING HEADACHE BLURRED VISION PAIN IN THE UPPER ABDOMEN PERSISTENT VOMITTING CHILLS/FEVER VAGINAL DISCHARGE		If at least one yes, then continue, Else go to next sections
19	Have you ever talked to your husband about the problem when you first had the problem? YES NO		Continue Go to 21
20	What was his reaction? I mean, was he concerned and took you to a doctor or wanted you to go to a doctor by yourself or was he indifferent and thought these were minor problems and would cure with time? TOOK ME TO THIS HOSPITAL IMMEDIATELY. TOOK ME TO OTHER CLINIC IMMEDIATELY WANTED ME TO SEE A DOCTOR BY MYSELF INDIFFERENT OTHER (SPECIFY.....)		Next section Next section Next section Next section Next section
21	Was there any particular reason why you did not talk to you husband immediately? I WAS AFRAID HE MIGHT GET ANGRY I WAS SHY I THOUGHT THE PROBLEM WOULD SOLVE ITSELF NO REASON HUSBAND IS NOT LIVING WITH ME AT THE MOMENT OTHER (Specify)		

SECTION 4: CIRCUMSTANCES AT THE ONSET OF SYMPTOM

Now I would like to ask you about the time immediately before you were brought to the hospital.

No.	QUESTIONS AND FILTERS	CODING CATEGORIES	TO
1	It may sound like we are asking the same question again, but let me ask you this question. Who in your family members did you inform first that you need to be taken to the hospital? (Or who first recognised that you are ill?) 1. MOTHER 2. HUSBAND 3. MOTHER-IN-LAW 4. SISTER-IN-LAW 5. SON 6. DAUGHTOR		
2	When did you inform this person or when did this person find that you ... ill? DATE: TIME:		
	IF RESPONDENT FINDS IT DIFFICULT TO ANSWER, READ AND CHECK THE MOST APPROPRIATE ONE: It was BEFORE *nawaz sobh* It was AFTER *namaz sobh* and BEFORE *namaz pishin* It was AFTER *namaz pishin* and BEFORE *namaz asr/namza digar* It was AFTER *namaz asr/namza digar* and BEFORE *namaz sham* It was AFTER *namaz sham* and BEFORE *namaz hoftan* It was AFTER *namaz hoft*an and BEFORE MIDNIGHT		
3	At the time the person found you were ill, what medical conditions did you have?		
4	Did the person [in Q1] make the decision to take you to the hospital? YES NO	 1 2	 Go to 7 Continue
5	So what happened? (Please explain how the decision to come to the hospital was made)		
6	So who made the decision to come to the hospital? HUSBAND MYSELF Mother Mother in law OTHER - Specify		
7	How soon (how many hours or days later) did you leave home after you became ill?		

SECTION 5: WOMEN'S POSITION/STATUS/SOCIAL SUPPORT

No.	QUESTIONS AND FILTERS	CODING CATEGORIES	TO
1	I would like to ask you about your current marriage. How long had you know your husband before you were engaged to him? A. MET ON THE ENGAGEMTN DAY B. LESS THAN A MONTH BEFORE ENGAGEMENT C. ONE MONTH TO LESS THAN A YEAR BEFORE ENGAGEMENT d. ONE YEAR OR MORE BEFORE ENGAGEMENT e. OTHER (SPECIFY.....)		
2	Is(Was) there a blood relationship between you and your husband or your family and his family? (between the deceased and her husband) YES NO	 1 2	 Continue Go to Q4
3	What type of relation was it? FIRST COUSIN ON FATHER'SIDE..... FIRST COUSIN ON MOTHER'SIDE..... SECOND COUSIN ..... OTHER (SPECIFY)		
4	Had you yourself ever met and spoken to your husband before you were married to him? YES NO	 1 2	
5	Who decided that you and your husband were to be married? WOMAN HERSELF WOMAN AND HUSBAND CHOSE EACH OTHER WOMAN AND SOMEONE ELSE WOMAN'S FAMILY (WOMAN'S FATHER AND MOTHER) HUSBAND OR HUSBAND'S FAMILY CHOSE SOMEONE ELSE	 1 2 3 4 5 6	 GO to 7 Continue
6	When your husband was being chosen for you, were you asked whether you wanted to marry him or not? YES NO	 1 2	
7	Was there any kind of ceremony or anything else done to formalize your union with your husband? YES - SPECIFY WHAT NO		
8	Prior or at the time of your marriage, did the groom or his family give or promise any bridewealth to you or your family? YES NO		
9	Does any member of your birth family (woman's real mother, father, sisters and brothers) live close enough for you to be able to visit them and come home on the same day? YES NO		
10	How often do you meet or talk to a member of your birth family (woman's mother, father, sisters and brothers)? 1. ONCE A WEEK OR MORE 2. ONCE A MONTH OR MORE BUT LESS THAN ONCE A WEEK 3. LESS THAN ONCE A MONTH AND MORE THAN 4. ONCE A YEAR 5. ABOUT ONCE A YEAR OR LESS 6. NEVER		

Section 6. Support for women

Please conduct this section with the woman ONLY. Please secure privacy.

No.	QUESTIONS AND FILTERS	CODING CATEGORIES	TO
11	Do you feel free to make contact with your birth family or do you sometimes feel limited to make contact?? FREE SOMETIME LIMITED LIMITED DON'T KNOW	 1 2 3 4	
12	Do you feel free to meet your female friends or do you sometimes feel limited to meet your female friends? FEEL FREE SOMETIMES LIMITED LIMITED DON'T KNOW	 1 2 3 4	
13	People sometimes look to other for companionship, assistance, or other types of support. How often is each of following kinds of support available to you if you need it. 1 = none of the time 2 = a little of the time 3 = some of the time 4 = most of the time 5 = all of the time 1. SOMEONE WHO SHOWS YOU LOVE AND AFFECTION 2. SOMEONE TO TAKE YOU TO THE DOCTOR IF YOU NEEDED IT 3. SOMEONE TO CONFIDE IN OR TALK ABOUT YOURSELF OR YOUR PROBLEMS 4. SOMEONE WHO HUGS YOU 5. SOMEONE TO GET TOGETHER WITH FOR RELAXATION 6. SOMEONE TO HELP WITH DAILY CHORES IF YOU WERE SICK 7. SOMEONE TO TURN TO FOR SUGGESTIONS ABOUT HOW TO DEAL WITH A PERSONAL PROBLEM	1 2 3 4 5	
14	Who provide most of the support/assistance you need? 1 - HUSBAND 2 - MOTHER 3 - FATHER 4 - MOTHER-IN-LAW 5 - SON 6 - DAUGHTOR 7- SISTER 8 - SISTER-IN-LAW 9- BROTHER 10 - FRIENDS 1. SOMEONE WHO SHOWS YOU LOVE AND AFFECTION 2. SOMEONE TO TAKE YOU TO THE DOCTOR IF YOU NEEDED IT 3. SOMEONE TO CONFIDE IN OR TALK ABOUT YOURSELF OR YOUR PROBLEMS 4. SOMEONE WHO HUGS YOU OR KISS YOU 5. SOMEONE TO GET TOGETHER WITH FOR RELAXATION 6. SOMEONE TO HELP WITH DAILY CHORES IF YOU WERE SICK 7. SOMEONE TO TURN TO FOR SUGGESTIONS ABOUT HOW TO DEAL WITH A PERSONAL PROBLEM		
15	Are you usually permitted to go to the following places on your own, only if someone accompanies you or not at all? **CODING CATEGORIES:** Alone.....1 With company.....2 Not at all.....3 a. ANY PLACE OUTSIDE YOUR HOUSE OR COMPOUND..... b. TO THE MARKET..... c. TO THE HEALTH CENTER..... d. THE HOME OF RELATIVES OR FRIENDS..... e. THE NEXT CITY/VILLAGE.....	A C N 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3	
16	Have you been to the following places in the last 3 months? a. TO THE MARKET..... b. TO THE HEALTH CENTER..... c. THE HOME OF RELATIVES OR FRIENDS..... a. THE NEXT CITY/VILLAGE.....	YES NO 1 2 1 2 1 2 1 2	
17	Do you have any money of your own that you alone can decide how to use? YES NO	 1 2	
Thank you very much for your cooperation. Please be assured that your answers will be handled very carefully so that no one will find out that you have given these answers.			

Appendix 2

Data Extraction Form

Instruction to Research Doctors

Please fill out this form for each patient who has a complication or sign of severe morbidity or life-threatening condition. Sections A should be filled out for every patient with complication but Section B should be filled out for patient who had life-threatening condition.

Registration No.	
Date of admission	Date /Month /Year
Time of admission	AM • PM
Gestational age Or How many days after end of pregnancy?	

Reason(s) for which this patient is suspected to have severe maternal morbidity.

- ☐ Signs of eclampsia/pre-eclapmsia → Complete Section A-1
- ☐ Dystocia
- ☐ CPD (grade:) or Pelvic problems (contracted pelvis)
- ☐ Prolonged labour
- ☐ Abnormal presentation (Breech, transverse arrest, shoulder)
- ☐ Bandl's ring/contraction ring
- ☐ Rupture of uterus

→ Complete Section A-2

- ☐ Bleeding (vaginal, intra-abdominal or concealed bleeding)
  - Ectopic pregnancy
  - Incomplete abortion
  - Abruptio Placenta
  - Placenta previa
  - Atony of uterus
  - PPH
  - Laceration of cervix
- ☐ Retention of placenta and vaginal bleeding

→ Complete Section A-3

- ☐ Retention of placenta without vaginal bleeding
- ☐ Vaginal discharge
- ☐ Infection (post-partum)

→ Complete Section A-4

- ☐ Maternal anemia not related to vaginal bleeding → Complete Section A-5
- ☐ Heart disease → Complete Section A-6
- ☐ The woman has none of the above but has other organ dysfunction
  - Vascular dysfunction (hypovoleamic shock)
  - Cerebral dysfunction (coma of unknown cause)
  - Respiratory dysfunction

Section A-1: Pre-eclampsia, eclampsia

No.	Women's condition at admission	Answers	Instruction
1	Blood pressure at admission فشار خون در اولین ملاقات Systolic / diastolic blood pressure فشار اعظمی/اصغری خون		
2	Blood pressure at 4 hours after admission Systolic / diastolic blood pressure فشار اعظمی/اصغری خون		
3	Urine protein/albumin level	DIPSTI	
4	Signs of severe pre-eclampsia at admission?	Y N	
	Epigastric pain, RUQ pain, tenderness or heart burn	1 2	
	Visual disturbances اختلال های دید	1 2	
	Generalized edema پندیدگی عمومی	1 2	
	Vomiting استفراغ	1 2	
	Headache سر درد	1 2	
	Oliguria (Patient complained no urine output or very little urine output)	1 2	
5	Fit before or at admission? سابقه غش کردن را داشت؟		
	Yes بلی.....	1	
	No نخیر.....	2	
6	Was she in coma or unconscious at admission?		
	Yes بلی.....	1	
	No نخیر.....	2	
7	Does she have severe pre-eclampsia as defined by the research team? (Please check the criteria sheet.)		
	Yes بلی.....	1	
	No نخیر.....	2	
8	Does she have eclapmsia as defined by the research team? (Please check the criteria sheet.)		
	Yes بلی.....	1	
	No نخیر.....	2	

Section A-2 Dystocia

No.	Women's condition at admission	Answers	Instruction
1	Did she have Bandl's ring when she was admitted to the hospital?		
	Yes	1	
	No	2	
2	Presentation		
	Abnormal ( )	1	
	Normal	2	
3	Did she have the following genital tract sign of obstruction when she was first examined by a doctor?		

No.	Women's condition at admission	Answers	Instruction
	Infected liquor افرازات چرکین Vulva oedema پندیدگی مهبل	Y N 1 2 1 2	
4	Did she have haemoturia? Yes No	 1 2	
5	Mother's condition Good Fair Poor	 1 2 3	 →Go to 8 →Go to next →Go to next
6	Pulse rate at admission..... Temperature at admission..... Restlessness Yes..... No..... Dehydration Yes..... No..... Abdominal pain Yes..... No.....	(/min) ( ) 1 2 1 2 1 2	
7	Did she have rupture of uterus when she was admitted? Yes No	 1 2	
8	Does she have severe dystocia, or impending rupture of uterus which was defined by the research team when she was admitted in the hospital? (Please check the criteria sheet.) Yes بلی..... No نخیر.....	 1 2	

Section A-3 Haemorrhage

No.	Women's condition at admission		
1	Pulse rate (at least for 1 minutes) at admission حد اقل نبض در د در اولین دقیقه ملاقات		
2	Blood pressure at admissionفشار خون در اولین ملاقات Systolic / diastolic blood pressure فشار اعظمی/اصغری خون		
3	Respiratory rate at admissionحدود تنفس در اولین ملاقات		
4	Temperature at admission درجه حرارت در زمان ورود		
5	Pallor in Conjunctiva or in nail beds Yes..... No.....	 1 2	
6	Cold hands/feet or Cold sweating Yes ..... No	 1 2	
7	Confusion or unconsciousness Yes ..... No	 1 2	
8	Patient complained oliguria Yes ..... No	 1 2	
9	Haemoglobin level درجه هیموکلوبین	g/dl	

10	Did the woman need IV therapy? Yes...بلی..... No...نخیر.....	 1 → 2 →	 Continue
11	How many liters?؟چند پاکت		
12	Was it given in two lines at a time? Yes...بلی..... No...نخیر.....	 1 →	
13	Did she need blood transfusion? ون گرفته Yes بلی..... No نخیر.....	 1 → 2 →	 Continue Go to Q15
14	How many liters?؟چند پاکت		
15	Emergency hysterectomy was necessary? Yes...بلی..... No نخیر.....	 1 2	
16	Did the woman have severe haemorrhage as defined by the research team? (Please check the criteria sheet.)Yes...بلی..... Noنخیر.....	 1 2	

Section A-4 Infection/Sepsis

No.	Women's condition at admission		
1	Temperature at admission درجه حرارت در زمان ورود		
2	Pulse rate (at least for 1 minutes) at admission حد اقل نبض در د در اولین دقیقه ملاقات OR very weak or impalpable pulse? بسیار ضعیف یا غیر قابل احساس Yes بلی ..... No نخیر.....		
3	Respiratory rate at admissionحدود تنفس در اولین ملاقات		
4	Other signs of maternal distress/shock at admission? دیگر علایم فشار دماغی/شوک در زمان ورودنزدش موجود است Pallor in conjunctiva or in nail beds Cold hands/feet or cold sweating	Y N 1 2 1 2	
5	Acute alteration of mental status حالات متناوب حاد دماغی (Confusion/restlessness(تشنج/نا راحتی) Yes بلی ..... No نخیر.....	 1 2	
6	Blood pressure at admissionفشار خون در اولین ملاقات Systolic/diastolic B/P فشار اعظمی/اصغری خون		
7	Urine output in 4 hrsاندازه ادرار در طی چهار ساعت مراقبت		
8	White cell countشمارش کرویات سفید خون	___x 10^9/L	
9	Does the woman have sepsis as defined by the research team? (Please check the criteria sheet.) Yes بلی ..... No نخیر.....	 1 2	
10	Does the woman have severe sepsis as defined by the		

No.	Women's condition at admission		
	research team? (Please check the criteria sheet.) Yes بلی ..... No نخیر.....	 1 2	

Section A-5 Anaemia

No.	Women's condition at admission		
1	Hemoglobin level		
2	Temperature at admission		
3	Blood pressure at admission		
4	Respiratory rate		
5	Difficulty in breathing Yes بلی..... No نخیر.....		
6	Pallor in conjunctiva or in nail beds		
7	Jaundice Yes...بلی..... Noنخیر.....	 1 2	
8	Blood transfusion خون گرفته Yes بلی..... No نخیر.....	 1 2	
9	How many liters?چند پاکت؟		

Section A-6 Heart disease

No.	Women's condition at admission		
1	Diagnosed to have cardiac lesion Yes..... No.....		
2	Diagnosed with being in heart failure Yes..... No.....		
3	The woman needs furosemide		
4	Blood pressure at admissionفشار خون در اولین ملاقات Systolic / diastolic فشار اعظمی/اصغری خون		
5	Respiratory rate		
6	Irregular heart beats Yes..... No.....		
7	Pulse rate		
8	Swelling in legs Yes..... No.....		
9	Jaundice Yes..... No.....		

Section B (After consent has been obtained, record the following)

Age of the woman:		
Gravida:		
Para:		
Number of live children		
Status at admission		
1. Early stage of pregnancy (before 22 weeks or less than 5 months) → END 2. After 22 weeks (more than 4 months) 2-1. Antepartum → GO TO NEXT 2-2. 1st stage of labour → GO TO NEXT 2-3. 2nd stage of labour → GO TO NEXT 2-4. 3rd stage of labour → End 2-5. Postpartum (days) → End		
Were there foetal heart sounds at admission? Yes ..... No.....	 1 ——→ 2 ——→	
When was the baby delivered? Date Time		
How was it delivered? Normal..... Vacuum..... Forceps..... Caesarean section.....	 1 2 3 4	
Foetal outcome تولدنوزاد Stillbirth تولد مرده Live-birth تولد زنده	 1 → 2 →	 Write 0 next Continue
Apgar score		

Pre-existing medical condition شرایط قبلی دوائی

Information from referral sheet (Treatment received before admission to the maternity ward)

Other important information (treatment received, diagnosis etc.)

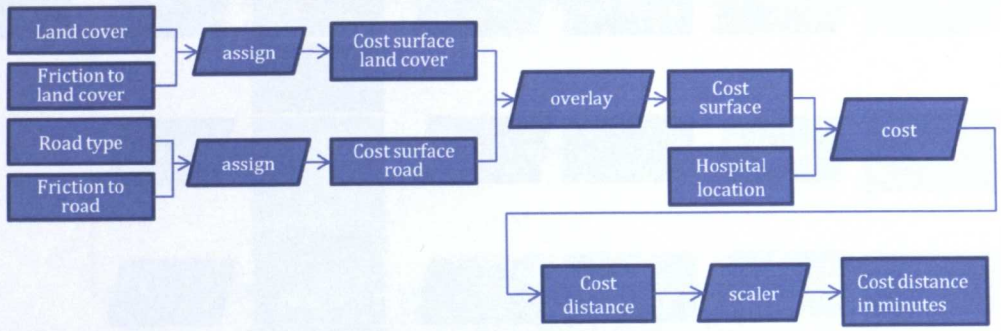
Signed by _____ Date _____

Appendix 3.1. Travel speeds and friction values used for GIS models 1 and 2 in chapter 7

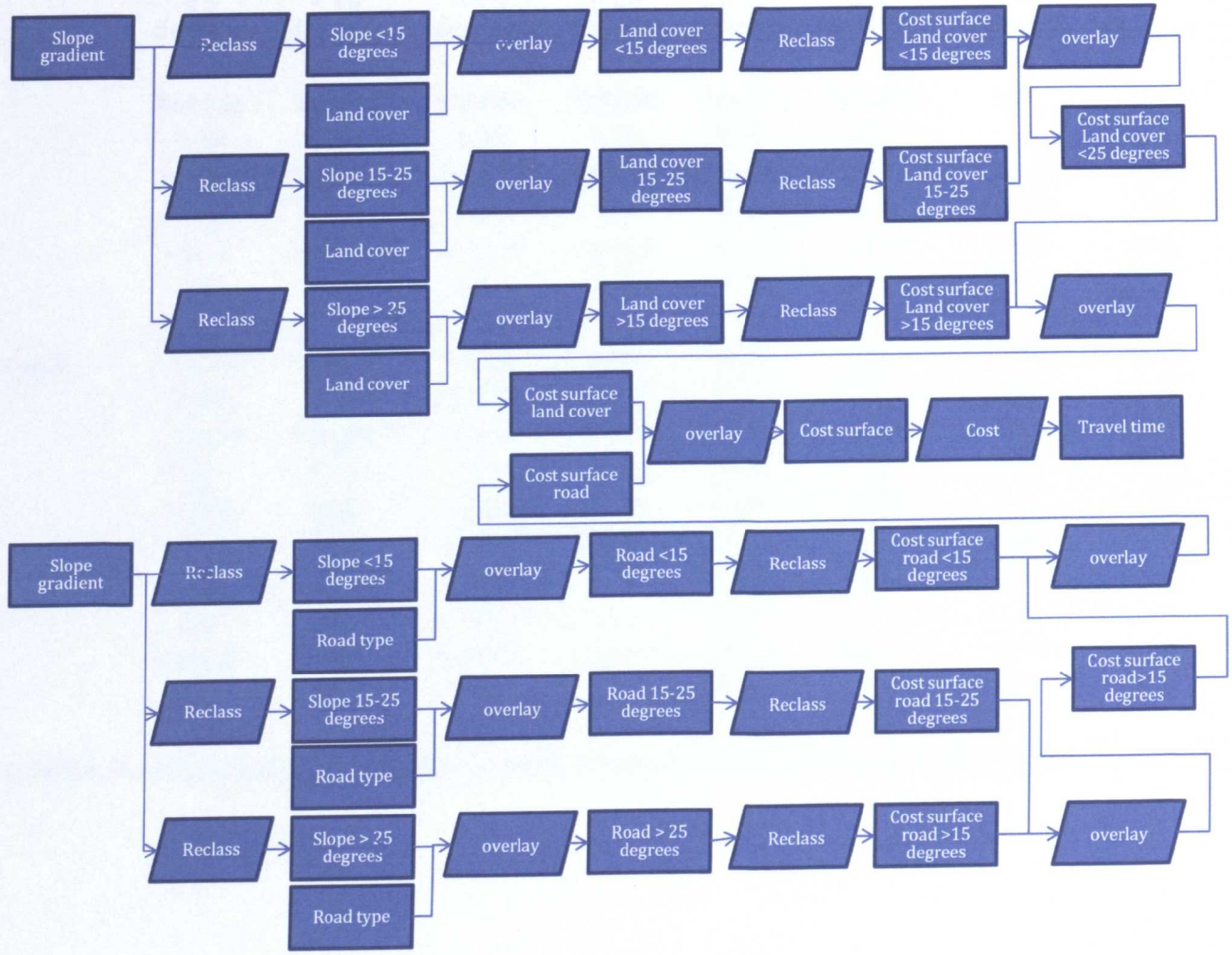
	Model 1		Model 2					
	All surface		< 15 degrees		< 25 degrees		> =25 degrees	
	KM/h	Friction	KM/h	Friction	KM/h	Friction	KM/h	Friction
Road type								
Primary	80	1.00	80	1.00	50	1.60	10	8.00
Secondary	55	1.45	55	1.45	32	2.50	5	16.00
Track	40	2.00	40	2.00	18	4.44	1.27	62.99
Land use								
Rock outcrop/bare soil	26	3.08	26	3.08	11	7.27	0.5	160.00
Rangeland (grassland/forbs/low shrubs)	20	4.00	20	4.00	4	20.00	0.5	160.00
Non-drivable land surface	2.5	32.00	3.0	26.14	1.4	57.55	0.5	160.00
Settlements	1	80.00	1	80		n/a		n/a
Water bodies (lake and primary and secondary rivers)	0.1	800.00	0.1	800.00	0.1	800.00	0.1	800.00

Non-drivable land includes forest, fruit trees, vineyards, gardens, irrigated land, crop land, marshland.

Appendix 3.2. Cartographic model 1



Appendix 3.3. Cartographic model 2



Appendix 3.4. Travel speeds and friction values used for Model 3-1

	Slope gradients									
	< 5 degrees	< 10 degrees	< 15 degrees	< 20 degrees	< 25 degrees	< 30 degrees	< 35 degrees	< 40 degrees	< 45 degrees	> = 45 degrees
Road type										
Primary Road	Vehicle 1.00	Vehicle 1.14	Vehicle 1.33	Vehicle 1.60	Vehicle 2.00	Vehicle 3.20	n/a	n/a	n/a	n/a
Secondary road	Vehicle 1.45	Vehicle 1.67	Vehicle 2.00	Vehicle 2.50	Vehicle 3.20	Vehicle 5.33	walk 52.63	walk 57.55	walk 62.99	walk n/a
Track	Vehicle 2.00	Vehicle 2.29	Vehicle 2.86	Vehicle 4.44	Vehicle 26.67	walk 48.19	walk 52.63	walk 57.55	walk 62.99	walk 69.57
Land use										
Rock outcrop/bare soil	Vehicle 3.08	Vehicle 3.64	walk 26.14	walk 24.17	walk 43.9	walk 96	walk 105	walk 115	walk 126	walk 139
Rangeland	Vehicle 4.00	Vehicle 5.33	walk 26.14	walk 24.17	walk 43.9	walk 96	walk 105	walk 115	walk 126	walk 139
Non-drivable land	walk 32	walk 28.07	walk 26.14	walk 24.17	walk 43.9	walk 96	walk 105	walk 115	walk 126	walk 139
Settlements	walk 80	walk 80	walk 80	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Water bodies	barrier 800	barrier 800	barrier 800	barrier 800	barrier 800	barrier 800	barrier 800	barrier 800	barrier 800	barrier 800

Non-drivable land includes forest, fruit trees, vineyards, gardens, irrigated land, crop land, and marshland.

Appendix 3.5. Friction values used for Model 3-2

	Slope gradients									
	< 5 degrees	< 10 degrees	< 15 degrees	< 20 degrees	< 25 degrees	< 30 degrees	< 35 degrees	< 40 degrees	< 45 degrees	> = 45 degrees
Road type										
Primary Road	Vehicle 1.00	Vehicle 1.00	Vehicle 1.14	Vehicle 1.33	Vehicle 1.60	Vehicle 2.00	n/a	n/a	n/a	n/a
Secondary road	Vehicle 1.45	Vehicle 1.50	Vehicle 1.67	Vehicle 1.80	Vehicle 2.50	Vehicle 4.00	walk 52.63	walk 57.55	walk 62.99	walk 69.57
Track	Vehicle 2.00	Vehicle 2.29	Vehicle 3.08	Vehicle 18.00	Vehicle 30.00	walk 48.19	walk 52.63	walk 57.55	walk 62.99	walk 69.57
Land use										
Rock outcrop/bare soil	Vehicle 3.08	Vehicle 3.64	walk 26.14	walk 24.17	walk 43.9	walk 96	walk 105	walk 115	walk 126	walk 139
Rangeland	Vehicle 4.00	Vehicle 5.33	walk 26.14	walk 24.17	walk 43.9	walk 96	walk 105	walk 115	walk 126	walk 139
Non-drivable land	walk 32	walk 28.07	walk 26.14	walk 24.17	walk 43.9	walk 96	walk 105	walk 115	walk 126	walk 139
Settlements	walk 80	walk 80	walk 80	walk 80	walk 80	walk 80	walk 80	walk 80	walk 80	walk 80
Water bodies (lake and	barrier 800									

Non-drivable land includes forest, fruit trees, vineyards, gardens, irrigated land, crop land, and marshland.

Appendix 3.6. Friction values used for Model 3-3

	Slope gradients									
	< 5 degrees	< 10 degrees	< 15 degrees	< 20 degrees	< 25 degrees	< 30 degrees	< 35 degrees	< 40 degrees	< 45 degrees	> = 45 degrees
Road type										
Primary Road	Vehicle 1.00	Vehicle 1.00	Vehicle 1.11	Vehicle 1.18	Vehicle 1.33	Vehicle 2.00	n/a	n/a	n/a	n/a
Secondary road	Vehicle 1.33	Vehicle 1.33	Vehicle 1.38	Vehicle 1.51	Vehicle 2.50	Vehicle 4.00	vehicle 16	walk 57.55	walk 62.99	walk 69.57
Track	Vehicle 1.86	Vehicle 2.29	Vehicle 5.60	Vehicle 12.00	Vehicle 22.00	walk 48.19	walk 52.63	walk 57.55	walk 62.99	walk 69.57
Land use										
Rock outcrop/bare soil	Vehicle 3.08	Vehicle 4.58	walk 26.14	walk 24.17	walk 43.9	walk 96	walk 105	walk 115	walk 126	walk 139
Rangeland (grassland/forbs/low shrubs)	Vehicle 4.00	Vehicle 5.33	walk 26.14	walk 24.17	walk 43.9	walk 96	walk 105	walk 115	walk 126	walk 139
Non-drivable land	walk 32	walk 28.07	walk 26.14	walk 24.17	walk 43.9	walk 96	walk 105	walk 115	walk 126	walk 139
Settlements	walk 80	walk 80	walk 80	walk 80	walk 80	walk 80	walk 80	walk 80	walk 80	walk 80
Water bodies (lake and primary and	barrier 800									

Non-drivable land includes forest, fruit trees, vineyards, gardens, irrigated land, crop land, and marshland.

References

1. WHO, UNICEF, UNFPA, Bank TW. Maternal Mortality in 2005: Estimates developed by WHO, UNICEF, UNFPA, and The World Bank. Geneva: WHO, 2007.
2. Starrs A. The Safe Motherhood Action Agenda: Priorities for the next decade. Sri Lanka: Inter-Agency Group for Safe Motherhood, 1997.
3. Sabri B, Siddiqi S, Ahmed AM, Kakar FK, Perrot J. Towards sustainable delivery of health services in Afghanistan: Options for the future. *Bull World Health Organ* 2007;85(9):712-18.
4. MSH. REACH - Transforming a Fragile Health System. Cambridge, MA: Management Science for Health, 2006.
5. Azfar P. Delivering high-impact interventions: Afghanistan's experience in scaling up skilled birth attendants. *Briefing on 'Maternal Health in Afghanistan: How Can We Save Women's Lives?'*. Washington DC, 2009.
6. Bartlett LA, Mawji S, Whitehead S, Crouse C, Dalil S, Ionete D, et al. Where giving birth is a forecast of death: Maternal mortality in four districts of Afghanistan, 1999-2002. *Lancet* 2005;365(9462):864-70.
7. Mantel GD, Buchmann E, Rees H, Pattinson RC. Severe acute maternal morbidity: A pilot study of a definition for a near-miss. *Br J Obstet Gynaecol* 1998;105(9):985-90.
8. Stones W, Lim W, Al-Azzawi F, Kelly M. An investigation of maternal morbidity with identification of life-threatening 'near miss' episodes. *Health Trends* 1991;23(1):13-15.
9. Ronsmans C. Severe acute maternal morbidity in low-income countries. *Best Pract Res Clin Obstet Gynaecol* 2009;23(3):305-16.
10. Filippi V, Ronsmans C, Gohou V, Goufodji S, Lardi M, Sahel A, et al. Maternity wards or emergency obstetric rooms? Incidence of near-miss events in African hospitals. *Acta Obstet Gynecol Scand* 2005;84(1):11-16.
11. Adisasmita A, Deviany PE, Nandiaty F, Stanton C, Ronsmans C. Obstetric near miss and deaths in public and private hospitals in Indonesia. *BMC Pregnancy Childbirth* 2008;8(10):10.

12. Ganatra BR, Coyaji KJ, Rao VN. Too far, too little, too late: A community-based case-control study of maternal mortality in rural west Maharashtra, India. *Bull World Health Organ* 1998;76(6):591-8.
13. Maine D, Rosenfield A, Wallace M, Kimball AM, Kwast BE, Papiernik E, et al. Prevention of Maternal Deaths in Developing Countries: Program Options and Practical Considerations. *International Safe Motherhood Conference.* Nairobi, 1987.
14. WHO. International Statistical Classification of Diseases and Related Health Problems 10th Revision 2007.
15. Rosenfield A, Maine D. Maternal mortality - a neglected tragedy. Where is the M in MCH? *Lancet* 1985;2(8446):83-5.
16. Starrs A. Preventing the tragedy of maternal deaths: A Report on the International Safe Motherhood Conference. Nairobi: World Bank, 1987.
17. United Nations Millennium Declaration, 2000.
18. WHO. *The World Health Report 2005 Make every mother and child count.* Geneva: WHO, 2005.
19. Kwast BE. Postpartum haemorrhage: Its contribution to maternal mortality. *Midwifery* 1991;7(2):64-70.
20. Khan KS, Wojdyla D, Say L, Gulmezoglu AM, Van Look PF. WHO analysis of causes of maternal death: A systematic review. *Lancet* 2006;367(9516):1066-74.
21. WHO. *Managing complications in pregnancy and childbirth: A guide for midwives and doctors.* Geneva: WHO, 2003.
22. Symonds EM, Symonds IM. *Essential obstetrics and gynaecology.* 4th ed. Edinburgh: Churchill Livingstone, 2004.
23. Neilson JP, Lavender T, Quenby S, Wray S. Obstructed labour. *Br Med Bull* 2003;67:191-204.
24. Tran TS, Jamulitrat S, Chongsuvivatvong V, Geater A. Postoperative hospital-acquired infection in Hungvuong Obstetric and Gynaecological Hospital, Vietnam. *J Hosp Infect* 1998;40(2):141-7.
25. Baldo MH. Caesarean section in countries of the Eastern Mediterranean Region. *East Mediterr Health J* 2008;14(2):470-88.

26. Tharpe N. Postpregnancy genital tract and wound infections. *J Midwifery Womens Health* 2008;53(3):236-46.

27. Van Lerberghe W, De Brouwere V. Of blind alleys and things that have worked: History's lessons on reducing maternal mortality. In: De Brouwere V, Van Lerberghe W, editors. *Safe Motherhood Strategies: A Review of the Evidence.* Antwerp: ITG Press, 2001:7-34.

28. Sibley LM, Sipe TA, Brown CM, Diallo MM, McNatt K, Habarta N. Traditional birth attendant training for improving health behaviours and pregnancy outcomes. *Cochrane Database Syst Rev* 2007;18(3):CD005460.

29. WHO. *Risk approach for maternal and child health care.* Geneva: WHO, 1978.

30. Vanneste AM, Ronsmans C, Chakraborty J, De Francisco A. Prenatal screening in rural Bangladesh: From prediction to care. *Health Policy Plan* 2000;15(1):1-10.

31. Maine D. Safe Motherhood Programs: Options and issues. New York: Center for Population and Family Health, Columbia University, 1991.

32. Tsu VD. Antenatal screening: Its use in assessing obstetric risk factors in Zimbabwe. *Journal of Epidemiology and Community Health* 1994;48:297-305.

33. The Kasongo Project Team Antenatal screening for fetopelvic dystocias. A cost-effectiveness approach to the choice of simple indicators for use by auxiliary personnel.. *J Trop Med Hyg* 1984;87(4):173-83.

34. Koenig MA, Fauveau V, Chowdhury AI, Chakraborty J, Khan MA. Maternal mortality in Matlab, Bangladesh: 1976-85. *Stud Fam Plann* 1988;19(2):69-80.

35. Greenwood AM, Greenwood BM, Bradley AK, Williams K, Shenton FC, Tulloch S, et al. A prospective survey of the outcome of pregnancy in a rural area of the Gambia. *Bulletin of the World Health Organization* 1987;65(5):635-43.

36. Hurt LS, Alam N, Dieltiens G, Aktar N, Ronsmans C. Duration and magnitude of mortality after pregnancy in rural Bangladesh. *Int J Epidemiol* 2008;37(2):397-404.

37. Koblinsky MA, Campbell O, Heichelheim J. Organizing delivery care: What works for safe motherhood? *Bull World Health Organ* 1999;77(5):399-406.

38. Kruske S, Barclay L. Effect of shifting policies on traditional birth attendant training. *J Midwifery Womens Health* 2004;49(4):306-11.

39. Sibley L, Sipe TA, Koblinsky M. Does traditional birth attendant training improve referral of women with obstetric complications: a review of the evidence. *Soc Sci Med* 2004;59(8):1757-68.

40. Liljestrand J, Pathmanathan I. Reducing maternal mortality: Can we derive policy guidance from developing country experiences? *J Public Health Policy* 2004;25(3-4):299-314.

41. Graham WJ, Bell JS, Bullough CH. Can skilled attendance at delivery reduce maternal mortality in developing countries? In: Brouwere VD, Lerberghe WV, editors. *Safe Motherhood Strategies: A review of the evidence.* Antwerp, 2001:97-129.

42. Blum LS, Sharmin T, Ronsmans C. Attending home vs. clinic-based deliveries: Perspectives of skilled birth attendants in Matlab, Bangladesh. *Reprod Health Matters* 2006;14(27):51-60.

43. Makowiecka K, Achadi E, Izati Y, Ronsmans C. Midwifery provision in two districts in Indonesia: How well are rural areas served? *Health Policy Plan* 2008;23(1):67-75.

44. UNFPA. Maternal Mortality Update 2002, A focus on emergency obstetric care. New York: UNFPA, 2003.

45. Thaddeus S, Maine D. Too far to walk: Maternal mortality in context. *Soc Sci Med* 1994;38(8):1091-110.

46. WHO Technical Working Group. *Essential obstetric functions at first referral level to reduce maternal mortality.* Geneva: WHO, 1986.

47. Paxton A, Maine D, Freedman L, Fry D, Lobis S. The evidence for emergency obstetric care. *Int J Gynaecol Obstet* 2005;88(2):181-93.

48. UNICEF. *Guidelines for monitoring the availability and use of obstetric services.* New York: UNICEF, 1997.

49. Koblinsky M. Essential obstetric care and subsets - Basic and Emergency Obstetric Care: What's the difference? Arlington: John Snow, 1999.

50. Campbell OM, Graham WJ. Strategies for reducing maternal mortality: Getting on with what works. *Lancet* 2006;368(9543):1284-99.

51. Miller S, Sloan NL, Winikoff B, Langer A, Fikree FF. Where is the 'E' in MCH? The need for an evidence-based approach in safe motherhood. *J Midwifery Womens Health* 2003;48(1):10-18.

52. Maine D, Akalin MZ, Chakraborty J, de Francisco A, Strong M. Why did maternal mortality decline in Matlab? *Stud Fam Plann* 1996;27(4):179-87.

53. Chowdhury ME, Botlero R, Koblinsky M, Saha SK, Dieltiens G, Ronsmans C. Determinants of reduction in maternal mortality in Matlab, Bangladesh: A 30-year cohort study. *Lancet* 2007;370(9595):1320-8.

54. Kaunitz AM, Spence C, Danielson TS, Rochat RW, Grimes DA. Perinatal and maternal mortality in a religious group avoiding obstetric care. *Am J Obstet Gynecol* 1984;150(7):826-31.

55. Loudon I. Maternal mortality in the past and its relevance to developing countries today. *Am J Clin Nutr* 2000;72(1 Suppl):241S-46S.

56. Loudon I. The transformation of maternal mortality. *BMJ* 1992;305:1557-60.

57. PMM-Network. Barriers to treatment of obstetric emergencies in rural communities of West Africa.. *Stud Fam Plann* 1992;23(5):279-91.

58. Road map towards the implementation of the United Nations Millennium Declaration, 2001.

59. WHO. *Beyond the numbers : Reviewing maternal deaths and complications to make pregnancy safer.* Geneva: WHO, 2004.

60. Lewis G, editor. *The Confidential Enquiries into Maternal and Child Health (CEMACH). Saving mothers' lives: Reviewing maternal deaths to make motherhood safer - 2003-2005. The Seventh Report on Confidential Enquiries into Maternal Deaths in the United Kingdom*. London: CEMACH, 2007.

61. Pattinson RC, Buchmann E, Mantel G, Schoon M, Rees H. Can enquiries into severe acute maternal morbidity act as a surrogate for maternal death enquiries? *BJOG* 2003;110(10):889-93.

62. Drife JO. Maternal 'near miss' reports? *BMJ* 1993;307(6912):1087-8.

63. Baskett TF, Sternadel J. Maternal intensive care and near-miss mortality in obstetrics. *Br J Obstet Gynaecol* 1998;105(9):981-4.

64. Filippi V. Validation of women's perceptions of near-miss obstetric morbidity in South Benin. University of London, 1999.

65. Fortney J, Smith J. Measuring maternal morbidity. In: Berer M, Ravindran TS, editors. *Safe Motherhood Initiatives: Critical issues.* Oxford: Blackwell Science, 1999:43-50.

66. Stewart MK, Festin M. Validation study of women's reporting and recall of major obstetric complications treated at the Philippine General Hospital. *Int J Gynaecol Obstet* 1995;48 Suppl:S53-66.

67. Filippi V, Ronsmans C, Gandaho T, Graham W, Alihonou E, Santos P. Women's reports of severe (near-miss) obstetric complications in Benin. *Stud Fam Plann* 2000;31(4):309-24.

68. Ronsmans C, Achadi E, Cohen S, Zazri A. Women's recall of obstetric complications in south Kalimantan, Indonesia. *Stud Fam Plann* 1997;28(3):203-14.

69. Cham M, Sundby J, Vangen S. Fetal outcome in severe maternal morbidity: Too many stillbirths. *Acta Obstet Gynecol Scand* 2009;88(3):343-9.

70. Filippi V, Richard F, Lange I, Ouattara F. Identifying barriers from home to the appropriate hospital through near-miss audits in developing countries. *Best Practice and Research: Clinical Obstetrics and Gynaecology* 2009;23(3):389-400.

71. Center for Policy and Human Development, Kabul University. *Afghanistan Human Development Report 2007.* Islamabad, Pakistan, 2007.

72. Waldman R, Hanif H. The Public Health System in Afghanistan. Kabul: AREU, 2002.

73. MSH. *Afghanistan National Health Resources Assessment.* Kabul, Afghanistan: MOH, 2002.

74. Kolaczinski J, Graham K, Fahim A, Brooker S, Rowland M. Malaria control in Afghanistan: progress and challenges. *Lancet* 2005;365(9469):1506-12.

75. Richards T, Little R. Afghanistan needs security to rebuild its health services. *BMJ* 2002;324(7333):318.

76. WHO. *The world health report 2006: working together for health.* Geneva: WHO, 2006.

77. Ministry of Health. *A Basic Package of Health Services for Afghanistan.* Kabul: Transitional Islamic Government of Afghanistan, 2003.

78. Strong L, Wali A, Sondorp E. Health Policy in Afghanistan: Two years of rapid change. London: London School of Hygiene & Tropical Medicine, 2005.

79. Ministry of Public Health. *A basic package of health services for Afghanistan,* 2005/1384. Kabul, Afghanistan, 2005.

80. Palmer N, Strong L, Wali A, Sondorp E. Contracting out health services in fragile states. *BMJ* 2006;332(7543):718-21.

81. Brundtland GH. Afghanistan: Rebuilding a health system. *JAMA* 2002;287(18):2354-.

82. Currie S, Azfar P, Fowler RC. A bold new beginning for midwifery in Afghanistan. *Midwifery* 2007;23(3):226-34.

83. Mayhew M, Hansen PM, Peters DH, Edward A, Singh LP, Dwivedi V, et al. Determinants of skilled birth attendant utilization in Afghanistan: A cross-sectional study. *Am J Public Health* 2008.

84. Central Statistics Office, UNICEF. *Moving beyond 2 decades of war: Progress of provinces, multiple indicator cluster survey.* Kabul: Afghanistan Transitional Authority, 2003.

85. Gohou V, Ronsmans C, Kacou L, Yao K, Bohoussou KM, Houphouet B, et al. Responsiveness to life-threatening obstetric emergencies in two hospitals in Abidjan, Cote d'Ivoire. *Trop Med Int Health* 2004;9(3):406-15.

86. Orji EO, Fasubaa OB, Onwudiegwu U, Dare FO, Ogunniyi SO. Decision-intervention interval in ruptured uteri in Ile-Ife, Nigeria. *East Afr Med J* 2002;79(9):496-8.

87. Cham M, Sundby J, Vangen S. Maternal Mortality in the rural Gambia, a qualitative study on access to emergency obstetric care. *Reprod Health* 2005;2(1):3.

88. Fawcus S, Mbizvo M, Lindmark G, Nystrom L. A community-based investigation of avoidable factors for maternal mortality in Zimbabwe. *Stud Fam Plann* 1996;27(6):319-27.

89. Fawcus S, Mbizvo M, Lindmark G, Nystrom L. A community-based investigation of maternal mortality from obstetric haemorrhage in rural Zimbabwe. Maternal Mortality Study Group. *Trop Doct* 1997;27(3):159-63.

90. Urassa E, Massawe S, Lindmark G, Nystrom L. Operational factors affecting maternal mortality in Tanzania. *Health Policy Plan* 1997;12(1):50-7.

91. Barnes-Josiah D, Myntti C, Augustin A. The 'three delays' as a framework for examining maternal mortality in Haiti. *Soc Sci Med* 1998;46(8):981-93.

92. Supratikto G, Wirth ME, Achadi E, Cohen S, Ronsmans C. A district-based audit of the causes and circumstances of maternal deaths in South Kalimantan, Indonesia. *Bull World Health Organ* 2002;80(3):228-34.

93. Orji EO, Ogunlola IO, Onwudiegwu U. Brought-in maternal deaths in south-west Nigeria. *J Obstet Gynaecol* 2002;22(4):385-8.

94. Shah N, Hossain N, Shoaib R, Hussain A, Gillani R, Khan NH. Socio-demographic characteristics and the three delays of maternal mortality. *J Coll Physicians Surg Pak* 2009;19(2):95-8.

95. Hoestermann CF, Ogbaselassie G, Wacker J, Bastert G. Maternal mortality in the main referral hospital in The Gambia, west Africa. *Trop Med Int Health* 1996;1(5):710-17.

96. Vork FC, Kyanamina S, van Roosmalen J. Maternal mortality in rural Zambia. *Acta Obstet Gynecol Scand* 1997;76(7):646-50.

97. Onah HE, Okaro JM, Umeh U, Chigbu CO. Maternal mortality in health institutions with emergency obstetric care facilities in Enugu State, Nigeria. *J Obstet Gynaecol* 2005;25(6):569-74.

98. Ezechi OC, Fasubaa OB, Dare FO. Socioeconomic barriers to safe motherhood among booked patients in rural Nigerian communities. *Journal of Obstetrics and Gynaecology* 2000;20(1):32-34.

99. Okong P, Byamugisha J, Mirembe F, Byaruhanga R, Bergstrom S. Audit of severe maternal morbidity in Uganda - Implications for quality of obstetric care. *Acta Obstetricia et Gynecologica Scandinavica* 2006;85(7):797-804.

100. D'Ambruoso L, Achadi E, Adisasmita A, Izati Y, Makowiecka K, Hussein J. Assessing quality of care provided by Indonesian village midwives with a confidential enquiry. *Midwifery* 2008.

101. De Muylder X. Maternal mortality audit in a Zimbabwean province. *Arch Gynecol Obstet* 1990;247(3):131-8.

102. Cham M, Vangen S, Sundby J. Maternal deaths in rural Gambia. *Glob Public Health* 2007;2(4):359-72.

103. Ozumba BC, Nwogu-Ikojo EE. Avoidable maternal mortality in Enugu, Nigeria. *Public Health* 2008;122(4):354-60.

104. Koenig MA, Jamil K, Streatfield PK, Saha T, Al-Sabir A, El Arifeen S, et al. Maternal health and care-seeking behavior in Bangladesh: Findings from a national survey. *Int Fam Plan Perspect* 2007;33(2):75-82.

105. Killewo J, Anwar I, Bashir I, Yunus M, Chakraborty J. Perceived delay in healthcare-seeking for episodes of serious illness and its implications for safe motherhood interventions in rural Bangladesh. *J Health Popul Nutr* 2006;24(4):403-12.

106. PMM-Network. Situation analyses of emergency obstetric care: Examples from eleven operations research projects in west Africa. *Social Science and Medicine* 1995;40(5):657-67.

107. Okonofua FE, Abejide A, Makanjuola RA. Maternal mortality in Ile-Ife, Nigeria: A study of risk factors. *Stud Fam Plann* 1992;23(5):319-24.

108. Shaheen B, Hassan L, Obaid M. Eclampsia, a major cause of maternal and perinatal mortality: A prospective analysis at a tertiary care hospital of Peshawar. *Journal of the Pakistan Medical Association* 2003;53(8):346-50.

109. Tukur J, Umar BA, Rabi'u A. Pattern of eclampsia in a tertiary health facility situated in a semi-rural town in Northern Nigeria. *Annals of African Medicine* 2007;6(4):164-67.

110. Okusanya BO, Okogbo FO, Momoh MM, Okogbenin SA, Abebe JO. Maternal mortality and delay: Socio-demographic characteristics of maternal deaths with delay in Irrua, Nigeria. *Niger J Med* 2007;16(1):38-41.

111. Hennekens CH, Buring JE. *Epidemiology in Medicine.* Philadelphia: Lippincott Williams & Wilkins, 1987.

112. Borghi J, Ensor T, Somanathan A, Lissner C, Mills A. Mobilising financial resources for maternal health. *Lancet* 2006;368(9545):1457-65.

113. Walraven G, Telfer M, Rowley J, Ronsmans C. Maternal mortality in rural Gambia: Levels, causes and contributing factors. *Bull World Health Organ* 2000;78(5):603-13.

114. Amowitz LL, Reis C, Iacopino V. Maternal mortality in Herat Province, Afghanistan, in 2002: an indicator of women's human rights. *JAMA* 2002;288(10):1284-91.

115. WHO. *The sisterhood method for estimating maternal mortality: Guidance for potential users.* Geneva: WHO, 1997.

116. Say L, Souza JP, Pattinson RC. Maternal near miss - Towards a standard tool for monitoring quality of maternal health care. *Best Pract Res Clin Obstet Gynaecol* 2009;23(3):287-96.

117. Ronsmans C, Scott S, Adisasmita A, Deviany P, Nandiaty F. Estimation of population-based incidence of pregnancy-related illness and mortality (PRIAM) in two districts in West Java, Indonesia. *BJOG* 2009;116(1):82-90.

118. Filippi V, Alihonou E, Mukantaganda S, Graham WJ, Ronsmans C. Near misses: maternal morbidity and mortality. *Lancet* 1998;351(9096):145-6.

119. Prual A, Huguet D, Garbin O, Rabe G. Severe obstetric morbidity of the third trimester, delivery and early puerperium in Niamey (Niger). *Afr J Reprod Health* 1998;2(1):10-19.

120. Wandabwa JN. Investigation of risk factors for severe maternal morbidity and progression to mortality, a case control and follow up study in Mulago hospital complex Uganda. University of London, 2004.

121. Roost M, Altamirano VC, Liljestrand J, Essen B. Priorities in emergency obstetric care in Bolivia – Maternal mortality and near-miss morbidity in metropolitan La Paz. *BJOG* 2009;116(9):1210-17.

122. Oladapo OT, Sule-Odu AO, Olatunji AO, Daniel OJ. 'Near-miss' obstetric events and maternal deaths in Sagamu, Nigeria: A retrospective study. *Reprod Health* 2005;2:9.

123. Dott MM, Orakail N, Ebadi H, Hernandez F, MacFarlane K, Riley PL, et al. Implementing a facility-based maternal and perinatal health care surveillance system in Afghanistan. *J Midwifery Womens Health* 2005;50(4):296-300.

124. ORC Macro. *Model Questionnaire with Commentary*. Claverton, MD: ORC Macro, 2006.

125. Studies NIoP. Pakistan Reproductive Health and Family Planning Survey. Islamabad: National Institute of Population Studies, 2001.

126. Sherbourne CD, Stewart AL. The MOS Social Support Survey. *Soc Sci Med* 1991;32(6):705-14.

127. Grootaert C, Narayan D, Jones VN, Woolcock M. Measuring social caapital, An integrate questionnaire. Washington, D.C.: The World Bank, 2004.

128. Borghi J, Hanson K, Acquah CA, Ekanmian G, Filippi V, Ronsmans C, et al. Costs of near-miss obstetric complications for women and their families in Benin and Ghana. *Health Policy Plan* 2003;18(4):383-90.

129. Britten N. Qualitative interviews in medical research. *BMJ* 1995;311(6999):251-3.

130. Britten N, Fisher B. Qualitative research and general practice. *Br J Gen Pract* 1993;43(372):270-1.

131. Richards H, Emslie C. The 'doctor' or the 'girl from the University'? Considering the influence of professional roles on qualitative interviewing. *Fam Pract* 2000;17(1):71-5.

132. Reventlow S, Tulinius C. The doctor as focus group moderator--shifting roles and negotiating positions in health research. *Fam Pract* 2005;22(3):335-40.

133. Hoddinott P, Pill R. Qualitative research interviewing by general practitioners. A personal view of the opportunities and pitfalls. *Fam Pract* 1997;14(4):307-12.

134. Yang M-L, Yu R-R. The interviewer effect when there is an education gap with the respondent: Evidence from a survey on biotechnilogy in Taiwan. *Social Science Research* 2008;37:1321-31.

135. Katz MH. *Multivariable analysis: A practical guide for clinicians*. Cambridge: Cambridge University Press, 2006.

136. Kirkwood B, Sterne J. *Essential Medical Statistics.* Oxford: Blackwell Publishing Ltd, 2003.

137. Khorrami H, Karzai F, Macri CJ, Amir A, Laube D. Maternal healthcare needs assessment survey at Rabia Balkhi Hospital in Kabul, Afghanistan. *Int J Gynaecol Obstet* 2008;101(3):259-63.

138. Hadi A, Mujaddidi MN, Rahman T, Ahmed J. The inaccessibility and utilization of antenatal health-care services in Balkh province of Afghanistan. *Asia-Pacific Population Journal* 2007;22(1):29-42.

139. Bolam A, Manandhar DS, Shrestha P, Ellis M, Malla K, Costello AM. Factors affecting home delivery in the Kathmandu Valley, Nepal. *Health Policy Plan* 1998;13(2):152-8.

140. Furuta M, Salway S. Women's position within the household as a determinant of maternal health care use in Nepal. *Int Fam Plan Perspect* 2006;32(1):17-27.

141. Chakraborty N, Islam MA, Chowdhury RI, Bari W, Akhter HH. Determinants of the use of maternal health services in rural Bangladesh. *Health Promot Int* 2003;18(4):327-37.

142. Ekele BA, Tunau KA. Place of delivery among women who had antenatal care in a teaching hospital. *Acta Obstet Gynecol Scand* 2007;86(5):627-30.

143. Letamo G, Rakgoasi SD. Factors associated with non-use of maternal health services in Botswana. *J Health Popul Nutr* 2003;21(1):40-7.

144. Anwar I, Sami M, Akhtar N, Chowdhury ME, Salma U, Rahman M, et al. Inequity in maternal health-care services: Evidence from home-based skilled-birth-attendant programmes in Bangladesh. *Bull World Health Organ* 2008;86(4):252-9.

145. Borghi J, Ensor T, Neupane BD, Tiwari S. Financial implications of skilled attendance at delivery in Nepal. *Trop Med Int Health* 2006;11(2):228-37.

146. Ahmed S, Koenig MA, Stephenson R. Effects of domestic violence on perinatal and early-childhood mortality: Evidence from North India. *American Journal of Public Health* 2006;96(8):1423-28.

147. Howe LD, Hargreaves JR, Huttly SR. Issues in the construction of wealth indices for the measurement of socio-economic position in low-income countries. *Emerg Themes Epidemiol* 2008;5:3.

148. Mumtaz Z, Salway S. 'I never go anywhere': Extricating the links between women's mobility and uptake of reproductive health services in Pakistan. *Soc Sci Med* 2005;60(8):1751-65.

149. Unnithan-Kumar M. Households, kinship and access to reproductive health care among rural Muslim women in Jaipur. *Economic and Political Weekly* 1999;34(10-11):621-30.

150. Sathar ZA, Kazi S. Women's autonomy in the context of rural Pakistan. *The Pakistan Development Review* 2000;39(2):89-110.

151. Bardhan K. Women's work, welfare and status: Forces of tradition and change in India. *Economic and Political Weekly* 1985;20(50):2207-20.

152. Matthews Z, Bookes M, Stones RW, Hossein B. Village in the city: Autonomy and maternal health seeking among slum populations of Mumbai. In: Moores S, editor. *A focus on gender: Collected papers on gender using DHS data.* . Calverton, MD: DHS ORC Macro, 2005.

153. Dyson T, Moore M. On kinship structure, female autonomy, and demographic behavior in India. *Population and Development Review* 1983;9(1):35-60.

154. Mumtaz Z. Gender and reproductive health. A need for conceptualisation [PhD]. University of London, 2002.

155. Winkvist A, Akhtar HZ. God should give daughters to rich families only: attitudes towards childbearing among low-income women in Punjab, Pakistan. *Soc Sci Med* 2000;51(1):73-81.

156. Khan A. Mobility of women and access to health and family planning services in Pakistan. *Reproductive Health Matters* 1999;7(14):39-48.

157. Victoria CG, Huttly SR, Fuchs SC, Olinto MTA. The role of conceptual frameworks in epidemiological analysis: A hierarchical approach. *International Journal of Epidemiology* 1997;26(1):224-27.

158. Kawachi I, Berkman L. Social cohesion, social capital, and health. In: Berkman LF, Kawachi I, editors. *Social Epidemiology*. Oxford: Oxford University Press, 2000.

159. Bourdieu P. The forms of capital. In: Richardson JE, editor. *Handbook of theory of research for the sociology of education* New York: Greenwood Press, 1986:241-58.

160. Gray D, Shaw J, Farrington J. Community transport, social capital and social exclusion in rural areas. *Area* 2006;38(1):89-98.

161. Aye M, Champagne F, Contandriopoulos AP. Economic role of solidarity and social capital in accessing modern health care services in the Ivory Coast. *Soc. Sci. Med.* 2002;55(11):1929-46.

162. Narayan D, Pritchett L. Cents and sociability: Household income and social capital in rural Tanzania. *Economic Development and Cultural Change* 1999;47(4):871-97.

163. Grootaert C, Oh GT, Swamy A. Social capital, household welfare and poverty in Burkina Faso. *J. Afr. Econ.* 2002;11(1):4-38.

164. Grootaert C, Narayan D. Local institutions, poverty and household welfare in Bolivia. *World Dev.* 2004;32(7):1179-98.

165. Harpham T, Grant E, Thomas E. Measuring social capital within health surveys: key issues. *Health Policy and Planning* 2002;17(1):106-11.

166. McCall MK. Political economy and rural transport: a reappraisal of transportation impacts. *Antipode* 1977;9(1):56-67.

167. Rao N. A Forest Economy and Women's Transportation. In: Fernando P, Porter G, editors. *Balancing the Load.* London: Zed Books, 2002:186-205.

168. Bryceson DF, Bradbury A, Bradbury T. Roads to Poverty Reduction? Exploring Rural Roads' Impact on Mobility in Africa and Asia. *Development Policy Review* 2008;26(4):459-82.

169. Hettige H. When do rural roads benefit the poor and how? : Asian Development Bank, 2006.

170. Perry M, Williams RL, Wallerstein N, Waitzkin H, Aye M, Champagne F, et al. Social capital and health care experiences among low-income individuals Economic role of solidarity and social capital in accessing modern health care services in the Ivory Coast. *Am J Public Health* 2008;98(2):330-6.

171. Moghadam VM. Patriarchy, the Taleban, and politics of public space in Afghanistan. *Women's Studies International Forum* 2002;25(1):19-31.

172. Lawn JE, Yakoob MY, Haws RA, Soomro T, Darmstadt GL, Bhutta ZA. 3.2 million stillbirths: epidemiology and overview of the evidence review. *BMC Pregnancy Childbirth* 2009;9 Suppl 1(9):S2.

173. Wigglesworth JS. Monitoring perinatal mortality. A pathophysiological approach. *Lancet* 1980;2(8196):684-6.

174. Cole SK, Hey EN, Thomson AM. Classifying perinatal death: an obstetric approach. *Br J Obstet Gynaecol* 1986;93(12):1204-12.

175. McClure EM, Nalubamba-Phiri M, Goldenberg RL. Stillbirth in developing countries. *Int J Gynaecol Obstet* 2006;94(2):82-90.

176. Alberman E, Blatchley N, Botting B, Schuman J, Dunn A. Medical causes on stillbirth certificates in England and Wales: distribution and results of hierarchical classifications tested by the Office for National Statistics. *Br J Obstet Gynaecol* 1997;104(9):1043-9.

177. Smith GC, Fretts RC. Stillbirth. *Lancet* 2007;370(9600):1715-25.

178. Goldenberg RL, Kirby R, Culhane JF. Stillbirth: a review. *J Matern Fetal Neonatal Med* 2004;16(2):79-94.

179. Subramanian SV, Smith GD. Patterns, distribution, and determinants of under- and overnutrition: a population-based study of women in India. *Am J Clin Nutr* 2006;84(3):633-40.

180. Agarwal DK, Agarwal A, Singh M, Satya K, Agarwal S, Agarwal KN. Pregnancy wastage in rural Varanasi: relationship with maternal nutrition and sociodemographic characteristics. *Indian Pediatrics* 1998;35:1071-79.

181. Conde-Agudelo A, Belizan JM, Diaz-Rossello JL. Epidemiology of fetal death in Latin America. *Acta Obstet Gynecol Scand* 2000;79(5):371-8.

182. Furquim de Almeida M, Alencar GP, Novaes HM, Franca I, Jr., Franco de Siqueira AA, Campbell OM, et al. Risk-factors for antepartum fetal deaths in the city of Sao Paulo, Brazil. *Rev Saude Publica* 2007;41(1):35-43.

183. Cruz-Anguiano V, Talavera JO, Vazquez L, Antonio A, Castellanos A, Lezana MA, et al. The importance of quality of care in perinatal mortality: a case-control study in Chiapas, Mexico. *Arch Med Res* 2004;35(6):554-62.

184. Hindin MJ. Women's power and anthropometric status in Zimbabwe. *Soc Sci Med* 2000;51(10):1517-28.

185. Ackerson LK, Subramanian SV. Domestic violence and chronic malnutrition among women and children in India. *Am J Epidemiol* 2008;167(10):1188-96.

186. Duckitt K, Harrington D. Risk factors for pre-eclampsia at antenatal booking: systematic review of controlled studies. *Bmj* 2005;330(7491):565.

187. Cypryk K, Szymczak W, Czupryniak L, Sobczak M, Lewinski A. Gestational diabetes mellitus - an analysis of risk factors. *Endokrynol Pol* 2008;59(5):393-7.

188. Hossein-Nezhad A, Maghbooli Z, Vassigh AR, Larijani B. Prevalence of gestational diabetes mellitus and pregnancy outcomes in Iranian women. *Taiwan J Obstet Gynecol* 2007;46(3):236-41.

189. Hughes PF, Morrison J. Grandmultiparity--not to be feared? An analysis of grandmultiparous women receiving modern antenatal care. *Int J Gynaecol Obstet* 1994;44(3):211-7.

190. Odar E, Wandabwa J, Kiondo P. Maternal and fetal outcome of gestational diabetes mellitus in Mulago Hospital, Uganda. *Afr Health Sci* 2004;4(1):9-14.

191. Correa A, Gilboa SM, Besser LM, Botto LD, Moore CA, Hobbs CA, et al. Diabetes mellitus and birth defects. *Am J Obstet Gynecol* 2008;199(3):237 e1-9.

192. Huang L, Sauve R, Birkett N, Fergusson D, van Walraven C. Maternal age and risk of stillbirth: a systematic review. *Cmaj* 2008;178(2):165-72.

193. Fretts RC, Schmittdiel J, McLean FH, Usher RH, Goldman MB. Increased maternal age and the risk of fetal death. *N Engl J Med* 1995;333(15):953-7.

194. Hook EB, Cross PK, Schreinemachers DM. Chromosomal abnormality rates at amniocentesis and in live-born infants. *JAMA* 1983;249(15):2034-8.

195. Little RE, Weinberg CR. Risk factors for antepartum and intrapartum stillbirth. *Am J Epidemiol* 1993;137(11):1177-89.

196. Heffner LJ. Advanced maternal age--how old is too old? *N Engl J Med* 2004;351(19):1927-9.

197. Naeye RL. Maternal age, obstetric complications, and the outcome of pregnancy. *Obstet Gynecol* 1983;61(2):210-6.

198. Thornburg KL, Jacobson SL, Giraud GD, Morton MJ. Hemodynamic changes in pregnancy. *Semin Perinatol* 2000;24(1):11-4.

199. Edmond KM, Quigley MA, Zandoh C, Danso S, Hurt C, Owusu Agyei S, et al. Aetiology of stillbirths and neonatal deaths in rural Ghana: implications for health programming in developing countries. *Paediatr Perinat Epidemiol* 2008;22(5):430-7.

200. Chalumeau M, Bouvier-Colle MH, Breart G. Can clinical risk factors for late stillbirth in West Africa be detected during antenatal care or only during labour? *Int J Epidemiol* 2002;31(3):661-8.

201. Di Mario S, Say L, Lincetto O. Risk factors for stillbirth in developing countries: a systematic review of the literature. *Sex Transm Dis* 2007;34(7 Suppl):S11-21.

202. Frias AE, Jr., Luikenaar RA, Sullivan AE, Lee RM, Porter TF, Branch DW, et al. Poor obstetric outcome in subsequent pregnancies in women with prior fetal death. *Obstet Gynecol* 2004;104(3):521-6.

203. Greenwood R, Samms-Vaughan M, Golding J, Ashley D. Past obstetric history and risk of perinatal death in Jamaica. *Paediatr Perinat Epidemiol* 1994;8 Suppl 1:40-53.

204. Lawn JE, Cousens S, Zupan J. 4 million neonatal deaths: when? Where? Why? *Lancet* 2005;365(9462):891-900.

205. Black M, Shetty A, Bhattacharya S. Obstetric outcomes subsequent to intrauterine death in the first pregnancy. *BJOG* 2008;115(2):269-74.

206. Sharma PP, Salihu HM, Kirby RS. Stillbirth recurrence in a population of relatively low-risk mothers. *Paediatric and perinatal epidemiology* 2007;21 (Suppl 1):24-30.

207. Ferraz EM, Gray RH. A case-control study of stillbirths in northeast Brazil. *Int J Gynaecol Obstet* 1991;34(1):13-9.

208. Feresu SA, Harlow SD, Welch K, Gillespie BW. Incidence of stillbirth and perinatal mortality and their associated factors among women delivering at Harare Maternity Hospital, Zimbabwe: a cross-sectional retrospective analysis. *BMC Pregnancy Childbirth* 2005;5(1):9.

209. Raatikainen K, Heiskanen N, Heinonen S. Under-attending free antenatal care is associated with adverse pregnancy outcomes. *BMC Public Health* 2007;7(268):268.

210. Jejeebhoy SJ. Associations between wife-beating and fetal and infant death: impressions from a survey in rural India. *Stud Fam Plann* 1998;29(3):300-8.

211. Mbaruku G, van Roosmalen J, Kimondo I, Bilango F, Bergstrom S. Perinatal audit using the 3-delays model in western Tanzania. *Int J Gynaecol Obstet* 2009;106(1):85-8.

212. Chigbu CO, Okezie OA, Odugu BU. Intrapartum stillbirth in a Nigerian tertiary hospital setting. *Int J Gynaecol Obstet* 2009;104(1):18-21.

213. Cruikshank DP, Linyear AS. Term stillbirth: causes and potential for prevention in Virginia. *Obstet Gynecol* 1987;69(6):841-4.

214. McPherson RA, Khadka N, Moore JM, Sharma M. Are birth-preparedness programmes effective? Results from a field trial in Siraha district, Nepal. *J Health Popul Nutr* 2006;24(4):479-88.

215. Baqui AH, El-Arifeen S, Darmstadt GL, Ahmed S, Williams EK, Seraji HR, et al. Effect of community-based newborn-care intervention package implemented through two service-delivery strategies in Sylhet district, Bangladesh: a cluster-randomised controlled trial. *Lancet* 2008;371(9628):1936-44.

216. Kumar V, Mohanty S, Kumar A, Misra RP, Santosham M, Awasthi S, et al. Effect of community-based behaviour change management on neonatal mortality in Shivgarh, Uttar Pradesh, India: a cluster-randomised controlled trial. *Lancet* 2008;372(9644):1151-62.

217. Moran AC, Sangli G, Dineen R, Rawlins B, Yameogo M, Baya B. Birth-preparedness for maternal health: findings from Koupela District, Burkina Faso. *J Health Popul Nutr* 2006;24(4):489-97.

218. Stanton CK. Methodological issues in the measurement of birth preparedness in support of safe motherhood. *Eval Rev* 2004;28(3):179-200.

219. Hounton SH, Sombie I, Townend J, Ouedraogo T, Meda N, Graham WJ. The tip of the iceberg: evidence of seasonality in institutional maternal mortality and implications for health resources management in Burkina Faso. *Scand J Public Health* 2008;36(3):310-7.

220. Lema VM, Changole J, Kanyighe C, Malunga EV. Maternal mortality at the Queen Elizabeth Central Teaching Hospital, Blantyre, Malawi. *East Afr Med J* 2005;82(1):3-9.

221. Anya SE. Seasonal variation in the risk and causes of maternal death in the Gambia: malaria appears to be an important factor. *Am J Trop Med Hyg* 2004;70(5):510-3.

222. Etard JF, Kodio B, Ronsmans C. Seasonal variation in direct obstetric mortality in rural Senegal: role of malaria? *Am J Trop Med Hyg* 2003;68(4):503-4.

223. Bakeera SK, Wamala SP, Galea S, State A, Peterson S, Pariyo GW. Community perceptions and factors influencing utilization of health services in Uganda. *Int J Equity Health* 2009;8(25):25.

224. Chalumeau M, Salanave B, Bouvier-Colle MH, de Bernis L, Prual A, Breart G. Risk factors for perinatal mortality in West Africa: a population-based study of 20326 pregnancies. MOMA group. *Acta Paediatr* 2000;89(9):1115-21.

225. Alio AP, Nana PN, Salihu HM. Spousal violence and potentially preventable single and recurrent spontaneous fetal loss in an African setting: cross-sectional study. *Lancet* 2009;373(9660):318-24.

226. Kishor S. Empowerment of women in Egypt and links to the survival and health of their infants. In: Sen HBPaG, editor. *Women's empowerment and demographic processes*. Oxford: Oxford University Press, 1998.

227. Shroff M, Griffiths P, Adair L, Suchindran C, Bentley M. Maternal autonomy is inversely related to child stunting in Andhra Pradesh, India. *Matern. Child Nutr.* 2009;5(1):64-74.

228. Kana'Iaupuni SM, Donato KM, Thompson-Colon T, Stainback M. Counting on kin: Social networks, social support, and child health status. *Soc. Forces* 2005;83(3):1137-64.

229. Grace J. Gender roles in agricultyure. Case studies of five villages in northern Afghanistan. Kabul: The Afghanistan Research and Evaluation Unit, 2004.

230. IFRC. Afghanistan: Severe Winter: International Federation of Red Cross and Red Crescent Societies, 2008.

231. Jafarey SN, Korejo R. Mothers brought dead: an enquiry into causes of delay. *Soc Sci Med* 1993;36(3):371-2.

232. Kandasamy T, Merialdi M, Guidotti RJ, Betran AP, Harris-Requejo J, Hakimi F, et al. Cesarean delivery surveillance system at a maternity hospital in Kabul, Afghanistan. *Int J Gynaecol Obstet* 2009;104(1):14-7.

233. DeMaris A. Truncated and Censored Regression Models. *Regression With Social Data: Modeling Continuous and Limited Response Variables*. xxx: Wiley, 2004.

234. Ramakrishna J, Ganapathy S, Matthews Z, Mahendra S, Kilaru A. Health, illness and care in the obstetric period: a prospective study of women in rural karnataka. In: Koenig MA, Jejeebhoy S, Cleland JC, Ganatra B, editors. *Reproductive health in India*. Jaipur, India: Rawat Publications, 2008.

235. Carroli G, Rooney C, Villar J. How effective is antenatal care in preventing maternal mortality and serious morbidity? An overview of the evidence. *Paediatr Perinat Epidemiol* 2001;15 Suppl 1:1-42.

236. Tapper N. Brideprice and direct exchange. *Bartered Brides: politics, gender and marriage in an Afghan tribal society*. Cambridge: Cambridge University Press, 1991.

237. Smith DJ. Decisions, desires and diversity: Marriage practices in Afghanistan. Kabul: Afghanistan Research and Evaluation Unit, 2009.

238. Manandhar DS, Osrin D, Shrestha BP, Mesko N, Morrison J, Tumbahangphe KM, et al. Effect of a participatory intervention with women's groups on birth outcomes in Nepal: cluster-randomised controlled trial. *Lancet* 2004;364(9438):970-9.

239. Raghupathy S. Education and the use of maternal health care in Thailand. *Soc. Sci. Med.* 1996;43(4):459-71.

240. Graham WJ. Criterion-based clinical audit in obstetrics: bridging the quality gap? *Best Pract Res Clin Obstet Gynaecol* 2009;23(3):375-88.

241. Waters H, Garrett B, Burnham G. Rehabilitating health systems in post-conflict situations. Helsinki: UNU, 2007.

242. The World Bank. *Global monitoring report 2007*. Washington DC: The World Bank, 2007.

243. Newbrander W. Providing health services in fragile states. Arlington, VA: Basic Support for Institutionalizing Child Survival (BASICS) for the United States Agengy for International Development (USAID), 2006.

244. Roberts B, Guy S, Sondorp E, Lee-Jones L. A basic package of health services for post-conflict countries: implications for sexual and reproductive health services. *Reprod Health Matters* 2008;16(31):57-64.

245. Macrae J. Dilemmas of legitimacy, sustainability, and coherence: rehabilitating the health sector. In: Kumar K, editor. *Rebuilding societies after civil war-critical roles for international assistance*. London: Lynn Rienner, 1996.

246. MacQueen G, Santa-Barbara J. Peace building through health initiatives. *BMJ* 2000;321(7256):293-6.

247. Vaux T, Visman E. Service Delivery In Countries Emerging From Conflict. Bradford: University of Bradford, 2005.

248. Brune NE, Bossert T. Building social capital in post-conflict communities: evidence from Nicaragua. *Soc Sci Med* 2009;68(5):885-93.

249. Maynard KA. Rebuilding community: psychosocial healing, reintegration and reconsiliation at the grassroots level. In: Kumar K, editor. *Rebuilding societies after civil war - critical roles for international assistance*. London: Lynne Rienner, 1996.

250. Gutlove P. Health bridges for peace: Integrating health care with conflict prevention and community reconciliation. *Medicine, Conflict and Survival* 1998;14(1):6-23.

251. Onwudiegwu U, Makinde ON, Ezechi OC, Adeyemi A. Decision-caesarean delivery interval in a Nigerian university hospital: implications for maternal morbidity and mortality. *J Obstet Gynaecol* 1999;19(1):30-3.

252. van den Broek NR, Graham WJ. Quality of care for maternal and newborn health: the neglected agenda. *BJOG* 2009;116 Suppl 1:18-21.