PART A

BACKGROUND
CHAPTER 1

Introduction

“Not everything that can be counted counts, and not everything that counts can be counted.”

Albert Einstein
Every year 535,900 women die worldwide as a result of their pregnancy.1 In high-income countries relatively few women die due to pregnancy and childbirth.2-7 Even when the number of maternal deaths is relatively low in high income countries, Maternal Mortality Ratios (MMRs) are internationally used as an indicator of the quality of obstetric care, next to perinatal mortality figures. Measuring the quality of care becomes more and more important, as the standard of care has become more transparent. Indicators can be used to compare care between hospitals or countries and indicate trends over time.

Different approaches have been developed for maternal mortality measurement, monitoring and surveillance.7 In the Netherlands, a systematic national multidisciplinary confidential enquiry of maternal deaths is performed, in order to achieve a reliable classification of underlying causes of maternal deaths and to provide a systematic review of the main problems in overcoming maternal mortality. Before 1981, there was a nationwide confidential enquiry into maternal deaths in the Netherlands in 1966 and 1967 only.8 In other years, data were derived from national vital statistics. The value of these data are, however, limited in that no detailed information can be obtained and significant underreporting occurs.9-15 A population-based nationwide confidential enquiry provides more precise data. The data can be classified more accurate to identify trends. Cases can be used for medical audits, to be able to identify risk groups and substandard care factors. It can be investigated whether substandard care contributed to the chain of events leading to death. Examination of access to care and the responsiveness of obstetric care systems to specific health care emergencies lead to more specific recommendations for health sector and community action. The only other countries using medical audit to perform nationwide Confidential Enquiries into maternal mortality are the United Kingdom from 1952 till now15, and South Africa from 1998.16,17 The Millennium Declaration of the United Nations was endorsed by 189 countries. The fifth Millenium Development Goal was set to reduce maternal mortality with 75% by the year 2015, as compared with the level in 1990.18 Periodic confidential enquiries into maternal mortality should take place in each country to assess the level of obstetric care and observe trends of maternal mortality.

The Dutch Maternal Mortality Committee
The Netherlands Society of Obstetrics and Gynaecology established a Maternal Mortality Committee (MMC) in 1981. This thesis, by one of the members of the committee, is the result of data collection by this MMC.
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The first report was published in 1998, covering the years 1983-1992. Cases are voluntarily reported to the MMC by obstetricians, midwives and general practitioners. Additional cases are collected after a cross-check with the vital data collected by Statistics Netherlands. The anonymised cases are individually classified according to the definitions of the World Health Organisation’s International Classification of Diseases (Chapter 2), and assessed for substandard care factors by the members of the MMC. After that, all cases are discussed at a group meeting for a final decision on classification and substandard care factors. When consensus cannot be reached, the decision is based on the assessment of the majority of the group.

A confidential enquiry is completed on each case reported to the MMC. For each maternal death, data are collected on a standard questionnaire including information concerning general and obstetric histories, as well as the index pregnancy. Other sources of information, such as antenatal charts, laboratory and bacteriological results, pathology and autopsy reports and professional correspondence, are also analysed.

For every report in this thesis, data from the analysis by the MMC are used. In some reports also data from the LEMMoN study (Nationwide study into Ethnic determinants of Severe maternal morbidity in the Netherlands, also initiated by the Dutch Maternal Mortality Committee), and from the National In Vitro Fertilization Working Committee and the national cohort on late effect of ovarian stimulation (OMEGA study) are used.

The analysis of the collected data should lead to recommendations, which should be implemented in national guidelines. The implementation of these guidelines should lead to a decline in maternal mortality, measured in the subsequent report on maternal mortality.

Trend of maternal mortality

From 1900 the number of maternal deaths in Western societies showed a remarkable decrease but remained roughly stable since 1985. This tendency could be observed in the Netherlands as well, with a MMR of 242 per 100,000 livebirths in 1920, 105 in 1950, 13.4 in 1970 and 9.7 in the period 1983-1992 (Fig. 1). The steepest decline was in the period after 1930. This decline was different from the decline in general mortality as seen by Statistics Netherlands. The lowering in general mortality showed an association with improved living standards, whereas
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The trend of maternal mortality since the 19th century runs parallel with the improvement of obstetric care.20-25 Catharina van Tussenbroek studied the trend of maternal mortality in the Netherlands in the 19th century, comparing death certificates with birth registration of all women who died between the age of 20 and 50.20 She identified a clear connection between maternal mortality and death due to sepsis: the introduction of antisepsis around 1885 was followed by a reduction of the numbers of mortality due to sepsis. In 1925 it was discovered that puerperal sepsis was mostly caused by Group A Streptococci (GAS, identified in 1865 and classified by Lancefield in 1928). The other two factors reducing maternal mortality in the last quarter of the 19th century were the improvement of general health and the decreasing birth rate in the population.

In the 20th century a further decline could be seen. The efficiently organized maternity services, with three schools for midwives, led to the improvement of obstetric practice by well-trained birth attendants. Death due to sepsis was further reduced by the introduction of antibiotics (sulphonamides in 1935, penicillin in 1941). A short rise in maternal mortality could be seen around 1930 (Fig. 1), which was probably caused by an increased virulence of GAS.22 Mortality due to obstetric haemorrhage decreased due to the introduction of blood transfusion (1940-1945)
and the use of oxytocic drugs (ergotamine). Also, the improvements in anaesthesia led to a further decrease to the present level. During the last 20 to 25 years, no further decline in the MMR has been achieved in the Netherlands.

The MMR in the period 1983-1992 in the Netherlands was 9.7 per 100,000 live births. It may seem that no further improvement can be achieved, but the level of substandard care in pre-eclampsia cases (93%) and the 20% underreporting to the enquiry in that period indicated goals for improvement in the next period.

The studies address the following questions on Dutch maternal mortality:
1. What is the maternal mortality ratio in the period 1993-2005?
2. What are the underlying causes of maternal mortality in the period 1993-2005?
3. Has there been an improvement of the maternal mortality ratio compared to the previously reported period (1983-1992)?
4. What was the overall level of substandard care in this period and what are the factors associated with substandard care?
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OUTLINE OF THE THESIS

Chapter 2 presents the definitions related to maternal mortality used in this thesis.

Chapter 3 provides the degree of underreporting of maternal mortality in official statistics and in the reports by the maternal mortality committee, using the capture-recapture method.

Chapter 4 describes the national confidential enquiry into maternal mortality in the Netherlands in the period January 1993 to December 2005.

Chapter 5 addresses all cases identified as indirect maternal mortality in the Netherlands in the period of January 1993 to December 2005.

Chapter 6 presents an analysis of substandard care in cases of maternal mortality due to pre-eclampsia.

Chapter 7 presents maternal deaths due to thrombo-embolism.

Chapter 8 addresses maternal mortality and morbidity due to obstetric sepsis in the Netherlands in the period 1993-2006.

Chapter 9 focuses on serious maternal morbidity and mortality in Jehovah’s witnesses in the Netherlands.

Chapter 10 describes maternal deaths after elective caesarean section for breech presentation in the Netherlands.

Chapter 11 focuses on maternal mortality due to vascular dissections and ruptures.

Chapter 12 describes maternal mortality due to psychiatric disorders in the Netherlands.

Chapter 13 considers maternal death related to In Vitro Fertilization.

Chapter 14 provides a general discussion.

Chapter 15 contains a summary of recommendations.

Chapter 16 is the summary, both in English and in Dutch, of this thesis.
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REFERENCES

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