# ETHNIC DIFFERENCES IN ANTENATAL CARE USE, QUALITY OF CARE AND PREGNANCY OUTCOMES

The Generation R Study

**Anushka Choté**

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# Ethnic Differences in Antenatal Care Use, Quality of Care and Pregnancy Outcomes

*The Generation R Study*

Etnische verschillen in gebruik en kwaliteit
van de verloskundige zorg en zwangerschapsuitkomsten
*Het Generation R Onderzoek*

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**rector magnificus**

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# Introduction

# Introduction

The Netherlands has a long history of immigration. Currently almost 20% of the Dutch population are immigrants or children of immigrant parents. Migrants, especially those with a non-Western background, tend to live in urban areas. Nearly 40% of them reside in the four largest cities (Amsterdam, Rotterdam, The Hague and Utrecht), as compared to 13% of the Dutch population. In Amsterdam and Rotterdam approximately 35% of the population has a non-Western background.[1] The majority of the first generation migrants belong to the fertile age groups[2] and approximately 1 out of each 6 children born in the Netherlands has a non-Western background.[3] Non-Western migrant groups are generally in a disadvantaged position, both socioeconomically and with respect to health.[4-7]

In the Netherlands, as in many other industrialised countries, migrant women are an important risk group in antenatal care, given their elevated perinatal and maternal mortality rates and adverse perinatal and maternal outcomes.[8,9] Also, perinatal mortality figures are more elevated in the larger cities.[10,11]

Adverse pregnancy outcomes are traditionally considered as indicators for the accessibility and quality of obstetric care, including antenatal care. Early and comprehensive antenatal care is often *considered* as a cornerstone to improve maternal and perinatal outcomes.[12,13] In the obstetric world the necessity of timely entrance into antenatal care in general is unquestioned. Some studies have described differences in antenatal care use between native and migrant women[14,15] also in the Netherlands.[16] Most studies are descriptive and little is known about how these ethnic differences can be explained. In addition, studies into ethnic differences in the quality of antenatal care are very scarce. Finally, empirical evidence on the beneficial effects of antenatal care on maternal and neonatal outcomes is difficult to obtain and available studies provide no unequivocal results.[17-19]

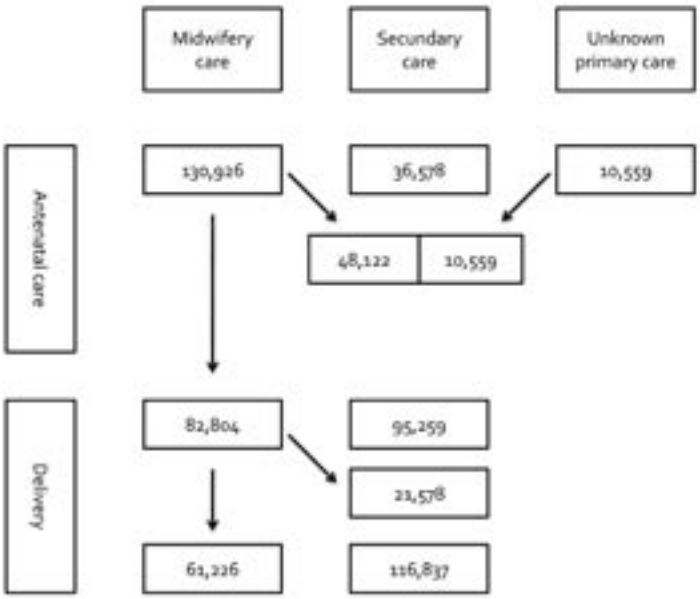
The organisation of the Dutch obstetrical system is different from that in many other European countries. Community midwifery[a] has a central role in Dutch antenatal care: only women with high risk pregnancies are referred to hospital based obstetric care by a gynaecologist. In 2005 73.5% of all pregnant women start antenatal care in a midwifery practice (based on the Netherlands Perinatal Registry[20]). This thesis is confined to initially low-risk pregnant women that entered antenatal care in a midwifery practice and thus were not referred immediately to secondary care because of pre-existing medical problems.

In figure 1 a flow chart for the Netherlands is displayed of the pregnant women throughout antenatal care and delivery based on the PRN data.[b] The PRN data comprise data of pregnancies resulting in a delivery from 20 weeks of pregnancy onwards.

This flow chart shows that 48,122 of the pregnant women that started antenatal care at a midwifery practice were referred during pregnancy (36.8%) and another 21,578 during delivery (26.1% of those that started delivery in midwifery care).

[a] Besides midwives, also a limited number of GPs provide primary antenatal and obstetric care.
[b] The figures presented are those of the year 2005, which were most close (although somewhat more recent) to the period in which the data collection for this thesis was carried out.

*Figure 1. Flow chart: care trajectory pregnant women 2005 (adapted from PRN 2008[c]).*




Overall this implies that 53.2% of all women that started antenatal care in the Netherlands in a midwifery practice, delivered in secondary care.

In this thesis differences between migrant and native Dutch pregnant women regarding the use of antenatal care, the quality of antenatal care and pregnancy outcomes are subject of study. This thesis focuses on women that received antenatal care in community midwifery in the city of Rotterdam, the Netherlands. Both primiparous and multiparous women are included. Most primiparous women start antenatal care in primary care; in Rotterdam only community midwives provide primary antenatal care. Based on risk assessment some are referred immediately to secondary care in case of preexisting medical conditions (e.g. diabetes mellitus type 1 or type 2). They are not included in this study. Our study population includes two groups of women that start antenatal care in community midwifery: (a) women considered as continuously low risk, who receive antenatal care by community midwives and deliver at home or in hospital depending on the wish of the woman, and (b) pregnant women, that were referred during pregnancy because of risk factors that were not yet present or known before pregnancy but rose during pregnancy (e.g. pregnancy hypertension), or during delivery or even after delivery.

[c] The PRN report contains a number of obscurities. First, in figure 9.1. of the report, 10,559 women started antenatal care at an unknown primary care provider. We included them also in our figure 1. The text that accompagnies table 9.1.1. in the PRN report (p. 92) suggests that these 10,559 women actually started antenatal care at a GP practice. However, apparently from figure 9.1., they were all referred to secondary care ultimately before delivery, and not during delivery. Furthermore, based on figures 9.1. and 9.2.1. of the PRN report, the percentage of 27% women that were referred during pregnancy by the midwives (mentioned in figure 9.1., and also in the text on p. 93 in the PRN report) is not correct because it includes all pregnant women, also those that started antenatal care in secondary care in the denominator. Finally, it is not clear whether how women that are referred immediately to secondary care were classified in the figure.

This thesis aimed to answer the following specific questions:

1. Are there differences in the use of antenatal care provided by community midwives between migrant and native pregnant women in Rotterdam? And if there are differences, how can they be explained?
2. Are there differences in the quality of antenatal care as provided by community midwives between migrant and native pregnant women? And if there are differences, how can they be explained?
3. Are there differences in obstetric outcomes between migrant and native pregnant women starting antenatal care in community midwifery? And if so, are such differences related to the timing of antenatal care entry?

**Study population and data sources**

*Generation R Study*

For this thesis data from the Generation R Study were used. The Generation R Study is a multi-ethnic population-based prospective cohort study to investigate growth, development and health of urban children from fetal life until young adulthood.[21] The study was conducted in Rotterdam, the second-largest city in the Netherlands. Rotterdam has an ethnically very diverse population and thus is an ideal setting to investigate the research questions of this thesis. Of all Dutch cities the percentage of births from mothers with a non-Western background is highest in Rotterdam (48%).[10] The study was approved by the Medical Ethics Committee of the Erasmus Medical Centre, Rotterdam. Eligible women received written and oral information about the study and were asked for written informed consent. While the primary aim of the Generation R Study focused on children, our study focused on the pregnant women.

*Study population*

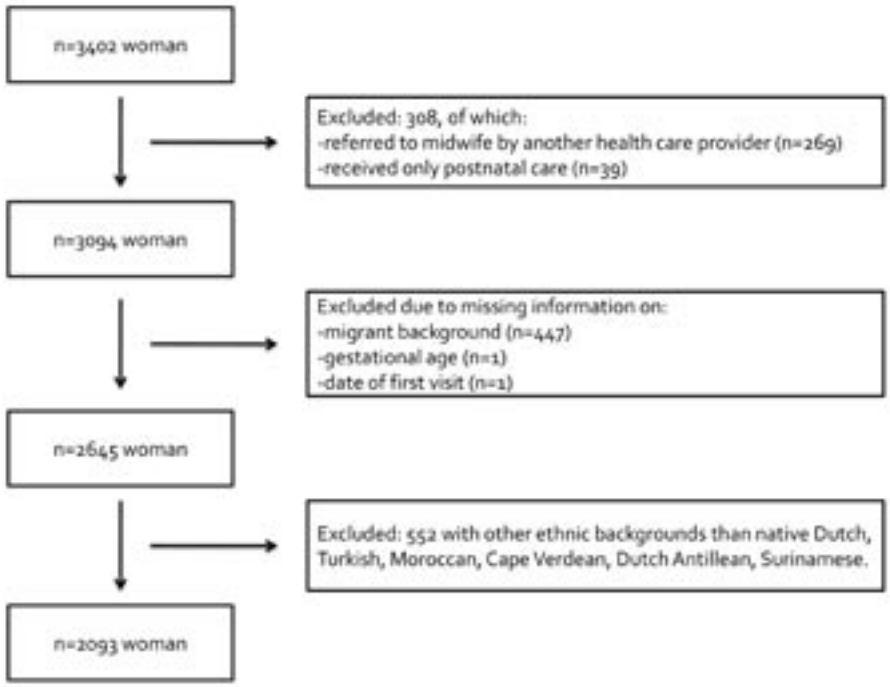
For this study, 3402 women who entered antenatal care at the practices of 23 midwives and that were participating in the Generation R Study, with at least two registered contacts and with an expected date of delivery between April 2002 and December 2004, were included. Women that only had one contact with the midwife were referred immediately because of medical problems to secondary care.

This group of 3402 pregnant women was the only group in the Generation R Study for which all necessary data were available. Of these 3402 women (see figure 2 for a flow chart of the study population) 308 were excluded, since they received only postnatal care by the participating midwives (n=39), or were referred to the participating midwife practices by another health care provider (n=269), because in these cases it was not possible to establish time of entry into antenatal care and gestational age at first visit. Subsequently, 447 women were excluded because no information on their migrant background was available and two more women were excluded because information

on gestational age or date of first visit could not be retrieved. Women with other migrant backgrounds than the ones mentioned below were excluded because they belonged to too many different groups, resulting in an excessively small number of women in each group available for study (N=552). If a woman had more than one pregnancy during the research period, only the first pregnancy was included. This resulted in a total population for analysis of 2093 women. Of them, 58.1% were referred during pregnancy or delivery. This is a higher figure than observed overall in the Netherlands (see above, figure 1), although it should be observed that the Generation R Study in principle included all pregnant women, and not only those with pregnancy durations of 20 weeks and more, as is the case in the PRN.

Non-Dutch status of the participating pregnant women was assessed according to current practice of Statistics Netherlands[22]: when at least one of the parents of the woman was born outside the

*Figure 2. Flow chart of the study population*




Netherlands, the woman was considered as non-Dutch. Included in our study were the seven largest migrant groups in Rotterdam: Native Dutch, Moroccan, Turkish, Cape-Verdean, Dutch Antillean, Surinamese-Hindustani and Surinamese-Creole. The distinction between the latter two groups was based on self-reports. We distinguished between both groups, because they differ racially and culturally, Hindustani being of Asian descent, Creole of African descent.

*Data*

Data were derived from electronic antenatal charts (Micronatal®) in which the midwives participating in the study registered their patient data, from data derived from the LVR1 (Landelijke Verloskundige Registratie 1e lijn) and LVR2 (Landelijke Verloskundige Registratie 2e lijn), and from written questionnaires filled out by the pregnant women at enrolment in a midwife practice. These questionnaires were available in foreign languages whenever necessary. Also, in case of illiteracy, assistance was available to fill out the questionnaire. More detailed information on data collection and data sources is provided in the following chapters (2 – 6) of this thesis.

**Outline of the thesis**

This thesis consists of seven chapters.

In ***chapter 1*** background information is presented that forms a framework in which this thesis can be situated. It starts with the declining position of the Netherlands in the European ranking as far as perinatal mortality is concerned. Many hypotheses have been put forward to explain the lower ranking. Two of these hypotheses also form the cornerstones of this thesis: the way in which obstetric care is organised in the Netherlands, which is different compared with many other European countries, and the increase and composition of the migrant population. Therefore, this chapter also provides some background information on the Dutch obstetric care system, and a short description of the recent migration history of the Netherlands. Also, available information on ethnic differences in perinatal and maternal mortality in the Netherlands is presented.

In ***chapter 2*** ethnic differences in antenatal care use in Rotterdam are described. Most studies in the United States assess antenatal care use by so-called adequacy of antenatal care use indexes, consisting of two components: gestational age at first visit and the total number of visits. In our study we constructed such an index based on the well-known Kotelchuck index[23], making use of the schedule for basic antenatal care of the Dutch Society of Obstetrics and Gynaecology (NVOG) (see annex).

In ***chapter 3*** we focus on a further explanation of these ethnic differences in timely use. In the Netherlands information on the background of ethnic differences in antenatal care use is still limited. Most studies explaining differences in antenatal care originate from the United States[23] and include possible determinants on a rather ad hoc basis of data that are available. In this thesis, point of departure was the Andersen's model to study differences in health care use. This model distinguishes between three groups of determinants of use: (1) need factors, (2) predisposing factors, reflecting the propensity to use services, and (3) enabling factors, reflecting opportunities to use services.[24] Besides classical predisposing variables such as age, parity and

concerns regarding the pregnancy, we considered it also interesting to determine whether late entry into antenatal care is associated with other health behaviours such as the use of tobacco or alcohol, and the use of folic acid. We hypothesised that women who were not likely to adopt health behaviours regarding pregnancy will also not be inclined to enter antenatal care early in pregnancy. Thus far, focus of the thesis was on the differences in antenatal care use between native and migrant pregnant women.

In ***chapter 4*** we switch the focus to differences within the migrant groups and we investigated differences in timely use between first and second generation migrants. Investigating differences according to generational status also allows assessing the role of language as an indicator of acculturation. Health literacy is considered as an important barrier to adequate health care use. In the Netherlands some migrants are rather fluent in Dutch (Surinamese), while others are less so (especially Turks and Moroccans).
Studies into antenatal care have focused primarily on use, especially the initiation and its timing, while the content and quality of care have received less attention.

In ***chapter 5*** the attention shifts from ethnic differences in use to ethnic differences in the content and quality of care. Available studies assess quality of antenatal care by means of satisfaction reports of the pregnant women. A few studies have assessed obstetric-technical aspects of care, based on reports by pregnant women. However, pregnant women may not always be aware of the technical procedures carried out. In this chapter we defined quality of antenatal care as the extent to which midwives adhered to antenatal care guidelines. We corrected for adequate antenatal care use, thus assessing quality as far as midwives have the opportunity to adhere to the guideline.

In ***chapter 6*** of this thesis, we deal with two questions. We examined whether migrant background of the mother was associated with pregnancy outcomes including hypertensive pregnancy complications, gestational age at birth and birth weight. In western societies perinatal and certainly maternal mortality have low incidences, therefore we focused on outcomes that are risk factors for perinatal and maternal mortality. We also investigated to what degree differences in gestational age at birth and birth weight between native and migrant pregnant women can be explained by differences in the timing of entry into antenatal care and/or by differences in socio-demographic, obstetric and life style factors. We do not investigate the role of quality of care – as assessed in chapter 5 – in explaining ethnic differences in pregnancy outcomes, because we did not find ethnic differences in quality of care.

***Chapter 7*** contains a summary of the empirical findings and discusses the methodological strengths and limitations of our study. Subsequently, some policy implications of the study are discussed, and directions for future research are suggested.

**References**


1. Suurmond J, Stronks K, Foets M, Schuster J. Allochtone groepen in Nederland. Definities en achtergrondinformatie. In: Foets M, Schuster J, Stronks K, editors. Gezondheids(zorg)onderzoek onder allochtone bevolkingsgroepen, een praktische introductie. 2008:15-28.
2. Mulder M. Niet-westerse allochtonen per gemeente. In: Volksgezondheid Toekomst Verkenning, Nationaal Kompas Volksgezondheid. 2009.
3. Gijsberts M, Dagevos J. Jaarrapport integratie 2009. The Hague: The Netherlands Institute for Social Research / SCP 2009.
4. Bollini P, Siem H. No real progress towards equity: health of migrants and ethnic minorities on the eve of the year 2000. Soc Sci Med 1995;41(6):819-828.
5. Nazroo JY. The structuring of ethnic inequalities in health: economic position, racial discrimination, and racism. Am J Public Health 2003;93(2):277-284.
6. van der Veen E, Schrijvers C, Redout E. Bewijs voor verschil? ZonMw 2003.
7. Kunst A, Mackenbach J, Lamkaddem M, Rademakers J, Devillé W. Overzicht en evaluatie van resultaten van wetenschappelijk onderzoek naar etnische verschillen in gezondheid, gezondheidsrisico's en zorggebruik in Nederland. MGZ/Nivel 2008.
8. Bollini P, Pampallona S, Wanner P, Kupelnick B. Pregnancy outcome of migrant women and integration policy: a systematic review of the international literature. Soc Sci Med 2009;68(3):452-461.
9. Gagnon AJ, Zimbeck M, Zeitlin J, ROAM Collaboration, Alexander S, Blondel B, et al. Migration to western industrialised countries and perinatal health: a systematic review. Soc Sci Med 2009;69(6):934-946.
10. de Graaf JP, Ravelli AC, Wildschut HI, Denktas S, Voorham AJ, Bonsel GJ, et al. Perinatal outcomes in the four largest cities and in deprived neighbourhoods in The Netherlands. Ned Tijdschr Geneeskd 2008;152(50):2734-2740.
11. Racape J, De Spiegelaere M, Alexander S, Dramaix M, Buekens P, Haelterman E. High perinatal mortality rate among immigrants in Brussels. Eur J Public Health 2010 May.
12. Anachebe NF, Sutton MY. Racial disparities in reproductive health outcomes. American Journal of Obstetrics and Gynecology, 2003;188(4):S37-S42.
13. Healy AJ, Malone FD, Sullivan LM, Porter TF, Luthy DA, Comstock CH, et al. Early Access to Prenatal Care: Implications for Racial Disparity in Perinatal Mortality. Obstet Gynecol 2006;107(3):625-631.
14. Rowe RE, Magee H, Quigley MA, Heron P, Askham J, Brocklehurst P. Social and ethnic differences in attendance for antenatal care in England. Public Health 2008;122(12):1363-1372.
15. Ny P, Dykes AK, Molin J, Dejin-Karlsson E. Utilisation of antenatal care by country of birth in a multi-ethnic population: a four-year community-based study in Malmö, Sweden. Acta Obstet Gynecol Scand 2007;86(7):805-813.
16. Alderliesten ME, Vrijkotte TG, van der Wal MF, Bonsel GJ. Late start of antenatal care among ethnic minorities in a large cohort of pregnant women. BJOG 2007;114(10):1232-1239.

17. Alexander GR, Kotelchuck M. Assessing the role and effectiveness of prenatal care: history, challenges, and directions for future research. Public Health Rep 2001;116(4):306-316.
18. Carroli G, Villar J, Piaggio G, Khan-Neelofur D, Gulmezoglu M, Mugford M, et al. WHO systematic review of randomised controlled trials of routine antenatal care. Lancet 2001;357(9268):1565-1570.
19. Raatikainen K, Heiskanen N, Heinonen S. Under-attending free antenatal care is associated with adverse pregnancy outcomes. BMC Public Health 2007;7:268.
20. Nederland SPR. Perinatale Zorg in Nederland 2006. Utrecht, the Netherlands: Stichting Perinatale Registratie Nederland 2008.
21. Jaddoe VW, van Duijn CM, van der Heijden AJ, Mackenbach JP, Moll HA, Steegers EA, et al. The Generation R Study: design and cohort update until the age of 4 years. Eur J Epidemiol 2008;23(12):801-811.
22. Stronks K, Kulu-Glasgow I, Agyemang C. The utility of 'country of birth' for the classification of ethnic groups in health research: the Dutch experience. Ethn Health 2009;14(3):255-269.
23. Kotelchuck M. The Adequacy of Prenatal Care Utilization Index: its US distribution and association with low birthweight. Am J Public Health 1994;84(9):1486-1489.
24. Andersen RM. National health surveys and the behavioral model of health services use. Med Care 2008;46(7):647-653.

# Chapter 1

## Background information

# Introduction

*Antenatal care*

Until the end of the 19th century, obstetric care was largely limited to assistance during the delivery. In many western countries antenatal care originated at the beginning of the 20th century and now passed its 100th birthday. The first antenatal clinics were established as soon as in 1858 in Ireland (Dublin), in 1910 in Australia, in 1911 in the United States and in 1915 in Scotland.[1,2] Initial ideas originated from the second part of the 19th century. In 1843 Lever discovered that albumin in the urine of pregnant women was associated with the subsequent development of preeclampsia. A Dutch general practitioner – Mijnlieff – advised in 1890 to examine pregnant women in the final stage of their pregnancy on the prevalence of proteinuria in order to detect (pre)eclampsia. In addition, the gynaecologist De Snoo proposed a salt limited diet during the 20ies of the previous century. The French physician Pinard is also considered as a founder, since in 1878 he advised to examine each pregnant woman in order to detect deviant presentation of the child.[2-5]

Since then, systems of health care have been[6] developed for pregnant women consisting of visits to physicians or midwives, at regular intervals, in order to provide opportunities for timely life style advice during pregnancy, as well as opportunities for detection and treatment of adverse pregnancy outcomes. Concern about hypertensive disorders in pregnancy, but also about the detection and treatment of syphilis, fulfilled an important role in the first antenatal schemes.[2,6]

Still, *empirical* evidence on the beneficial effects of antenatal care on maternal and neonatal outcomes is difficult to obtain and available studies provide no unequivocal results.[6,7] Nevertheless, the decline in maternal and perinatal mortality in the course of the 20th century *might* be the confirmation of its contribution. Early and comprehensive antenatal care is often *considered* as a cornerstone to improve maternal and perinatal outcomes.[8,9]

*Migrant health and health care use*

Like other European countries, the Netherlands is increasingly an immigrant society. Research on migrant health still focuses strongly on describing and explaining differences in *health status* between migrant and native populations. Often, migrants are not in a favourable situation, also regarding perinatal health.[10-13] Results varied according to the perinatal outcome measure under study, and depended on the migrant group and the receiving country under study.

Research that investigates ethnic differences in *use, access and quality of care* lags behind. This also applies to the field of obstetric care, except with regard to the situation in non-industrialised countries as appeared from a recent review by Simkhada et al.[14] Adequate use and good quality of care also *may* contribute to better health outcomes. Primary objectives of antenatal care are indeed good pregnancy outcomes for both mother and child.

*Content of this chapter*

This chapter first discusses the declining position of the Netherlands in the European ranking as far

as perinatal mortality is concerned. In the Netherlands, perinatal mortality is 9.7‰, of which 6.6‰ are fetal deaths and 3.1‰ early neonatal deaths. The Netherlands compares badly with its neighbour countries. Many hypotheses have been put forward to explain the decline in ranking. Two of them lie at the basis of this thesis: the way in which obstetric care is organised and delivered in the Netherlands as compared to many other European countries and the increase and composition of the migrant population. Therefore, the second part of this chapter provides some background information on the Dutch obstetric care system. Subsequently, we briefly review the recent migration history of the Netherlands and describe the magnitude and composition of its migrant population. In this part, we also refer to some definitional issues regarding the concept of "ethnicity" and related concepts, making comparisons with other countries but also within the Netherlands sometimes difficult. Finally, we summarise available information on ethnic differences in obstetric outcomes in the Netherlands.

## 1. Perinatal mortality in the Netherlands: declining position in Europe[a]

*Evolution of perinatal mortality since the eighties of the previous century and its possible causes*

Since a long time, the Netherlands is under the spell of its place in the European rank order of perinatal mortality. Already in 1986 Hoogendoorn[15] noticed that there was no further decline in perinatal mortality in the Netherlands, as compared to the surrounding countries. He suggested a causal relation with the number of home births. Home births were much more frequent in the Netherlands as compared to other countries, and Hoogendoorn showed that no further decline in home births had occurred.[15] Both the comparability of the mortality data of the different European countries and the suggestion that home births might be the main reason for the slower decrease of perinatal mortality without real arguments resulted in heavy debate in the Dutch scientific medical journal (Nederlands Tijdschrift voor Geneeskunde), but also in the newspapers and on television.[16-18]

In 2001, the Dutch National Institute for Public Health and Environment (RIVM)[19] published a study concluding that perinatal mortality (based on OECD data, which for the Netherlands were based on data of Statistics Netherlands) declined from 26.6‰ life births in 1960 to 17.9‰ in 1996. However this decline had been less pronounced in the Netherlands than in most of the 12 EU countries. As a consequence, in 1997 the Netherlands had fallen in the European countries' ranking of perinatal mortality rates, from the 4$^{th}$ to the 11$^{th}$ place[19], although one should keep in mind that the differences between countries were decreasing. Subsequently, the authors discussed several risk factors affecting perinatal mortality which might provide explanations for this decline. Besides differences in the definition of perinatal mortality, making comparisons between countries difficult, other likely explanations put forward were the increasing age of the pregnant women, the increase in the twin pregnancy rate, partly as a consequence of IVF, the relatively high number of pregnant women smoking, and finally the increase of pregnant women from non-Dutch origin.[19] The authors mentioned that data regarding these risk factors were not always available in different countries or were not easily comparable, also regarding the number

[a] We decided not to include comparative figures because comparability between different countries was difficult because of differences in definition: depending on the country mortality was included ranging from after 28 until 22 weeks.

of pregnant women from non-native origin. Indeed, definitions of what should be considered as non native varied between different countries. Furthermore, in the RIVM study, the role of possible differences in preterm birth and low birth weight and of complications around or after the delivery in the Netherlands as compared to other western European countries remained uncertain, as well as the role of congenital disorders. Several of the risk factors might be positively influenced by providing prevention and care. Therefore, the authors of the RIVM report finally discussed to what degree the decreasing rank of the Netherlands could be attributed to deficiencies in this respect. In general, they concluded that at that time there were few indications that the Dutch system of care was functioning less optimal than the systems of other countries, although improvement was of course considered possible.[b] The authors noticed a more conservative policy in the Netherlands regarding treatment of very preterm neonates as a possible explanation for the differences in mortality. In addition, they mentioned the possibility – without being more specific – that there was still room for improvement in the care for pregnant women of a non-Dutch origin. Also, health education aiming at reducing the number of pregnant women smoking could still be intensified. Finally, they mentioned that antenatal screening of congenital disorders such as Down's syndrome and neural tube defects was less frequent in the Netherlands than in many other countries although the contribution to the higher mortality rates remained to be investigated.[19] Indeed, at that time the 20 week ultrasound was not standard practice in the Netherlands. Van der Pal et al[20] indeed showed that differences in screening and termination practices might affect perinatal mortality rates. Termination of pregnancy is conducted because of very serious health problems in the foetus, which without screening and termination (before the lower limit to be registered as perinatal deaths) would otherwise have resulted in perinatal deaths.

Shortly after this first RIVM report, the results of the EURONATAL study - a retrospective audit study - were published, suggesting that the poorer perinatal mortality rates in the Netherlands could be attributed to the presence of some suboptimal care factors. This study investigated 1543 individual mortality cases in the period between 1993 and 1998 in ten European regions.[21] Overall, in 46.3% of the cases substandard care was present that possibly or likely contributed to the fatal outcome. In the Netherlands this figure was slightly higher: 48.4%. Only in Finland and Sweden these percentages were significantly lower (31.9% and 35.7%). Especially, the failure to detect growth restriction and maternal smoking were important suboptimal factors. There was a positive relation between the proportion of cases with suboptimal factors and the overall perinatal mortality rates.

In 2003, the negative portrait that appeared from the RIVM report of 2001, was confirmed by results from the PERISTAT-I study – a European collaborative study[22] –, although a lot of discussion took place whether the data were comparable.[23,24] The figures for the Netherlands (1999) were based on a merged database from three professional registers: LVR1, LVR2 and LNR (Landelijke Neonatale Registratie).[22] Foetal mortality was even highest in the Netherlands (7.4‰), early neonatal mortality was 3.5‰, the second highest score. The PERISTAT-I study mentioned in part the same factors that might have contributed to the relatively high perinatal mortality in the

[b] The authors of the RIVM report refer to the high number of home births and to the low number of technical procedures such as Caesarean sections (see also paragraph 2 of this chapter).

Netherlands. These were: a relatively high proportion of older pregnant women, multiple births and non-Dutch pregnant women, the conservative policy in the treatment of premature newborns, which reduces survival chances, and less prenatal screening for congenital abnormalities in the Netherlands than in most other European countries.[24]

A publication by Garssen and Van der Meulen[25] proposed similar explanations as presented in the RIVM report by Achterberg and Kramers.[19] Regarding the non-western background of many pregnant women, Garssen and Van der Meulen additionally noticed the more frequent occurrence of risky sexual behaviour in some groups, resulting in more genital infections.

A subsequent study by the RIVM[26] showed that perinatal mortality in the Netherlands stabilised in the nineties of the previous century whereas some risk factors nevertheless increased: higher age of the mother, increase of multiple births and more pregnant women with a migrant background. It therefore was suggested that care or prevention might have improved or that improvement took place in the life style and social conditions of pregnant women. This study also concluded that differences between the Netherlands and the two countries with the most favourable perinatal mortality (Finland and Sweden), could not be attributed to differences in the registration of perinatal mortality, and thus required further explanation. The differences could not be explained by differences in the increase of the age of the pregnant women, and only to a limited extent by differences in the increase in multiple births (largely as the consequence of IVF and other techniques, to a lesser extent as the consequence of higher maternal age). The number of births of pregnant women with a migrant background did contribute to the difference. For the increased risk on perinatal mortality among migrant women, the authors mentioned several possible reasons. They referred to their lower socioeconomic position, to the higher occurrence of congenital abnormalities in some migrant groups as a consequence of co-sanguine marriages, to the increased risk of infections and of obesitas and diabetes among some migrant groups. Other contributing factors were the number of women smoking – considerably higher in the Netherlands – and substandard care factors. Regarding the latter, they referred to the EURONATAL study already mentioned above. Achterberg further discussed the possible role of overweight and obesity of expecting women as risk factors for perinatal mortality, factors not yet mentioned in previous reports and papers. However, only small differences were found in obesity between the four countries and the author concluded cautiously that it was not likely that they explained the differences in perinatal mortality. Moreover, Achterberg concluded that part of the differences with Finland and Sweden could be attributed to less frequent second trimester ultrasound screening, followed by abortion, in the Netherlands at that time. Finally, he mentioned that differences in treatment policy – in the Netherlands more watchful – of seriously premature new-borns might contribute to differences. In this report not all differences in the provision of care could be evaluated on their consequences for the differences in perinatal mortality between the three countries.

These results gave rise to a commentary in the Dutch Medical Journal in which was stated that notwithstanding all negative evidence, there were still no signs of a clear policy response to improve

the situation. This observation had as a title: "Perinatal mortality in the Netherlands: a problem of many, a problem of nobody".[27] This commentary led to a reaction by Merkus and Eskes[28], in which they mentioned that two commissions in the Health Insurance Board did consider perinatal mortality as their problem, and that they were in consultation with the RIVM to realise an efficient perinatal audit, making use of the experience obtained in a feasibility study, the so-called Dutch National Perinatal Audit Study.[29,30]

The strong decrease of perinatal mortality in the year 2004 (both in data from Statistics Netherlands and the PRN registrations) attracted the attention not only of researchers but also of politicians. The RIVM was asked to investigate whether this decrease was the start of a structural improvement.[31] The figures from the period 2000-2005 only pointed to a slight decline, especially regarding foetal deaths. The authors concluded that registration features were not very likely to contribute to the decrease, that statistical fluctuation could not be excluded regarding the decline in 2004, and that the decline in perinatal mortality did not result in mortality at a later age because of changes in the survival of newborns. An analysis of the underlying risk factors of perinatal mortality showed a slight increase of older pregnant women and of pregnant women with a migrant background, whereas the share of the multiple births had been stable. The changing policy regarding IVF, where single instead of multiple embryo transfer was used more often, could not explain the decrease in 2004, since it only occurred from 2005 on. The increase of prenatal screening for Down's syndrome and neural tube defects was another possible explanation. Most parents decide to interrupt pregnancy in case of abnormal test results. Without screening, part of these children would have died before or shortly after delivery. But because of lack of accurate data, the actual contribution of prenatal screening on perinatal mortality could not be estimated, although a decrease of children born with serious impairments such as neural tube defects had been observed.[32] The increase of caesarean deliveries since 2000[33] after the publication of the results of the Term Breech Trial[c] may have had a small positive effect on the perinatal mortality as well as the increase of capacity at the Neonatal Intensive Care Units (NICUs), although the contribution of the latter could not be estimated well at time of publication.[34] Again, it was not possible to assess the role of overweight because of lack of data. Equally, data on the use of folic acid in the period after 2000 were lacking. However, a decrease of pregnant women smoking between 2001 and 2003 may have contributed in a positive way. The authors also allude to the introduction of a national perinatal audit which might contribute to a better insight into substandard care factors and thus contribute to better perinatal outcomes.

In 2008, the results of PERISTAT-II appeared. In this study, 25 instead of 15 European countries participated.[35] It appeared that the position of the Netherlands remained unfavourable. The data of 2004 showed that the Netherlands had the highest perinatal mortality after France and Letland (10‰). Between 1999 and 2004 the decline in perinatal mortality again was slower in the Netherlands than in the other countries[36](see also: www.europeristat.com). The authors confirmed that still problems were present in the quality of the data, making comparisons difficult, but they didn't consider it very likely that the Dutch place in the ranking could only be ascribed to

[c] The Term Breech Trial was a study on the best mode of delivery of term infants in breech position. The conclusion was that a planned caesarean section was substantially better for the singleton fetus in breech position at term, without higher risk of serious problems for the mother. [34] After publication of the results the rate of caesarean sections in case of breech position in the Netherlands increased from 50% to 80%.[33]

differences in registration methods. Finally, they again assessed the evolution of some of the main risk factors, and compared them to other countries: the share of older pregnant women was still high in the Netherlands, as well as the number of multiple pregnancies, although in the opinion of the authors these factors alone could not explain the higher perinatal mortality figures. A subsequent study indeed confirmed that taking into account differences in the prevalence of multiple births, and differences in maternal age and parity did not substantially change the country ranking.[37]

In a reaction to PERISTAT-II, Merkus[38,39] published a comment in which he provided more recent figures for 2006, indicating that there was barely improvement. He also compared the Dutch system with the situation in its southern neighbour, the region Flanders in Belgium, where the perinatal mortality rate was lower. However, at the same time there were few differences regarding some of the known risk factors, except the age of the pregnant women. He concluded cautiously that the expectative policy in all professional groups in the Netherlands might be a main factor.[d]

Concluding, perinatal mortality has been subject of heavy debate in the Netherlands for more than 30 years now. Especially, the results of PERISTAT–II attracted attention not only in the Netherlands, but also in the British Medical Journal.[40,41]

*Time for action*

Meanwhile, finally initiatives were developed by central and local governments and by professional organisations to improve perinatal outcomes.

First, the Ministry of Health, Welfare and Sport, decided to introduce a *national perinatal audit system.*[39] After the positive results of a feasibility study,[29,30] the system was introduced very recently, on the first of January 2010, as one of the instruments for the improvement of the quality of obstetric care. This system was prepared by the RIVM.[42,43] The national perinatal audit consists of three levels. At the local level all health care providers evaluate perinatal mortality cases in a systematic way in order to do proposals for care improvement at the local level. At the regional level, issues are discussed such as referrals during the pregnancy to the perinatology centres, as well as transfers of neonates to the NICU's. Aim is to improve regional service delivery. Finally, at the national level the audits are performed by a national panel of professionals and experts. The focus at this national level is on selected topics, e.g. specific groups of women or specific diseases, in order to investigate specific patterns or explanations for perinatal deaths. Aim at the national level is to formulate recommendations e.g. for adjustment of guidelines, for better implementation of standards, training, and preventive measures. Little evidence is yet available on the actual functioning of the system. By July 2010 54 audit meetings had taken place (of which two regional ones), in which 571 health care providers participated (www.perinataleaudit.nl accessed 18-10-2010).

Also in 2008, the Dutch Ministry of Health, Welfare and Sports initiated a *Steering Group Pregnancy and Birth* that had to prepare an advice in order to optimise pregnancy and birth care, in order

[d] See paragraph 2

to reduce perinatal mortality as much as possible.[44] This advice was presented to the ministry of Health, Welfare and Sports in early 2010.[45] It offered proposals to reduce avoidable perinatal mortality, but also perinatal morbidity and maternal mortality and morbidity by improving care and prevention. The advice was based in part on a at that time not yet published study by Bonsel et al[46](see below) showing that the main causes of perinatal mortality in the Netherlands were (in order of importance): preterm birth, serious congenital abnormality, low birth weight and perinatal asphyxia. The Steering Group proposed many recommendations. Some are general principles, such as more demand oriented care, good evidence-based quality of care, and shared responsibility of all care providers involved. Therefore, the Steering group stated that web based patient files were required. Also, the installation of a "Perinatal Care College" that would initiate and implement multidisciplinary guidelines was proposed as well as the installation of local partnerships. The Steering group also offered more concrete recommendations regarding preventive possibilities in different stages. First, healthy behaviour before pregnancy has to be promoted, including - among other things - preconception care. Second, during pregnancy new instruments were proposed, besides health education: (a) the introduction of a case management function in charge of continuity of care, especially in case of transfer of care; (b) the introduction of a birth plan including a personal pregnancy trajectory; and (c) an obligatory home visit around the 34$^{th}$ week of pregnancy to identify medical or psychosocial problems and the safety of the home environment. Besides, the Steering Group wanted to retain the already existing intake at home by maternity care before the 7$^{th}$ month of each pregnancy. Professional caregivers should be well trained, including the acquirement of good collaborative skills. Every pregnant woman should have the guarantee of good and adequate care in acute situations 24 hours a day and seven days a week. In acute situations, all professionals must be able to start treatment within 15 minutes. Once delivery has started, the pregnant woman must not be left alone, and pain medication should always be accessible. Deliveries should take place in primary care when possible and in secondary care when necessary. The report does not blame home births, stating that "current research didn't show a causal link with perinatal mortality". For deliveries in primary care the choice of the delivery location must not be hindered by personal financial considerations.[e] The steering committee recommends an increase of birth centres directly connected to hospitals, where low risk pregnant women can give birth. Finally, safe postnatal care should be guaranteed by providing good maternity care by both the midwife and the maternity assistant. Therefore, existing practice should be intensified, both care providers should collaborate in a constructive way and a maternity file should be introduced. Finally, the Steering Group separately paid attention to the situation of women in disadvantaged situations, such as migrant women with a non-western background. It suggested that part of the naturalisation courses should pay attention to the organisation of Dutch obstetric care. The advice also made a plea for specific education, also in the languages of migrant women, an advice which goes against the current policy regarding immigrants. Finally, active detection and monitoring of specific risk factors were advised. Because the government was brought down shortly thereafter, treatment of the advice was put on the list of controversial

[e] The basic package of the Dutch health care insurance does cover a home delivery but not a so-called polyclinic delivery. For the latter a personal contribution is required.

subjects by the Dutch parliament (16th of March 2010), meaning that the parliament would not treat the advice. Only measures without financial consequences or measures initiated by the partners in the field could proceed. Measures that were postponed to a next government by the minister (letter to the Dutch parliament 15th of June 2010) were: the availability of acute obstetric care 24 hours a day and 7 days a week and the abolition of a personal contribution for polyclinic deliveries and maternal care. Also, the minister promised to ask the Health Insurance Board for advice regarding an ultrasound in the third trimester of the pregnancy in order to detect growth retardation. The minister further merely supported many of the advices by the Steering Group and asked the stakeholders to start implementation.

Meanwhile, all partners agreed that there will be one electronic file for every pregnant woman by the year 2014, in order to optimise communication between care providers, and the establishment of the "Perinatal Care College" is near.[47]

The advices by the *Steering Group Pregnancy and Birth* that concerned hospital care were assessed commissioned by the Dutch organisation of hospitals (NVZ). According to this study, the proposals require more personnel and lead to higher costs per delivery. The advices cannot be implemented by the aimed date of 2012.[48]

As an immediate reaction to a study published by the end of 2010 [49] (more details on this study are presented at the end of the next section), the new Dutch Minister presented a number of policy measures to be implemented in the near future.[50] In her letter to Parliament, she announced that in January 2011 a general brochure will be available on preconception care, with special focus on groups difficult to attain. Also, she expressed the necessity of more evidence based information on the effectiveness of preconception care by means of pilot studies that focus directly on women with a knowledge setback. Before 34 weeks of pregnancy a midwife has to inform the pregnant woman on the possibilities for a safe delivery and post delivery period at home. Ultimately in week 34, a decision has to be made on the preferred place of delivery. Furthermore, the Perinatal Care College has to start in early 2011. Aim of this College is to enhance the quality of obstetric care. All partners involved in obstetric care will take part in this college. Continuous accompaniment of women during labour will be guaranteed by means of earlier attendance of maternity nurses. Also, communication between the different care providers has to be enhanced. The introduction of webbased patient files is considered essential by the minister and will be introduced by mid 2012. Furthermore, the possibility of one tariff for obstetric care will be investigated. The birth centres that have been established in the previous years are considered as a possible alternative for unsafe home births. Their effectiveness and efficiency will be investigated. The revision of the Obstetric Indication List (Verloskundige Indicatie Lijst – VIL), which will be explained in the next section, has to be accomplished before the summer of 2011. The effectiveness and necessity of an ultrasound at the beginning of the third trimester will be investigated. Furthermore, the Minister requested the Health Care Inspectorate to ask all hospitals to prepare a plan of what they consider necessary in order to fulfil the criteria of the 'Stuurgroep Pregnancy and Birth'. The Minister especially mentioned the ability to start an acute obstetric treatment within 15 minutes

after arrival in the hospital during 24 hours and 7 days a week.
In the four largest Dutch cities, including in Rotterdam, perinatal mortality was even higher than in other parts of the country. In Rotterdam perinatal mortality was 11.4‰. Other pregnancy outcomes were also worse. Also, the situation was even worse in deprived neighbourhoods.[51,52] In February 2008, the Rotterdam Rijnmond Public Health Service and the Erasmus Medical Centre organised an expert meeting that ultimately resulted in the *Aanvalsplan Perinatale Sterfte* which was launched in June of the same year.[53] The main objective of this *Aanvalsplan* was to reduce perinatal mortality in all districts to at least the current national average of 10‰, within the next 10 years. This plan involves several measures. First of all, a pilot study with an innovative character has been launched in order to prepare a protocol for preconception care. An important challenge is how to reach vulnerable populations such as non-native women and women with a low socioeconomic status. Besides general preconception care, in another project parents are approached within one year after the birth of a child without a good pregnancy outcome. Aim is to systematically screen parents with a child wish that had a negative pregnancy outcome in a previous pregnancy. These parents obtain more specialised interconception care together with general preconception care. A second important task is the delivery of antenatal care especially in the first trimester of the pregnancy.[54,55] The *Aanvalsplan* now is called *Klaar voor een Kind* and information on its development can be followed on the website www.klaarvooreenkind.nl.
Furthermore, the Netherlands Organisation for health research and development (ZonMw) asked for a study in which available knowledge would be synthesized in order to prioritize further research in this field.[46] This study had a broad perspective and focused on all possible factors affecting the position of the Netherlands regarding perinatal mortality. Contrary to previous hypotheses, a number of women related characteristics – especially the higher maternal age in the Netherlands, but also consanguinity and the higher prevalence of multiple births and of smoking – did not contribute to the higher level of perinatal mortality in the Netherlands, nor did less prenatal screening. The authors conclude that the specific Dutch organisation of obstetric care probably does play a role, such as the late antenatal care entry of pregnant women among some groups, such as migrant women. Further research into the background of this delayed entry is considered necessary. According to this study, the Dutch obstetric system is not able to timely detect or prevent these causes and therefore concludes that risk selection is not working optimal.
The specific characteristics of the organisation of obstetric care will be explained in the next section. We may conclude that throughout the years, many hypotheses have been put forward to explain the decline in the European ranking. Some hypotheses refer to the risk profile of the pregnant women in the Netherlands, including the large amount of non-native pregnant women. Other hypotheses refer to the obstetrical system in the Netherlands, including the risk selection in which community midwives play an important role, but also factors hindering timely entry by non-native women. In the present thesis ethnic differences in timely entry and quality of antenatal care between Dutch and non-Dutch women was a central subject of study, as well as their explanation.

## 2. Organisation of Dutch obstetric care

*Introduction and historical background*

Obstetric care is easily accessible for all pregnant women in the Netherlands. It is part of the basic insurance system; all expenses are covered. Furthermore, geographical accessibility is guaranteed since the midwifery density is high in the Netherlands.[56,57]

The Dutch obstetrical organisation has some specific characteristics, distinguishing it from the systems in many other developed countries. This specific situation finds its origins partly in the "Law on Medical Practice" (Wet op de Uitoefening van de Geneeskunst) which already in 1865 - much earlier than in most other countries - recognised the midwife as an independent medical professional.[4,58] At this early stage her competency was limited to deliveries of *non-medical*, uncomplicated pregnancies, without the use of medical instruments. Besides, very early in the 20th century, consultation and well-baby clinics were established, that also offered motherhood courses to pregnant women, often those pregnant a second time. This – as compared to other countries – early recognition of the midwifery profession was essential for the further development of the Dutch system. Dutch midwives have relatively high autonomy.

In the period between 1928-1932 a controversy between gynaecologists and midwives was going on regarding the question whether antenatal care was primarily the competence of gynaecologists or midwives. In 1932 the legal competence of midwives was expanded to the provision of antenatal care from the 30th week of pregnancy.[4,58,59] This legal competence was expanded in the years to follow. The economic crisis and World War II disturbed further activities for improvement of antenatal care. However, the period just before, during and after World War II brought along a lot of medical progress (introduction of vitamin D in order to prevent rickets and thus pelvic abnormalities, discovery of penicillin resulting in a decrease of infections and lues, the discovery of the association between rhesus (D) antibodies and haemolytic diseases, better diagnosis of diabetes and treatment, the introduction of the first blood banks, the discovery of new blood groups, the discovery of the association between rubella infections and congenital malformations). But the decrease in perinatal mortality was slower than before World War II and again improvement was expected from better access and quality of antenatal care. In this post war period the first antenatal scheme was presented. It consisted of a first visit in the first trimester of the pregnancy. At this first, visit a blood examination was scheduled for lues and blood group-rhesus D type, followed by control visits after 6 and after 12 weeks. Subsequently, visits would follow every 3 weeks until 30 weeks of pregnancy, and every 2 weeks until 30 weeks of pregnancy, and finally every week until delivery. Between 30 and 34 weeks of pregnancy examination would take place of the presence of rhesus (D) antibodies in case the woman was rhesus (D) negative. In 1951, the legal competence of the midwives again was expanded, and since that time also included antenatal care in the first trimester of the pregnancy.

However, in the sixties again perinatal mortality did not decrease as much as was expected. It resulted in a lot of controversy on the Dutch system between midwives, GPs and gynaecologists

and also paediatricians and ultimately resulted in the introduction of so called echelons in Dutch obstetric care (see below). In the course of the seventies and eighties of the previous century the legal competence of the midwives has further increased, together with an improvement of their professional education.[4]

*Normality of pregnancy*

The emphasis in the Netherlands is on pregnancy as an in essence "physiological" and not a "pathological" process, resulting in a policy described as in general as watchful waiting, trusting in a good result without interventions.[39,58] This expectant policy appears for example from the low percentages of caesarean sections and inductions[f]. Recently, epidural pain relief became available for all delivering women, at least in theory. In obstetrics it is no longer considered as something luxurious, as appears from the guideline.[60] Its use is now increasing, but nowadays is lower than in other countries.[61]

*Echelons, risk selection by community midwifery and home births*

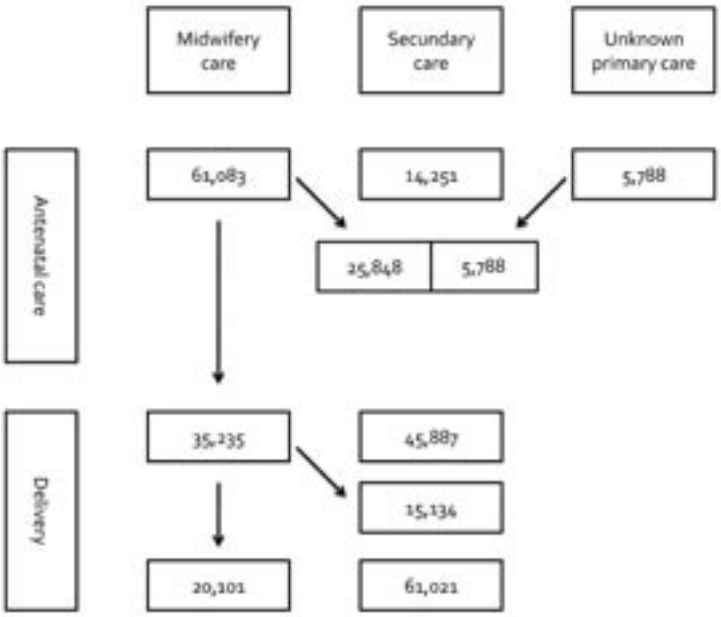
In the Netherlands, antenatal care is divided into primary, secondary and tertiary care. Primary antenatal care can be delivered by community midwives and – strongly decreasing – by general practitioners in rural areas. Community midwifery has a central role in Dutch antenatal care: only women with medical problems or a complicated obstetric history are referred to hospital based obstetric care by a gynaecologist. Referral can take place during pregnancy, during delivery and also in the postpartum period. Women with a high risk profile are under supervision of a gynaecologist, and they cannot choose for a home delivery. Thus, antenatal care in the Netherlands is based on risk selection[58,62,63] and guided by the Obstetric Indication List (VIL), that specifies which indications require a referral to a medical specialist.[64] The first list (the so-called Kloosterman list) was published in 1973. This list was agreed upon by the professional groups, and is now under revision.[65] Over time, the number of conditions on the list has increased.[58] The aim of this system is to obtain good obstetric results and to restrict the use of expensive technology to those who will benefit, and in doing so to preserve the, in the Netherlands appreciated, low technology care, that includes home delivery (see further). The postulation is that potential hazardous risk factors that are amenable to detection, surveillance, and treatment should be timely recognised, and the patient should be referred to the suitable level of care.

Community midwives and GPs also practicing obstetric care thus have a gatekeeper function to more specialised care. As already mentioned in the introduction, in the Netherlands app. 73.5% of the pregnant women begin antenatal care in primary care, most often at independent community midwifery practices. Of them 53.2% were referred to secondary care during pregnancy or delivery. This percentage has gradually increased starting from 18.4% in 1988. This increase took place mostly in antepartum referrals and the trend was more pronounced among multiparous than among nulliparous women.[66]

[f] Few exact data are available, but the difference with e.g. Flanders diminished over time and even reversed: in 2003 in Flanders the percentage of inductions was 30% and the percentage of caesarean sections 18.3%; the corresponding Dutch figures were 28.8% and 14.8%. In 2007 these figures were 25.6% and 19% in Flanders, 33% and 15.4% in the Netherlands.[61]

The referral rates are higher for nulliparae than for multiparae: 67.1% versus 41.1% (see detailed data in the figures 1 and 2, based on PRN data[67] – we refer to the introduction for some comments on the publication of these data).

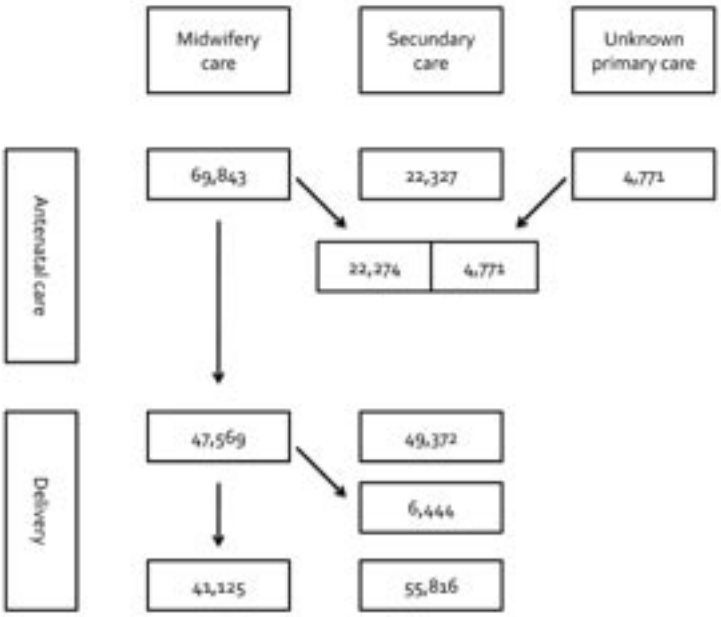
*Figure 1. Flow chart: care trajectory primiparous pregnant women 2005 (adapted from PRN 2008).* [67]




Ethnic differences exist. Data for the period 1995-2002 show that the percentages of women that enter antenatal care in primary care rather than in secondary care are lower among women with a background of the Indian subcontinent (72.2%) and among women with an African background (71.2%). In the same period this percentage was 82.4% for Dutch women. Differences between Dutch women and other ethnic groups were small.[68]

A second main difference between the Netherlands and most other western countries is the relatively *high number of home births*, although it decreases in the course of time. If the pregnancy remains uncomplicated, the pregnant woman can choose between a home delivery, a delivery at a birth centre or in a hospital, under supervision of her own midwife or general practitioner (policlinic delivery). Referral is also possible during delivery. In 2000, the number of home births was 30.3%[69], in 2002 28.9%.[70]

*Figure 2. Flow chart: care trajectory multiparous pregnant women 2005 (adapted from PRN 2008).*[67]




Although the number of home births is still high as compared to most other western countries, its number is decreasing: in the period 1997-2000 it was still 35%[9].[71] Furthermore, home births are more frequent among multiparous women, among women above 25 years, and among women not living in large cities.[69,70,72] In Rotterdam e.g. it decreased from 15% in 2002 to 10% in 2007.[73] It also appeared that home births were more frequent among women with a medium or high socioeconomic status, indicated by the mean household income level of the neighbourhood of the women.[70,72]

Home births are less frequent among non-Dutch women as compared to their native counterparts.[69,70,72] This result was confirmed in a study which distinguished between different non-native groups.[68] Among women that have the choice between a delivery at home or a policlinic delivery, non-native women substantially deliver less often at home. Especially among women with a background from the Indian subcontinent and with an African background, the number of homedeliveries is much lower (figures for the period 1995-2002: 7.5% and 8.6%). This partly is the consequence of the circumstance that more of them start antenatal care in secondary care, but also because they are referred more often to secondary care during pregnancy or during delivery. Mediterranean and other Asian women have an intermediate position.[68]

*Adequate functioning of the system?*

Discussion and research is on-going whether this process of risk selection functions in an optimal

[9] The figures of Statistics Netherlands are based on health surveys (the so-called POLS - Permanent Onderzoek Leefsituatie - among a sample of the Dutch population and therefore not fully comparable with the PRN data.

way, especially in view of the unfavourable perinatal mortality figures (see above). Ever since the publication by Hoogendoorn in 1986 (see above), especially home births are subject of discussion in the Netherlands. Recently, four studies were rather positive on the functioning of the Dutch system[h], but a final one challenged these results. In this section, we only shortly describe these studies since place of delivery is not subject of study in this thesis.

In an evaluation of intrapartum referrals to secondary care in 280,000 low risk women under the exclusive care of a community midwife at the start of labour, only a small number of urgent referrals (3.6%) were found.[74] Besides, neonatal outcomes overall were satisfactory (intrapartum and first day mortality was 0.05%), although less good in the group that was referred urgently (intrapartum and first day mortality was 1.07%). The researchers therefore suggest that the Dutch risk selection works well.

A second study did not find significant differences between outcomes (perinatal mortality - including intrapartum and neonatal deaths before 7 days and admissions to NICU's) of pregnancies (2000-2006) that were planned to take place at home and pregnancies that were planned to be in a hospital among women starting labour in primary care, when taking into account possible confounders (parity, gestational age, age of the pregnant women, ethnic background and socioeconomic position).[72] In this study, no separate data were presented for women referred during delivery. The authors therefore conclude that the higher level of perinatal mortality in the Netherlands could not be explained by the high number of homedeliveries. As a response to the criticism on this study by Bonsel et al[46], the authors reanalysed the data, and limited this analysis to a homogeneous subgroup of Dutch primipari that gave birth between $38^{+0}$ and $40^{+6}$ and came to the same conclusion.[75]

A third study found the lowest mortality risk in newborns delivered at home in term (0.4% per 1000 births), while the overall risk was 2.8‰, the risk in low risk (at the start of delivery) pregnancies 1.3‰, the risk in intrapartum referrals 2.4‰ and 4.5‰ in high risk women.[76]

In a study that assessed the role of travel time between home and hospital, a travel time of 20 minutes or more was associated with an increased risk of perinatal mortality. In low-risk women at start of delivery, no effect of travel time was observed.[77]

Recently, less reassuring figures were published.[49] Pregnant women at low risk that started labour in primary care under the supervision of a midwife had a higher risk of delivery related perinatal death (antepartum, intrapartum an neonatal deaths) and the same risk of admission to the NICU compared to women at high risk whose labour started in secondary care under the supervision of an obstetrician. The risk was highest in case referral to secondary care took place during delivery. The authors do not conclude that their results are the consequence of the care provided by midwives, but rather that the Dutch obstetric system itself is not effective. Rapidly after publication these results were discussed and questioned based on several methodological objections (such as the limitation to one region, the possibility that not all births have been included).[72,75,78] Soon after, these arguments were refuted by Vandenbroucke.[79]

Besides criticism on home births in the Netherlands, recently de Graaf et al[80] also showed that

[h] Previously more studies failed to find evidence for inadequate functioning of the specific Dutch system (see e.g. [18,62] )

hospital deliveries at night were associated with an elevated level of perinatal mortality and adverse perinatal outcome. In non-tertiary hospitals this was also the case regarding hospital deliveries during the evening. In non-tertiary hospitals perinatal mortality and adverse perinatal outcome were lower when staff was better qualified and when the size of the hospital was small.

## 3. Migrant groups in the Netherlands

As mentioned above, the increase of pregnant women with a non-Dutch origin is considered as a possible reason for the unfavourable perinatal mortality figures. Also, maternal mortality is more frequent in some migrant groups (see below). In this paragraph, we present a review of the main migrant groups in the Netherlands, their migration history and some relevant characteristics. Before doing so, we discuss some definitional issues.

*Definitional issues*

It should be noticed that the description of migrant/ethnics groups is far from unequivocal in research[81,79]: authors make use of different descriptions such as migrants, ethnic groups, and ethnic minorities. There is no agreement within Europe, not to mention worldwide, on what should be understood by migrant or ethnic groups. Researchers use different definitions and different classifications. Sometimes they even do not give any definition at all, assuming that the concepts they use are clear by themselves.[82-84] This situation does apply to all research in the field of ethnic/migrant health disparities, whether in Europe, the United States or elsewhere. It makes comparison of research results difficult, often impossible, as also became clear in the above mentioned RIVM publication where the Netherlands was compared with Finland and Sweden.[26] In the subsequent chapters of this thesis, we will often refer to the international literature, so it should be remembered that comparability is often limited.

In the Netherlands the groups in question often are called 'allochtonen' (Greek: άλλοχθονους-allochtonous, coming from foreign ground). In most Dutch health (care services) research it is common practice nowadays to define 'allochtonen' as those persons having at least one parent born abroad, irrespective of their own country of birth. In doing so, researchers follow the practice as used by Statistics Netherlands. This implies that first and second generation migrants are included. Advantages of this approach are multiple: application of this criterion is not subject to interpretation, and application of this definition facilitates comparisons.[85] However, it impedes some international comparisons, since other countries usually apply other criteria to define non-native inhabitants, e.g. nationality, self-defined ethnicity, or they include only first generation migrants.

At the same time, especially in the field of Dutch obstetric and perinatal research, application of the definition of Statistics Netherlands is not yet general practice. The Dutch perinatal registrations use another classification: European/Caucasian, Mediterranean (mainly Turkish and Moroccan), other European (all other European countries, Canada and North America); Creole (African, Surinamese

and Antillean with Negroid descent); Hindustan (Pakistani, Indian, Surinamese and Antillean with Hindustan descent); Asian (Chinese, Japanese, Indonesian, Ambonese, Vietnamese); mixed/other (South American among others). Classification is done by the health care provider, probably based on (a combination of) appearance, last name and language of the pregnant women.[86] It is sometimes suggested that the Hindustan group only includes women from Surinam and that the Asian group only comprises women with an African descent from Surinam (see e.g.[87]). Adaptation is announced[45,67], but still not realised. This situation affects comparability of Dutch research results, also in this thesis, whenever we refer to previous publications especially those based on PRN data.

Furthermore, often not all 'allochtonen' are included in Dutch research, but only those with a non-western background, who therefore are considered as being more at risk for adverse health outcomes. Migrants from Eastern Europe have been seldom studied, although they may be also at risk, e.g. because their health insurance status is not adequate, in part because some of them reside illegally in the country.

To conclude, we want to make explicit that in our own research, as described in the following chapters, we basically made use of the definitions and classifications following the practice of Statistics Netherlands. When at least one of the parents was born outside the Netherlands, the pregnant woman was classified as non-Dutch. If she was not born in the Netherlands, her migrant background was determined based on her own country of birth. When the pregnant woman was born in the Netherlands, her migrant background was determined by country of birth of her mother, unless this was also the Netherlands. If that was the case, migrant background was established by country of birth of her father. When country of birth of both parents of the mother was the Netherlands, women were classified as native Dutch.

*Migration history and composition of the migrant population*

In the post-war period, the Netherlands increasingly became an immigrant society, especially since the sixties of the previous century.[i]

An important part of the recent migration history of the Netherlands is related to its colonial history. The availability of study facilities initially was an important reason for Surinamese and Antilleans to migrate to the Netherlands. Surinam is a former Dutch colony that gained independence in 1975. The independence of Surinam in 1975 initiated large scale immigration to the Netherlands, and was followed by marriage migration in order to form families.[j] The Surinamese migrant group consists of distinct groups, the largest being Hindustani and Creoles. Hindustani mainly originate from the Indian continent and Creoles from Africa. Migration from the former Dutch Antilles strongly increased after the closure of the oil refineries since the sixties and later in the eighties of the 20th century; Antilleans could easily come to the Netherlands since they had Dutch citizenship.

'Guest worker' migration to the Netherlands started in the beginning of the sixties of the previous century as a result of shortages on the labour market for unskilled jobs. These migrants first

[i] Besides 'guest workers' and immigrants from (former) colonies, a more recent migration wave consists of refugees. We do not deal with this group in this chapter, as they are not included as a research group in this thesis. This equally applies for the recent immigration wave of labour migration from Eastern Europe. For the same reason we also leave out of consideration immigrants from developed countries.

[j] Between 1945 and 1965 also many persons left Indonesia to settle in the Netherlands. Indonesia became independent in 1949. Accordingly to Statistics Netherlands they are not considered as non-western migrants.

came from southern European countries, but soon mainly from Morocco and Turkey. Initially it was expected that this migration would be temporal, both by the Netherlands and by the migrants themselves. The active recruitment ended with the first oil crisis. However, despite the recruitment stop in 1974, during the seventies of the previous century this migration became permanent (especially in case of the Turkish and Moroccan migrants, less so for the Southern European migrants) and resulted in chain migration by processes of family reunion, and later of family formation. Besides, their birth rates were and still are higher than in the native Dutch part of the population.

At the time of the data collection for this thesis, approximately 3.1 million persons living in the Netherlands had at least one parent born outside the Netherlands (19% of the Dutch inhabitants). A little more than half of them had a non-western background.[88] These numbers are increasing and by the beginning of 2009 3.3 million persons had a non-native background, of which 1.8 million had a non-western background.

Overall, the first generation is still larger than the second generation and the first generation is concentrated in the fertile age groups.[89] Nevertheless, the increase of first generation non-western migrants has been limited in recent years, while the increase of the second generation has been much stronger, due to the higher number of children per woman, especially in some groups.[90]

The largest non-western migrant groups in the Netherlands – Moroccans, Turks, Antilleans and Surinamese – are also the groups included in this research. By the end of 2005 (time of the collection of the data for this thesis) app. 364,000 inhabitants are of Turkish descent, 323,000 of Moroccan descent, 332,000 of Surinamese descent and 130,000 of Antillean descent.[88] Until today, these are the four largest groups with a non-western background and together they constitute two third of the inhabitants with a non-western background. By now, the size of the Moroccan group has become larger than that of the Surinamese.

The first generation (those born themselves outside the Netherlands) was still slightly larger than the second generation (those born themselves in the Netherlands and at least one of the parents outside the Netherlands), although this very recently changed for the Moroccans. In the four largest Dutch cities the proportion of non-Dutch inhabitants is over 50%.[88] In these cities also great amounts of other migrant groups reside: this is e.g. the case for Ghanaians (19,733 in 2009), of which most reside in Amsterdam, and for Cape Verdeans (20,669 in 2009) of which most live in Rotterdam.[91-96] As this thesis is embedded in the Generation R Study conducted in Rotterdam, we do not elaborate further on the Ghanaian migrants. The migration of Cape Verdeans to Europe started around 1960 and can be considered as labour migration, since they were recruited for the merchant navy. After the independence of the islands in 1975, and again in the nineties of the previous century new migration waves took place. Since then, more female migrants came to the Netherlands, in the framework of family formation, but also as the result of demand for domestic work.

*Some basic characteristics of the migrant groups that belong to the study population in this thesis*

Contrary to what was the case previously and contrary to what often is still thought, the fertility

rates among migrant women have strongly decreased (see table 1). No figures are available for Cape Verdeans, nor are separate figures for Hindustani and Creole Surinamese.
Dutch mothers have their first child at app. the age of 29.6. The mean age at which migrants have their first child has increased, especially among the first generation. Second generation migrant women have their first child at app. the same age as the native Dutch women (see table 1).

*Table 1.Fertility figures of native Dutch, Turkish, Moroccan, Surinamese and Antillean women*[90]

| | | mean number of children | age at birth of first child |
|---|---|---|---|
| Turks | 1st generation | 1.96 | 26.4 |
| | 2nd generation | 1.66 | 29.3 |
| Moroccans | 1st generation | 2.95 | 27.2 |
| | 2nd generation | 1.93 | 26.7 |
| Surinamese | 1st generation | 1.71 | 27.2 |
| | 2nd generation | 1.70 | 28.4 |
| Antillean | 1st generation | 1.94 | 25.7 |
| | 2nd generation | 1.81 | 29.1 |
| Dutch | | 1.78 | 29.6 |

Compared to the native Dutch population, the socioeconomic position of non-western inhabitants in general is weaker. Of the four groups just mentioned, Turks and Moroccans are the most disadvantaged: they are characterised by a lower educational level and by higher levels of unemployment. In 2006, app. half of the Turkish and Moroccan populations at most had a primary school education, among the Surinamese and Antilleans this is app. 20% and among the native population only 8%.[90] These data apply for the total adult population of migrants, including both males and females. The situation for women is even less favourable among Moroccan and Turkish women. For the Cape Verdean population no recent information is available, data from 2003 mention 11%.[92] Also, the level of labour participation is lower in all four groups, but especially among Turkish and Moroccan migrants. The level of unemployment (second quarter of 2009) was 3.8% among native Dutch, and considerably higher among Moroccans (12.3%), Turkish (10%), Surinamese (10.7%) and Antilleans (11%). Once more, among women, especially Turkish and Moroccan women, the situation is worse. Furthermore, large groups are dependent on welfare benefits: 8.3% of the Turks, 12.1% of the Moroccans, 6.9% of the Surinamese and 9.3% of the Antilleans.[90] Again, no recent data are available for Cape Verdeans, in Rotterdam their level of unemployment and their degree of dependency on welfare benefits was lower than among Turkish, Moroccan and Surinamese migrants (data for 2001/2002; more recent data not available).
Finally, we provide some information on *the mastery of Dutch language*. In general, mastery of Dutch is worst among Turkish migrants, followed by the Moroccans. Mastery of Dutch is much better among

Surinamese and – a little less – among Antilleans. Especially among first generation migrants from Turkey and Morocco this mastery is limited. Among the second generation, Dutch mastery is better and approximately equal among the Moroccans and Antilleans and approximately equal to the total Surinamese group. Some deterioration takes place among (first generation) Antillean migrants, because of the recent immigration of lower social class groups. The actual use of Dutch language within families is less, but has a similar pattern: least among the Turks, followed by the Moroccans, most frequent among Surinamese and somehow less frequent among Antilleans. Especially remarkable is the increase of the use of Dutch by Moroccan mothers with their children.[90]

## 4. Ethnic differences in perinatal and maternal mortality in the Netherlands

*Perinatal mortality*

Doornbos and Nordbeck[97] showed that already in the seventies of the previous century ethnic background seemed to influence perinatal mortality rates among women delivering in hospitals in Amsterdam, the Netherlands. A further analysis of these data concluded however that migrant background was not independently related to perinatal mortality when other factors (maternal age, infant sex, paternal and maternal level of education, income level) were taken into account. Especially, employment status of the father was strongly associated with perinatal mortality.[98]

Subsequent studies showed that most migrant groups – black pregnant women (mostly originating from Suriname and the Dutch Antilles), Hindustani women and Mediterranean women (mostly Turkish and Moroccan migrants) all have higher perinatal mortality rates than native Dutch.[99,100] Especially, among black women the number of perinatal deaths was more than twice as high. In other groups (Hindustani and Mediterranean women), the prevalence of perinatal deaths was also higher but less pronounced. No significant increase was found among other Asian and non-Dutch western European women. The increased risk in the Black and the Hindustani women could be fully explained by higher rates of preterm birth; socioeconomic status had no influence. The difference between native Dutch and Mediterranean women was explained by teenage pregnancies, grande multiparity and to a small degree to low socioeconomic status. In this study socioeconomic status was assessed on an aggregated level based on the postcode region in which persons lived. Also an increased risk to die from hereditary disorders (especially metabolic and autosomal disorders) was found among Turkish and Moroccan children.[100,101]

In a later study[102], a much higher mortality risk due to congenital disorders was found in Turkish and Moroccan children as compared to native Dutch, Surinamese and Antillean children. Because approximately 40-50% of these disorders were autosomal recessive, the authors hypothesized that consanguinity is the probable cause, but they did not investigate the actual relationship with consanguinity.

Troe[103] found an increased risk of infant mortality in Turkish, Moroccan, Surinamese and Antillean children. Infant mortality differences could be partly explained by socioeconomic differences, and besides by maternal age and marital status. In the early neonatal period, risk was elevated in

Surinamese and Antillean children, in the late neonatal period for Turkish and Antillean children and in the post neonatal period for Turkish and Moroccan children. Turkish and Moroccan children had an increased risk to die from congenital causes, Surinamese and Antillean children from perinatal causes.

Consanguinity is a factor that increases the risk of congenital disorders. It is often considered as a cause of the differences in perinatal mortality between native Dutch and non-native children. Already in 2002 and 2003, and again in 2006, it was discussed in the Dutch parliament. Consanguinous relationships are indeed more frequent among some migrant groups, although estimates are not unequivocal.[103,104] The most recent information comes from the Generation R Study in Rotterdam. In this study, 23.9% of the marriages were consanguinous among the Turks, and 22.2% among the Moroccans.[105] Also, Anthony et al[32] concluded that the risk of congenital malformations was 20% higher among Mediterranean women as compared to the native Dutch. They therefore also suggested consanguinity as one of the possible explanatory factors for the increased risk of perinatal mortality. Ultimately, the RIVM was requested to conduct a literature review on this topic.[105] They concluded as follows. Children from consanguinous partners are especially at risk for rare autosomal recessive disorders, especially haemoglobinopathies such as sickle cell disease, and thalassemia. A limited amount of these autosomal recessive disorders results in mortality, especially mortality in the first year of life. Only a limited amount of these autosomal recessive disorders is associated with consanguinity. Therefore, mortality as a result of these disorders is not a sufficient explanation for the elevated perinatal mortality among migrants in the Netherlands.

More recent studies again found differences in perinatal mortality between native women and women with a non-western background. Based on data from the Dutch Perinatal Registry it was found that non-western background was associated with an increased risk of 40% in the period 2000-2006.[76,106] Women with a non-western background contributed to 21.7% of the perinatal mortality.[106] It further appeared that –among primiparous women – there were significant differences between the different migrant groups. Most had elevated perinatal mortality rates as compared to the Dutch women, except the other western and Asian women (mainly from Indonesia). Highest rates were found among the women with an African descent (including Creole women), followed by the South-Asian women (including Hindustani women) and the group of other non-western women. Women with another western background and East-Asians had lower perinatal mortality rates than Dutch women.[87] African and South Asian women also had high risks on preterm births and low birth weights. Booking for antenatal care before 18 weeks of pregnancy decreased some, but not all ethnic differences in mortality. Ethnic differences were not related to maternal age or the presence of a preexisting disease. Ethnic differences were not related to socio-economic position (assessed on an aggregated level).[87] The authors also concluded that the decline in perinatal mortality in the Netherlands in the period 2000/2006 could not be explained by changes in the ethnic background or by maternal age.[76]

Recently Statistics Netherlands linked PRN data and data from the municipal administrations in order to enhance the reliability of perinatal and infant mortality rates. This also enabled to assess ethnic differences in perinatal mortality, now based on the Dutch Statistics classification of migrant background. Overall, the perinatal mortality was 40% higher in most migrant groups, except in those from other western countries. Perinatal mortality was lowest among non-native newborns with a western background, followed by native Dutch newborns, and followed by Turkish newborns. The perinatal mortality among Moroccan newborns was significantly higher than among the Dutch. But most unfavourable was the situation among Surinamese and Antillean newborns, with perinatal mortality rates that were approximately twice as high as among native newborns. Equally interesting was the possibility to assess differences according to generational status. Perinatal mortality improves in the second generation: perinatal mortality was only 10% higher.[71]

*Maternal mortality*[k]

Contrary to perinatal morality which has been in the centre of political and scientific debate in the Netherlands, maternal mortality received less attention. Although in western countries the prevalence of maternal mortality is overall low, ethnic differences in maternal mortality have been observed in the Netherlands.

In the period 1983-1992, 21% of the maternal deaths occurred in women with a non-Caucasian background, mainly originating from Surinam, Turkey and Morocco. The most frequent direct cause was (pre)eclampsia.[107] The authors of the latter publication conclude with a remark on the stagnation in the maternal mortality rate, which they tentatively explain by changes in the demographic composition of the population: increasing age of pregnant women, and an increase of the migrant population.

According to Van Roosmalen et al[108], the maternal mortality ratios in the Netherlands (1983-1992) were 8.7 per 100,000 live births in the indigenous population, versus 19.1 per 100,000 in the immigrant population.[l] Therefore, they investigated substandard care factors in both groups and concluded that these were disproportionally more frequent in immigrant women.

Maternal mortality due to hypertensive disorders even increased when comparing the period 1993-2002 with the period 1983-92: from 2.7 to 4.0 per 100,000 live births.[109] Therefore a study has been conducted into substandard care in cases of maternal mortality due to hypertensive disorders in pregnancy. In 96% of the cases substandard care was the case, and in 63% more than five different substandard factors were present. 37% of the cases concerned immigrant women, most originating from sub-Saharan Africa.[110]

Subsequently, it was found that the incidence of eclampsia was higher in the Netherlands (2004-2006) than in other western countries.[111,112] The researchers found an incidence rate of 6.2 per 10,000 deliveries and compared with figures in other western countries this was clearly elevated. Risk factors were among others a non-western immigrant background. Substandard treatment of hypertension, not according to the protocol of the Dutch guideline, occurred in at least 60% of the cases.

[k] In the studies described in this paragraph, unfortunately obscurity remains on what the authors exactly understood by the migrant populations they refer to. Schuitemaker et al.[107] use the concept of 'Caucasian', without defining it. Van Roosmalen et al.[108] mention that no distinction could be made between ethnicity and country of birth, but do not further explain which definition they used. Schutte et al use the term 'immigrant' without further explanation. In the study by Zwart et al.[111] it was not clear whether only first generation migrants were included or also second generation migrants. The authors refer to the definition of Statistics Netherlands, but use both the circumscription 'country of origin' and 'country of birth'.

Finally, overall maternal mortality appeared to have increased when comparing the ratio for the period 1983-1992 with the period 1993-2005: from 9.7 per 100,000 live births to 12.1.[113] The authors suggest that changes in the demographic composition may partly explain the increase, besides a better reporting. They refer to the increasing age of pregnant women and the increase of the immigrant population. The most important cause remained (pre)eclampsia. Women with a non western immigrant background were more at risk.

## Conclusion

In this introductory chapter, background information is presented that serves a framework in which this thesis can be situated. The declining position of the Netherlands in the European rank as far as perinatal mortality is concerned is subject of scientific and societal debate for many years now. Many hypotheses have been put forward to explain this decline. Two of these hypotheses also form the cornerstones of this thesis: the organisation of Dutch obstetric care, which is different when compared to many other European countries, and the increase and composition of the migrant population. Therefore, this chapter also included some background information on the Dutch obstetric care system, in which midwifery has a central role. This chapter also provided a short description of the recent migration history of the Netherlands, including background information of the major migrant groups. Also, available information on ethnic differences in perinatal and maternal mortality in the Netherlands is presented.
In this thesis, differences between migrant and native Dutch pregnant women regarding the use, and the quality of antenatal care as provided by midwives will be investigated, as well as differences regarding a number of pregnancy outcomes of these women.

[l] They refer to the publication van Schuitemaker et al.[107]; however, these figures couldn't be found there. No definition of migrant status was provided. The terminology used suggests that only first generation women are included.

**References**


1. Dragonas T. Prenatal care. Clin Psychol Rev 1998;18(2):127.
2. Bernstein PS, Merkatz IR. A life course perspective on women's reproductive health and the outcome of pregnancy. J Womens Health 2010;19(3):555-560.
3. Steegers EAP, Eskes T, Jongsma HW, Hein PR. Dietary sodium restriction during pregnancy; a historical review. European Journal of Obstetrics & Gynecology and Reproductive Biology 1991;40(2):83-90.
4. Heringa MP. Computer-ondersteunde screening in de prenatale zorg. Groningen: Rijksuniversiteit Groningen 1998.
5. Dunn PM. Adolphe Pinard (1844-1934) of Paris and intrauterine paediatric care. Arch Dis Child Fetal Neonatal Ed 2006;91(3):F231-2.
6. Alexander GR, Kotelchuck M. Assessing the role and effectiveness of prenatal care: history, challenges, and directions for future research. Public Health Rep 2001;116(4):306-316.
7. 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.
8. Anachebe NF, Sutton MY. Racial disparities in reproductive health outcomes. American Journal of Obstetrics and Gynecology, 2003 4;188(4):S37-S42.
9. Healy AJ, Malone FD, Sullivan LM, Porter TF, Luthy DA, Comstock CH, et al. Early access to prenatal care: implications for racial disparity in perinatal mortality. Obstet Gynecol 2006;107(3):625-631.
10. Bollini P, Pampallona S, Wanner P, Kupelnick B. Pregnancy outcome of migrant women and integration policy: a systematic review of the international literature. Soc Sci Med 2009;68(3):452-461.
11. Gissler M, Alexander S, MacFarlane A, Small R, Stray-Pedersen B, Zeitlin J, et al. Stillbirths and infant deaths among migrants in industrialized countries. Acta Obstet Gynecol Scand 2009;88(2):134-148.
12. Gagnon AJ, Zimbeck M, Zeitlin J, ROAM Collaboration, Alexander S, Blondel B, et al. Migration to western industrialised countries and perinatal health: a systematic review. Soc Sci Med 2009;69(6):934-946.
13. Urquia ML, Glazier RH, Blondel B, Zeitlin J, Gissler M, Macfarlane A, et al. International migration and adverse birth outcomes: role of ethnicity, region of origin and destination. J Epidemiol Community Health 2010;64(3):243-251.
14. Simkhada B, Teijlingen ER, Porter M, Simkhada P. Factors affecting the utilization of antenatal care in developing countries: systematic review of the literature. J Adv Nurs 2008;61(3):244-260.
15. Hoogendoorn D. Indrukwekkende en tegelijk teleurstellende daling van de perinatale sterfte in Nederland. Ned Tijdschr Geneeskd 1986;130(32):1436–1440.
16. Kloosterman GJ, Gelderman-Vink M, Cranendonk E, Kollée LAA. Mededelingen. Indrukwekkende en tegelijk teleurstellende daling van de perinatale sterfte in Nederland. Ned Tijdschr Geneeskd 1986;130:1714-1717.
17. Keirse MJ. De Nederlandse perinatale sterft in internationaal perspectief. Ned Tijdschr Geneeskd 1987;131(21):905-909.

18. Mackenbach JP, Van Leengoed PLM. Regionale verschillen in perinatale sterfte: het verband met enkele aspecten van de zorg rond de geboorte. Ned Tijdschr Geneeskd 1989;133:1839-1844.
19. Achterberg PW, Kramers PGN. Een gezonde start. Sterfte rond de geboorte in Nederland: trends en oorzaken vanuit een internationaal perspectief. RIVM rapport 2001;271558:003.
20. van der Pal-de Bruin KM, Graafmans W, Biermans MC, Richardus JH, Zijlstra AG, Reefhuis J, et al. The influence of prenatal screening and termination of pregnancy on perinatal mortality rates. Prenat Diagn 2002;22(11):966-972.
21. Richardus J, Graafmans W, Verloove-Vanhorick S, Mackenbach J, EuroNatal International Audit Panel, EuroNatal Working Group. Differences in perinatal mortality and suboptimal care between 10 European regions: results of an international audit. BJOG 2003;110(2):97-105.
22. Buitendijk S, Zeitlin J, Cuttini M, Langhoff-Roos J, Bottu J. Indicators of fetal and infant health outcomes. European Journal of Obstetrics & Gynecology and Reproductive Biology 2003 11/28;111(Supplement 1): S66-S77.
23. Treffers PE. Veertig jaar discussie over perinatale sterfte in Nederland . Ned Tijdschr Geneeskd 2004;148(38):1853-1855.
24. Buitendijk SE, Nijhuis JG. Hoge perinatale sterfte in Nederland in vergelijking tot de rest van Europa. Ned Tijdschr Geneeskd 2004;148(38):1855-1860.
25. Garssen J, van der Meulen MJ. Ontwikkelingen rond de perinatale sterfte in Nederland. CBS Bevolkingstrends. Ontwikkelingen rond perinatale sterfte in Nederland. CBS Bevolkingstrends 2004;52(3):15-31.
26. Achterberg PW. Met de besten vergelijkbaar. Internationale verschillen in sterfte rond de geboorte. Bilthoven: RIVM 2005.
27. Mackenbach JP. Perinatale sterfte in Nederland: een probleem van velen, een probleem van niemand. Ned Tijdschr Geneeskd 2006;150(8):409-412.
28. Merkus JM, Eskes M. Perinatal mortality in the Netherlands: everyone's problem and yet no one's problem. Ned Tijdschr Geneeskd 2006; 150(18):1042; author reply 1042.
29. de Reu P, Van Diem M, Eskes M, Oosterbaan H, Smits L, Merkus H, et al. The Dutch Perinatal Audit Project: a feasibility study for nationwide perinatal audit in the Netherlands. Acta Obstet Gynecol Scand 2009;88(11):1201-1208.
30. van Diem M, De Reu P, Eskes M, Brouwers H, Holleboom C, Slagter-Roukema T, et al. National perinatal audit, a feasible initiative for the Netherlands!? A validation study. Acta Obstet Gynecol Scand 2010;89(9):1168-1173.
31. Achterberg PW, Waelput AJM. Recente perinatale sterftetrends in Nederland. National institute for Public Health and Environment (RIVM) 2007.
32. Anthony S, Schönbeck Y, Jacobusse GW, van der Pal-de Bruin, K.M., Verloove-Vanhorick SPV. Aangeboren afwijkingen in Nederland 1996-2004. Gebaseerd op de landelijke verloskunde en neonatologie registraties. TNO 2006.

33. Rietberg CCT, Elferink-Stinkens PM, Visser GHA. The effect of the Term Breech Trial on medical intervention behaviour and neonatal outcome in The Netherlands: an analysis of 35,453 term breech infants. BJOG 2005;112(2):205-209.
34. Hannah ME, Hannah WJ, Hewson SA, Hodnett ED, Saigal S, Willan AR. Planned caesarean section versus planned vaginal birth for breech presentation at term: a randomised multicentre trial. Term Breech Trial Collaborative Group 2000;356(9239):1375-1383.
35. Zeitlin J, Mohangoo A, Cuttini M, EUROPERISTAT Report Writing Committee, Alexander S, Barros H, et al. The European Perinatal Health Report: comparing the health and care of pregnant women and newborn babies in Europe. J Epidemiol Community Health 2009;63(9):681-682.
36. Mohangoo AD, Buitendijk SE, Hukkelhoven C, Ravelli ACJ, Rijninks-van Driel GC, Tamminga P, et al. Hoge perinatale sterfte in Nederland vergeleken met andere Europese landen: de Peristat-II studie. Ned Tijdschr Geneeskd 2008;152:2718-2727.
37. Anthony S, Jacobusse GW, van der Pal-de KM. Do differences in maternal age, parity and multiple births explain variations in fetal and neonatal mortality rates in Europe? Results from the EURO-PERISTAT project. Paediatr Perinat Epidemiol 2009;23(4):292-300.
38. Merkus JM. De verloskundige zorg in Nederland opnieuw de maat genomen. Ned Tijdschr Geneeskd 2008;152(50):2707-2708.
39. Merkus JM. Perinatale sterfte in Nederland: audit dringend nodig. Ned Tijdschr Geneeskd 2008;152(11):603-605.
40. Sheldon T. Perinatal mortality in Netherlands third worst in Europe. BMJ 2008;337:a3118.
41. Keirse MJNC. Perinatal mortality in the Netherlands. Consistently poor performance indicates that it is time for a change. BMJ 2009;338:b1491.
42. Leeman LD, Waelput AJM, Eskes M, Achterberg PW. Op weg naar de landelijke invoering van perinatale audit. National institute for Public Health and Environment (RIVM) 2007.
43. Waelput AJM, Van Overbeeke H, Eskes M, Achterberg PW. Landelijke perinatale audit: werk in uitvoering. National institute for Public Health and Environment (RIVM) 2008;270212001.
44. Klink A. Instellingsbesluit Stuurgroep Zwangerschap en Geboorte. [CZ/EKZ/2930473] 05-07-2009.
45. van der Velden J. Nieuwe uitdagingen aan de verloskunde. Ned Tijdschr Geneeskd 2008;152(46):2489-2490.
46. Bonsel GJ, Birnie E, Denktaş S, Poeran P, Steegers EAP. Lijnen in de Perinatale Sterfte, Signalementstudie Zwangerschap en Geboorte 2010. Rotterdam: Erasmus MC 2010.
47. http://www.perinataleaudit.nl/nieuws/De_stuurgroep_Zwangerschap_en_Geboorte_een_volgende_stap.jsp. 2010.
48. Van der Putten J, Lemmens K, Rooijmans D. Praktijkonderzoek naar gevolgen van "Een goed begin". NVZ vereniging van ziekenhuizen / Plexus 2010.
49. Evers ACC, Brouwers HAA, Hukkelhoven CWPM, Nikkels PGJ, Boon J, van Egmond-Linden A, et al. Perinatal mortality and severe morbidity in low and high risk term pregnancies in the Netherlands: prospective cohort study. BMJ 2010;341.

50. http://www.rijksoverheid.nl/documenten-en-publicaties/kamerstukken/2010/12/14/kamerbrief-zwangerschap-en-geboorte.html. 2010.
51. de Graaf JP, Ravelli AC, Wildschut HI, Denktas S, Voorham AJ, Bonsel GJ, et al. Perinatal outcomes in the four largest cities and in deprived neighbourhoods in The Netherlands. Ned Tijdschr Geneeskd 2008;152(50):2734-2740.
52. Poeran J, Denktas S, Birnie E, Bonsel GJ, Steegers EAP. Urban perinatal health inequalities. Journal of Maternal-Fetal and Neonatal Medicine 2010(00):1-4.
53. Gemeente Rotterdam / GGD. Aanvalsplan perinatale sterfte Rotterdam. Rotterdam 2008.
54. Steegers EAP. Recht op een goede start. Perinatale sterfte in Rotterdam maakt preconceptiezorg noodzakelijk. Medisch Contact 2008;63(3):100-102.
55. Denktaş S, Koopmans G, Birnie E, Foets M, Bonsel G. Underutilization of prescribed drugs use among first generation elderly immigrants in the Netherlands. BMC Health Serv Res 2010;10:176.
56. Wiegers TA, van der Velden LFJ, Hingstman L. Behoefteraming verloskundigen 2004-2015. NIVEL, Utrecht 2005.
57. Hingstman L, Kenens RJ. Cijfers uit de registratie van verloskundigen: peiling 2007. 2007.
58. Amelink-Verburg MP, Buitendijk SE. Pregnancy and labour in the Dutch maternity care system: what is normal? The role division between midwives and obstetricians. J Midwifery Womens Health 2010;55(3):216-225.
59. Marland H. Questions of competence: the midwife debate in The Netherlands in the early twentieth century. Med Hist 1995;39(3):317-337.
60. CBO. Richtlijn medicamenteuze pijnbehandeling tijdens de bevalling. Nederlandse Vereniging voor Anesthesiologie en Nederlandse Vereniging voor Obstetrie en Gynaecologie 2008.
61. Christiaens W, Verhaeghe M, Bracke P. Pain acceptance and personal control in pain relief in two maternity care models: a cross-national comparison of Belgium and the Netherlands. BMC Health Serv Res 2010;10:268.
62. Bais JMJ, Pel M. The basis of the Dutch obstetric system: risk selection. European Clinics in Obstetrics and Gynaecology 2006;2(4):209-212.
63. De Vries R, Wiegers TA, Smulders B, van Teijlingen E. The Dutch Obstetrical System. In: Davis-Floyd, R.E.; Barclay, L.; Daviss, B.A.; Tritten, J. Birth models that work. Berkeley: University of California 2009:31.
64. Verloskundig Vademecum. Amstelveen: College voor Zorgverzekeringen 2003.
65. Tesselaar M, Wiegerinck M, MOL BW. De VIL 2010, een levende richtlijn: van domeindenken naar ontschotting. NTOG 2010;123:101-103.
66. Amelink-Verburg M, Rijnders M, Buitendijk S. A trend analysis in referrals during pregnancy and labour in Dutch midwifery care 1988?2004. BJOG 2009;116(7):923-932.
67. Nederland SPR. Perinatale zorg in Nederland 2005. Utrecht: Stichting Perinatale Registratie Nederland 2008.

68. Anthony S, Amelink-Verburg MP, Korfker DG, van Huis AM, van der Pal-de Bruin KM. Ethnic differences in preference for home delivery and in pregnancy care received by pregnant women. Ned Tijdschr Geneeskd 2008;152(46):2514-2518.
69. Anthony S, Buitendijk SE, Offerhaus PM, Dommelen P, Pal-de Bruin KM. Maternal factors and the probability of a planned home birth. BJOG 2005;112(6):748-753.
70. Anthony S, Amelink-verburg MP, Jacobusse GW, van der Pal-de Bruin, K.M. De thuisbevalling in Nederland 1995-2002. Rapportage over de jaren 2001-2002. PRN/TNO rapport KvL/JPB;2005.
71. CBS. Gezondheid en zorg in cijfers. Perinatale sterfte onder de loupe genomen. 2009:9-21.
72. de Jonge A, van der Goes BY, Ravelli AC, Amelink-Verburg MP, Mol BW, Nijhuis JG, et al. Perinatal mortality and morbidity in a nationwide cohort of 529,688 low-risk planned home and hospital births. BJOG 2009;116(9):1177-1184.
73. Denktas S, Voorham T, Bonsel G, Spittje J, Huizer M, Willems M, et al. Grootstedelijke perinatale gezondheid. Programmatische aanpak van perinatale sterfte in Rotterdam. TSG 2009;87(5):199-202.
74. Amelink-Verburg M, Verloove-Vanhorick S, Hakkenberg R, Veldhuijzen I, Bennebroek Gravenhorst J, Buitendijk S. Evaluation of 280 000 cases in Dutch midwifery practices: a descriptive study. BJOG 2008;115(5):570-578.
75. Mol BWJ, de Jonge A, Nijhuis JG, Buitendijk SE. Thuisbevalling niet verantwoordelijk. Medisch Contact 2010;65(45).
76. Ravelli AC, Tromp M, van Huis MM, Steegers EA, Tamminga P, Eskes M, et al. Decreasing perinatal mortality in the Netherlands, 2000-2006: a record linkage study. J Epidemiol Community Health 2009 May 4.
77. Ravelli ACJ, Jager KJ, De Groot MH, Erwich J, Rijninks-van Driel GC, Tromp M, et al. Travel time from home to hospital and adverse perinatal outcomes in women at term in the Netherlands. BJOG 2010.
78. Pop VJ, Wijnen H. Results don't seem generalisable. BMJ 2010;341.
79. Vandenbroucke JP. Dutch perinatal mortality. Study did a good job. BMJ 2010;341:c7042.
80. de Graaf JP, Ravelli AC, Visser GH, Hukkelhoven C, Tong WH, Bonsel GJ, et al. Increased adverse perinatal outcome of hospital delivery at night. BJOG 2010;117(9):1098-1107.
81. Jacobs D, Swyngedouw M, Hanquinet L, Vandezande V, Andersson R, Horta APB, et al. The challenge of measuring immigrant origin and immigration-related ethnicity in Europe. Journal of International Migration and Integration 2009;10(1):67-88.
82. Bhopal R. Glossary of terms relating to ethnicity and race: for reflection and debate. J Epidemiol Community Health 2004;58(6):441.
83. Dein S. Race, culture and ethnicity in minority research: a critical discussion. J Cult Divers 2006;13(2):68-75.
84. Ma IWY, Khan NA, Kang A, Zalunardo N, Palepu A. Systematic review identified suboptimal reporting and use of race/ethnicity in general medical journals. J Clin Epidemiol 2007;60(6):572-578.
85. Stronks K, Kulu-Glasgow I, Agyemang C. The utility of 'country of birth' for the classification of ethnic groups in health research: the Dutch experience. Ethn Health 2009;14(3):255-269.

86. Nederland SPR. Perinatale Zorg in Nederland 2003. Bilthoven: Stichting Perinatale Registratie Nederland 2006.
87. Ravelli AC, Tromp M, Eskes M, Droog JC, van der Post JA, Jager KJ, et al. Ethnic differences in stillbirth and early neonatal mortality in The Netherlands. J Epidemiol Community Health 2010 Aug 18.
88. Foets M, Schuster J, Stronks K. Gezondheids(zorg)onderzoek onder allochtone bevolkingsgroepen. Een praktische introductie. 2007.
89. den Hertog FRJ. Niet-westerse allochtonen 2007. In: Volksgezondheid Toekomst Verkenning, Nationale Atlas Volksgezondheid. RIVM 2007.
90. Gijsberts MD. Jaarrapport integratie 2009. The Hague: The Netherlands Institute for Social Research / SCP; 2009.
91. de Gruijter M. Community report: Kaapverdianen in Rotterdam. Utrecht: Verwey-Jonker instituut 2003.
92. Choenni C. Kaapverdianen in Nederland. CBS. Bevolkingstrends, 3e kwartaal 2004.
93. Choenni C. Kaapverdianen in Nederland: een profiel. Den Haag: Ministerie van Justitie Directie coördinatie integratiebeleid minderheden 2004.
94. Carling J. Cape Verdeans in the Netherlands. Transnational archipelago: perspectives on Cape Verdean migration and diaspora 2008:91-100.
95. Carling J. Toward a demography of immigrant communities and their transnational potential. International Migration Review 2008;42(2):449-475.
96. Carling J, Åkesson L. Mobility at the heart of a nation: Patterns and meanings of Cape Verdean Migration. International Migration 2009;47(3):123-155.
97. Doornbos JPR, Nordbeck, HJ.Perinatal mortality: Obstetric risk factors in a Community of Mixed Ethnic Origin in Amsterdam. Amsterdam: University of Amsterdam; 1985.
98. Lumey LH, Reijneveld SA. Perinatal mortality in a first generation immigrant population and its relation to unemployment in The Netherlands. J Epidemiol Community Health 1995;49(5):454-459.
99. van Enk A, Buitendijk SE, van der Pal KM, Van Enk WJ, Schulpen TWJ. Perinatal death in ethnic minorities in The Netherlands. J Epidemiol Community Health 1998;52(11):735.
100. Schulpen TWJ, van Steenbergen JE, van Driel HF. Influences of ethnicity on perinatal and child mortality in the Netherlands. Arch Dis Child 2001;84(3):222-226.
101. Steenbergen JIME, Schulpen TWJ, Hoogenboezem J, Driel HF, Bijlsma F. Ethnicity and childhood mortality in The Netherlands. The European Journal of Public Health 1999;9(3):205-210.
102. Schulpen TWJ, van Wieringen J, van Brummen PJ, van Riel JM, Beemer FA, Westers P, et al. Infant mortality, ethnicity, and genetically determined disorders in The Netherlands. The European Journal of Public Health 2006;16(3):290-293.
103. Troe EJ, Bos V, Deerenberg IM, Mackenbach JP, Joung IM. Ethnic differences in total and cause-specific infant mortality in The Netherlands. Paediatr Perinat Epidemiol 2006;20(2):140-147.
104. Poppel FWA. Huwelijken tussen bloedverwanten. Demos: bulletin over bevolking en samenleving 2009;25:5-8.

105. Waelput AJM, Achterberg PW. Kinderwens van consanguïne ouders: risico's en erfelijkheidsvoorlichting. Bilthoven: RIVM: Rijksinstituut voor Volksgezondheid en Milieu; 2007.
106. Ravelli AC, Eskes M, Tromp M, van Huis AM, Steegers EA, Tamminga P, et al. Perinatal mortality in The Netherlands 2000-2006; risk factors and risk selection. Ned Tijdschr Geneeskd 2008;152(50):2728-2733.
107. Schuitemaker N, van Roosmalen J, Dekker G, van Dongen P, van Geijn H, Gravenhorst JB. Confidential enquiry into maternal deaths in The Netherlands 1983-1992. European Journal of Obstetrics & Gynecology and Reproductive Biology 1998;79(1):57-62.
108. van Roosmalen J, Schuitemaker NW, Brand R, van Dongen P, Bennebroek Gravenhorst J. Substandard care in immigrant versus indigenous maternal deaths in The Netherlands. BJOG 2002;109:212-213.
109. Schutte JM, De Boer K, Briet JW, Pel M, Santema JG, Schuitemaker NWE, et al. Moedersterfte in Nederland: het topje van de ijsberg. Ned Tijdschr Obstet Gynaecol 2005;118:89-91.
110. Schutte JM, Schuitemaker NWE, Van Roosmalen J, Steegers EAP. Substandard care in maternal mortality due to hypertensive disease in pregnancy in the Netherlands. BJOG 2008;115(6):732-736.
111. Zwart JJ, Richters A, Ory F, de Vries JI, Bloemenkamp KW, van Roosmalen J. Eclampsia in the Netherlands. Obstet Gynecol 2008;112(4):820-827.
112. Zwart JJ, Richters JM, Ory F, de Vries JI, Bloemenkamp KW, van Roosmalen J. Severe maternal morbidity during pregnancy, delivery and puerperium in the Netherlands: a nationwide population-based study of 371,000 pregnancies. BJOG 2008;115(7):842-850.
113. Schutte JM, Steegers EA, Schuitemaker NW, Santema JG, de Boer K, Pel M, et al. Rise in maternal mortality in the Netherlands. BJOG 2010;117(4):399-406.

# Chapter 2

## Ethnic differences in antenatal care use

## Abstract

*Objectives*
The objective of this study was to determine differences in antenatal care use between the native population and different ethnic minority groups in the Netherlands.

*Methods*
Data are obtained from the Generation R Study. This is a multi-ethnic population-based prospective cohort study conducted in the city of Rotterdam. In total 2093 pregnant women with a Dutch, Moroccan, Turkish, Cape Verdean, Antillean, Surinamese Creole and Surinamese Hindustani background were included in this study. To assess adequate antenatal care use, we constructed an index, including two indicators; gestational age at first visit and total number of antenatal care visits. Logistic regression analysis was used to assess differences in adequate antenatal care use between different ethnic groups and the Dutch reference group, taking into account differences in maternal age, gravidity and parity.

*Results*
Overall, the percentages of women making adequate use are higher in nulliparae than in multiparae, except in Dutch women where no differences are present.
Except for the Surinamese-Hindustani, all women from ethnic minority groups make less adequate use as compared to the native Dutch women, especially because of late entry in antenatal care. When taking into account potential explanatory factors such as maternal age, gravidity and parity, differences remain significant, except for Cape-Verdean women. Dutch-Antillean, Moroccan and Surinamese-Creole women exhibit most inadequate use of antenatal care.

*Conclusions*
This study shows that there are ethnic differences in the frequency of adequate use of antenatal care, which cannot be attributed to differences in maternal age, gravidity and parity. Future research is necessary to investigate whether these differences can be explained by socio-economic and cultural factors.

## Introduction

Primary objective of antenatal care is good quality outcome of pregnancy for both mother and child as it offers the opportunity for timely detection and treatment of adverse pregnancy outcomes. In developed countries, women from ethnic minorities are a high-risk group in antenatal care since they have a higher risk of adverse pregnancy outcomes, such as perinatal and maternal mortality and morbidity.[1,2] This also applies to the Netherlands.[3-5]
In most European countries, antenatal care is universally available, but research nevertheless shows the existence of ethnic differences in antenatal care uptake. A review of U.K. studies identified four studies, all revealing that women of Asian origin were more likely to book late for antenatal care as compared to White British women.[6] A British study showed that women of Pakistani and Indian origin had almost 10% fewer antenatal visits than women of white British origin, independent of a number of specific risk factors.[7] They also were more likely to start antenatal care at a later gestational age than white women.[8] Similar findings have been found recently in Malmö (Sweden).[9] A recent English study again showed that being Black or Asian, and born outside the United Kingdom were significantly associated with late entry, but when taking into account other risk factors, only country of birth outside the U.K. remained significantly related with late entry.[10] Studies in the United States show that inadequate antenatal care use occurred more often among African - and Mexican Americans as compared to non-Hispanic Whites. Adequacy of antenatal care use in these studies was based on the gestational age (month) in which care started and the total number of visits, adjusted for gestational age. The percentage of women starting care after the third month of pregnancy was higher in African Americans and Hispanic Americans compared to non-Hispanic Whites.[11-13]

Aim of our study is to examine whether differences exist in adequacy of antenatal care use between the native population and different ethnic minority groups in a large multi-ethnic urban area in the Netherlands. As gravidity, parity and maternal age may have an independent effect on antenatal care use[14-16], we will assess to what degree ethnic difference maintain when controlling for these factors.

## Methods

*Data collection*
Data on antenatal care use were obtained from the Generation R study. The Generation R Study is a multi-ethnic population-based prospective cohort study to investigate growth, development and health of urban children from fetal life until young adulthood. The study was conducted in Rotterdam, the second-largest city in the Netherlands. Study design and study population have been described in detail elsewhere.[17] Data were derived from electronic antenatal charts (Micronatal®) in which the midwives participating in the Generation R Study registered their

patient data. In the Netherlands community midwifery has a central role in antenatal care. Only women with an increased risk for abnormal pregnancy outcome or an obstetric history are referred to hospital based obstetric care by a gynaecologist. A set of detailed guidelines, indicating which pregnancies are low-, medium and high risk, is regularly updated.

*Participants*

Included were 3402 women with an expected date of delivery in 2002-2004. From these 3402 women, 308 were excluded, who received only (post-) natal care (n=39) or who were referred to the participating midwife practices by another health care provider (n=269); as in these cases it was not possible to establish their previous antenatal care visits and their gestational age at first visit. Subsequently, 447 women were excluded because no information on ethnic background was available and 2 more women were excluded because information on gestational age or date of first visit could not be retrieved.

Ethnic background of the study population was defined on the basis of the countries of birth of the expecting mother and of her parents, according to current practice of Statistics Netherlands.[18] When at least one of the parents was born outside the Netherlands, the woman was classified as non-Dutch. When country of birth of the pregnant women was the Netherlands, ethnic background was determined by country of birth of her mother, unless this was also the Netherlands: in that case county of birth of her father was decisive. When country of birth of both parents was the Netherlands, women were classified as native Dutch. We divided the Surinamese group into Surinamese-Hindustani and Surinamese-Creole by asking the pregnant woman for her ethnic origin. In this study, we included the seven largest ethnic groups in Rotterdam: Native Dutch, Moroccan, Turkish, Cape-Verdian, Dutch Antillean, Surinamese-Hindustani and Surinamese-Creole. We excluded 552 women belonging to other ethnic minority groups, as they belonged to too many different groups, with too small numbers of women available for study. This resulted in a total study population of 2093 women. In case a woman had more than one pregnancy during the research period, only the first pregnancy was included.

*Measures*

To assess adequate antenatal care use, we constructed an index, which is derived from the Kotelchuck Index[19], widely used in the United States, by combining gestational age of the first antenatal visit and the total number of visits. The values range from 1 to 5. We used the recommended schedule of antenatal care of the Dutch Society of Obstetrics and Gynaecology (NVOG) (www.nvog.nl, 1-1-2006) as the basis of our index. As the NVOG advises more antenatal visits for nulliparae than for multiparae, the total group of women has been divided into a nulliparae and a multiparae group. Regarding nulliparae, our index has the following five categories of antenatal care use in case of a completely fulfilled pregnancy; 1: adequate use reflecting a minimum number of 8 visits and a first visit before gestational age of 15 weeks; 2:

less adequate use reflecting less than 8 visits and a first visit before gestational age of 15 weeks; 3: inadequate use reflecting a minimum number of 8 visits and a first visit at gestational age between 15-24 weeks of pregnancy; 4: more inadequate use reflecting less than 8 visits and a first visit at gestational age of 15-24 weeks of pregnancy; 5: most inadequate use reflecting a first visit after gestational age of 24 weeks. This situation is displayed in the upper part of table 1. For the multiparae this is largely the same, except that the minimum total visits for a completely fulfilled pregnancy is six visits (see upper part table 2).
In a number, of cases it was necessary to adjust the values of this index. Indeed, in case of preterm birth or a miscarriage, or another reason for terminating antenatal care with the participating midwife, gestational age was lower than normal and it was thus not fair to apply the foregoing criteria. A similar situation occurred when a participating midwife referred a woman to another midwife or gynaecologist: in this case the registration of subsequent antenatal visits was no longer at the disposition of the researchers and therefore we adjusted the values of the index. Table 1 and table 2 also display how this adaptation took place for different registration periods of the pregnancy.

*Analysis*
Descriptive analyses have been carried out separately for nulliparae and multiparae and include data on antenatal care use and on the independent variables included, all according to ethnic group.

As the distribution of the antenatal care index was skewed (see table 4), whereby some categories were scarcely represented, we subsequently dichotomised this index in two categories: adequate use (category 1) and inadequate use (categories 2 till 5) for further analysis. Logistic regression analysis was used to assess differences in adequate antenatal care use between ethnic minority groups and native Dutch. The Dutch group was the reference group. Because of small numbers in some ethnic minority groups, we combined nulliparae and multiparae in the logistic regression analysis, and corrected for parity. We first present crude odds ratios (model 1) and subsequently odds ratios for inadequate use corrected separately for maternal age (model 2), gravidity (model 3), parity (model 4) and midwife practice (model 5). In model 6 odds ratios are adjusted for all these independent variables together. Statistical analyses were performed using SPSS version 12.0 for Windows (SPSS Inc. Chicago, Illinois, USA).

*Table 1. Index of antenatal care use for nulliparae adjusted for registered antenatal care and gestational age at first antenatal care visit*

| Antenatal care registered up to gestational age of | Gestational age 1st antenatal care visit | Total number of visits | Index |
|---|---|---|---|
| > 40 weeks (Term pregnancy) | <15 weeks | > 8 | 1 |
| | | < 8 | 2 |
| | 15-24 weeks | > 8 | 3 |
| | | < 8 | 4 |
| | > 24 weeks | > 8 | 5 |
| | | < 8 | 5 |
| 38-40 weeks | <15 weeks | > 7 | 1 |
| | | < 7 | 2 |
| | 15-24 weeks | > 7 | 3 |
| | | < 7 | 4 |
| | > 24 weeks | > 7 | 5 |
| | | < 7 | 5 |
| 35-37 weeks | <15 weeks | > 6 | 1 |
| | | < 6 | 2 |
| | 15-24 weeks | > 6 | 3 |
| | | < 6 | 4 |
| | > 24 weeks | > 6 | 5 |
| | | < 6 | 5 |
| 31-34 weeks | <15 weeks | > 5 | 1 |
| | | < 5 | 2 |
| | 15-24 weeks | > 5 | 3 |
| | | < 5 | 4 |
| | > 24 weeks | > 5 | 5 |
| | | < 5 | 5 |
| 28-30 weeks | <15 weeks | > 4 | 1 |
| | | < 4 | 2 |
| | 15-24 weeks | > 4 | 3 |
| | | < 4 | 4 |
| | > 24 weeks | > 4 | 5 |
| | | < 4 | 5 |
| 21-27 weeks | <15 weeks | > 3 | 1 |
| | | < 3 | 2 |
| | 15-24 weeks | > 3 | 3 |
| | | < 3 | 4 |
| | > 24 weeks | > 3 | 5 |
| | | < 3 | 5 |
| 15-20 weeks | <15 weeks | > 2 | 1 |
| | | <2 | 2 |
| | 15-20 weeks | > 2 | 3 |
| | | <2 | 4 |
| 0-14 weeks | < 15 weeks | > 1 | 1 |

*Table 2: Index of antenatal care use for multiparae adjusted for registered antenatal care and gestational age at first antenatal care visit*

| Antenatal care registered up to gestational age of | Gestational age 1st antenatal care visit | Total number of visits | Index |
|---|---|---|---|
| > 40 weeks (Term pregnancy) | <15 weeks | > 6 | 1 |
| | | <6 | 2 |
| | 15-24 weeks | > 6 | 3 |
| | | <6 | 4 |
| | > 24 weeks | > 6 | 5 |
| | | <6 | 5 |
| 33-40 weeks | <15 weeks | > 5 | 1 |
| | | < 5 | 2 |
| | 15-24 weeks | > 5 | 3 |
| | | < 5 | 4 |
| | > 24 weeks | > 5 | 5 |
| | | < 5 | 5 |
| 28-32 weeks | <15 weeks | > 4 | 1 |
| | | < 4 | 2 |
| | 15-24 weeks | > 4 | 3 |
| | | < 4 | 4 |
| | > 24 weeks | > 4 | 5 |
| | | < 4 | 5 |
| 21-27 weeks | <15 weeks | > 3 | 1 |
| | | < 3 | 2 |
| | 15-24 weeks | > 3 | 3 |
| | | < 3 | 4 |
| | > 24 weeks | > 3 | 5 |
| | | < 3 | 5 |
| 15-20 weeks | <15 weeks | > 2 | 1 |
| | | <2 | 2 |
| | 15-20 weeks | > 2 | 3 |
| | | <2 | 4 |
| 0-14 weeks | < 15 weeks | > 1 | 1 |

## Results

Table 3 displays descriptive data, separately for nulliparae and for multiparae according to ethnic background. In general the mean maternal age of native Dutch women was higher than of women in the other ethnic groups; the number of antenatal visits was higher in the ethnic minority groups, as well as the percentages of women entering antenatal care after 14 weeks of gestation.

*Table 3. Study population according to maternal age, gravidity, number of antenatal visits and % women with intake after 14 weeks of gestation*

| | Dutch | Turkish | Moroccan | Surinamese-Hindustani | Surinamese-Creole | Cape Verdean | Dutch Antillean | Total |
|---|---|---|---|---|---|---|---|---|
| **Nulliparae** | (n=735) | (n=129) | (n=73) | (n=53) | (n=45) | (n=82) | (n=67) | (n=1184) |
| Mean maternal age in years (SD) | 29.98 (4.68) | 24.11 (3.89) | 24.58 (3.61) | 24.90 (4.68) | 25.09 (5.47) | 23.92 (4.45) | 24.41 (4.57) | 27.86 (5.30) |
| Gravidity (median and range) | 1 (6) | 1 (2) | 1 (1) | 1 (2) | 1 (4) | 1 (3) | 1 (2) | 1 (6) |
| Total number of visits (median and range) | 12 (2-20) | 13 (3-19) | 12 (5-21) | 12 (2-17) | 11 (4-18) | 12 (2-22) | 12 (2-18) | 12 (2-22) |
| Intake after gestational age of 14 weeks (%) | 10.5% | 16.3% | 26% | 11.3% | 20% | 22% | 31.3% | 14.4% |
| **Multiparae** | (n=507) | (n=111) | (n=135) | (n=33) | (n=31) | (n=51) | (n=41) | (n=909) |
| Mean maternal age in years (SD) | 32.71 (4.00) | 27.60 (4.31) | 29.43 (4.70) | 28.90 (4.12) | 29.65 (6.02) | 31.24 (4.45) | 27.82 (4.04) | 31.05 (4.70) |
| Gravidity (median and range) | 2 (6) | 3 (5) | 3 (8) | 3 (4) | 3 (4) | 3 (5) | 3 (6) | 3 (8) |
| Total number of visits (median and range) | 12 (1-28) | 12 (1-18) | 12 (3-17) | 11 (6-15) | 11 (3-16) | 11 (5-25) | 15 (1-16) | 12 (1-28) |
| Intake after gestational age of 14 weeks (%) | 10.8% | 26.1% | 37% | 21.2% | 41.9% | 27.5% | 29.3% | 19.8% |

*Table 4. Study population according to index of adequate antenatal care use*

| | Dutch | Turkish | Moroccan | Surinamese-Hindustani | Surinamese-Creole | Cape Verdean | Dutch Antillean | Total |
|---|---|---|---|---|---|---|---|---|
| **Nulliparae** | (n=735) | (n=129) | (n=73) | (n=53) | (n=45) | (n=82) | (n=67) | (n=1184) |
| Adequate use | 89.3% | 83.7% | 74% | 88.7% | 80% | 76.8% | 68.7% | 85.3% |
| Less adequate use (few visits) | 0.3% | 0% | 0% | 0% | 0% | 1.2% | 0% | 0.3% |
| Inadequate use (late intake) | 9.7% | 16.3% | 24.7% | 11.3% | 20% | 22% | 31.3% | 13.9% |
| More inadequate use (few visits and late intake) | 0.1% | 0% | 0% | 0% | 0% | 0% | 0% | 0.1% |
| Most inadequate use (intake >24 weeks) | 0.7% | 0% | 1.4% | 0% | 0% | 0% | 0% | 0.5% |
| **Multiparae** | (n=507) | (n=111) | (n=135) | (n=33) | (n=31) | (n=51) | (n=41) | (n=909) |
| Adequate use | 89% | 73.9% | 63% | 78.8% | 58.1% | 72.5% | 70.7% | 80.1% |
| Less adequate use (few visits) | 0.2% | 0% | 0% | 0% | 0% | 0% | 0% | 0.1% |
| Inadequate use (late intake) | 10.3% | 26.1% | 34.8% | 21.2% | 38.7% | 25.5% | 29.3% | 18.9% |
| More inadequate use (few visits and late intake) | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0.% |
| Most inadequate use (intake >24 weeks) | 0.6% | 0% | 2.2% | 0% | 3.2% | 2.0% | 0% | 0.9% |

*Table 5. Crude odds ratios for inadequate antenatal care use, followed by odds ratios adjusted for maternal age, gravidity, parity and midwife practice (separately) and for all explanatory variables together. Significant differences from the Dutch are printed in bold*

| Odds ratios and 95% confidence intervals | **Dutch** | **Turkish** | **Moroccan** | **Surinamese-Hindustani** | **Surinamese-Creole** | **Cape Verdean** | **Dutch Antillean** |
|---|---|---|---|---|---|---|---|
| **Nulliparae and multiparae (n=2093)** | (n=1242) | (n=240) | (n=208) | (n=86) | (n=76) | (n=133) | (n=108) |
| Model 1: inadequate use, unadjusted | 1 | **2.16** | **4.07** | 1.46 | **3.34** | **2.71** | **3.61** |
| | | (1.51-3.09) | (2.90-5.72) | (0.79-2.71) | (1.97-5.66) | (1.76-4.17) | (2.31-5.64) |
| Model 2: adjusted for age | 1 | **1.98** | **3.86** | 1.35 | **3.12** | **2.52** | **3.31** |
| | | (1.35-2.90) | (2.72-5.47) | (0.72-2.53) | (1.83-5.34) | (1.62-3.93) | (2.08-5.27) |
| Model 3: adjusted for gravidity | 1 | **2.13** | **3.69** | 1.44 | **3.15** | **2.57** | **3.42** |
| | | (1.49-3.05) | (2.61-5.22) | (0.78-2.67) | (1.85-5.34) | (1.66-3.96) | (2.18-5.37) |
| Model 4: adjusted for parity | 1 | **2.10** | **3.58** | 1.45 | **3.35** | **2.71** | **3.55** |
| | | (1.47-3.02) | (2.51-5.09) | (0.78-2.68) | (1.97-5.67) | (1.76-4.17) | (2.27-5.56) |
| Model 5: adjusted for midwife practice | 1 | **1.84** | **3.51** | 1.22 | **2.86** | **2.28** | **3.10** |
| | | (1.27-2.65) | (2.48-4.96) | (0.65-2.27) | (1.68-4.88) | (1.47-3.54) | (1.97-4.88) |
| Model 6: adjusted for age, gravidity, | 1 | 1.48 | **2.60** | 1.02 | **2.39** | **1.91** | **2.44** |
| midwife practice and parity | | (1.00-2.20) | (1.77-3.81) | (0.54-1.93) | (1.38-4.16) | (1.21-3.03) | (1.51-3.96) |

In table 4 the distribution of the antenatal care index, adjusted for registered antenatal care period is presented for each ethnic group. Overall, percentages women making adequate care were lower in ethnic minority groups as compared to native Dutch women. The percentage of women making adequate use was lowest in multiparae Surinamese-Creole women (only 58.1%), although - remarkably – the percentage of nulliparae women in this ethnic group was much higher (80%). Low percentages making adequate use were also prominent in both nulli- and multiparae Moroccan women. Nulliparae Surinamese-Hindustani women did not differ from native Dutch women, but multiparae did differ.

Except in native Dutch and Dutch Antillean women, the percentages of multiparae women making adequate use of antenatal care were lower than in nulliparae in all ethnic minority groups.

As already mentioned, some categories of our index were scarcely represented: the category "less adequate use" characterised by few visits, the category "more inadequate use" characterised by few visits and late intake and the category "most inadequate use" characterised by very late intake. Inadequate use thus was primarily attributable to a late intake only.

Table 5 first shows the crude odds ratios for inadequate antenatal care use, followed by odds ratios adjusted for maternal age, gravidity, midwife practice and parity for the nulliparae and the multiparae separately and for all explanatory variables together. Crude odds ratios indicate significantly higher inadequate use for all ethnic minority groups as compared to the Dutch reference group, except for Surinamese-Hindustani. When taking into account the other independent variables separately, the picture changed little. When taking them into account together, odd ratios decreased, but differences between ethnic minority groups and native Dutch remained significant, except in the case of Turkish women, who no longer differed from the native Dutch.

## Discussion

The main finding of this study was that ethnic differences exist in adequate use of antenatal care between the native population and different ethnic minority groups in Rotterdam, a large multi-ethnic urban area in the Netherlands. When taking into account maternal age, parity, gravidity and midwife practice, more women in ethnic minority groups make less adequate use of antenatal care as compared to native Dutch women, except for Surinamese-Hindustani and Turkish women. Use was especially inadequate among multiparae Surinamese-Creole women and among all Moroccan women. The main reason for inadequate use was a first antenatal visit after a gestational age of 14 weeks. This implies major disadvantages; although there is debate on the ideal number of antenatal visits, there is no disagreement on the necessity of an early start of antenatal care.[20] Timely entry into antenatal care enables pregnant women to obtain information on available screening tests in time, as well as relevant health education.

Contrary to most other studies, we distinguished between primiparous and multiparous women. In all ethnic minority groups, the percentages of multiparous women making adequate use of antenatal care were often considerable lower than in nulliparae, except in native Dutch and Dutch Antillean women.

We constructed an index of adequate antenatal care use, based on the principles of the Kotelchuck index, which is frequently used in the United States.[19] Contrary to the situation in the United States, where the Kotelchuck index shows reasonable distributions over its categories, the distribution of our index was skewed (see table 4), whereby some categories were scarcely represented. Especially categories including few visits were scarce, indicating that ethnic differences do not concern the number of visits but relate to timely entrance. This might be explained by the fact that antenatal care is accessible for all legal residing pregnant women in the Netherlands and suggests that other factors play a role rather than financial considerations. Therefore, an index as often used in the United States probably is less appropriate in an European context.

Our results are in line with previous studies in the U.K and U.S[6-8,11-13] although initiation of antenatal care in the United State in general is later and no antenatal care is more frequent, because of financial restraints. However, a recent English study[10] in general did not find ethnic differences in antenatal care entry, except regarding those born outside the U.K. However, contrary to most studies in the U.K., our results are based on registered data rather than on self-report on postal questionnaires. Our study is also roughly in line with a recent Dutch study in Amsterdam[21], though the results are difficult to compare. Indeed, the analyses in the Amsterdam study were confined to women entering care after 9 weeks of pregnancy and both pregnancies initiated in primary care by midwives and hospital-based pregnancies were included whereas our study included all pregnant women entering antenatal care but was confined to pregnancies that started in primary care.

This is the first study on antenatal care use in the Netherlands, in which Surinamese-Creole and Surinamese-Hindustani people could be distinguished. They have different origins, namely African and Asian. This study illustrates that there were large differences in delay in antenatal care use between both groups, whereby delay was clearly less in Hindustani than in Creoles. Explaining these differences requires further investigation.

Our results should be interpreted with some caution because this study has some limitations.

First, we excluded three midwife practices, which did not use electronic antenatal charts. No indications were available that the ethnic composition of these practices is different from the participating practices. Secondly, we excluded mothers whose ethnic background was unknown. We analysed whether their antenatal care use differed from the antenatal care use of the women included, and this was not the case (results not shown).

Thirdly, we took the recommendations for basic antenatal care developed by the NVOG as the point of departure for the construction of our index. However, in this study we focused on antenatal care given by midwives. At the time of our study, there were no comparable recommendations by the Dutch Society of Midwives. The recommendations by the NVOG are rather based on professional

agreement than on scientific evidence. Nevertheless, especially regarding an early start of antenatal care, no difference in opinion exists.[20] Regarding the required number of antenatal visits there is no agreement, as debate is ongoing regarding an optimal number of visits.

It is likely that ethnic minority groups with a higher socio-economic position were overrepresented in the Generation R Study, as enrolment of ethnic minority groups was more difficult due to language and cultural barriers. Since a higher socio-economic position is associated with more adequate antenatal care use, the ethnic differences found in this study probably were an underestimation of true differences.

In this study, we adjusted for a number of well documented other variables explaining differences in antenatal care use. Although ethnic differences diminished, they nevertheless, remained significant, which is in line with findings from the United States and the United Kingdom. Research in the United States and the United Kingdom showed that late entry in antenatal care is also associated with socio-economic and socio-cultural factors such as educational level, marital status, unplanned pregnancy and language problems.[15,20,21] Whether similar factors are associated with ethnic differences in antenatal care use in the Netherlands requires further investigation, including collecting data by survey as these factors are not regularly included in registrations such as Micronatal®.

Finally, this study focused on ethnic differences in the utilisation of antenatal care. It does not inform us on eventual ethnic differences in the content and quality of care. Future research also needs to investigate ethnic differences in the content of antenatal care.

**References**


1. Bernstein PS, Merkatz IR. A life course perspective on women's reproductive health and the outcome of pregnancy. J Womens Health 2010;19(3):555-560.
2. Hessol NA, Fuentes-Afflick E. Ethnic differences in neonatal and postneonatal mortality. Pediatrics 2005;115(1):e44-51.
3. Schuitemaker N, van Roosmalen J, Dekker G, van Dongen P, van Geijn H, Gravenhorst JB. Confidential enquiry into maternal deaths in The Netherlands 1983-1992. European Journal of Obstetrics & Gynecology and Reproductive Biology 1998;79(1):57-62.
4. Drooger JC, Troe JWM, Borsboom G, Hofman A, Mackenbach JP, Moll HA, et al. Ethnic differences in prenatal growth and the association with maternal and fetal characteristics. Ultrasound in Obstetrics and Gynecology 2005;26(2):115-122.
5. Schulpen TWJ, van Wieringen J, van Brummen PJ, van Riel JM, Beemer FA, Westers P, et al. Infant mortality, ethnicity, and genetically determined disorders in The Netherlands. The European Journal of Public Health 2006;16(3):290-293.
6. Rowe RE, Garcia J. Social class, ethnicity and attendance for antenatal care in the United Kingdom: a systematic review. J Public Health 2003;25(2):113-119.
7. Petrou S, Kupek E, Vause S, Maresh M. Clinical, provider and sociodemographic determinants of the number of antenatal visits in England and Wales. Soc Sci Med. 2001 4;52(7):1123-1134.
8. Kupek E, Petrou S, Vause S, Maresh M. Clinical, provider and sociodemographic predictors of late initiation of antenatal care in England and Wales. BJOG 2002;109(3):265-273.
9. Ny P, Dykes AK, Molin J, Dejin-Karlsson E. Utilisation of antenatal care by country of birth in a multi-ethnic population: a four-year community-based study in Malmö, Sweden. Acta Obstet Gynecol Scand 2007;86(7):805-813.
10. Rowe RE, Magee H, Quigley MA, Heron P, Askham J, Brocklehurst P. Social and ethnic differences in attendance for antenatal care in England. Public Health 2008 12;122(12):1363-1372.
11. Frisbie WP, Echevarria S, Hummer RA. Prenatal care utilization among non-Hispanic Whites, African Americans, and Mexican Americans. Matern Child Health J 2001;5(1):21-33.
12. Alexander GR, Kogan MD, Nabukera S. Racial differences in prenatal care use in the United States: are disparities decreasing? Am J Public Health 2002;92(12):1970-1975.
13. Park JH, Vincent D, Hastings-Tolsma M. Disparity in prenatal care among women of colour in the USA. Midwifery 2007;23(1):28-37.
14. Blondel B, Marshall B. Poor antenatal care in 20 French districts: risk factors and pregnancy outcome. J Epidemiol Community Health 1998;52(8):501-506.
15. Delvaux T, Buekens P, Godin I, Boutsen M. Barriers to prenatal care in Europe. Am J Prev Med 2001;21(1):52-59.
16. Yu SM, Alexander GR, Schwalberg R, Kogan MD. Prenatal care use among selected Asian American groups. Am J Public Health 2001;91(11):1865-1868.

17. Jaddoe VW, van Duijn CM, van der Heijden AJ, Mackenbach JP, Moll HA, Steegers EA, et al. The Generation R Study: design and cohort update until the age of 4 years. Eur J Epidemiol 2008;23(12):801-811.
18. Centraal Bureau voor De Statistiek. Allochtonen in Nederland 2003. Voorburg/Heerlen: CBS 2003.
19. Kotelchuck M. The Adequacy of Prenatal Care Utilization Index: its US distribution and association with low birthweight. Am J Public Health 1994;84(9):1486-1489.
20. Villar J, Bergsjo P. Scientific basis for the content of routine antenatal care. Philosophy, recent studies, and power to eliminate or alleviate adverse maternal outcomes. Acta Obstet Gynecol Scand 1997;76(1):1-14.
21. Alderliesten ME, Vrijkotte TG, van der Wal MF, Bonsel GJ. Late start of antenatal care among ethnic minorities in a large cohort of pregnant women. BJOG 2007;114(10):1232-1239.

# Chapter 3

## Explaining ethnic differences in late antenatal care entry

## Abstract

*Objectives*

Despite compulsory health insurance in Europe, ethnic differences in access to health care exist. The objective of this study is to investigate how ethnic differences between Dutch and non-Dutch women with respect to late entry into antenatal care provided by community midwives can be explained by need, predisposing and enabling factors.

*Methods*

Data were obtained from the Generation R Study. The Generation R Study is a multi-ethnic population-based prospective cohort study conducted in the city of Rotterdam. In total, 2093 pregnant women with a Dutch, Moroccan, Turkish, Cape Verdean, Antillean, Surinamese-Creole and Surinamese-Hindustani background were included in this study. We examined whether ethnic differences in late antenatal care entry could be explained by need, predisposing and enabling factors. Subsequently, logistic regression analysis was used to assess the independent role of explanatory variables in the timing of antenatal care entry. The main outcome measure was late entry into antenatal care (gestational age at first visit after 14 weeks).

*Results*

With the exception of Surinamese-Hindustani women, the percentage of mothers entering antenatal care late was higher in all non-Dutch compared to Dutch mothers. We could explain differences between Turkish (OR=0.95, CI: 0.57-1.58), Cape Verdean (OR=1.65. CI: 0.96-2.82) and Dutch women. Other differences diminished but remained significant (Moroccan: OR=1,74. CI: 1.07-2.85; Dutch Antillean OR 1.80, CI: 1.04-3.13).

*Conclusions*

We found that non-Dutch mothers were more likely to enter antenatal care later than Dutch mothers. Because we are unable to explain fully the differences regarding Moroccan, Surinamese-Creole and Antillean women, future research should focus on differences between first and second generation migrants, as well as on language barriers that may hinder access to adequate information about the Dutch obstetric system.

## Introduction

Studies in developed countries point to a later entry into antenatal care and/or fewer visits by ethnic minorities in comparison to other groups.[1-12] Although scientific debate continues regarding the optimal number of visits, the necessity of timely entrance is unquestioned.[13] If women enter antenatal care too late, they cannot receive important timely health educational advices. Nor can they profit from the benefits of screening tests for the early detection and prevention of adverse pregnancy outcomes, which largely take place during the first trimester of pregnancy. Only a few studies have been carried out in Europe but, despite universal insurance coverage in European countries, the studies that have been conducted nonetheless show similar results to studies conducted elsewhere.[4,5]

Many of the larger cities in western European countries are facing a strong increase in migrant populations. In the Netherlands, approximately 20% has a foreign background; in the large cities, nearly half of the population has a non-Dutch background. The largest groups are Turks, Moroccans, Surinamese and Dutch Antilleans. Turks and Moroccans came to the Netherlands as labor migrants during the 1960s and early 1970s. Suriname is a former colony that gained independence in 1975. During the period of decolonisation, many Surinamese migrated to the Netherlands. The Dutch Antilles are still part of the Kingdom of the Netherlands and the availability and quality of educational institutions are important reasons for Dutch Antilleans to migrate to the Netherlands. In general, these groups are characterized by socioeconomic and language-related disadvantages.[14]

Previous research has revealed that late entrance into antenatal care is associated with younger age[2,8,15,16], low socio-economic position[15,17,18,18-23], lack of insurance/insurance status[15-17,21,24,25], unmarried/single status[15,16,21,24-26], smoking[2,8], alcohol use[2], external barriers such as difficulty in getting an appointment[19], unintended/undesired/unplanned pregnancy[2,15,18,19,22,23,25,27,28] and multi-parity.[8,15,16,18,24,25] Many studies explaining ethnic and racial differences in initiating antenatal care were conducted in the USA, and are to a large degree data-driven.[1-3,6,7] Andersen's model to study differences in health care use more systematically distinguishes between three groups of determinants: (1) need factors, (2) predisposing factors, reflecting the propensity to use services, and (3) enabling factors, reflecting opportunities to use services.[29] LaVeist[30] assessed the role of a number of predisposing (marital status, age, educational attainment and income) and enabling factors (health insurance status, distance to antenatal care service) in differences between blacks and whites in timely antenatal care use. He concluded that ethnic differences are not the consequence of predisposing factors, but could be attributed to a lack of enabling sources. He only included a limited number of predisposing variables and did not take need factors into consideration, identifying these as a constant, since all women were pregnant. However, in our opinion, need factors should be defined more broadly. For example, women experiencing poorer health very early in pregnancy may feel the need to seek antenatal care early.

Predisposing factors may still encompass divergent variables. Besides classical predisposing

variables such as age, parity and concerns regarding the pregnancy, it is also interesting to determine whether late entry into antenatal care is associated with other health behaviors such as the use of tobacco or alcohol, and the use of folic acid. We hypothesize that women who are not likely to adopt healthy behavior regarding pregnancy will also not be inclined to enter antenatal care early in pregnancy.

Furthermore, because antenatal care is more universally accessible in Europe (including the Netherlands) than in the United States[31], we expect that predisposing and behavioral variables play a larger role than enabling factors. Financial barriers are largely absent, while midwifery practices are widely available. Dutch antenatal care is somewhat unique: community midwifery has a central role and only women with medical problems or a complicated obstetric history are referred to hospital-based obstetric care by a gynecologist.[32] Midwifery density is high in the Netherlands[33], whereby geographical access is also not an issue.



*Aim*

The aim of this study was to examine whether and to what extent ethnic differences between Dutch and several non-Dutch groups in late entry into antenatal care by community midwives can be explained by need, predisposing and enabling factors.

## Methods

*The Generation R Study*

Data for this study were obtained from the Generation R Study. The Generation R Study is a multi-ethnic population-based prospective cohort study to investigate growth, development and health of urban children from fetal life until young adulthood, conducted in Rotterdam, the second largest city in the Netherlands. The Generation R Study has been described in detail elsewhere.[34,35] In total 9,778 pregnant mothers with all ethnic backgrounds and with a delivery date between April 2002 and January 2006 were enrolled. Assessments during pregnancy included physical examinations, piloted questionnaires and fetal ultrasound examinations.[35] The questionnaires assessed a wide range of topics regarding health-related issues and lifestyle habits of the participants. The study was approved by the Medical Ethics Committee of the Erasmus Medical Centre, Rotterdam. Eligible women received written and oral information about the study and were asked for written informed consent.

*Study population*

While the primary aim of the Generation R Study focused on children, our aim focused on the pregnant mothers. For this particular analysis, only the women who entered antenatal care at a midwife practice, with an expected date of delivery between April 2002 and December 2004, were included. This is the only group for which all necessary data were available. Of these 3402 women, 308 were excluded, since they received only postnatal care by the participating midwives (n=39),

or were referred to the participating midwife practices by another health care provider (n=269), because in these cases it was not possible to establish time of entry into antenatal care and their gestational age at first visit. Subsequently, 447 women were excluded because no information on their migrant background was available and 2 more women were excluded because information on gestational age or date of first visit could not be retrieved. If a woman had more than one pregnancy during the research period, only the first pregnancy was included.

The ethnic background of the participating pregnant women was based on the country of birth of the expecting mother and her parents, using the rules applied in current practice by Statistics Netherlands.[36] When at least one of the parents was born outside the Netherlands, the woman was classified as non-Dutch. If the pregnant woman was not born in the Netherlands, her ethnic background was determined based on her own country of birth. When the pregnant woman was born in the Netherlands, her ethnic background was determined by country of birth of her mother, unless this was also the Netherlands. If that was the case, ethnic background was established by country of birth of her father. When country of birth of both parents of the mother was the Netherlands, women were classified as native Dutch. All information about country of birth was obtained by questionnaire. In this study, we included the largest migrant groups in Rotterdam: native Dutch, Moroccan, Turkish, Dutch Antilleans and Surinamese. Women with a Surinamese background are of mixed origin, mainly consisting of Hindustanis originating from India, and Creoles from Africa, and therefore differ in cultural background. For this reason, we further classified them as Surinamese-Hindustani and Surinamese-Creole, by asking the pregnant woman for her ethnic origin. Finally, we also included Cape Verdean migrants, because they constitute a large group in Rotterdam. Cape Verdeans migrated to the Netherlands from the 1960s onwards, mostly for work-related reasons. Women with other migrant backgrounds were excluded because they belonged to too many different groups, resulting in excessively small numbers of women in each group available for study (total N = 552).

The study population available for this analysis consisted of 2093 women. The ethnic distribution in the study population differed only moderately from that of the population in the study area.[35]

*Measurements*

Data were derived from the electronic antenatal charts (Micronatal®) from 23 midwives at seven midwife practices that were participating in the Generation R Study, and from written questionnaires at enrolment in the study, which were available in native languages whenever necessary. Also, in case of illiteracy, assistance was available to fill out the questionnaire.

The outcome variable was delay in entry (yes/no) into antenatal care and was defined as whether or not the first visit took place after the gestational age of 14 weeks. Information about antenatal care and gestational age was derived from the electronic charts in which the midwives register their patient data. This criterion was based on the recommendations of the Dutch Society of Obstetrics and Gynecology.[37]

Information on determinants was obtained from the participants through a questionnaire. As a need factor, we included self-perceived health during early pregnancy, consisting of five possible answers (excellent, very good, good, moderate, poor). Enabling factors included were: educational level of the mother and having a paid job (yes/no). Educational level was assessed by recording the highest completed education, which was later reclassified into three categories: lower (primary school), intermediate (secondary school) and higher (higher education). Predisposing variables included age, household arrangement (married, cohabiting, no partner), parity (nulliparous/multiparous), and planned pregnancy (yes/no). Another predisposing variable that was included was the degree to which the pregnant woman was concerned and worried about the pregnancy. This variable consisted of a scale from 1 to 5 and was based on a set of 13 items (sub-questions) about the confidence and worries of the women regarding their pregnancy, and each item was answered on a 5 point Likert scale ranging from almost never to almost always. The distribution of four items was highly skewed and these four items were therefore excluded. A principal component analysis was conducted on the remaining 9 items and showed only one clear factor consisting of four items (Cronbach's alpha, 0.65). These four items refer to confidence in a favorable course of the pregnancy and confidence in the personal ability of the mother to adequately deal with the pregnancy. This variable ranged from little (1) to a lot of concern (4). Healthy behaviors regarding pregnancy were also considered as predisposing factors. We therefore included information on the use of folic acid (before pregnancy, as soon as pregnancy was known, later or never), smoking (never smoked, stopped smoking when pregnancy was known, still smoking during pregnancy) and alcohol use (never drinking, stopped drinking when pregnancy was known, still drinking during pregnancy).



*Analysis*

Descriptive analyses were performed on the outcome variable (late entry (yes/no)) and all determinants according to ethnic group. Differences were compared using $\chi^2$ in the case of categorical variables and analysis of variance in the case of continuous variables. Differences between the native Dutch and all non-Dutch were compared.

Logistic regression analyses were performed to determine the extent to which ethnic differences in late entry into antenatal care could be explained by need, enabling and predisposing factors. We first calculated unadjusted odds ratios, and then odds ratios adjusting separately for need, enabling and predisposing factors. Regarding the predisposing variables, we divided this group of variables into two categories; those referring to health-protective behavior and the remaining other variables. We distinguished between these two groups of predisposing factors, because those reflecting health-protective behavior have rarely been included in research. Finally, a full model was applied, adjusting simultaneously for the four groups of explanatory variables.

Subsequently, we used the full logistic regression model to determine the degree of association that each factor – including ethnic background – had with the chance of late antenatal care use.

We used separate categories for the missing data on the categorical explanatory variables.

The statistical analyses were performed using SPSS version 15.0 for Windows (SPSS Inc, Chicago, Illinois, USA).

## Results

Figure 1 presents the distribution of gestational age at entry into antenatal care according to the ethnic background of the mother. This figure illustrates that the percentage of Dutch women entering antenatal care early is higher than any other ethnic group.

*Figure 1. Distribution of gestational age at entry into antenatal care according to the ethnic background*

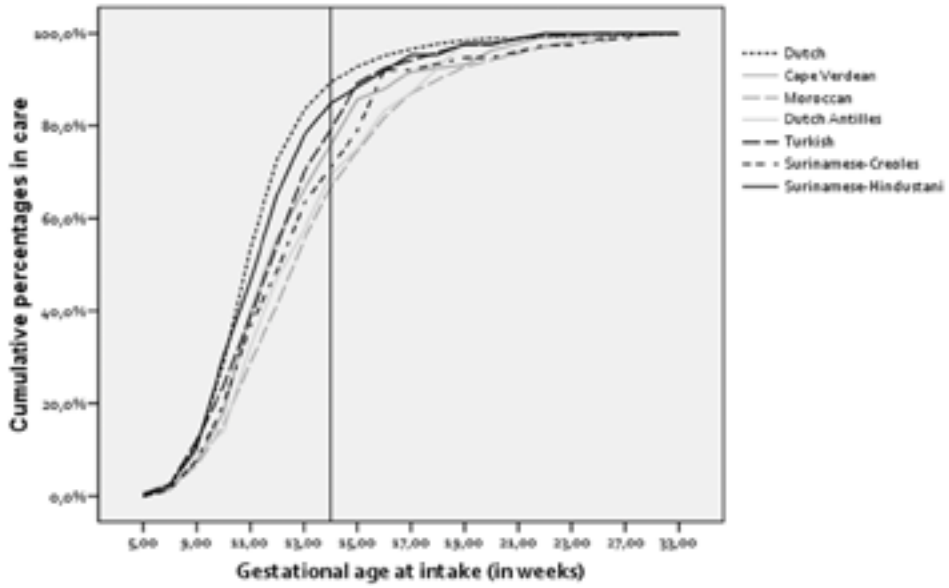



Table 1 shows the characteristics of the study population according to ethnic background. Among all non-Dutch groups, the percentages entering antenatal care after 14 weeks of pregnancy was higher than among Dutch mothers. Compared to Dutch mothers, the percentages of women who considered their health as excellent or very good were considerably lower among the non-Dutch mothers. Compared to Dutch women, the mean maternal age of women of non-Dutch origin was lower. Additionally, non-Dutch mothers had lower education levels, were more likely not to have a paid job, and were more often multiparous than Dutch mothers. In comparison to the Dutch, Moroccan and Turkish mothers were more often married; while single mothers were predominant in the Cape Verdean, Antillean and especially in the Surinamese Creole mothers. Compared to Dutch women, the frequencies of non-Dutch women taking folic acid before pregnancy were lower.

*Table 1. Characteristics of the study population*

| | Dutch | Moroccan | Turkish | Cape Verdean | Dutch Antillean | Surinamese-Creoles | Surinamese-Hindustani | P-value |
|---|---|---|---|---|---|---|---|---|
| **N** | **1242** | **208** | **240** | **133** | **108** | **76** | **86** | |
| **Late antenatal care entry** (%) | 10.6 | 33.2 | 20.8 | 24.1 | 30.6 | 28.9 | 15.1 | p < 0.001 |
| **Age in years** (mean-sd) | 31.1 (4.6) | 27.7 (4.9) | 25.7 (4.4) | 26.7 (5.7) | 25.7 (4.7) | 26.9 (6.1) | 26.4 (4.9) | p < 0.001 |
| **Perceived health status** (%) | | | | | | | | p < 0.001 |
| Excellent | 13.1 | 6.7 | 4.6 | 12.8 | 10.2 | 5.3 | 5.8 | |
| Very good | 37.8 | 18.8 | 10.3 | 17.3 | 19.4 | 25.0 | 23.3 | |
| Good | 42.1 | 54.3 | 63.8 | 51.9 | 57.4 | 51.3 | 52.3 | |
| Moderate | 3.1 | 13.9 | 12.1 | 10.5 | 8.3 | 9.2 | 14 | |
| Poor | 0.2 | 1.0 | 0.4 | 0.8 | 0 | 0 | 1.2 | |
| Missing | 3.8 | 5.3 | 2.9 | 6.8 | 4.6 | 9.2 | 3.5 | |
| **Paid job** (%) | | | | | | | | p < 0.001 |
| Yes | 72.4 | 19.2 | 28.3 | 42.9 | 19.4 | 39.5 | 30.2 | |
| No | 12.8 | 31.7 | 39.6 | 21.8 | 50.9 | 23.7 | 40.7 | |
| Missing | 14.8 | 49.0 | 32.1 | 35.3 | 29.6 | 36.8 | 29.1 | |
| **Educational level** (%) | | | | | | | | p < 0.001 |
| Lower | 3.6 | 24.0 | 27.1 | 22.6 | 13.9 | 14.5 | 12.8 | |
| Intermediate | 35.4 | 55.8 | 55.4 | 63.2 | 71.3 | 64.5 | 73.3 | |
| Higher | 60.1 | 12.0 | 12.1 | 9.0 | 12.0 | 15.8 | 10.5 | |
| Missing | 0.8 | 8.2 | 5.4 | 5.3 | 2.8 | 5.3 | 3.5 | |
| **Household arrangement** (%) | | | | | | | | p < 0.001 |
| Married | 42.8 | 93.3 | 83.8 | 12.0 | 15.7 | 10.5 | 34.9 | |
| Cohabiting | 47.7 | 2.4 | 6.3 | 32.3 | 29.6 | 31.6 | 38.4 | |
| No partner | 8.6 | 1.4 | 5.8 | 51.1 | 52.8 | 57.9 | 22.1 | |
| Missing | 0.8 | 2.9 | 4.2 | 4.5 | 1.9 | 0 | 4.7 | |
| **Parity** (%) | | | | | | | | p < 0.001 |
| 0 | 58.7 | 34.1 | 53.3 | 61.7 | 60.2 | 57.9 | 59.3 | |
| ≥1 | 41.1 | 65.9 | 46.7 | 36.8 | 38.9 | 40.8 | 40.7 | |
| Missing | 0.2 | 0 | 0 | 1.5 | 0.9 | 1.3 | 0 | |
| **Planned pregnancy** (%) | | | | | | | | p < 0.001 |
| Yes | 74.8 | 60.6 | 55.8 | 37.6 | 30.6 | 40.8 | 44.2 | |
| No | 21.4 | 32.2 | 37.9 | 52.6 | 62.0 | 55.3 | 52.3 | |
| Missing | 3.8 | 7.2 | 6.3 | 9.8 | 7.4 | 3.9 | 3.5 | |
| **Pregnancy concern** (mean-sd) | 2.1 (0.6) | 2.5 (0.7) | 2.6 (0.6) | 2.3 (0.7) | 2.3 (0.7) | 2.3 (0.7) | 2.5 (0.6) | p < 0.001 |
| **Folic acid use** (%) | | | | | | | | p < 0.001 |
| Before pregnancy | 44.4 | 13.0 | 14.2 | 18.0 | 21.3 | 9.2 | 15.1 | |
| When woman first knew about pregnancy | 37.3 | 16.3 | 24.2 | 24.1 | 21.3 | 42.1 | 39.5 | |
| Later in pregnancy | 3.2 | 3.4 | 3.3 | 3.8 | 11.1 | 9.2 | 5.8 | |
| Not | 13.3 | 63.5 | 52.5 | 49.6 | 43.5 | 36.8 | 38.4 | |
| Missing | 1.8 | 3.8 | 5.8 | 4.5 | 2.8 | 2.6 | 1.2 | |
| **Maternal smoking** (%) | | | | | | | | p < 0.001 |
| Never | 49.9 | 91.8 | 48.3 | 61.7 | 63.0 | 53.9 | 62.8 | |
| Stopped during pregnancy | 32.9 | 1.9 | 18.3 | 27.1 | 21.3 | 34.2 | 19.8 | |
| Continued during pregnancy | 15.9 | 4.3 | 32.9 | 10.5 | 13.9 | 10.5 | 16.3 | |
| Missing | 1.2 | 1.9 | 0.4 | 0.8 | 1.9 | 1.3 | 1.2 | |
| **Maternal alcohol use** (%) | | | | | | | | p < 0.001 |
| Never | 35.3 | 97.1 | 94.6 | 54.9 | 67.6 | 60.5 | 81.4 | |
| Stopped during pregnancy | 36.2 | 1.0 | 2.1 | 36.8 | 23.1 | 27.6 | 14.0 | |
| Continued in pregnancy | 27.2 | 0 | 1.7 | 6.8 | 7.4 | 9.2 | 3.5 | |
| Missing | 1.4 | 1.9 | 1.7 | 1.5 | 1.9 | 2.6 | 1.2 | |

Also the frequency of mothers who started taking folic acid once they knew they were pregnant was lower in non-Dutch mothers, except among both Surinamese groups. Moroccan women seldom smoke; the percentages for smoking cessation during pregnancy were highest in Dutch and Surinamese-Creole mothers. Turkish women most frequently smoke and less frequently quit smoking during pregnancy. In all non-Dutch groups, the percentage of women refraining from alcohol use was higher than among the Dutch mothers.

Table 2 displays the logistic regression models for investigating the degree to which ethnic differences in antenatal care could be explained by different types of variables. The unadjusted model showed large ethnic differences, which were more pronounced in Moroccan mothers, followed by the Dutch Antillean and the Surinamese-Creole. Surinamese-Hindustani did not differ from the Dutch reference group. Adjustment for perceived health at the beginning of the pregnancy (model 2) did not reduce ethnic differences. After adjustment for the enabling variables (model 3) the ethnic differences decreased but remained significant, except in the Turkish women. Adjustment for the classical predisposing variables reduced differences between all migrant groups and the Dutch (model 4), although these variables nevertheless remained significant. Adjustment for behavioral variables (model 5) also reduced ethnic differences: especially differences between Dutch, Turkish and Moroccan women became smaller, but remained significant. The degree of ethnic differences decreased after adjustment for all variables simultaneously (model 6, full model) especially in Turkish and Cape Verdean women, where the differences with Dutch women were no longer significant.

*Table 2. Late entry into antenatal care by ethnic background, as assessed by logistic regression analysis (odds ratios and 95% confidence intervals)*

| *Odds ratios and 95% confidence intervals* | **Moroccan** | **Turkish** | **Cape Verdean** | **Dutch Antillean** | **Surinamese-Creole** | **Surinamese-Hindustani** |
|---|---|---|---|---|---|---|
| Model 1: unadjusted | **4.16** (2.93-5.89) | **2.06** (1.41-3.01) | **2.76** (1.76-4.33) | **3.61** (2.28-5.70) | **3.45** (2.01-5.91) | 1.40 (0.74-2.64) |
| Model 2: adjusted for need: perceived health of mother | **4.36** (3.07-6.19) | **2.32** (1.60-3.36) | **2.82** (1.81-4.40) | **3.90** (2.48-6.14) | **3.61** (2.12-6.15) | 1.53 (0.82-2.84) |
| Model 3: adjusted for enabling variables: educational level, having a paid job | **2.61** (1.78-3.83) | 1.36 (0.91-2.02) | **1.82** (1.14-2.88) | **2.35** (1.45-3.79) | **2.45** (1.66-4.88) | 0.99 (0.52-1.87) |
| Model 4: adjusted for predisposing variables: age, parity, household arrangement, planned pregnancy, pregnancy concern | **3.36** (2.23-5.05) | **1.63** (1.05-2.54) | **2.06** (1.25-3.39) | **2.53** (1.53-4.20) | **2.40** (1.34-4.33) | 1.10 (0.57-2.13) |
| Model 5: adjusted for behavioural variables: intake folic acid, maternal smoking, alcohol use | **2.37** (1.56-3.61) | **1.27** (1.04-2.33) | **1.97** (1.22-3.15) | **2.65** (1.64-4.28) | **2.68** (1.54-4.68) | 1.08 (0.57-2.06) |
| Model 6: adjusted for predisposing, behavioural, enabling and need variables | **1.74** (1.07-2.85) | 0.95 (0.57-1.58) | 1.65 (0.96-2.82) | **1.80** (1.04-3.13) | **2.04** (1.10-3.78) | 0.75 (0.38-1.50) |

Table 3 shows the role of each independent predictor of model 6 on late entry, after adjustment for the other independent variables. Ethnic background was associated with late entry, independent of the other explanatory variables, except in Turkish, Cape Verdean and Surinamese-Hindustani women. Lack of a paid job was associated with late entry into antenatal care, as was a low or intermediate education (compared to a higher education). Late entry was not associated with perceived health of the mother, age, parity, marital status, nor degree of worry about the pregnancy. However, the behavioral factors were strongly associated with late entry. Odds ratios were significantly higher in women never using folic acid, as compared to those that already used it before getting pregnant. While women who started using folic acid later in pregnancy were more likely to receive late antenatal care, the chance was not significantly higher than the chance seen among women using folic acid before pregnancy. Women who stopped smoking during pregnancy were significantly less likely to receive late antenatal care than those who never smoked. The probability of late antenatal care among those who continued smoking during pregnancy did not differ from that seen among the never smokers. Very similar findings were observed for alcohol users: the women who stopped during pregnancy were the ones least likely to receive late antenatal care.

*Table 3. Association between independent variables and late entry into antenatal care, adjusted for the influence of the other independent variables, as assessed by logistic regression analysis (odds ratios and 95% confidence intervals)*

| *= reference group | **Odds ratio** | **95% C.I.** |
|---|---|---|
| **Ethnicity mother** | | |
| Dutch* | 1 | |
| Turkish | 0.95 | 0.57-1.58 |
| Moroccan | **1.74** | 1.07-2.87 |
| Surinamese-Hindustani | 0.75 | 0.38-1.50 |
| Surinamese-Creoles | **2.04** | 1.10-3.78 |
| Cape Verdean | 1.65 | 0.96-2.82 |
| Dutch Antillean | **1.80** | 1.04-3.13 |
| **Perceived health** | | |
| Excellent* | 1 | |
| Very good | 1.39 | 0.87 - 2.22 |
| Good | 0.91 | 0.58 - 1.44 |
| Moderate/poor | 1.28 | 0.70 - 2.31 |
| Missing | 0.86 | 0.36 – 2.04 |
| **Educational level** | | |
| Higher* | 1 | |
| Lower | **2.10** | 1.27-3.33 |
| Intermediate | **1.48** | 1.03-2.11 |
| Missing | 1.59 | 0.70-3.58 |
| **Having a paid job** | | |
| Yes* | 1 | |
| No | **1.65** | 1.18 - 2.32 |
| Missing | 1.31 | 0.94 - 1.84 |
| **Age** | 0.99 | 0.96 - 1.02 |
| **Parity** | | |
| Nulliparous* | 1 | |
| Multiparous | 1.18 | 0.89 - 1.58 |
| **Household arrangement** | | |
| Married* | 1 | |
| Cohabiting | 0.83 | 0.58 - 1.17 |
| No partner | 1.06 | 0.68 - 1.64 |
| Missing | 0.61 | 0.22 - 1.69 |
| **Planned pregnancy** | | |
| Yes* | 1 | |
| No | 1.27 | 0.94 - 1.70 |
| Missing | 0.58 | 0.26 - 1.30 |
| **Pregnancy concern** | 0.93 | 0.77 - 1.13 |
| **Folic acid use** | | |
| Before pregnancy* | 1 | |
| As soon as woman knew about their pregnancy | 1.04 | 0.72 - 1.51 |
| Later | 1.74 | 0.93 - 3.26 |
| No | **1.89** | 1.30 - 2.74 |
| Missing | 1.21 | 0.45 - 3.21 |
| **Smoking** | | |
| Never* | 1 | |
| Stopped | **0.67** | 0.48 - 0.94 |
| Continued | 0.94 | 0.65 - 1.35 |
| Missing | 0.08 | 0.01 - 1.31 |
| **Alcohol use** | | |
| Never* | 1 | |
| Stopped | **0.64** | 0.44 - 0.92 |
| Continued | 1.35 | 0.90 – 2.02 |
| Missing | 2.48 | 0.37 - 16.67 |

**Significant odds ratios (p<0.05) in bold**

## Discussion and conclusions

In this study, we found that the percentages of mothers entering antenatal care late was higher in non-Dutch than in Dutch mothers, with the exception of Surinamese-Hindustani. These percentages were especially high among Moroccan and Antillean mothers. As a consequence, mothers with a non-Dutch background are less likely to receive timely health educational advice or benefit from screening opportunities.

Additionally, we found that these ethnic differences diminished, but remained significant, in three of the six ethnic groups after taking into account many factors that can influence the entry into antenatal care. However, the differences between Turkish and Cape Verdean women versus the Dutch women could be fully explained by the explanatory variables included in the analysis. Differences in design notwithstanding, differences between Turkish and Dutch women also disappeared in the multivariate analysis in the study by Alderliesten.[9] The initially large difference between the Moroccan group and the Dutch group remained statistically significant in our study, but nevertheless diminished considerably. In this study we focused on the explanation of ethnic differences in the timing of entry into antenatal care, and not on ethnic differences in the number of contacts, because the latter did not occur in our study population.

A probable explanation for the difference between Dutch women and two non-Dutch groups (Moroccan and Turkish women) could be found in the behavioral factors. For example, women who adapt their behavior positively early in pregnancy – by abstaining from alcohol and tobacco use – entered antenatal care earlier than those already behaving healthy before the pregnancy. However, the observed differences between Dutch women and two non-Dutch groups (Turks and Moroccans) appeared to a large extent to exist because of the behavioral adaptation of the Dutch women. Neither Turkish nor Moroccan women usually drink alcohol, which is related to their religion, as most of them are Islamic. In addition, few Moroccan women smoke, unlike Turkish women, who were more likely to smoke than women in other groups, also during pregnancy. Furthermore, the causal sequence is questionable, as it could be the case that these women adapted their behavior after they were advised to do so by the midwives during early pregnancy. Unfortunately, we do not know whether the behavioral adaptation during pregnancy took place as a response to such advice. If it did, our hypothesis - that women who are not directed towards healthy behavior regarding pregnancy will also not be inclined to enter antenatal care early in pregnancy - cannot be confirmed. Further examination of this point is necessary.

Regarding folic acid use, women who never used it during pregnancy entered antenatal care late. A similar trend (not significant) was visible for those who used it late in pregnancy, compared to women who used it either before pregnancy or as soon as they knew that they were pregnant. These results suggest an underlying adverse behavioral pattern including both late entry and adverse health behavior. Because this seems to be at least partly the case, health education cannot be left only to the midwives. The continuation of smoking during pregnancy by Turkish mothers also points in that direction.

Although we expected that poorer perceived health would prompt early antenatal care use, our study

did not confirm this; nor did it explain differences in antenatal care entry between Dutch and non-Dutch women. Adjustment for more objective risk factors (e.g.: the presence of chronic conditions, such as diabetes, and complications in previous pregnancies) could only have been partly useful, because especially multiparae women then directly enter secondary care. However, future research should take into account more specific subjective health assessments directly related to pregnancy that could affect time of entry (e.g.: nausea and vomiting).

Enabling factors explained part of the differences between Dutch and non-Dutch women, but not the majority – except in Turkish women. We only included educational level and not other indicators of socio-economic position, such as occupational level and income level. We decided to focus on education because it reflects the more general concept of enabling factors better than other indicators. Indeed, educational level reflects not only financial resources, which are less relevant in a system without financial barriers, but also general health knowledge and health literacy. It should be mentioned that there is no consensus on whether having a paid job and educational level should be considered as either enabling or as predisposing factors. We decided to consider them as enabling factors, because they facilitate access to information. In this respect, we acknowledge one of the limitations of this study. Although ethnic minorities without a legal status are nevertheless formally entitled to antenatal care, in practice it is unlikely that many of them were included in the Generation R Study, because they would be afraid of recognition by official authorities.

The classical predisposing variables were not significantly associated with early/late entry into antenatal care. This is in contradiction with most previous studies. Nevertheless, in our study the associations between parity and time of entry, and between planned character of the pregnancy and time of entry, were as expected but without being significant. It is important to note that we assessed the influence of these factors after adjustment for all other explanatory variables, whereas most previous studies took into account fewer explanatory variables. Indeed, our inclusion of more explanatory variables than most previous studies represents an important strength of this study over previous studies. Nevertheless, we could not include a number of attitudinal characteristics, such as the degree to which women recognize the importance of early antenatal care. It might be possible that migrant women value antenatal care less than Dutch women. This might be the consequence of lack of familiarity with antenatal care in the country of origin, but also with lack of access to information due to problems with understanding the Dutch language. It could therefore be interesting to investigate differences in timing of entry between non-Dutch women born outside the Netherlands (first generation) and those born in the Netherlands (second generation).

An advantage of our study was the possibility to distinguish between Surinamese-Creole and Surinamese-Hindustani women, two distinctly different groups that have different origins, one with an African background, and the other with an Asian background. Our study found large differences in delay in antenatal care use between these two groups: Surinamese–Hindustani did not differ significantly from Dutch women, but Surinamese–Creoles did.

Our results should be interpreted with some caution because of some limitations in our study. Besides the ones already mentioned above, one should also acknowledge the following. First, we did not

include all midwife practices participating in the larger Generation R Study. We excluded three midwife practices, since they did not use electronic antenatal charts. There was no indication that the ethnic composition of these practices was different from the participating practices (analyses not shown). Secondly, we excluded mothers from the analysis whose ethnic background was unknown. We analyzed whether the timing of their entry into antenatal care was different from the women included in this study, and found that this was not the case (analyses not shown). Thirdly, we defined late antenatal care entry as entry after 14 weeks of pregnancy. This was based on the recommendations for basic antenatal care developed by the Dutch Society of Obstetrics and Gynecology (NVOG) at the time of the data collection. The recommendations by the NVOG are based more on professional agreement than on scientific evidence, and currently it is often advised to seek antenatal care earlier in pregnancy, and even before pregnancy.[38,39] Finally, it is likely that migrant groups with a higher socio-economic position were overrepresented in the Generation R Study, as enrolment of migrant women was more difficult due to language and cultural barriers. Since a higher socio-economic position is associated with earlier entry into antenatal care, it is probable that the ethnic differences found in this study represent an underestimation of true differences.



In conclusion, although we could explain part of the ethnic differences in the timing of entry into antenatal care, differences between Dutch women and women in some migrant groups remained statistically significant. One possible explanation might be that migrant women are not well informed about how obstetric care is organized in the Netherlands and that this lack of knowledge leads to delay in antenatal care entry. In particular, the role of midwives may be unknown, and women might prefer to consult their general practitioner early in pregnancy. However, at least in Rotterdam (where this study took place), a visit to the general practitioner is not likely to be the first step in antenatal care, since women are advised to consult a midwife first. We did not examine differences in generational status (first and second generation migrants) and language factors as indicators of cultural distance, as our main aim was to explain differences between non-Dutch and Dutch women. Generational status is not applicable for the Dutch group. As far as knowledge of Dutch among Dutch women was concerned, we assumed that their mastery of Dutch was optimal, and it was therefore not assessed in the questionnaire. Because we are unable to explain all of the differences between the native Dutch and a number of non-Dutch groups, it would be worth investigating whether mastery of Dutch language plays a role, also because health literacy is considered as an important barrier to adequate health care use.[40] In the Netherlands, some migrants are rather fluent in Dutch (Surinamese), while others are less so (especially Turks and Moroccans). Therefore, lack of good Dutch mastery cannot explain all of the remaining differences, especially not in Surinamese-Creole and Antillean women. Future research should assess differences within migrant groups by investigating differences by generational status and mastery of Dutch language.

The results of this study are also relevant for clinicians. Midwives need to inform women of the importance of timely booking for antenatal care especially when they booked late during a previous pregnancy. This is all the more important, given that a previous study demonstrated that the difference between Dutch and non-Dutch women in timely entry was greater among multiparae than among primiparae.[41]

**References**


1. Conrad JK, Hollenbach KA, Fullerton JT, Feigelson HS. Use of Prenatal Services by Hispanic Women in San Diego County: A Comparison of Urban and Rural Settings. Journal of Nurse-Midwifery, 1998 3/4;43(2):90-96.
2. Pagnini DL, Reichman NE. Psychosocial factors and the timing of prenatal care among women in New Jersey's HealthStart program. Family Planning Perspectives 2000;32(2):56-64.
3. Frisbie WP, Echevarria S, Hummer RA. Prenatal care utilization among non-Hispanic Whites, African Americans, and Mexican Americans. Matern Child Health J 2001;5(1):21-33.
4. Kupek E, Petrou S, Vause S, Maresh M. Clinical, provider and sociodemographic predictors of late initiation of antenatal care in England and Wales. BJOG 2002;109(3):265-273.
5. Rowe RE, Garcia J. Social class, ethnicity and attendance for antenatal care in the United Kingdom: a systematic review. J Public Health 2003;25(2):113-119.
6. Johnson AA, El-Khorazaty MN, Hatcher BJ, Wingrove BK, Milligan R, Harris C, et al. Determinants of late prenatal care initiation by African American women in Washington, DC. Matern Child Health J 2003;7(2):103-114.
7. Gavin NI, Adams EK, Hartmann KE, Benedict MB, Chireau M. Racial and ethnic disparities in the use of pregnancy-related health care among Medicaid pregnant women. Matern Child Health J 2004;8(3):113-126.
8. Trinh LT, Rubin G. Late entry to antenatal care in New South Wales, Australia. Reprod Health 2006;3:8.
9. Alderliesten ME, Vrijkotte TG, van der Wal MF, Bonsel GJ. Late start of antenatal care among ethnic minorities in a large cohort of pregnant women. BJOG 2007;114(10):1232-1239.
10. Park JH, Vincent D, Hastings-Tolsma M. Disparity in prenatal care among women of colour in the USA. Midwifery 2007;23(1):28-37.
11. Ny P, Dykes AK, Molin J, Dejin-Karlsson E. Utilisation of antenatal care by country of birth in a multi-ethnic population: a four-year community-based study in Malmö, Sweden. Acta Obstet Gynecol Scand 2007;86(7):805-813.
12. Rowe RE, Magee H, Quigley MA, Heron P, Askham J, Brocklehurst P. Social and ethnic differences in attendance for antenatal care in England. Public Health 2008 12;122(12):1363-1372.
13. Villar J, Bergsjo P. Scientific basis for the content of routine antenatal care. I. Philosophy, recent studies, and power to eliminate or alleviate adverse maternal outcomes. Acta Obstet Gynecol Scand 1997;76(1):1-14.
14. Foets M, Schuster J, Stronks K. Gezondheids(zorg)onderzoek onder allochtone bevolkingsgroepen. Een praktische introductie. 2007.
15. McCaw-Binns A, La Grenade J, Ashley D. Under-users of antenatal care: a comparison of non-attenders and late attenders for antenatal care, with early attenders. Soc Sci Med 1995;40(7):1003-1012.
16. Blondel B, Marshall B. Women with little or no prenatal care during pregnancy. Results of a study of twenty departments. J Gynecol Obstet Biol Reprod (Paris) 1996;25(7):729-736.
17. Melnikow J, Alemagno S. Adequacy of prenatal care among inner-city women. J Fam Pract 1993;37(6):575-582.

18. Delgado-Rodriguez M, Gómez-Olmedo M, Bueno-Cavanillas A, Gálvez-Vargas R. Unplanned pregnancy as a major determinant in inadequate use of prenatal care. Prev Med 1997;26(6):834-838.
19. Roberts RO, Yawn BP, Wickes SL, Field CS, Garretson M, Jacobsen SJ. Barriers to prenatal care: factors associated with late initiation of care in a middle-class midwestern community. J Fam Pract 1998;47(1):53-61.
20. Braveman P, Marchi K, Egerter S, Pearl M, Neuhaus J. Barriers to timely prenatal care among women with insurance: the importance of prepregnancy factors. Obstetrics & Gynecology 2000;95(6, Part 1):874.
21. Delvaux T, Buekens P, Godin I, Boutsen M. Barriers to prenatal care in Europe. Am J Prev Med 2001;21(1):52-59.
22. Chandler D. Late entry into prenatal care in a rural setting. J Midwifery Womens Health 2002;47(1):28-34.
23. Cano-Serral G, Rodriguez-Sanz M, Borrell C, Perez Mdel M, Salvador J. Socioeconomic inequalities in the provision and uptake of prenatal care. Gac Sanit 2006;20(1):25-30.
24. Blondel B, Marshall B. Poor antenatal care in 20 French districts: risk factors and pregnancy outcome. J Epidemiol Community Health 1998;52(8):501-506.
25. Nothnagle M, Marchi K, Egerter S, Braveman P. Risk factors for late or no prenatal care following Medicaid expansions in California. Matern Child Health J 2000;4(4):251-259.
26. D'Ascoli PT, Alexander GR, Petersen DJ, Kogan MD. Parental factors influencing patterns of prenatal care utilization. J Perinatol 1997;17(4):283-287.
27. Campbell JD, Mitchell P, Stanford JB, Ewigman BG. Validating a model developed to predict prenatal care utilization. J Fam Pract 1995;41(5):457-464.
28. Hulsey TM. Association between early prenatal care and mother's intention of and desire for the pregnancy. J Obstet Gynecol Neonatal Nurs 2001;30(3):275-282.
29. Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? J Health Soc Behav 1995;36(1):1-10.
30. LaVeist TA, Keith VM, Gutierrez ML. Black/white differences in prenatal care utilization: an assessment of predisposing and enabling factors. Health Serv Res 1995;30(1):43-58.
31. Anum EA, Retchin SM, Strauss III JF. Medicaid and preterm birth and low birth weight: The last two decades. Journal of Women's Health 2010;19(3):443-451.
32. Bais JMJ, Pel M. The basis of the Dutch obstetric system: risk selection. European Clinics in Obstetrics and Gynaecology 2006;2(4):209-212.
33. Hingstman L, Kenens RJ. Cijfers uit de registratie van verloskundigen: peiling 2007. 2007.
34. Jaddoe VW, Mackenbach JP, Moll HA, Steegers EAP, Tiemeier H, Verhulst FC, et al. The Generation R Study: design and cohort profile. Eur J Epidemiol 2006;21(6):475-484.
35. Jaddoe VW, van Duijn CM, van der Heijden AJ, Mackenbach JP, Moll HA, Steegers EA, et al. The Generation R Study: design and cohort update until the age of 4 years. Eur J Epidemiol 2008;23(12):801-811.
36. Aalders M. Classification of the population with a foreign background in the Netherlands. 2001:29-05-2007.

37. http://www.nvog-documenten.nl/uploaded/docs/basis%20prenatale%20zorg/Tabel%203.pdf.
38. Korenbrot CC, Steinberg A, Bender C, Newberry S. Preconception care: a systematic review. Matern Child Health J 2002;6(2):75-88.
39. de Weerd S, Steegers EAP. The past and present practices and continuing controversies of preconception care. Community Genet 2002;5(1):50-60.
40. Chin MH, Alexander-Young M, Burnet DL. Health care quality-improvement approaches to reducing child health disparities. Pediatrics 2009;124(Supplement):S224.
41. Chote AA, de Groot CJ, Bruijnzeels MA, Redekop K, Jaddoe VW, Hofman A, et al. Ethnic differences in antenatal care use in a large multi-ethnic urban population in the Netherlands. Midwifery 2011;27(1):36-41.

# Chapter 4

## Differences in late antenatal care between first and second generation migrants

## Abstract

*Objectives*

The purpose of our study thus was to investigate whether first generation migrants enter later in antenatal care than second generation migrants, and if so, how these differences could be explained.

*Methods*

Data were obtained from the Generation R Study. The Generation R Study is a multi-ethnic population-based prospective cohort study conducted in the city of Rotterdam. In this study, we included the largest ethnic groups in Rotterdam: Moroccan, Turkish, Cape Verdean, Dutch Antillean, Surinamese-Hindustanis and Surinamese-Creoles from. This resulted in a study population of 845 women.

The main outcome measure was late entry into antenatal care (gestational age at first visit after 14 weeks) and was derived from the electronic antenatal charts of the participating midwives. Explanatory variables were derived from written questionnaires at antenatal booking of the pregnancy. Besides descriptive analyses, logistic regression analyses have been carried out to investigate whether difference could be explained by need, predisposing and enabling factors.

*Results*

Compared to the second generation, the percentages entering antenatal care after 14 weeks of pregnancy were higher in the first generation pregnant women (28.1% versus 18.7%). Women who were not likely to adopt healthy behaviour regarding pregnancy – such as timely taking folic acid – were also not inclined to enter antenatal care early in pregnancy.

*Conclusions*

Because of these results, first generation pregnant women are less likely to receive timely health educational advice or to benefit from screening opportunities than second generation pregnant women. This seems to be going hand in hand with a more general active attitude towards healthy behaviour, as appears from an earlier start of folic acid use by second generation women.

The delay in seeking antenatal care in first generation women could not been explained by language mastery in our study. Future research should both investigate the role of language and the role of broader health literacy factors.

## Introduction

In Western countries, previous studies point to a late intake into antenatal care and/or fewer visits by migrant groups.[1-6] Scientific debate exists about the optimal number of visits, the necessity of timely entrance is unquestioned, as it offers the opportunity for early health educational advices and detection and treatment of adverse pregnancy outcomes. Also in the Netherlands, ethnic differences have been found in timely entrance in antenatal care.[2,6] These differences could be explained only partially by taking into account other factors known to have an independent effect on antenatal care use such as maternal age and parity.[6]

In the Netherlands approximately 20% of the population has a foreign background. In the larger cities like Amsterdam and Rotterdam even half of the population consists of first and second generation migrants. The largest groups are Turks, Moroccans, Surinamese and Dutch Antillean. Turks and Moroccans came to the Netherlands as labour migrants since the sixties and early seventies of the previous century. Surinam is a former colony that gained independence in 1975. During the period of decolonisation most people from Surinam migrated to the Netherlands. The Dutch Antilles are still part of the Dutch Kingdom. For Dutch Antillean employment and educational facilities were important reasons to migrate to the Netherlands.[7] Finally, especially Rotterdam attracted migration from the Cape Verdean islands since the sixties of the previous century. Rotterdam nowadays is the second largest Cape Verdean community in Europe, after Lisbon.

The Netherlands is characterised by a unique organisation of obstetric care, in which pregnancy and childbirth are considered in principle as normal physiological phenomena. Low-risk women receive antenatal care by midwives and sometimes by general practitioners. Only women with medical problems or a complicated obstetric history are referred to hospital-based obstetric care.[8] Migrant women are often unfamiliar with this distinctive system. In Western Europe, they expect to find highly specialised antenatal and obstetric care to be offered by medical specialists in hospitals, rather than by midwives, often working outside the hospitals. The latter is not considered as an improvement compared to their countries of origin.[9] In any case, migrants in the Netherlands are not acquainted with the specific Dutch system. This might explain the delay in antenatal care entry of migrant women in the Netherlands.

Most studies investigating ethnic differences in timely attendance for antenatal care compare native and non-native women. Therefore, the role of generational status has seldom been assessed, as generational status is a characteristic not applicable within the native population. It can be expected that first generation migrants are less acquainted with the Dutch health care organisation as well as with the benefits of early antenatal care, simply because of their relatively shorter stay in the Netherlands, and also because of less proficiency in Dutch, which is the language of the host country. Studies in other health care sectors provide evidence that language barriers may affect access to health care services.[10,11] In the Netherlands, proficiency in Dutch is better among migrants from the (former) colonies (Dutch Antilles, Suriname) than from other

countries of origins (Turkey, Morocco and the Cape Verdean islands).[12]
In the present study, we hypothesise that first generation women enter antenatal care later than second generation women. The purpose of our study thus was to investigate whether first generation migrants enter later in antenatal care than second generation migrants, and if so, how these differences could be explained. In order to explain differences between first and second generation pregnant women, our study was guided by the conceptual framework of Andersen[13], in which health care use is a function of three groups of determinants: need, enabling and predisposing factors. Enabling factors reflect possible barriers to the use of antenatal care. Financial barriers do not play a role in the Netherlands, as antenatal care is included in health insurance for everybody. Also, midwifery density is high in the Netherlands, so geographical access is not an issue.[14] However, health literacy is considered as an important barrier to health care use.[15] Educational level, position on the labour market and mastery of Dutch language may be important means to health literacy, because they facilitate access to information. It can be expected that both educational level and the level of proficiency in Dutch are lower among first generation migrants.
Predisposing factors of the Andersen model reflect the propensity to use services. Besides classical predisposing variables such as age[16,17] and parity[17,18], we also determined whether ethnic differences in timely entry were associated with life style characteristics indicating an inclination towards healthy behaviour such as abstaining from the use of tobacco and alcohol, and the use of folic acid, which all may be partly culturally shaped.



## Methods

*Study population*
Data for this study were obtained from the Generation R Study. The Generation R Study is a multi-ethnic population-based prospective cohort study to investigate growth, development and health of urban children from foetal life until young adulthood, conducted in Rotterdam, the second largest city in the Netherlands. The Generation R Study has been described in detail elsewhere.[19,20] The study was approved by the Medical Ethics Committee of the Erasmus Medical Centre, Rotterdam. Eligible women received written and oral information of the study and were asked for written informed consent.
Data for the present analysis were obtained from seven midwife practices, including 23 midwives, participating in the Generation R Study. In this study, pregnant women entering antenatal care at a midwife practice with an expected date of delivery in 2002-2004 were included. Non-Dutch status of the participating pregnant woman was assessed on the basis of the countries of birth of the expecting mother and of her parents, according to current practice of Statistics Netherlands.[21] When at least one of the parents was born outside the Netherlands, the expecting mother was classified as non-Dutch. Further, when country of birth of the pregnant women was not the Netherlands, she was considered as first generation and her ethnic background was determined

by her own country of birth. When country of birth of the pregnant woman was the Netherlands, she was considered as second generation and her ethnic background was determined by country of birth of her mother, unless this was also the Netherlands: in that case ethnic background was established by country of birth of her father.
We excluded pregnant women when information on her or her parents' country of birth was missing. In addition, women only receiving postnatal care were excluded, as well as women referred to these practices by other health care providers. In these cases it was not possible to establish their entry into antenatal care and their gestational age at first visit.
In this study, we included the largest ethnic groups in Rotterdam: Moroccan, Turkish, Cape Verdean, Dutch Antillean and Surinamese. Surinamese women consist mainly of Hindustanis originating from India, and Creoles from Africa. Because they have a different cultural background, we further classified them as Surinamese-Hindustani and Surinamese-Creole, by asking the pregnant woman for her ethnic origin. This resulted in a study population of 845 women.

*Measurements*
The outcome variable was delay in intake (yes/no), which was derived from the electronic antenatal charts (Micronatal®) of the participating midwives in which the midwives register their patient data. Delay of entry has been defined as a first visit after 14 weeks of pregnancy. This criterion is based on the recommendations of the Dutch Society of Obstetrics and Gynaecology (www.nvog.nl, 1-1-2006). Explanatory variables were derived from written questionnaires at antenatal booking of the pregnancy. As a need factor, we included a single-item question regarding self-perceived health during early pregnancy, consisting of five possible answers (excellent, very good, good, moderate, poor). As enabling variables we included educational level, labour market position and proficiency in Dutch speaking. Educational level consisted of the highest completed education, which was later reclassified into three categories: primary school, secondary school and higher education. Labour market position was determined by having a paid job (yes/no). Proficiency in Dutch language was measured by asking proficiency in Dutch speaking (good/not good). Predisposing variables included age, marital status (married, cohabiting, no partner), parity (nulliparous/multiparous), and planned pregnancy (yes/no). We also included a scale indicating confidence in the pregnancy. This scale was based on a set of 13 items about the confidence and worries of the women regarding their pregnancy. Each item was answered on a 5 point Likert scale ranging from almost never to almost always. The distribution of four items was highly skewed and therefore these four items were excluded. A principal component analysis was conducted on the remaining 9 items and showed only one clear factor consisting of four items reflecting the confidence in a favourable course of the pregnancy and in the personal ability of the pregnant woman to adequately deal with the pregnancy (Cronbach's alpha, 0.65). This variable ranged from little (1) to a lot of concern (4). Finally, also healthy behaviours regarding pregnancy were included as predisposing factors. We included information on the use of folic acid (before pregnancy, as soon as pregnancy was known, later, or never), smoking (never smoked, stopped smoking when

pregnancy was known, still smoking during pregnancy) and alcohol use (never drinking, stopped drinking when pregnancy was known, still drinking during pregnancy).

*Analysis*

Descriptive analyses were performed presenting the outcome variable according to generational status and ethnic background. In addition, descriptive analyses of the independent variables according to generational status were performed. Differences in independent variables between first and second generation migrants were compared using Chi-square statistic in case of categorical variables and analysis of variance (ANOVA) in case of continuous variables.

Logistic regression analyses were performed to examine to what extent differences between first and second generation migrant women in late entry into antenatal care could be explained by need, enabling and predisposing factors. We first calculated unadjusted odds ratios and then adjusted separately for need, enabling and predisposing factors. Regarding the predisposing variables, we divided this group of variables into two categories; those referring to health protective behaviour and the classical predisposing variables. This distinction has been made because the variables reflecting health protective behaviour have seldom been included in previous research. Finally, a full model was applied, adjusting simultaneously the four groups of explanatory variables.

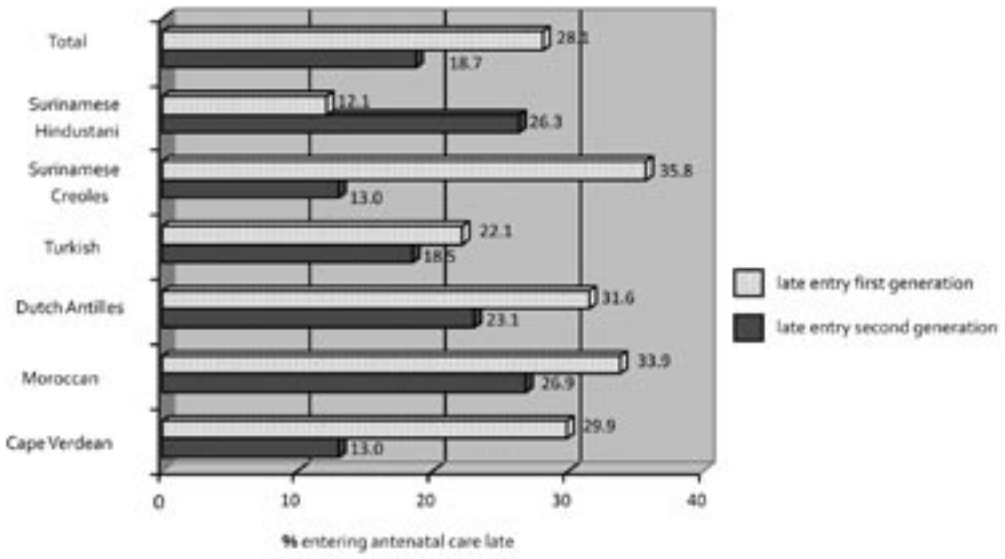
Further, we used logistic regression analysis to assess the association between each independent variable and late antenatal care use, corrected for the role of the other variables.

We used separate categories for the missing data on the categorical explanatory variables. The statistical analyses were performed using SPSS version 15.0 for Windows (SPSS Inc. Chicago, Illinois, USA).

## Results

In figure 1 the percentages of pregnant women entering into antenatal care are displayed according to generational status for the total study population and for each ethnic group. Compared to the second generation, the percentages entering antenatal care after 14 weeks of pregnancy were higher in the first generation pregnant women, except among Surinamese-Hindustani.

*Figure 1. Late antenatal care according to generational status and ethnic background*




The p-values of the differences in percentages between first and second generation within the groups are:
Cape Verdean p=0.03 (significant), Moroccan p=0.5, Dutch Antillean p=0.5, Turkish p=0.5, Surinamese-Creoles p=0.04 (significant), Surinamese-Hindustani p=0.13 and in the total group p=0.006 (significant).

Among all ethnic groups, the first generation was larger than the second generation (see upper part of table 1). The lower part of table 1 shows the characteristics of the other independent variables according to generational status.

*Table 1. Explanatory variables according to generational status*

| **N** | **First generation N = 626** | **Second generation N = 219** | |
|---|---|---|---|
| Cape Verdean (n=133) | 65.4 | 34.6 | |
| Moroccan (n=206) | 87.4 | 23.6 | |
| Dutch Antillean (n=108) | 88.0 | 12.0 | |
| Turkish (n=237) | 61.2 | 38.8 | |
| Surinamese-Creole (n=76) | 69.7 | 30.3 | |
| Surinamese-Hindustani (n=85) | 77.6 | 22.4 | |
| Total (n =845) | 74.0 | 26.0 | |
| **Independent variables** | | | P-value |
| **Age in years** (mean-sd) | 27.5 (5.0) | 23.9 (4.0) | p < 0.001 |
| **Perceived health status** (%) | | | p=0.76 |
| Excellent | 7.5 | 6.4 | |
| Very good | 18.5 | 20.5 | |
| Good | 55.8 | 58.0 | |
| Moderate | 12.6 | 9.6 | |
| Poor | 0.5 | 0.9 | |
| Missing | 5.1 | 4.6 | |
| **Paid job** (%) | | | p < 0.04 |
| Yes | 26.2 | 34.7 | |
| No | 35.5 | 34.2 | |
| Missing | 38.3 | 31.1 | |
| **Educational level** (%) | | | p < 0.001 |
| Lower | 24.3 | 12.3 | |
| Intermediate | 55.9 | 77.2 | |
| Higher | 12.5 | 10.0 | |
| Missing | 7.3 | 0.5 | |
| **Dutch speaking** (%) | | | p < 0.001 |
| Good | 61.7 | 95.9 | |
| Not good | 35.0 | 3.2 | |
| Missing | 3.4 | 0.9 | |
| **Marital status** (%) | | | p =0.019 |
| Married | 56.9 | 47.9 | |
| Cohabiting | 18.1 | 17.4 | |
| No partner | 21.6 | 32.0 | |
| Missing | 3.5 | 2.7 | |
| Parity (%) | | | p < 0.001 |
| 0 | 45.4 | 71.9 | |
| ≥1 | 54.6 | 28.1 | |
| Missing | 0 | 0 | |
| **Planned pregnancy** (%) | | | |
| Yes | 49.0 | 46.1 | P=0.41 |
| No | 43.8 | 48.4 | |
| Missing | 7.2 | 5.5 | |
| **Pregnancy concern** (mean-sd) | 2.5 (0.7) | 2.4 (0.7) | p = 0.314 |
| **Folic acid use** (%) | | | p < 0.001 |
| Before pregnancy | 14.9 | 15.1 | |
| When woman first knew about pregnancy | 20.8 | 37.9 | |
| Later in pregnancy | 4.5 | 7.3 | |
| No | 55.8 | 37.0 | |
| Missing | 4.2 | 2.7 | |
| **Maternal smoking** (% ) | | | p < 0.001 |
| Never | 72.2 | 44.3 | |
| Stopped during pregnancy | 14.1 | 27.4 | |
| Continued during pregnancy | 12.3 | 27.9 | |
| Missing | 1.4 | 0.5 | |
| **Maternal alcohol use** (%) | | | |
| Never | 81.6 | 79.5 | p=0.22 |
| Stopped during pregnancy | 12.3 | 16.9 | |
| Continued in pregnancy | 4.2 | 2.3 | |
| Missing | 1.9 | 1.4 | |

The mean maternal age of women in the first generation was higher than among the second generation. No differences were found regarding perceived health status. First generation women more often had no paid job, more frequently were less educated, more often were married and more often multiparous than the second generation women. Mastery of Dutch language was better among the second generation, where only app. 3.2% admitted to have problems with speaking Dutch. No differences were found regarding planned pregnancy and pregnancy concerns.
Compared to the second generation, significantly more women in the first generation did not take folic acid at all. Conversely, compared to the second generation, less first generation women started taking folic acid once they knew they were pregnant. Among the first generation more women were never smokers. Quitting smoking during pregnancy occurred more often among the second generation. Regarding the use of alcohol no differences were found between first and second generation women.

*Table 2. Late entry in antenatal care in first generation migrants, as assessed by logistic regression analysis (odds ratios and 95% confidence intervals). (Second generation is reference group)*

| Odds ratios (ORs) and 95% confidence Intervals | first generation |
|---|---|
| Model 1: unadjusted | **1.70** (1.16-2.49) |
| Model 2: adjusted for need: perceived health of pregnant woman | **1.71** (1.17-2.51) |
| Model 3: adjusted for enabling variables: educational level, having a paid job, Dutch proficiency | **1.58** (1.05-2.37) |
| Model 4: adjusted for predisposing variables: age, parity, marital status, planned pregnancy, pregnancy concern | **1.66** (1.09-2.52) |
| Model 5: adjusted for behavioural variables: intake folic acid, maternal smoking, alcohol use | 1.39 (0.93-2.09) |
| Model 6: adjusted for predisposing, behavioural, enabling and need variables | 1.29 (0.83-2.05) |

**Significant ORs (p<0.05) in bold**

Table 2 displays the logistic regression models to investigate to what extent differences between first and second generation migrant women in late entry into antenatal care could be explained by need, enabling and predisposing factors. The unadjusted model shows that first generation women were significantly more likely to enter antenatal care late. This difference remained after perceived health at the beginning of the pregnancy was entered into the model (model 2). Adjustment for enabling variables (model 3) did reduce this difference somewhat, however not significantly. Adjustment for the classical predisposing variables did not reduce differences between first and second generation in late entry (model 4), but adjusting for behavioural variables (model 5) significantly reduced generational differences. The degree of generational

differences in late entry also decreased after adjustment for all variables simultaneously (model 6, full model), and the differences were no longer significant.

Finally we assessed the association of each independent variable with late antenatal care entry, adjusted for the role of all other variables (not in table). Not having a paid job was associated with late entry (OR: 1.63; 95% CI: 1.02-.60). Women not using folic acid were more likely to enter antenatal care late than those already using folic acid before pregnancy (OR: 1.76; 95% CI: 1.03-3.03). A similar but not significant trend was found for women starting folic acid use late (OR: 1.77; 95% CI: 0.75-4.16). Women starting folic acid as soon as they knew they were pregnant did not differ from those already using folic acid before pregnancy. All other variables were not significantly associated with late antenatal care use.

## Discussion

In this study, we found that first generation pregnant women entered later in antenatal care than second generation pregnant women (28.1% versus 18.7%). As a consequence, first generation pregnant women are less likely to receive timely health educational advice or to benefit from screening opportunities than second generation pregnant women.



To our knowledge, this is the first study assessing differences in timely entry into antenatal care between first and second generation migrant women, so comparison with previous studies is not possible. Among Dutch women included in the Generation R Study 10.6% enters antenatal care late[22]; therefore we can conclude that second generation migrants take an intermediate position regarding timely entry into antenatal care: they are doing better than first generation women, but worse than their Dutch counterparts.

One exception to this general conclusion has to be mentioned: among second generation Surinamese-Hindustani the percentage entering antenatal care late was higher among the first generation. However, this might be coincidence, as the number of second generation Hindustani women was small (see table 1).

Additionally, in this study the difference in late entry between the first and second generation could be explained by the independent variables included in the analysis. Especially, the behavioural variables seemed to be important, as our analysis showed that they explained most of the differences in late entry between the first and second generation pregnant women. Our results suggest that women who are not likely to adopt healthy behaviour regarding pregnancy are also not inclined to enter antenatal care early in pregnancy. Especially not taking folic acid, or taking it only late in pregnancy was clearly associated with late entry. Lower use of folic acid before or during pregnancy among migrants has been reported previously by Timmermans et al.[23] and by van Eijsden et al.[24] In the latter study actual use of folic acid was strongly associated with knowledge of periconceptional use of folic acid in all migrant groups. Knowledge on folic acid use in turn was less prevalent in migrants with a mother tongue other than Dutch as compared to Dutch pregnant women.

Furthermore, the causal sequence is questionable; as it could be that women started to take folic acid after they were advised to do so by the midwives during early pregnancy. Unfortunately, we have no information whether this could have been the case. If so, our hypothesis - that women who are not inclined towards healthy behaviour regarding pregnancy will also not be inclined to enter antenatal care early in pregnancy - cannot be confirmed. Further research on this point is necessary.

Quitting smoking had not an independent effect on antenatal care entry, although in our study large differences existed between first and second generation women: among the second generation the number of never smokers was significantly lower. Possibly we could not find a relation because of a power problem: the second generation is small in our sample and obviously the numbers of those quitting or continuing smoking in pregnancy are even smaller. As most migrants – whether first or second generation – do not use alcohol, this variable did not contribute to the difference in late entry. This limited use of alcohol is in part related to the religion of some of the migrant groups: most Turkish and Moroccan are Islamic. Compared to the Dutch women, also among other migrant groups the percentages of women drinking alcohol is lower.[22]

Poorer perceived health did not contribute to the explanation of the difference in late entry between first and second generation women, which also was not surprising, as no significant difference in perceived health was found between both groups (see table 1). Future research could take into account more specific subjective health assessments directly related to pregnancy that could affect time of entry (e.g. nausea and vomiting).

In our study, the classical predisposing variables also did not explain differences between first and second generation women in late entry. This could partly be expected, as only differences were found regarding age, marital status and parity between first and second generation women. Also, these classical predisposing variables (age, parity, marital status, pregnancy concern and whether or not the pregnancy was planned) were not significantly associated with entry into antenatal care. This seems to be in contradiction with most previous studies. However, the role of predisposing factors has been assessed merely among native women. Also, it should be noticed that we assessed the influence of these factors after adjustment for all other explanatory variables, whereas most previous studies took into account fewer explanatory variables.

Notwithstanding large differences in enabling variables (educational level, proficiency in Dutch speaking) between first and second generation migrants, somewhat surprisingly they did not contribute to the explanation of the difference in timing of entry into antenatal care between the first and the second generation. The relationship between proficiency in the local language and antenatal care use has seldom been assessed, especially not in Europe. In a study by Alderliesten et al.[2] poor mastery of the language of the host country was a factor that contributed to the explanation of the later entry into antenatal care of some migrant groups as compared to the native group.

However, the results are difficult to compare because of several reasons: difference in aim of the study, several differences in the study population (Dutch and migrant pregnant women, other migrant groups, only first generation migrants, limitation to women entering after 9 completed weeks of pregnancy), difference in the way language proficiency was assessed and finally difference in the statistical procedures. A recent review from the U.S. revealed that women reported language as a barrier to the use of antenatal care[25], but this review was restricted to perceptions by women, and did not include studies investigating the actual relationship between language mastery and antenatal care entry. Our survey did not include information on the knowledge women have on the importance of early entry into antenatal care, but they might have obtained this information from sources in their mother tongue. Indeed, increasingly written information is available in other languages advising on the importance of early entry into antenatal care. Also they may rely on information from their informal networks, e.g. family members with a better proficiency in Dutch. Possibly the role of language mastery is mitigated by the use of such interpreters. Also more in general the relation between language skills and health care use remains unclear.[26,27]

Some limitations of our study should be acknowledged. First, it is likely that some response bias exists to the disadvantage of very poorly educated and illiterate women, although the survey was available in the language of the participating pregnant women. This may have masked the role of educational background, which did not contribute to differences in antenatal care use in our study population, although its role was in the direction that could be expected: increased risk on late use as educational level decreases. Response bias may also have masked the role of language mastery. Second, our assessment of Dutch language proficiency by self-reports may have suffered from a tendency to positive answers, and thus not accurately describes actual ability to speak Dutch. Again, this may have masked the role of language proficiency in our analysis. Third, we did not include all midwife practices participating in the larger Generation R Study. We excluded three midwife practices, since they did not use electronic antenatal charts. There was no indication that the ethnic composition of these practices was different from the participating practices (analyses not shown). Also, we excluded pregnant women from the analysis whose ethnic background was unknown. We analyzed whether the timing of their entry into antenatal care was different from the women included in this study, and found that this was not the case (analyses not shown). Next, we defined late antenatal care entry as entry after 14 weeks of pregnancy. This was based on the recommendations for basic antenatal care developed by the Dutch Society of Obstetrics and Gynaecology (NVOG) at the time of the data collection. The recommendations by the NVOG are rather based on professional agreement than on scientific evidence, and currently it is often advised to seek antenatal care earlier in pregnancy, and even before pregnancy.[28]

Finally, we were not able to assess a possible differential role of our explanatory variables within the distinct ethnic groups in our study, as for that purpose our study population was too small.

In conclusion, we found that second generation women enter antenatal care earlier than first generation women, but still later than Dutch women. This seems to be going hand in hand with a more general active attitude towards healthy behaviour, as appears from an earlier start of folic

acid use by second generation women. However, most migrants in the Netherlands still belong to the first generation, as also was the case in the population included in this study. To a large degree this is the consequence of family formation: many migrants still marry with partners born in their country of origin. The delay in seeking antenatal care in this group could not been explained by language mastery. Future research should both investigate the role of language and the role of broader health literacy factors.

**References**


1. Kupek E, Petrou S, Vause S, Maresh M. Clinical, provider and sociodemographic predictors of late initiation of antenatal care in England and Wales. BJOG 2002;109(3):265-273.
2. Alderliesten ME, Vrijkotte TG, van der Wal MF, Bonsel GJ. Late start of antenatal care among ethnic minorities in a large cohort of pregnant women. BJOG 2007;114(10):1232-1239.
3. Park JH, Vincent D, Hastings-Tolsma M. Disparity in prenatal care among women of colour in the USA. Midwifery 2007;23(1):28-37.
4. Ny P, Dykes AK, Molin J, Dejin-Karlsson E. Utilisation of antenatal care by country of birth in a multi-ethnic population: a four-year community-based study in Malmö, Sweden. Acta Obstet Gynecol Scand 2007;86(7):805-813.
5. Rowe RE, Magee H, Quigley MA, Heron P, Askham J, Brocklehurst P. Social and ethnic differences in attendance for antenatal care in England. Public Health 2008 12;122(12):1363-1372.
6. Choté AA, de Groot CJ, Bruijnzeels MA, Redekop K, Jaddoe VW, Hofman A, et al. Ethnic differences in antenatal care use in a large multi-ethnic urban population in the Netherlands. Midwifery 2011;27(1):36-41.
7. Foets M, Schuster J, Stronks K. Gezondheids(zorg)onderzoek onder allochtone bevolkingsgroepen. Een praktische introductie. 2007.
8. Bais JMJ, Pel M. The basis of the Dutch obstetric system: risk selection. European Clinics in Obstetrics and Gynaecology 2006;2(4):209-212.
9. AbouZahr C, Wardlaw T. Antenatal care in developing countries: promises, achievements and missed opportunities-an analysis of trends, levels and differentials, 1990-2001: World Health Organization; 2003.
10. Timmins CL. The impact of language barriers on the health care of Latinos in the United States: a review of the literature and guidelines for practice. The Journal of Midwifery & Women's Health 2002;47(2):80-96.
11. Jacobs E, Chen AH, Karliner LS, Agger-Gupta N, Mutha S. The need for more research on language barriers in health care: a proposed research agenda. Milbank Q 2006;84(1):111-133.
12. Gijsberts M DJ. Jaarrapport integratie 2009. The Hague: The Netherlands Institute for Social Research / SCP; 2009.
13. Andersen RM. National health surveys and the behavioral model of health services use. Med Care 2008;46(7):647-653.
14. Wiegers TA, van der Velden LFJ, Hingstman L. Behoefteraming verloskundigen 2004-2015. NIVEL, Utrecht 2005.
15. Nutbeam D. The evolving concept of health literacy. Soc Sci Med 2008;67(12):2072-2078.
16. Pagnini DL, Reichman NE. Psychosocial factors and the timing of prenatal care among women in New Jersey's HealthStart program. Family Planning Perspectives 2000;32(2):56-64.
17. Trinh LT, Rubin G. Late entry to antenatal care in New South Wales, Australia. Reprod Health 2006;18;3:8.

18. Nothnagle M, Marchi K, Egerter S, Braveman P. Risk factors for late or no prenatal care following Medicaid expansions in California. Matern Child Health J 2000;4(4):251-259.
19. Jaddoe VW, Mackenbach JP, Moll HA, Steegers EAP, Tiemeier H, Verhulst FC, et al. The Generation R Study: design and cohort profile. Eur J Epidemiol 2006;21(6):475-484.
20. Jaddoe VW, van Duijn CM, van der Heijden AJ, Mackenbach JP, Moll HA, Steegers EA, et al. The Generation R Study: design and cohort update until the age of 4 years. Eur J Epidemiol 2008;23(12):801-811.
21. Stronks K, Kulu-Glasgow I, Agyemang C. The utility of 'country of birth'for the classification of ethnic groups in health research: the Dutch experience. Ethn Health 2009;14(3):255-269.
22. Choté AA, Koopmans GT, Redekop WK, de Groot CJ, Hoefman RJ, Jaddoe VW, et al. Explaining Ethnic Differences in Late Antenatal Care Entry by Predisposing, Enabling and Need Factors in the Netherlands. The Generation R Study. Matern Child Health J 2010.
23. Timmermans S, Jaddoe VW, Mackenbach JP, Hofman A, Steegers-Theunissen RP, Steegers EA. Determinants of folic acid use in early pregnancy in a multi-ethnic urban population in The Netherlands: The Generation R study. Prev Med 2008.
24. van Eijsden M, van der Wal MF, Bonsel GJ. Folic acid knowledge and use in a multi-ethnic pregnancy cohort: the role of language proficiency. BJOG 2006;113(12):1446-1451.
25. Phillippi JC. Women's perceptions of access to prenatal care in the United States: a literature review. J Midwifery Womens Health 2009;54(3):219-225.
26. Smith GD, Chaturvedi N, Harding S, Nazroo J, Williams R. Ethnic inequalities in health: a review of UK epidemiological evidence. Critical Public Health 2000;10(4):375-408.
27. Scheppers E, van Dongen E, Dekker J, Geertzen J, Dekker J. Potential barriers to the use of health services among ethnic minorities: a review. Fam Pract 2006;23(3):325-348.
28. Berghella V, Buchanan E, Pereira L, Baxter JK. Preconception care. Obstet Gynecol Surv 2010;65(2):119.

# Chapter 5

## Compliance to guidelines for antenatal care in low-risk pregnant women

## Abstract

*Objectives*

Traditionally, adverse pregnancy outcomes are considered as indicators for the quality of maternal and antenatal care. The risk of adverse pregnancy outcomes is increased among migrant groups. This raises the question whether there are differences between different migrant groups in quality of antenatal care provided. Objective of this study was to determine whether ethnic differences exist in the adherence to the national guideline of the Society of Obstetrics and Gynaecology regarding basic obstetric antenatal care by Dutch midwives.

*Methods*

Observational study consisting of data derived from the electronic antenatal charts from seven midwife practices, including 23 midwives, participating in the Generation R Study. This is a multi-ethnic population-based prospective cohort study that investigates growth, development and health of urban children from fetal life until young adulthood, conducted in Rotterdam, the Netherlands.

Antenatal charts of 2093 low-risk pregnant women with an expected date of delivery in 2002-2004, were used to determine mean quality of antenatal care scores indicating adherence to the guideline, regarding 10 tests and examinations for seven ethnic groups .

*Results*

Few ethnic differences were found in the obstetric-technical quality of antenatal care. This finding applied more in nulli- than in multiparae women. In the latter, ethnic differences were not always in favour of the native pregnant women. Regarding most tests, midwives adhered well to the guideline. For all women, irrespective of ethnic background, haemoglobin was less good determined, and this was especially the case in Moroccan, Surinamese-Creole and Dutch-Antillean multiparae.

*Conclusions*

The explanation of ethnic differences, which are often found in adverse obstetric outcomes, has to be sought in other quality of care aspects, e.g. in ethnic differences in timely referral to secondary care, and/or in differences in the providing of and adherence to health educational advices.

## Introduction

The risk of adverse pregnancy outcomes is increased among ethnic minority women as compared to the native population. Evidence is largely confined to the United States.[1-3] Although available evidence from European countries is less consistent,[4,5] in the Netherlands ethnic differences have been found in perinatal[6,7] and maternal mortality.[8] Since the 1960s, perinatal mortality has decreased significantly in Europe, but this trend has been less pronounced in the Netherlands. Several explanations have been suggested. Besides differences in definition, making comparisons between countries difficult, other explanations suggested are the increasing age of the mothers and the increase of the number of multiple pregnancies.[9]

Adverse pregnancy outcomes are traditionally considered as indicators for the quality of antenatal and maternity care.[10] This raises the question whether there are ethnic differences in the quality of the antenatal care provided. Studies into antenatal care have focused primarily on use, while quality of care itself has received less attention.[11,12] Existing studies usually assess quality by means of satisfaction reports by pregnant women.[13,14] A few studies have assessed obstetric-technical aspects of care, based on reports by women.[11,15,16] However, women may not always be aware of the technical procedures carried out. Therefore assessment, of compliance with guidelines based on registration data is preferable but rarely carried out.

In the Netherlands, community midwifery has a central role in antenatal care.[17] Pregnancy is considered in principle as a normal physiological process. Community midwives are fully qualified to provide all care to women without risk factors in their medical or obstetric history. If risks or complications develop they refer women to an obstetrician at any moment during pregnancy, labour or after birth.

The aim of this study was to investigate whether ethnic differences exist in the quality of antenatal care provided to women that start antenatal care at midwifery practices, making use of registration data. Quality was defined as the degree in which Dutch midwives adhere to the guideline for basic antenatal care of the Dutch Society of Obstetrics and Gynaecology (NVOG), regarding objective data including physical examinations and laboratory tests.

## Methods

*Study population*

Data were obtained from the Generation R study, a multi-ethnic population-based prospective cohort study to investigate growth, development and health of urban children from fetal life until young adulthood, conducted in Rotterdam.[18] Data were derived from the electronic antenatal charts from seven midwife practices, including 23 midwives. Included were 3402 women with an expected date of delivery in 2002-2004. The Generation R Study was approved by the Medical Ethics Committee of the Erasmus Medical Centre, Rotterdam. Eligible women were asked for their written informed consent. Of these 3402 women, 308 were excluded, who received only postnatal care (n= 39), or were referred

to the participating midwife practices by another health care provider (n=269), as in these cases it was not possible to establish quality of antenatal care. Subsequently, 447 women were excluded because no information on ethnic background was available and 2 more because information on gestational age or date of first visit could not be retrieved. If a woman had more than one pregnancy during the research period, only the first pregnancy was included.Corresponding with Statistics Netherlands, women were classified as non-Dutch when at least one of their parents was born outside the Netherlands.[19] We furthermore divided the Surinamese group into Hindustani and Creole, as they differ racially and culturally. Surinamese-Hindustani are of Asian descent whereas Surinamese-Creole are of African descent. This distinction was based on a question in the questionnaires women filled out. We included the seven largest ethnic groups: Native Dutch, Moroccan, Turkish, Cape Verdean, Dutch Antillean, Surinamese-Hindustani and Surinamese-Creole. We excluded 552 women belonging to other ethnic groups, as too many different groups were involved, with too small numbers of women available for study. This resulted in a total study population of 2093 women.

*Quality assessment*

In order to evaluate the quality of antenatal care, we assessed whether midwives adhered to the guideline of the Dutch Society for Obstetricians and Gynaecologists (NVOG) for basic antenatal care (www.nvog.nl, 1-1-2006). Figure 1 shows the quality scoring system according to the guideline as used in this study. In line with the NVOG, we distinguished between nulli- and multiparae (columns 4 and 5). These columns describe the necessary examinations and tests to be carried out at a given gestational age. As all women participating in Generation R received fetal ultrasound examination at first visit to establish gestational age,[18] it was not necessary to evaluate this element of the guideline. According to the guideline, first contact should take place in the first trimester of the pregnancy, i.e. before 15 weeks gestation (see columns 1 and 2 of the scheme). Since antenatal contacts do not take place exactly at the gestational age as described by the guideline (column 2 in figure 1), we adapted the time-line in order to establish a scoring system with consecutive weeks of gestation (see column 3). The guideline does not provide instructions for women with a gestational age over 40 weeks. We included an extra contact at weeks 41-42, since midwives are expected to supervise an antenatal control for these women before delivery and refer by 42 weeks (post date). This contact includes the same items as the contact at week 40. Midwives are supposed to register these activities and test results in electronic antenatal charts (Micronatal®).

The following example clarifies the method of calculation used. A nulliparae woman, who gave birth at 40 weeks pregnancy, had 5 contacts (instead of the 7 contacts as scheduled). She had no contact in the period between 15 and 20 weeks, and no contact between week 28 and week 30. In the schedule one can see that blood pressure had to be assessed between weeks 28 and 30, but not between weeks 15 and 20. Thus, the total number of contacts in which blood pressure had to be and could be assessed was 5 out of 6 (denominator). The midwife in fact assessed blood pressure 4 times; in trimester 1, in weeks 22-26, in weeks 39-40 and in weeks 36-37, but not in weeks 33-34, although the woman visited the midwife in this period. The nominator thus is 4. The score equals 4 divided by 5, thus 0.8.

*Figure 1. Assessment of quality scores according to NVOG guidelines*

| 1[a] Contact number multi / nulliparae | 2 Weeks of pregnancy accordingto NVOG | 3 Weeks added as acceptable | 4 Multiparae (items) | 5 Nulliparae (items) | 6 Scoring multiparae | 7 Scoring nulliparae |
|---|---|---|---|---|---|---|
| **Visit 1 / 1** | First trimester | | Length and weight | | 1 | 1 |
| | | | Blood pressure (BP) | | 1 | 1 |
| | | | ABO Blood group and Rhesus D (RhD) | | 1 | 1 |
| | | | Screening for irregular erythrocyte antibodies (IEA) | | 1 | 1 |
| | | | Screening for HbsAg | | 1 | 1 |
| | | | Screening for anaemia (Hb) | | 1 | 1 |
| | | | Screening for syphilis | | 1 | 1 |
| **Visit 2 / 2** | 15 – 20 weeks | | Fundus height | | 1 | 1 |
| | | | Fetal heart rate (FHR) | | 1 | 1 |
| **Visit 3 / 3** | 26 – 27 weeks | + weeks 21–25 | Blood pressure (BP) | | 1 | 1 |
| | | | Fundus height | | 1 | 1 |
| | | | Fetal heart rate (FHR) | | 1 | 1 |
| **Visit 4 / 4** | 28 – 30 weeks | | Blood pressure (BP) | | 1 | 1 |
| | | | Fundus height | | 1 | 1 |
| | | | Fetal heart rate (FHR) | | 1 | 1 |
| | | | Screening for anaemia (Hb) | | 1 | 1 |
| **Visit – / 5** | 33 – 34 weeks | + weeks 31–32 | | Blood pressure (BP) | | 1 |
| | | | | Fundus height | | 1 |
| | | | | Fetal heart rate (FHR) | | 1 |
| **Visit 5 / 6** | 36 – 37 weeks | + week 35 | Blood pressure (BP) | | 1 | 1 |
| | | | Fundus height | | 1 | 1 |
| | | | Fetal heart rate (FHR) | | 1 | 1 |
| | | | Fetal presentation and engagement | | 1 | 1 |
| **Visit – / 7** | 39 – 40 weeks | + week 38 | | Blood pressure (BP) | | 1 |
| | | | | Fundus height | | 1 |
| | | | | Fetal heart rate (FHR) | | 1 |
| | | | | Fetal presentation and engagement | | 1 |
| **Visit 6 / 8** | 41 / 42 weeks | | Blood pressure (BP) | | 1 | 1 |
| | | | Fundus height | | 1 | 1 |
| | | | Fetal heart rate (FHR) | | 1 | 1 |
| | | | Fetal presentation and engagement | | 1 | 1 |

[a] The first figures in this row refers to multiparae, the second to nulliparae; a – refers to the situation in which no visit is scheduled for the multiparae.

*Analysis*

One point was assigned for each of the examinations/tests, accomplished at the specific antenatal contact in the weeks of pregnancy according to the NVOG guideline. We assigned the same value to each examination/test, since there is little evidence for unequal importance of the examinations/tests included. To calculate a total score for each examination or test, the number of accomplished examinations or tests was first added up for each woman. Taking blood pressure as an example, the maximum possible score for blood pressure was 7 for nulliparae and 5 for multiparae. This maximum was limited by the maximum number of contacts for which blood pressure measurement was scheduled by the guideline. Thus, even when blood pressure was measured at visit 2 between 15 and 20 weeks of pregnancy, this measurement did not receive a value of one point. This total score, consisting of the frequency with which an examination or test was carried out, was the nominator.

Subsequently, this total score has been adjusted for the actual number of contacts the woman had with the midwife, as women can give birth earlier, can be referred at any moment during pregnancy, or cannot show up at an appointment. Therefore, the denominator consisted of the actual number of contacts the woman had with the midwife, again limited to those in which the examination or test were scheduled. The division of the nominator by the denominator resulted in the quality score for a given examination or test, and this score can range from 0 to 1.

Measurement of body length and weight should be assessed once, in the first trimester, according to the guideline (see figure 1). As not all women saw a midwife in the first trimester, quality scores were first established for women attending in time. However, we also established whether these measurements had been carried out at all, irrespective of whether they were done in the first trimester, as in case of a higher BMI it nevertheless is important to assess the risk.Screening for irregular erythrocyte antibodies (IEA), HbsAg and syphilis, also has to be done in the first contact. Unfortunately, data regarding the time when these laboratory tests were carried out are not registered in Micronatal®. Therefore, it was only possible to assess whether or not these tests were carried out.

Quality scores of the non-Dutch groups were compared with those of the Dutch. Whether differences in means were significant was assessed by means of t-tests. The significance level was set at 0.05. Statistical analyses were performed using SPSS version 15.0. (SPSS Inc. Chicago, Illinois, USA).

*Table 1. Quality scores for nulliparae*

| | BP | Hb | IEA | HbsAg | Syphilis | Fundus height | FHR | Fetal presentation |
|---|---|---|---|---|---|---|---|---|
| **Dutch (n=735)** | 0.99 | 0.80 | 0.95 | 0.96 | 0.96 | 0.99 | 0.99 | 0.82 |
| **Cape Verdean (n=82)** | 0.99 | 0.70 | 0.94 | 0.94 | 0.94 | 0.99 | 0.99 | 0.79 |
| **Moroccan (n=73)** | 0.99 | **0.60**** (p=0.002) | 0.96 | 0.96 | 0.96 | 0.99 | 0.99 | **0.90**** (p=0.027) |
| **Dutch Antillean (n=67)** | 0.98 | **0.56**** (p=0.001) | 0.96 | 0.96 | 0.96 | 0.98 | 0.98 | 0.81 |
| **Turkish (n=129)** | 0.99 | 0.77 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.86 |
| **Surinamese-Creole (n=45)** | 0.99 | **0.62*** (p=0.02) | 0.98 | 0.98 | 0.98 | 0.97 | 0.97 | 0.76 |
| **Surinamese-Hindustani (n=53)** | 1.00 | 0.78 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | **0.66*** (p=0.022) |

| | Length & weight | Blood group & rhesus |
|---|---|---|
| <u>In first trimester</u> | | |
| **Dutch (n=658)** | 0.99 | 0.98 |
| **Cape Verdean (n=64)** | 0.97 | 0.94 |
| **Moroccan (n=54)** | 0.93 | 0.96 |
| **Dutch Antillean (n=46)** | 0.93 | 0.93 |
| **Turkish (n=108)** | 0.93 | 0.99 |
| **Surinamese-Creole (n=36)** | 0.97 | 1.00 |
| **Surinamese-Hindustani (n=47)** | 0.96 | 0.98 |
| <u>At all</u> | | |
| **Dutch (n=735)** | 0.99 | 0.97 |
| **Cape Verdean (n=82)** | 0.95 | 0.94 |
| **Moroccan (n=73)** | 0.92 | 0.97 |
| **Dutch Antillean (n=67)** | 0.91 | 0.95 |
| **Turkish (n=129)** | 0.95 | 0.98 |
| **Surinamese-Creole (n=45)** | 0.98 | 1.00 |
| **Surinamese-Hindustani (n=53)** | 0.96 | 0.96 |

**Figures, which significantly differ from the Dutch population, are printed in bold**
***0.01 < p < 0.05**
**** 0.001 < p < 0.01**
***** p < 0.001**

*Table 2. Quality scores for multiparae*

| | BP | Hb | IEA | HbsAg | Syphilis | Fundus height | FHR | Fetal presentation |
|---|---|---|---|---|---|---|---|---|
| **Dutch (n=507)** | 0.98 | 0.72 | 0.94 | 0.95 | 0.94 | 0.97 | 0.79 | 0.90 |
| **Cape Verdean (n=51)** | 0.96 | 0.65 | 0.96 | 0.96 | 0.96 | 0.98 | 0.80 | 0.84 |
| **Moroccan (n=135)** | 0.98 | 0.67 | **0.98*** (p=0.017) | 0.97 | **0.98*** (p=0.037) | 0.98 | **0.76*** (p=0.038) | 0.90 |
| **Dutch Antillean (n=41)** | 0.91 | 0.72 | 0.93 | 0.93 | 0.93 | **0.88*** (p=0.045) | **0.73*** (p=0.044) | 0.77 |
| **Turkish (n=111)** | 0.99 | 0.64 | 0.95 | 0.96 | 0.96 | 0.95 | **0.72***** (p<0.000) | 0.91 |
| **Surinamese-Creole (n=31)** | **1.00***** (p<0.000) | 0.71 | 0.88 | 0.88 | 0.88 | 0.95 | 0.74 | 0.74 |
| **Surinamese-Hindustani (n=33)** | 0.99 | 0.70 | **1.00***** (p<0.001) | **1.00***** (p<0.001) | **1.00***** (p<0.001) | 0.99 | 0.80 | 0.85 |

| | Length & weight | Blood group & rhesus |
|---|---|---|
| <u>In first trimester</u> | | |
| **Dutch (n=452)** | 0.96 | 0.93 |
| **Cape Verdean (n=37)** | 0.92 | 0.89 |
| **Moroccan (n=85)** | 0.92 | 0.89 |
| **Dutch Antillean (n=29)** | 0.90 | 0.93 |
| **Turkish (n=82)** | **0.89*** (p=0.047) | 0.88 |
| **Surinamese-Creole (n=18)** | 0.89 | **1.00***** (p<0.001) |
| **Surinamese-Hindustani (n=26)** | 0.96 | 0.92 |
| <u>At all</u> | | |
| **Dutch (n=507)** | 0.98 | 0.93 |
| **Cape Verdean (n=51)** | 0.98 | 0.88 |
| **Moroccan (n=135)** | 0.93 | 0.90 |
| **Dutch Antillean (n=41)** | 0.95 | 0.95 |
| **Turkish (n=111)** | **0.90*** (p=0.011) | 0.88 |
| **Surinamese-Creole (n=31)** | 0.90 | 0.97 |
| **Surinamese-Hindustani (n=33)** | 0.94 | 0.91 |

**Figures, which significantly differ from the Dutch population, are printed in bold**
***0.01 < p < 0.05**
**** 0.001 < p < 0.01**
***** p < 0.001**

## Results

The quality scores for nulliparae and multiparae women are presented in tables 1 and 2. Little or no differences were found in quality of antenatal care between the different ethnic groups (tables 1 and 2). This applies more in case of nulliparae than in case of multiparae women. Among the latter, ethnic differences were not always in favour of the native Dutch women: 7 out of 13 significant differences were in favour of the non-Dutch groups. Furthermore, in general, quality scores were high, indicating that midwives adhered well to the guideline.
Quality scores for testing haemoglobin were less good and especially unfavourable in Moroccan (0.60), Surinamese-Creole (0.62) and Dutch-Antillean (0.56) nulliparae. In multiparae no ethnic differences were found. The midwives did not describe the fetal presentation in all cases. The nulliparae Surinamese-Hindustani women had the lowest score, whereas the Moroccan nulliparae had an even better score than the Dutch women. Among the multiparae no ethic differences were found. Finally, in multiparae fetal heart rates were not always assessed when scheduled. Measurement of body length and weight should be assessed once, in the first trimester, according to the guideline (see figure 1). As not all women saw a midwife in the first trimester, quality scores were first established for women attending in time. However, we also established whether these measurements had been carried out at all, irrespective of whether they were done in the first trimester, as in case of a higher BMI it nevertheless is important to assess the risk.

## Discussion

Few differences in quality of antenatal care between different ethnic groups were found in a Dutch prospective cohort study consisting of low risk women. Regarding most tests, midwives adhered well to the clinical guideline irrespective of ethnic background, and when ethnic differences were present these were not systematically less favourable for non Dutch pregnant women.
To our knowledge, this is the first European study that assessed adherence to antenatal care guidelines, based on registration data (patient charts) rather than on self-reports. Also, quality scores were only determined by the actual care given by the midwives, and not confounded by whether or not women actually attended the visits as scheduled. Therefore, the quality data were adjusted for attending at the appropriate gestational age by the women. The only comparable study was carried out in Brasil and although it was based on self-reports by the pregnant women, they equally concluded that by adjusting for prenatal care use, differences in quality indicators disappeared.[16] From previous analyses few ethnic differences appeared in the number of antenatal care visits. However, non-Dutch women enter antenatal care later than Dutch pregnant women.[20] Because of the latter, it remains possible that women from non-Dutch origin received less quality of care.One should keep in mind that midwives participating in our study may not be fully representative for the total population of Dutch midwives. They may have been working in a more systematic way than on average; indeed, all midwives in our study used an electronic

system. Therefore, we may not exclude that overall ethnic differences are larger than appeared from this study.

The maximum scores in our study were limited by the maximum number of contacts for which a given test or examination was scheduled by the guideline. One could argue that carrying out more tests and examinations might reflect better quality of care. We decided not to attribute higher scores in these cases, as our point of departure was adherence to the guidelines of the NVOG. Moreover, the data did not allow concluding whether extra tests or examinations were carried out because there was an indication to do so.

As midwives supervise the antenatal care for women with low-risk pregnancies in the Netherlands, it would have been preferable to use a guideline by the Dutch Society of Midwives (KNOV). Unfortunately, no such guideline was available at the time of the study. Recently a KNOV standard has been published.[21] Although it contains a scheme for the timing of the visits, it does not contain guidelines which tests and examinations should be carried out, neither when. However, the KNOV had previously published a separate guideline on anaemia.[22] Following this guideline, haemoglobin has to be assessed twice: at the first visit, and around the 30$^{th}$ week of pregnancy, which is comparable to the NVOG guideline. Notwithstanding these guidelines by the NVOG and the KNOV, the quality scores regarding the assessment of the haemoglobin levels were less optimal than most other quality indicators. A number of the tests scheduled by the NVOG guideline are often conducted at the same time in the first trimester, and midwives indicate on a laboratory form a standard item 'pregnancy tests', including besides haemoglobin, also blood group & rhesus, IEA, HbsAg and syphilis. However, only haemoglobin has to be tested twice during pregnancy, so it might be that midwives do test haemoglobin in the first trimester of pregnancy, but not a second time around the 30$^{th}$ week, as at that moment no other laboratory tests are required (see Figure 1). A separate analysis (not shown) of the registration of haemoglobin around the 30$^{th}$ week indeed shows less tests registered.

It also might be that midwives do the test themselves and register less adequate. In a study carried out by Wildschut et al.[23] all participating midwives reported to always conduct haemoglobin tests an average of three times during pregnancy. A more recent study on the effect of the anaemia guideline on Dutch midwives revealed that 88% reported to adhere to the guideline regarding haemoglobin, and that 74% agreed with the guideline.[24] However, these studies may have suffered from bias that results in socially desirable answers.

In this study, quality was assessed by measuring adherence to the NVOG guideline basic antenatal care. It should be acknowledged that most antenatal care guidelines are only partly evidence based, but reflect to some degree professional agreement.[25] Many guidelines include more examinations and tests than the ones required in the Netherlands.[26]

Although it is an important advantage of this study that data are not based on self-reports but on registration data, this also implies some possible limitations. First, we included only those examinations and tests, which have to be carried out unconditionally. Subsequent therapy or referral required on the basis of previous test results have not been included, since this information

is not adequately registered in Micronatal®. At the same time, no obvious reasons are present why midwives would less adequately follow the guideline in this respect. Second, this study included only differences in examinations and tests, whereas an important part of antenatal care concerns health education and advice, e.g. regarding tobacco and alcohol use, medication use, folic acid use and regarding life style in general. Moreover, pregnant women should receive information from the midwives regarding regular tests and extra possibilities, e.g. screening for Down's syndrome. All these issues are not registered in Micronatal®, and therefore not evaluated in this study. Finally, Dutch midwives have to decide from the beginning of and throughout the pregnancy whether risks for adverse pregnancy outcomes are present. Of course a good assessment is also essential for good quality of care. Because this assessment depends on a wide array of factors, it was not possible to establish this aspect of good quality on the basis of the data available in Micronatal®. A final limitation of this study is that it only focused on the quality of antenatal care from a professional point of view, whereas assessment of the quality by the pregnant women might reveal a different picture. However, satisfaction is also an important quality aspect, as it may affect adherence to life style advices.

In conclusion, we were unable to find large ethnic differences in the obstetric technical quality of antenatal care provided by Dutch midwives to low-risk pregnant women. This result suggests that the explanation of ethnic differences in adverse obstetric outcomes should be sought elsewhere. Ethnic differences have been found in timely entry of antenatal care[23], and in case of late entry, women can only be offered part of the antenatal care as scheduled. Also, there might be ethnic differences in quality aspects not investigated in this study, e.g. in differences in adherence to health education or in timely referral to secondary care.

**References**


1. Anachebe NF. Racial and ethnic disparities in infant and maternal mortality. Ethn Dis 2006 Spring;16(2 Suppl 3):S3-71-6.
2. Gennaro S. Overview of current state of research on pregnancy outcomes in minority populations. Obstet Gynecol 2005;192(5):S3-S10.
3. IOM (Institute of Medicine). Preterm birth: causes, consequences and prevention. Brief Report. 2006.
4. Harding S, Rosato M, Cruickshank J. Lack of change in birthweights of infants by generational status among Indian, Pakistani, Bangladeshi, Black Caribbean, and Black African mothers in a British cohort study. Int J Epidemiol 2004;33(6):1279-1285.
5. Zeitlin J, Bucourt M, Rivera L, Topuz B, Papiernik E. Preterm birth and maternal country of birth in a French district with a multiethnic population. BJOG 2004;111(8):849-855.
6. Schulpen TW, van Steenbergen JE, van Driel HF. Influences of ethnicity on perinatal and child mortality in the Netherlands. Arch Dis Child 2001;84(3):222-226.
7. Schulpen TWJ, van Wieringen JCM, van Brummen PJ, van Riel JM, Beemer FA, Westers P, et al. Infant mortality, ethnicity, and genetically determined disorders in The Netherlands. Eur J Public Health 2006;16(3):290-293.
8. Schutte JM, Steegers EA, Schuitemaker NW, Santema JG, de Boer K, Pel M, et al. Rise in maternal mortality in the Netherlands. BJOG 2010;117(4):399-406.
9. Mohangoo AD, Buitendijk SE, Hukkelhoven C, Ravelli ACJ, Rijninks-van Driel GC, Tamminga P, et al. Hoge perinatale sterfte in Nederland vergeleken met andere Europese landen: de Peristat-II studie. Ned Tijdschr Geneeskd 2008;152:2718-2727.
10. Wildman K, Bouvier-Colle MH. Maternal mortality as an indicator of obstetric care in Europe. BJOG 2004;111(2):164-169.
11. Kogan MD, Alexander GR, Kotelchuck M, Nagey DA. Relation of the content of prenatal care to the risk of low birth weight. JAMA 1994;271(17):1340.
12. Moos MK. Prenatal care: Limitations and opportunities. Journal of Obstetric, Gynecologic, & Neonatal Nursing 2006;35(2):278-285.
13. Dowswell T, Renfrew MJ, Gregson B, Hewison J. A review of the literature on women's views on their maternity care in the community in the UK. Midwifery 2001;17(3):194-202.
14. van Teijlingen ER, Hundley V, Rennie AM, Graham W, Fitzmaurice A. Maternity satisfaction studies and their limitations: "What is, must still be best". Birth 2003;30(2):75-82.
15. Barber SL, Bertozzi SM, Gertler PJ. Variations in prenatal care quality for the rural poor in Mexico. Health Aff 2007.
16. Victora CG, Matijasevich A, Silveira MF, Santos IS, Barros AJD, Barros FC. Socio-economic and ethnic group inequities in antenatal care quality in the public and private sector in Brazil. Health Policy Plan 2010;25(4):253.

17. Bais JMJ, Pel M. The basis of the Dutch obstetric system: risk selection. European Clinics in Obstetrics and Gynaecology 2006;2(4):209-212.
18. Jaddoe VW, van Duijn CM, van der Heijden AJ, Mackenbach JP, Moll HA, Steegers EA, et al. The Generation R Study: design and cohort update until the age of 4 years. Eur J Epidemiol 2008;23(12):801-811.
19. CBS [Statistics Netherlands]. Standaarddefinitie allochtonen. Voorburg: Centraal Bureau voor de Statistiek 2000.
20. Choté AA, de Groot CJ, Bruijnzeels MA, Redekop K, Jaddoe VW, Hofman A, et al. Ethnic differences in antenatal care use in a large multi-ethnic urban population in the Netherlands. Midwifery 2011;27(1):36-41.
21. KNOV. KNOV-standaard verloskundige begeleiding. 2008.
22. Amelink-Verburg MP, Daemers DOA, Rijnders MEB. Anemie in de eerstelijns verloskundige praktijk. KNOV Standaard. Bilthoven: KNOV 2000.
23. Wildschut HIJ, Hoope-Bender PT, Borkent-Polet M, Traas H, Van Agt HME, De Kroon MLA, et al. Practice variation of test procedures reportedly used in routine antenatal care in The Netherlands. Acta Obstet Gynecol Scand 1999;78(1):27-32.
24. Offerhaus P, Fleuren M, Wensing M. Guidelines on anaemia: effect on primary-care midwives in The Netherlands. Midwifery 2005;21(3):204-211.
25. Gregory KD, Johnson CT, Johnson TRB, Entman SS. The content of prenatal care: Update 2005. Womens Health Issues 2006 8;16(4):198-215.
26. Haertsch M, Campbell E, Sanson-Fisher R. What is recommended for healthy women during pregnancy? A comparison of seven prenatal clinical practice guideline documents. Birth 1999;26(1):24-30.

# Chapter 6

## Ethnic disparities in maternal and neonatal pregnancy outcomes

## Abstract

*Objectives*
The objective of this study was to investigate ethnic disparities in pregnancy outcomes in women that started antenatal care in community midwifery.

*Methods*
Data were obtained from seven midwife practices participating in the Generation R Study conducted in the city of Rotterdam. Data of 2093 pregnant women with a Dutch, Moroccan, Turkish, Cape Verdean, Antillean, Surinamese Creole and Surinamese Hindustani background were obtained from midwifery and hospital registries and from written questionnaires. Main outcome measures were gestational hypertension, preeclampsia, gestational age at birth and birth weight.
Linear and logistic regression analyses were used to assess the association of ethnic background and pregnancy outcomes, taking into account socio-demographic and obstetric factors, life style factors and eventually late entry in antenatal care.

*Results*
Regarding gestational hypertension migrant women were not disadvantaged; Moroccan and Turkish women even had a decreased risk. Regarding preeclampsia no significant differences were found, although the prevalence was clearly elevated among Turkish and even more among Surinamese-Hindustani. As compared to Dutch women, Moroccan women had a significantly higher gestational age at birth. Turkish and Antillean women did not differ from the native Dutch. Cape Verdean and Surinamese women had a significantly lower gestational age at birth (unadjusted). Differences were reduced mostly by taking into account differences in socio-demographic characteristics and parity. Regarding birth weight, all migrant groups were disadvantaged, although only after adjusting for all explanatory variables in the Moroccan group. Again, differences became smaller but remained significant when taking into account socio-demographic characteristics and parity, except in Turkish newborns where life style factors contributed most to a reduction in difference with native Dutch newborns. Early antenatal care did not contribute to a reduction of ethnic differences in gestational age at birth or birth weight.

*Conclusions*
Despite their increased risk, we did not find higher levels of preeclampsia in Cape Verdean, Antillean and Surinamese Creole women. In the total population of the Generation R Study – including high risk women that received antenatal care by gynaecologists- preeclampsia was more prevalent among Cape Verdean, Antillean and Surinamese Creole women. This indicates that the selection at the beginning of the pregnancies in this respect functions fairly as intended. Cape Verdean and Surinamese women had a significantly lower gestational age at birth and all groups – except

Moroccan women – had lower birth weights (unadjusted). Differences were reduced mostly by taking into account differences in socio-demographic characteristics and parity. In Turkish newborns life style factors contributed most to the difference in birth weight. The lack of contribution of antenatal care to differences in birth weight adds to the previous doubts in the United States.

## Introduction

In several European countries increased maternal and perinatal mortality have been observed among immigrants.[1-6] Higher *maternal mortality* rates have also been observed in non-Dutch women[7] especially among those with a Surinamese or Antillean background, but also among Turkish and Moroccan women.[8] In the Netherlands, the most frequent cause of maternal mortality is preeclampsia.[7] Preeclampsia is associated worldwide with maternal mortality.[9] Eclampsia was more frequent among some groups of immigrant women: Surinamese, Dutch Antillean and especially Sub-Saharan women, but not among Moroccan and Turkish women.[10] Compared to the native Dutch population, also higher rates of *perinatal mortality* have been described in all migrant groups. Perinatal mortality is most elevated among Black children.[11-13] An important risk factor for perinatal mortality is low birth weight[14], and although survival among very low birth weight infants has increased, they are nevertheless at increased risk for subsequent health and psychosocial problems. Low birth weight can be caused by preterm delivery and/or intrauterine growth restriction. The increased perinatal mortality rates in Blacks and also in Hindustani in the Netherlands could be explained by higher rates of preterm birth.[11,12] Also, the prevalence of preterm birth was higher among Surinamese, Ghanaian and Antillean women, as compared to the native Dutch, but not among Turkish and Moroccan women.[15]

Early and comprehensive antenatal care is supposed to be the cornerstone of improving maternal and perinatal outcomes and eventually to reduce ethnic differences.[16] It is expected to reduce adverse pregnancy outcomes by the early and continuous identification of risks, by treating medical conditions in time and enhancing health behaviour through education.[9,17]

However, empirical evidence on the beneficial effects of antenatal care on maternal and neonatal outcomes is difficult to obtain. In a systematic review of randomised controlled trials the provision of a lower *number* of antenatal visits and a standard antenatal-visits programme did not result in a clinically differential effect on most outcome measures.[18] The beneficial effect of *timely* entry in antenatal care cannot be assessed by randomised controlled trials. Moreover, most experimental and observational studies in developed countries have been conducted in the United States where access to antenatal care is not yet universal and where the level of use is in general lower than in European countries. Observational studies conducted in the United States, started to question the evidence for the benefits of antenatal care especially with respect to the prevention of low birth weight.[14,19,20]

Evidence on the beneficial effects of early antenatal care is largely confined to child outcomes, especially birth weight, whereas maternal outcomes are seldom investigated. In a German study, late entry into antenatal care was associated with increased low birth weight rates.[21] In a French study, preterm delivery rates were higher among poor attenders, which included women that entered antenatal care late.[22]

In the Netherlands, antenatal care is based on risk selection and guided by the Obstetric Indication List (VIL) that specifies when women are required to obtain antenatal care by a medical specialist.

Community midwives have a central role in antenatal care as they provide antenatal care for women without an increased risk for abnormal pregnancy outcomes or a complicated medical- or obstetric history. Only those with medical problems or a problematic obstetric history are referred to hospital based obstetric care by a gynaecologist.[23] Since a long time, the Netherlands is under the spell of its place in the European rank order of perinatal mortality. In 2008, the results of PERISITAT-II appeared and showed that the Netherlands had the highest perinatal mortality after France and Letland.[24] This led to doubts about the Dutch obstetrical organisation, and often the care provided by community midwives is subject of suspicion.

In this study, we examined whether migrant background of the mother was associated with pregnancy outcomes including hypertensive pregnancy complications, gestational age at birth and birth weight, in a population of pregnant women that received at least part of antenatal care at a midwife practice, taking into account socio-demographic and life-style characteristics. Regarding gestational age at birth and birth weight, we also assessed the role of ethnic differences in late antenatal care entry.

## Methods

*Design and study population*

This study is embedded in the Generation R Study. The Generation R Study is a multi-ethnic population-based prospective cohort study to investigate growth, development and health of urban children from foetal life until young adulthood, conducted in Rotterdam and it has been described previously in detail.[25] The Medical Ethics Committee of the Erasmus Medical Centre approved the Generation R Study. Eligible women received written and oral information of the study and were asked for their written informed consent.

For this study, data were derived from the electronic antenatal charts of the participating midwives, hospital registries, and from written questionnaires. Seven midwife practices participating in the Generation R Study took part in this study, including 23 midwives. Women with an expected date of delivery in 2002-2004 and who started antenatal care by a midwife were included (N=3402). This implies that the study group consists of nulliparae without known pre-existing medical risk factors and of multiparae without complications in previous pregnancies and without other known risk factors. This connotes that we included women that received at least part of their antenatal care by a midwife. From these, 308 were excluded, who received only (post-) natal care (n=39) or who were referred to the participating midwife practices by another health care provider (n=269); as in these cases it was not possible to establish their entry into antenatal care and their gestational age at first visit. Subsequently, 447 women were excluded because no information on ethnic background was available and two more women were excluded because information on gestational age or date of first visit could not be retrieved. If a woman had more than one pregnancy during the research period, only the first pregnancy was included.

Migrant background of the participating pregnant women was assessed on the basis of the countries of birth of the expecting mother and of her parents, according to current practice of Statistics Netherlands.[26] When at least one of the parents was born outside the Netherlands, the woman was classified as non-Dutch. When country of birth of the pregnant women was not the Netherlands, her ethnic background was determined by her own country of birth. When country of birth of the pregnant woman was the Netherlands, her ethnic background was determined by country of birth of her mother, unless this was also the Netherlands: in that case ethnic background was established by country of birth of her father. When country of birth of both parents of the mother was the Netherlands, women were classified as native Dutch. Information about countries of birth was obtained by questionnaire. In this study, we included the largest ethnic groups in Rotterdam: native Dutch, Moroccan, Turkish, Cape Verdean, Dutch Antillean and Surinamese. Women with other ethnic backgrounds were excluded as they belonged to too many different groups, with too small numbers of women available for study (N = 552). Women with a Surinamese background are of mixed ethnic origin, mainly consisting of Hindustanis originating from India, and Creoles from Africa, and they thus differ regarding racial and cultural background. Therefore, we further classified them as Surinamese-Hindustani and Surinamese-Creole, by asking the pregnant woman for her ethnic origin. The study population available for this study consists of 2093 women.

*Pregnancy outcomes*

The most frequent hypertensive disorders are gestational hypertension and preeclampsia. *Gestational hypertension* was defined as blood pressure higher than 140/90 after 20 weeks gestation in previously normotensive women. *Preeclampsia* was diagnosed when blood pressure was higher than 140/90 after 20 weeks of pregnancy, in previously normotensive women, combined with proteinuria (≥ 0.3 g/24 hour).[27] Detailed information on the operationalisation has been published previously.[28,29]

*Gestational age at birth* was defined by ultrasound in early pregnancy. Crown-rump length was used for pregnancy dating up to a gestational age of 12 weeks and 5 days (crown-rump length < 65 mm), and biparietal diameter was used for pregnancy dating thereafter (gestational age from 12 weeks and 5 days onwards, biparietal diameter > 23 mm).[30] *Birth weight* was established directly postpartum in grams.

*Determinants*

- *Socio-demographic and obstetric determinants*

Maternal *age* was assessed at enrolment in the study. Data on *marital status* and *educational level* were obtained by questionnaire. Marital status of the pregnant women was categorised as follows: (1) married, (2) cohabiting and (3) no partner. Educational level of the pregnant woman was assessed by the highest completed education and reclassified into three categories: (1) primary school, (2) secondary school and (3) higher education. Information on the obstetric variable parity was retrieved from the medical records. *Parity* included two categories: nulliparous and multiparous. When relevant (see below), sex of the newborn (male/female) was taken into account.

- *Life style-related determinants*

Maternal *body mass index* (BMI) was calculated from maternal weight and maternal height [weight/height2 (kg/m2)], which were measured at enrolment in the study and subsequently adjusted for gestational age at intake. Height and weight were measured without shoes and heavy clothing at time of enrolment.

Maternal *smoking* as well as alcohol use was assessed by questionnaire, by asking pregnant women whether they smoked/consumed alcohol during pregnancy (yes/no).

- *Antenatal care entry*

*Antenatal care entry* was defined as entry before 15 weeks gestation or afterward, according to the guidelines of the Dutch Society of Gynaecologists and obstetricians at the time of the study (www.nvog.nl, 1-1-2006).

*Analysis*

The non-Dutch groups were compared with the Dutch reference population. First, the ethnic differences in dependent and independent variables were compared using the Chi-square statistic for categorical variables and analysis of variance (ANOVA) for continuous variables.

Subsequently, multivariate analyses have been conducted. The association of ethnic background with the continuous outcome variables gestational age at birth and birth weight were examined with linear regression models. The association between ethnic background and the dichotomous outcomes (gestational hypertension and preeclampsia) were assessed by logistic regression analysis. In the multivariate analyses, missing values were used as separate categories. For each outcome measure we first present an unadjusted model (model A in the tables).

In case of gestational hypertension and preeclampsia as outcome measures, we adjusted for socio-demographic and obstetric variables including educational level, marital status, maternal age and parity in the second model (B), in a third model (C) we adjusted for life style factors including maternal smoking, maternal alcohol use and body mass index[31-35] and in a fourth model

(D) we adjusted for both socio-demographic, obstetric and life style factors.

In case of gestational age at birth as outcome measure, the same socio-demographic and obstetric variables were included in the second model (B). In the third model (C) we adjusted for the same life style factors and for preeclampsia and gestational hypertension.[36] In the fourth model (D) we adjusted for antenatal care. Finally, in a fifth model we adjusted for socio-demographic factors, obstetric characteristics, life style factors, preeclampsia and gestational hypertension and antenatal care use. In case of birth weight as outcome measure, in the second model (B), we adjusted for the same socio-demographic and obstetric determinants, but also for infant sex and gestational age at birth. In the third (C) model we adjusted for maternal smoking[37], maternal alcohol use[38,39] and body mass index[40] and in the fourth model (D) for antenatal care use. Finally, in a fifth model (E) we adjusted for socio-demographic and obstetric characteristics, for infant sex, gestational age at birth, maternal smoking, alcohol use and body mass index, and use of antenatal care.
All measures of association are presented with their 95% confidence interval (CI). The statistical analyses were performed using Statistical Package of Social Sciences version 15.0 for Windows (SPSS Inc. Chicago, Illinois, USA).

## Results

In table 1 all independent variables are described according to ethnic background. Dutch women were on average older and had higher educational level. Turkish and Moroccan women were more frequently married than Dutch women, whereas the other migrant groups were married less frequently. Especially Moroccan women were more frequently multiparous. Differences in BMI were significant, and somewhat lower in Dutch and Surinamese-Hindustani women. Especially many Turkish women smoked during pregnancy, while few Moroccan women did so. Women of all non-Dutch groups less frequently used alcohol during pregnancy; this was especially pronounced among Turkish and Moroccan women. Compared to Dutch women, women in all other migrant groups entered later in antenatal care.

*Table 1. Subject characteristics*

| | Dutch | Moroccan | Turkish | Cape Verdean | Antillean | Surinam Creoles | Surinam Hindustani | p-value |
|---|---|---|---|---|---|---|---|---|
| **N** | **1242** | **208** | **240** | **133** | **108** | **76** | **86** | |
| **Age in years** (mean – sd) | 31.1 (4.6) | 27.7 (4.9) | 25.7 (4.4) | 26.7 (5.7) | 25.7 (4.7) | 26.9 (6.1) | 26.4 (4.9) | p < 0.001 |
| **Marital status** (%) | | | | | | | | |
| | | | | | | | | p < 0.001 |
| Married | 42.8 | 93.3 | 83.8 | 12.0 | 15.7 | 10.5 | 34.9 | |
| Cohabiting | 47.7 | 2.4 | 6.3 | 32.3 | 29.6 | 31.6 | 38.4 | |
| No partner | 8.6 | 1.4 | 5.8 | 51.1 | 52.8 | 57.9 | 22.1 | |
| Missing | 0.8 | 2.9 | 4.2 | 4.5 | 1.9 | 0 | 4.7 | |
| **Educational level** (%) | | | | | | | | p < 0.001 |
| Primary school | 3.6 | 24.0 | 27.1 | 22.6 | 13.9 | 14.5 | 12.8 | |
| Secondary school | 35.4 | 55.8 | 55.4 | 63.2 | 71.3 | 64.5 | 73.3 | |
| Higher education | 60.1 | 12.0 | 12.1 | 9.0 | 12.0 | 15.8 | 10.5 | |
| Missing | 0.8 | 8.2 | 5.4 | 5.3 | 2.8 | 5.3 | 3.5 | |
| **Parity** (%) | | | | | | | | p < 0.001 |
| 0 | 58.7 | 34.1 | 53.3 | 61.7 | 60.2 | 57.9 | 59.3 | |
| ≥1 | 41.1 | 65.9 | 46.7 | 36.8 | 38.9 | 40.8 | 40.7 | |
| Missing | 0.2 | 0 | 0 | 1.5 | 0.9 | 1.3 | 0 | |
| **BMI (kg/m2)** (mean-sd) | 24.0 (4.0) | 26.5 (5.1) | 25.2 (4.8) | 24.4 (4.3) | 26.9 (6.1) | 26.0 (6.3) | 24.1 (4.5) | p < 0.001 |
| **Maternal smoking** (%) | | | | | | | | p < 0.001 |
| Non-smoker | 78.7 | 92.8 | 60.0 | 77.4 | 78.7 | 80.3 | 77.9 | |
| Smoker | 19 | 4.3 | 36.3 | 18.8 | 19.4 | 17.1 | 20.9 | |
| Missing | 2.3 | 2.9 | 3.8 | 3.8 | 1.9 | 2.6 | 1.2 | |
| **Maternal alcohol use** (%) | | | | | | | | p < 0.001 |
| Non-drinker | 42.3 | 96.2 | 90 | 63.2 | 65.7 | 48.7 | 76.7 | |
| Drinker | 54 | 1.4 | 6.7 | 30.8 | 26.9 | 40.8 | 15.1 | |
| Missing | 3.7 | 2.4 | 3.3 | 6.0 | 7.4 | 10.5 | 8.1 | |
| **Antenatal care entry** (%) | | | | | | | | p < 0.001 |
| Too late | 10.6 | 33.2 | 20.8 | 24.1 | 30.6 | 28.9 | 15.1 | |
| **Sex of newborn** (%) | | | | | | | | |
| Boy | 49.6 | 50.0 | 52.9 | 48.1 | 40.7 | 55.3 | 47.7 | p=0.50 |
| Girl | 48.7 | 49.5 | 45 | 51.1 | 54.6 | 40.8 | 50 | |
| Missing | 1.7 | 0.5 | 2.1 | 0.8 | 4.7 | 3.9 | 2.3 | |

*Table 2. Outcome measures*

| | Dutch | Moroccan | Turkish | Cape Verdean | Antillean | Surinam Creoles | Surinam Hindustani | p-value |
|---|---|---|---|---|---|---|---|---|
| **N** | **1242** | **208** | **240** | **133** | **108** | **76** | **86** | |
| **Gestational hypertension (%)** | | | | | | | | p = 0.09 |
| No | 93.5 | 97.2 | 97.5 | 94.0 | 91.7 | 90.8 | 95.3 | |
| Yes | 5.0 | 1.4 | 1.7 | 4.5 | 3.7 | 3.9 | 2.3 | |
| Missing | 1.5 | 1.4 | 0.8 | 1.5 | 4.6 | 5.3 | 2.3 | |
| **Preeclampsia** (%) | | | | | | | | p = 0.07 |
| No | 96.2 | 98.1 | 95.8 | 97.0 | 93.5 | 93.4 | 93.0 | |
| Yes | 2.3 | 0.5 | 3.3 | 1.5 | 1.9 | 1.3 | 4.7 | |
| Missing | 1.5 | 1.4 | 0.8 | 1.5 | 4.6 | 5.3 | 2.3 | |
| **Gestat. age at birth (mean-sd)** | 39.9 (1.7) | 40.4 (1.2) | 39.9 (1.5) | 39.5 (2.1) | 39.7 (1.6) | 39.4 (1.9) | 39.1 (1.8) | p < 0.001 |
| **Birth weight (mean – sd)** | 3497.5 (554.4) | 3544.3 (433.2) | 3361.4 (473.7) | 3169.4 (559.4) | 3251.5 (527.9) | 3166.1 (593.6) | 3015.06 (582.7) | p < 0.001 |

Table 2 shows pregnancy outcomes according to ethnic background. Overall, no significant ethnic differences were observed regarding gestational hypertension and preeclampsia, although the latter was highest among Hindustani women, and the first lower among Turkish and Moroccan women. Gestational age at birth was somewhat lower in Surinamese, Antillean and Cape Verdean women, and higher in Moroccan women. Mean birth weight was highest in Moroccan newborns, followed by Dutch newborns, and lowest in Surinamese-Hindustani newborns.

Table 3 shows the results of the logistic regression analyses regarding gestational hypertension and preeclampsia. Whether or not we adjusted, the overall picture remained the same: both Turkish and Moroccan women have a significant decreased risk of *gestational hypertension*. Regarding *preeclampsia* no significant ethnic differences were found, although it was elevated among Turkish women and even more among Hindustani women, and decreased among Moroccan women.

*Table 3. Multivariate (logistic regression) analysis of gestational hypertension and preeclampsia according to ethnic background*

| | Moroccan (n=205) | Turkish (n=238) | Cape Verdean (n=131) | Antillean (n=103) | Surinamese-Creoles (n=72) | Surinamese-Hindustani (n=84) |
|---|---|---|---|---|---|---|
| | Differences in **gestational hypertension** (odds ratio (95% CI) Dutch are reference group) | | | | | |
| Model A | 0.3 (0.1, 0.9)* | 0.3 (0.1, 0.9)* | 0.9 (0.4, 2.1) | 0.8 (0.3, 2.1) | 0.8 (0.3, 2.7) | 0.5 (0.1, 1.9) |
| Model B | 0.2 (0.1, 0.8)* | 0.2 (0.1, 0.7)* | 0.7 (0.3, 1.9) | 0.7 (0.2, 1.9) | 0.8 (0.2, 2.8) | 0.3 (0.1, 1.4) |
| Model C | 0.2 (0.1, 0.6)* | 0.2 (0.1, 0.6)* | 0.8 (0.3, 1.9) | 0.5 (0.2, 1.4) | 0.6 (0.2, 2.0) | 0.4 (0.1, 1.6) |
| Model D | 0.2 (0.1, 0.7)* | 0.2 (0.1, 0.6)* | 0.9 (0.3, 2.2) | 0.5 (0.2, 1.6) | 0.7 (0.2, 2.5) | 0.4 (0.1, 1.6) |
| | Differences in **preeclampsia** (odds ratio (95% CI) Dutch are reference group) | | | | | |
| Model A | 0.2 (0.0, 1.5) | 1.5 (0.7, 3.3) | 0.7 (0.1, 2.8) | 0.8 (0.2, 3.6) | 0.6 (0.1, 4.5) | 2.1 (0.7, 6.2) |
| Model B | 0.3 (0.0, 2.7) | 1.9 (0.7, 5.0) | 0.8 (0.2, 3.6) | 0.9 (0.2, 4.4) | 0.6 (0.1, 5.2) | 2.5 (0.8, 7.8) |
| Model C | 0.1 (0.0, 1.0) | 1.4 (0.6, 3.4) | 0.6 (0.1, 2.5) | 0.6 (0.1, 2.5) | 0.4 (0.1, 3.0) | 1.8 (0.6, 5.5) |
| Model D | 0.2 (0.0, 2.1) | 2.2 (0.8, 5.9) | 0.6 (0.1, 3.1) | 0.7 (0.1, 3.2) | 0.4 (0.0, 3.2) | 2.2 (0.7, 7.3) |

**Model A: unadjusted**
**Model B: adjusted for socio-demographic and obstetric characteristics (educational level, marital status, maternal age, parity)**
**Model C: adjusted for lifestyle factors: maternal smoking, maternal alcohol use, body mass index**
**Model D: adjusted for socio-demographic characteristics, parity and lifestyle factors**
*** p-value < 0.05, ** p-value < 0.001**

Table 4 shows the results of the linear regression analyses regarding gestational age at birth and birth weight. The *gestational age at birth* of Moroccan women was higher, also after adjustment in the separate models and in the full model. Taking into account the socio-demographic and obstetric factors even increased the difference with the Dutch women. No significant differences were found between Turkish, Antillean and Dutch women. Unadjusted, the Cape Verdean, Surinamese-Creole and Surinamese-Hindustani women had a lower gestational age compared to Dutch women. When adjusting for socio-demographic and obstetric differences, these differences disappeared in the first two groups, and diminished but remained significant among Hindustani. Adjusting for other factors – life style factors and antenatal care use – did not change the picture. Except for Moroccan newborns, *birth weight* among all other migrant groups was significantly lower. Adjusting for socio-demographic and parity resulted in a decrease of the differences between all other groups, except the Turkish women. The difference between the latter group and the Dutch diminished when taking into account life style factors. Adjustment for timely entry into antenatal care had no influence on the ethnic differences.

*Table 4. Multivariate (linear regression) analysis of the relation between ethnic background and gestational age at birth and birth weight*

| | Moroccan | Turkish | Cape Verdean | Antillean | Surinamese-Creoles | Surinamese-Hindustani |
|---|---|---|---|---|---|---|
| | | Differences in **gestational age at birth** in weeks (Dutch is reference group, 95% CI) | | | | |
| Model A | 0,43 (0.19, 0.66)** | -0.06 (-0.30, 0.17) | -0.47 (-0.78, -0.16)* | -0.26 (-0.60, 0.07) | -0.59 (-0.98, -0.19)* | -0.87 (-1.24, -0.50)** |
| Model B | 0.60 (0.30-0.89)** | 0.06 (-0.23, 0.35) | -0.26 (-0.61, 0.09) | 0.01 (-0.36, 0.37) | -0.28 (-0.71, 0.15) | -0.68 (-1.07, -0.29)* |
| Model C | 0.42 (0.16, 0.69)* | 0.10 (-0.14, 0.35) | -0.44 (-0.74, -0.14)* | -0.30 (-0.64, 0.03) | -0.65 (-1.05, -0.25)* | -0.71 (-1.08, -0.34)** |
| Model D | 0,45 (0.2, 0.69)** | -0.06 (-0.30, 0.17) | -0.46 (-0.78, -0.15)* | -0.26 (-0.60, 0.07) | -0.58 (-0.98, -0.18)* | -0.87 (-1.24, -0.50)** |
| Model E | 0.50 (0.19, 0.80)* | 0.11 (-0.18, 0.40) | -0.38(-0.73, -0.03)* | -0.19 (-0.56, 0.19) | -0.46 (-0.90, -0.03)* | -0.65 (-1.04, -0.27)* |
| | | Difference in **birth weight** in grams (Dutch is reference group, 95% CI) | | | | |
| Model A | +47 (-32,126) | -136 (-211,-60)** | -328 (-428, -228)** | -246 (-358, -134)** | -331 (-464, -199)** | -482 (-606, -359)** |
| Model B | -57 (-136,22) | -129 (-204,-55)* | -141 (-232, -51)* | -100 (-199, -1.5)* | -110 (-222, 2.9)* | -262 (-365, -159)** |
| Model C | +26 (+26,112) | -82 (-163, -1.7)* | -315 (-414, -215)** | -265 (-378, -152)** | -346 (-478, -215)** | -447 (-570, -323)** |
| Model D | +58 (-24,139) | -132 (-208,-55)* | -318 (-419, -218)** | -237 (-350, -124)** | -320 (-453, -186)** | -480 (-604, -356)** |
| Model E | -104 (-186, -21)* | -132 (-207, -56)* | -169 (-260, -78)** | -152 (-253,-52)* | -157 (-271, -43)* | -288 (-390, -186)** |

**Gestational age:**

**Model A: unadjusted**
**Model B: adjusted for socio-demographic and obstetric characteristics: educational level, marital status, maternal age, and parity**
**Model C: adjusted for lifestyle factors (maternal smoking, maternal alcohol use, and body mass index), and preeclampsia and pregnancy induced hypertension**
**Model D: adjusted for antenatal care entry**
**Model E: adjusted for socio-demographic characteristics, parity, life style factors, preeclampsia and gestational hypertension and timely entry into antenatal care**
***p-value < 0.05, ** p-value < 0.001**

**Birth weight:**

**Model A: unadjusted**
**Model B: adjusted for socio-demographic and obstetric characteristics: educational level, marital status, maternal age, parity; and infant sex, and gestational age at birth**
**Model C: adjusted for lifestyle factors: maternal smoking, maternal alcohol use, and body mass index**
**Model D: adjusted for antenatal care entry**
**Model E: adjusted for socio-demographic variables, parity, infant sex, gestational age at birth, lifestyle variables, preeclampsia and gestational hypertension and timely entry into antenatal care**
*** p-value < 0.05, ** p-value < 0.001**

## Discussion

In this cohort of women who started their antenatal care by community midwives, gestational hypertension was not elevated in any of the migrant groups, and was even lower in women from Turkish and Moroccan origin. Regarding preeclampsia no significant ethnic differences were found, although this might be due to power problem. Odds ratios were elevated in Turkish and especially in Hindustani women. A previous analysis that did not exclude women that received antenatal care by obstetricians, found higher levels of preeclampsia among Cape Verdean, Antillean and Surinamese Creole women (3.3%, 3.6%, 3.3%) than we did. The prevalence of preeclampsia was also higher in these groups than in the Dutch (2.3%), which was not the case in our study.[41] This indicates that the selection at the beginning of the pregnancies in this respect functions fairly as intended.

We further found a significantly lower gestational age at birth in Cape Verdean women and in both groups of Surinamese women. The gestational age of Moroccan women was significantly higher. Regarding birth weight, all migrant groups were disadvantaged; in case of Moroccan newborns this only appeared in the full model. Ethnic disadvantage regarding gestational age at birth and regarding birth weight were reduced when taking into account socio-demographic factors and parity, except regarding the birth weight of Turkish newborns. In this latter group life style factors reduced differences. Early entry into antenatal care did not play a role in explaining ethnic differences.

Gestational hypertension rates in our study varied from 1.4% in Moroccans till 5% in native Dutch. Preeclampsia rates varied from 0.5% in Moroccans till 4.7% in Surinamese-Hindustani. Comparison with other studies is hindered because definitions of gestational hypertension and pre-eclampsia are not provided in all studies. Furthermore, in some studies it is impossible to distinguish between gestational hypertension and pre-eclampsia. Within these confines, the prevalences overall seem to correspond with results from previous research.[36,42-45]

In general, migrant women were not disadvantaged with respect to gestational hypertension and pre-eclampsia. On the contrary, the prevalence of gestational hypertension was even lower among Turkish and Moroccan than among Dutch pregnant women. The prevalence of pre-eclampsia was also lower in Moroccan women but higher in Turkish women, although these differences were not significant. Higher levels of preeclampsia were also found among Turkish migrants in Brussels, but not among migrants from Northern Africa.[32] At the same time, lower levels of gestational hypertension were found among Turkish migrants in Germany.[46] The divergent results regarding gestational hypertension on the one side and preeclampsia on the other side in the Turkish women remain puzzling. A decreased risk for pregnancy related hypertension has also been found among Hispanic women in the United States.[47] Regarding women with a predominantly African background however, our results are not in line with previous research that consistently found a higher risk in pregnant women of African descent.[47,48] Indeed, we did not find an elevated risk among the Surinamese Creole, Antillean and Cape Verdean women. We already mentioned

that risk selection may be part of the explanation. It should also be noticed that the composition of African Americans in the United States was different from those with an African descent in our own study. Our migrant study population was confined to first and second generation women, while studies in the United States often include ethnic groups residing there for many generations. Previous studies found a much higher risk on preeclampsia in sub-Saharan African migrants in Brussels (Belgium).[32] Similarly, the risk on severe maternal morbidity, including eclampsia in sub-Saharan African migrants in the Netherlands was much higher, also compared to the level among migrants from the Dutch Antilles of Suriname (Creole and Hindustani together).[10] Among the Turkish and Moroccan pregnant women no elevated risk was present for severe maternal morbidity in general, neither for eclampsia in particular.[10] Among Surinamese Hindustani women in our study we observed an elevated risk for pregnancies complicated by pre-eclampsia, although not significant. Previous studies in women of Asian descent showed different results depending on the exact descent of the women.[49] More in general, the Surinamese-Hindustani in the Netherlands are at increased risk of hypertension[50] and at increased risk for diabetes and cardiovascular disease in later life. Both diabetes and cardiovascular disease are associated with (maternal) endothelial dysfunction, which is associated with vascular pregnancy complications such as preeclampsia. Therefore, preeclampsia in Surinam-Hindustani women might be an early warning for cardiovascular disease in later life.[51]

We did not assess the role of early antenatal care entry regarding these two outcomes, because they cannot be prevented by *early* antenatal care provided by midwives. Preeclampsia is a condition that usually occurs in the second half of the pregnancy. In routine antenatal care blood pressure is regularly assessed, in order to detect hypertensive disorders and to refer for management by secondary care. In the Netherlands, it is scheduled at the first visit, and then in every visit after 20 weeks of pregnancy. A previous study showed that Dutch community midwives indeed assessed blood pressure when indicated by the guideline, without differences between native and non-native women[Choté et al publication submitted]. In our study population almost all pregnant women were in care before week 20 of the pregnancy.[52]

As compared to Dutch women, Moroccan women had a significantly higher gestational age at birth whether or not we took other factors into consideration. This result is in line with previous studies.[15,53] The lower mean gestational weight among Surinamese is also in line with previous Dutch findings of higher risks of preterm births in these groups.[11,12,15] Contrary to our findings, less preterm births among Turkish newborns were found previously.[15,54,55] We observed a significantly shorter gestational age at birth among Surinamese Creole and Cape Verdean pregnant women; in Antilleans gestational age was also shorter but not significantly. Several previous studies also showed a shorter gestation age at birth in Black women.[15,54,56] A study by Hitty[57] suggested that the increased risk of preterm birth in African Americans is associated with the occurrence of lower genital tract infections. Higher prevalences of chlamydia trachomatis were indeed found in the Netherlands among the Surinamese or Antillean population.[58] The lowest gestational age at birth was found among Hindustani women, which is in line with a previous study in London[56], and also

with a study conducted in the United States among several Asian American groups, where Indian and Pakistani women had the highest risk of preterm delivery.[49]

We found consistently lower mean birth weights in all migrant groups, although only after adjusting for all explanatory variables in the Moroccan group. In Norway and in Belgium, the unadjusted birth weight of Northern African newborns was higher than that of native newborns.[54,59] In the Belgian study, the difference was largely explained by their higher gestational age; in our study we could observe a similar pattern. Similarly, higher birth weights were found in the United States among Hispanic newborns.[60,61] Our results correspond with a previous study that found more low birth weights among Surinamese in the Netherlands[55], with Harding[62] who found higher proportions of low birth weight in South-Asian, Black-Caribbean and Black-African children as compared to children of UK born women, and with Vangen[59] who found lower birth weights among women of Pakistan descent in Norway. In the United States lower birth weight has been found among Americans from Asian descent[63] and among African-Americans.[64] None of these studies adjusted for gestational age at delivery.

Contrary to the few older studies in Europe,[21,22] our study adds to the doubts based on studies in the United States on the role of early antenatal care in reducing preterm delivery and low birth weight, and in reducing ethnic differences in this respect.[14,19,20] Equally, Healey[65] found that ethic differences in perinatal mortality in the U.S. remained in a population of women that was ensured of early access to antenatal care. Finally, in a previous analysis of birth weight in the total Generation R Study population mean birth weights were not different from the ones we found in our selected population. Also, the ethnic differences were the same.[39] This suggests that the risk selection typical for Dutch obstetric care does not result in differences in birth weight between those that only receive secondary antenatal care and those that receive at least part of antenatal care in community midwife practices.

Strengths of this study were its prospective design, the availability of data on a large number of known risk factors and especially the inclusion of women with different ethnic backgrounds, based on clear criteria. To our knowledge, this is the first study showing data on the gestational hypertension and preeclampsia in several *well-defined* ethnic groups in the Netherlands. Previous studies provided some information, but assessment of migrant background was not documented or had serious shortcomings, because no distinction was possible between Hindustani and Creole, and/or because all migrants with an African background were classified into one single category. To classify the participating women according to their ethnic background, we used country of birth as proposed by Statistics Netherlands. As compared to self-classification, it has the advantage to be objective and stable over time. We further could include Cape Verdeans, a seldom studied migrant group, and we had the opportunity to distinguish between Surinamese-Creole and Surinamese-Hindustani, which have different racial and cultural backgrounds.

Some limitations need to be addressed. The response rate among non-Dutch women was lower than among the Dutch women, which resulted in relatively low numbers in some migrant groups and consequently in some loss of power. Selective participation could also have affected the

magnitude of the observed ethnic differences in pregnancy outcomes. Furthermore, a majority of the non-Dutch women were firstgeneration migrants, ranging from 88% among the Antilleans till 60.4% among the Turks. Firstgeneration women may have had a relatively good health, resulting in relatively good pregnancy outcomes. Regarding gestational age at birth and birth weight, ethnic differences remained after taking into account a large number of known risk factors. This might be the consequence of the circumstance that we did not include all risk factors in an optimal way. For example, information on other life style factors such as physical activity and food habits were not available for analysis. Regarding antenatal care use, we only included timely entry, and not the number of contacts or the quality of care provided. We did not include these factors, as in previous analyses we did not find ethnic differences regarding these aspects.[52] However, quality of care is a broad concept, and we only had information on the more technical aspects, not on the quality of communication and information. Future research should take these aspects into consideration.

**References**


1. Bundey S, Alam H, Kaur A, Mir S, Lancashire R. Why do UK-born Pakistani babies have high perinatal and neonatal mortality rates? Paediatr Perinat Epidemiol 1991;5(1):101-114.
2. Ibison JM, Swerdlow AJ, Head JA, Marmot M. Maternal mortality in England and Wales 1970–1985: an analysis by country of birth. BJOG 1996;103(10):973-980.
3. Zeitlin J, Combier E, Caunes FD, Papiernik E. Socio-demographic risk factors for perinatal mortality A study of perinatal mortality in the French district of Seine-Saint-Denis. Acta Obstet Gynecol Scand 1998;77(8):826-835.
4. Razum O, Jahn A, Blettner M, Reitmaier P. Trends in maternal mortality ratio among women of German and non-German nationality in West Germany, 1980-1996. Int J Epidemiol 1999;28(5):919.
5. Essén B, Hanson BS, Östergren PO, Lindquist PG, Gudmundsson S. Increased perinatal mortality among sub-Saharan immigrants in a city-population in Sweden. Acta Obstet Gynecol Scand 2000;79(9):737-743.
6. Lewis G. The Confidential Enquiry 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.
7. Schutte JM, Steegers EA, Schuitemaker NW, Santema JG, de Boer K, Pel M, et al. Rise in maternal mortality in the Netherlands. BJOG 2010;117(4):399-406.
8. Schuitemaker N, van Roosmalen J, Dekker G, van Dongen P, van Geijn H, Gravenhorst JB. Confidential enquiry into maternal deaths in The Netherlands 1983-1992. European Journal of Obstetrics & Gynecology and Reproductive Biology 1998;79(1):57-62.
9. Sibai B, Dekker G, Kupferminc M. Pre-eclampsia. The Lancet 2005;365(9461):785-799.
10. Zwart JJ, Jonkers MD, Richters A, Ory F, Bloemenkamp KW, Duvekot JJ, et al. Ethnic disparity in severe acute maternal morbidity: a nationwide cohort study in the Netherlands. Eur J Public Health 2010 Jun 3.
11. van Enk A, Buitendijk SE, van der Pal KM, Van Enk WJ, Schulpen TWJ. Perinatal death in ethnic minorities in The Netherlands. J Epidemiol Community Health 1998;52(11):735.
12. Schulpen TWJ, van Steenbergen JE, van Driel HF. Influences of ethnicity on perinatal and child mortality in the Netherlands. Arch Dis Child 2001;84(3):222-226.
13. Ravelli AC, Tromp M, Eskes M, Droog JC, van der Post JA, Jager KJ, et al. Ethnic differences in stillbirth and early neonatal mortality in The Netherlands. J Epidemiol Community Health 2010 Aug 18.
14. Fiscella K. Does prenatal care improve birth outcomes? A critical review. Obstetrics & Gynecology 1995;85(3):468.
15. Goedhart G, van Eijsden M, van der Wal MF, Bonsel GJ. Ethnic differences in preterm birth and its subtypes: the effect of a cumulative risk profile. BJOG 2008;115(6):710-719.

16. Anachebe NF, Sutton MY. Racial disparities in reproductive health outcomes. American Journal of Obstetrics and Gynecology, 2003 4;188(4):S37-S42.
17. Roberts JM, Gammill HS. Preeclampsia: recent insights. Hypertension 2005;46(6):1243.
18. Carroli G, Villar J, Piaggio G, Khan-Neelofur D, Gulmezoglu M, Mugford M, et al. WHO systematic review of randomised controlled trials of routine antenatal care. Lancet 2001;357(9268):1565-1570.
19. Lu MC, Tache V, Alexander GR, Kotelchuck M, Halfon N. Preventing low birth weight: is prenatal care the answer? Journal of Maternal-Fetal and Neonatal Medicine 2003;13(6):362-380.
20. Walford HH, Trinh S, Wiencrot A, Lu MC. What is the role of prenatal care in reducing racial and ethnic disparities in pregnancy outcomes? Reducing racial/ethnic disparities in reproductive and perinatal outcomes 2011:151-179.
21. Wulf KH, Steck T. The impact of timing and frequency of prenatal visits on the outcome of pregnancy in the perinatal registry of Bavaria 1987-1988. European Journal of Obstetrics & Gynecology and Reproductive Biology 1994;57(2):79-84.
22. Blondel B, Marshall B. Poor antenatal care in 20 French districts: risk factors and pregnancy outcome. J Epidemiol Community Health 1998;52(8):501-506.
23. Bais JMJ, Pel M. The basis of the Dutch obstetric system: risk selection. European Clinics in Obstetrics and Gynaecology 2006;2(4):209-212.
24. Zeitlin J, Mohangoo A, Cuttini M, EUROPERISTAT Report Writing Committee, Alexander S, Barros H, et al. The European Perinatal Health Report: comparing the health and care of pregnant women and newborn babies in Europe. J Epidemiol Community Health 2009;63(9):681-682.
25. Jaddoe VW, Mackenbach JP, Moll HA, Steegers EAP, Tiemeier H, Verhulst FC, et al. The Generation R Study: design and cohort profile. Eur J Epidemiol 2006;21(6):475-484.
26. Aalders M. Classification of the population with a foreign background in the Netherlands. 2001:29-05-2007.
27. Sibai BM. Diagnosis and management of gestational hypertension and preeclampsia. Obstetrics & Gynecology 2003;102(1):181.
28. Silva LM, Coolman M, Steegers EAP, Jaddoe VW, Moll HA, Hofman A, et al. Low socioeconomic status is a risk factor for preeclampsia: the Generation R Study. J Hypertens 2008;26(6):1200-1208.
29. Silva LM, Coolman M, Steegers EAP, Jaddoe VW, Moll HA, Hofman A, et al. Maternal educational level and risk of gestational hypertension: the Generation R Study. J Hum Hypertens 2008;22(7):483-492.
30. Verburg BO, Steegers EAP, De Ridder M, Snijders RJ, Smith E, Hofman A, et al. New charts for ultrasound dating of pregnancy and assessment of fetal growth: longitudinal data from a population-based cohort study. Ultrasound Obstet Gynecol 2008;31(4):388-396.
31. Waite LL, Atwood AK, Taylor RN. Preeclampsia, an implantation disorder. Reviews in Endocrine & Metabolic Disorders 2002;3(2):151-158.
32. Haelterman E, Qvist R, Barlow P, Alexander S. Social deprivation and poor access to care as risk factors for severe pre-eclampsia. European Journal of Obstetrics & Gynecology and Reproductive Biology, 2003 11/10;111(1):25-32.

33. Duckitt K, Harrington D. Risk factors for pre-eclampsia at antenatal booking: systematic review of controlled studies. BMJ 2005;330(7491):565.
34. Gaugler-Senden IPM, Huijssoon AG, Visser W, Steegers EAP, de Groot CJM. Maternal and perinatal outcome of preeclampsia with an onset before 24 weeks' gestation: Audit in a tertiary referral center. European Journal of Obstetrics & Gynecology and Reproductive Biology, 2006 0;128(1-2):216-221.
35. Clausen T, Oyen N, Henriksen T. Pregnancy complications by overweight and residential area. A prospective study of an urban Norwegian cohort. Acta Obstet Gynecol Scand 2006;85(5):526-533.
36. Villar J, Carroli G, Wojdyla D, Abalos E, Giordano D, Ba'aqeel H, et al. Preeclampsia, gestational hypertension and intrauterine growth restriction, related or independent conditions? American Journal of Obstetrics and Gynecology, 2006 4;194(4):921-931.
37. Robinson JS, Moore VM, Owens JA, McMillen IC. Origins of fetal growth restriction. European Journal of Obstetrics & Gynecology and Reproductive Biology 2000;92(1):13-19.
38. Abel EL, Hannigan JH. 'J-shaped' relationship between drinking during pregnancy and birth weight: reanalysis of prospective epidemiological data. Alcohol and Alcoholism 1995;30(3):345.
39. Troe EJWM, Raat H, Jaddoe VW, Hofman A, Looman C, Moll H, et al. Explaining differences in birthweight between ethnic populations. The Generation R Study. BJOG 2007 12/33;114(12):1557-1565.
40. Frederick IO, Williams MA, Sales AE, Martin DP, Killien M. Pre-pregnancy body mass index, gestational weight gain, and other maternal characteristics in relation to infant birth weight. Matern Child Health J 2008;12(5):557-567.
41. Troe EJWM. Ethnic differences in gestational duration, preterm and very preterm delivery. In: Troe, EJWM. Ethnic differences in fetal growth, birth weight and infant mortality. The Generation R Study [dissertation]. 2008.
42. Jacquemyn Y, Osmanovic F, Martens G. Preeclampsia and birthweight by gestational age in singleton pregnancies in Flanders, Belgium: a prospective study. Clin Exp Obstet Gynecol 2006;33(2):96-98.
43. Tanaka M, Jaamaa G, Kaiser M, Hills E, Soim A, Zhu M, et al. Racial disparity in hypertensive disorders of pregnancy in New York State: a 10-year longitudinal population-based study. Am J Public Health 2007;97(1):163-170.
44. Hernandez-Diaz S, Toh S, Cnattingius S. Risk of pre-eclampsia in first and subsequent pregnancies: prospective cohort study. BMJ 2009;338:b2255.
45. Ananth CV, Basso O. Impact of pregnancy-induced hypertension on stillbirth and neonatal mortality. Epidemiology 2010;21(1):118-123.
46. David M, Pachaly J, Vetter K. Perinatal outcome in Berlin (Germany) among immigrants from Turkey. Arch Gynecol Obstet 2006;274(5):271-278.
47. Miranda ML, Swamy GK, Edwards S, Maxson P, Gelfand A, James S. Disparities in maternal hypertension and pregnancy outcomes: evidence from North Carolina, 1994-2003. Public Health Rep 2010;125(4):579-587.
48. Shen JJ, Tymkow C, MacMullen N. Disparities in maternal outcomes among four ethnic populations. Ethn Dis 2005;15(3):492-497.

49. Rao AK, Daniels K, El-Sayed YY, Moshesh MK, Caughey AB. Perinatal outcomes among Asian American and Pacific Islander women. American Journal of Obstetrics and Gynecology, 2006 9;195(3):834-838.
50. Agyemang C, Bindraban NR, Mairuhu G, Van Montfrans G, Koopmans R, Stronks K. Prevalence, awareness, treatment and control of hypertension among black Surinamese, South Asian Surinamese and white Dutch in Amsterdam, the Netherlands: the Sunset Study. J Hypertens 2005;23:1971-1977.
51. Bellamy L, Casas JP, Hingorani AD, Williams DJ. Pre-eclampsia and risk of cardiovascular disease and cancer in later life: systematic review and meta-analysis. BMJ 2007;335(7627):974.
52. Choté AA, de Groot CJ, Bruijnzeels MA, Redekop K, Jaddoe VW, Hofman A, et al. Ethnic differences in antenatal care use in a large multi-ethnic urban population in the Netherlands. Midwifery 2011;27(1):36-41.
53. Vahratian A, Buekens P, Delvaux T, Boutsen M, Wang Y, Kupper LL. Birthweight differences among infants of North African immigrants and Belgians in Belgium. Eur J Public Health 2004;14(4):381-383.
54. Racape J, De Spiegelaere M, Alexander S, Dramaix M, Buekens P, Haelterman E. High perinatal mortality rate among immigrants in Brussels. Eur J Public Health 2010 May 16.
55. van der Wal MF, Uitenbroek DG, van Buuren S. Geboortegewicht van Amsterdamse kinderen naar etnische afkomst. TSG 2000;78:15-20.
56. Patel RR, Steer P, Doyle P, Little MP, Elliott P. Does gestation vary by ethnic group? A London-based study of over 122 000 pregnancies with spontaneous onset of labour. Int J Epidemiol 2004;33(1):107-113.
57. Hitti J, Nugent R, Boutain D, Gardella C, Hillier SL, Eschenbach DA. Racial disparity in risk of preterm birth associated with lower genital tract infection. Paediatr Perinat Epidemiol 2007;21(4):330-337.
58. Van Bergen J, Götz HM, Richardus JH, Hoebe C, Broer J, Coenen AJT. Prevalence of urogenital Chlamydia trachomatis increases significantly with level of urbanisation and suggests targeted screening approaches: results from the first national population based study in the Netherlands. Sex Transm Infect 2005;81(1):17.
59. Vangen S, Stoltenberg C, Skjaerven R, Magnus P, Harris JR, Stray-Pedersen B. The heavier the better? Birthweight and perinatal mortality in different ethnic groups. Int J Epidemiol 2002;31(3):654-660.
60. Page RL. Positive pregnancy outcomes in Mexican immigrants: what can we learn? J Obstet Gynecol Neonatal Nurs 2004;33(6):783-790.
61. Acevedo-Garcia D, Soobader MJ, Berkman LF. Low birthweight among US Hispanic/Latino subgroups: the effect of maternal foreign-born status and education. Soc Sci Med 2007;65(12):2503-2516.
62. Harding S, Rosato M, Cruickshank J. Lack of change in birthweights of infants by generational status among Indian, Pakistani, Bangladeshi, Black Caribbean, and Black African mothers in a British cohort study. Int J Epidemiol 2004;33(6):1279-1285.
63. Alexander GR, Wingate MS, Mor J, Boulet S. Birth outcomes of Asian-Indian-Americans. International Journal of Gynecology & Obstetrics 2007 6;97(3):215-220.

64. Fuller KE. Low birth-weight infants: the continuing ethnic disparity and the interaction of biology and environment. Ethn Dis 2000;10(3):432-445.
65. Healy AJ, Malone FD, Sullivan LM, Porter TF, Luthy DA, Comstock CH, et al. Early access to prenatal care: implications for racial disparity in perinatal mortality. Obstet Gynecol 2006;107(3):625-631.

# Chapter 7

## General discussion

## 7.1 Summary

*Background, aim and research questions*

Good pregnancy outcomes for both mother and child are primary objectives of antenatal care. Timely entrance to antenatal care offers the opportunity for prevention, detection and treatment of potential signs of adverse pregnancy outcomes, as well as opportunities for providing health-educational advices.

The majority of studies in the field of antenatal care originate from non-industrialised countries[1], and focus on access to antenatal care as a means of improving pregnancy outcomes. This of course is not surprising: maternal and perinatal mortality and morbidity are much higher in these countries than in developed countries. In developed countries women with a migrant background, often from non-industrialised countries, are a higher-risk group in antenatal care since they often are more at risk for higher risk of adverse pregnancy outcomes.[2-5]

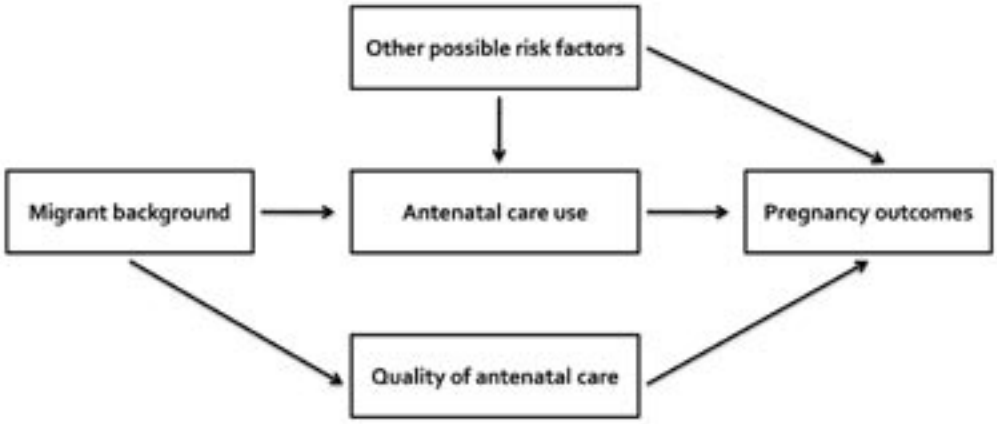
Worse outcomes among migrants may be the result of differences in risk factors, but also the consequence of less adequate antenatal care. As a consequence, interest in ethnic differences in antenatal care has increased.

Most studies on the use of antenatal care in developed countries have been carried out in the United States. Contrary to the situation in the United States, in most Western European countries antenatal care is accessible *formally* for all women residing in these countries, because there are no (or few) financial barriers. This also applies to the Netherlands. Even so, questions have been raised regarding the *actual* access and quality of antenatal care as provided by community midwives for women with a migrant background in the Netherlands.

In the Netherlands, approximately 20% of the population has a migrant background; and in the large cities this amounts to 35%. The largest groups consist of Turks, Moroccans, Surinamese and Dutch. Turks and Moroccans came to the Netherlands as labour migrants during the 1960s and early 1970s. Surinam is a former colony that gained independence in 1975. During the period of decolonization, many Surinamese migrated to the Netherlands. The Dutch Antilles were, until recently, were still part of the Kingdom of the Netherlands and the availability of study facilities was an important reason for Dutch Antilleans to migrate to the Netherlands. In general, these groups are characterised by socioeconomic and language-related disadvantages and by cultural barriers.[6]

Dutch antenatal care is somewhat unique: community midwifery has a central role and only women with medical problems or a complicated obstetric history are referred to hospital-based obstetric care by a gynaecologist. In combination with the relatively high number of home births, this system is often criticized. In 2005, nearly 73.5% of all pregnant women started antenatal care at independent community midwifery practices, so-called primary care.[7]

*Figure 1. The conceptual model*




The conceptual model underlying the core part of this thesis is shown in figure 1. The overall aim of the studies in this thesis was to explore and explain ethnic differences in the use and quality of antenatal care, and in pregnancy outcomes in a population of pregnant women that started antenatal care in community midwifery practices and received at least part of their antenatal care from these midwives. The aim of this thesis was to answer the following specific questions:

1. Are there differences in the **use** of antenatal care provided by community midwives between migrant and native women in the Netherlands? And if there are differences, how can they be explained?
2. Are there differences in the **quality** of antenatal care as provided by community midwives between migrant and native women? And if there are differences, how can they be explained?
3. Are there differences in **obstetric** outcomes between migrant and native pregnant women who receive antenatal care from community midwives? And if so, how can they be explained? Are some of these differences related to differences in utilisation of antenatal care as delivered by midwives?

The answers to research question 1 have been described in the chapters 2 until 4. The second question was addressed in chapter 5, the third question in chapter 6.
Because especially perinatal mortality in the Netherlands is subject of continuous heavy societal and scientific debate, we summarized this discussion in chapter 1. In this chapter also additional information was provided on the Dutch obstetric system, on the ethnic composition of the Dutch population and on available information on ethnic differences in obstetric outcomes, especially

perinatal and maternal mortality. The first chapter thus contains the societal and scientific basis in which this thesis can be situated.

## Methods

Data for this thesis were obtained from the Generation R Study. The Generation R Study is a multi-ethnic population-based prospective cohort study to investigate growth, development and health of urban children from fetal life until young adulthood. The study is conducted in Rotterdam, the second largest city in the Netherlands. Rotterdam has an ethnically diverse population and thus is an ideal setting to examine the research questions of this thesis. The Generation R Study has been described in detail elsewhere.[8]

For our study, 2093 women were included that started antenatal care at the practices of 23 midwives that were participating in the Generation R Study, with an expected date of delivery between April 2002 and December 2004. We included pregnant women that received at least part of their antenatal care from community midwives. We included the seven largest ethnic groups in Rotterdam: native Dutch, Moroccan, Turkish, Cape Verdean, Dutch Antillean, Surinamese-Hindustani and Surinamese-Creole.

The data for this study were obtained from the electronic antenatal charts (Micronatal®) of the participating midwives, from written questionnaires at enrolment in the study and from hospital registries. The questionnaires were available in the native languages of the pregnant women whenever necessary. Also, in case of illiteracy, assistance was available to fill out the questionnaire.

## Results

*Differences in the use of antenatal care*

1. Are there differences in the use of antenatal care provided by community midwives between migrant and native women in the Netherlands?

In **chapter 2** we examined to what degree differences between migrant and native Dutch women exist in the adequate use of antenatal care, and we assessed whether differences maintained when taking into account factors known to be related to antenatal care use: maternal age, parity and gravidity.

We constructed an index of adequate antenatal care use, based on the principles of the Kotelchuck index, which is widely used in the United States.[9] This index combines the time of entry and the total number of visits. We adapted this index for use in the Dutch situation by founding it on the recommended schedule of antenatal care of the Dutch Society of Obstetrics and Gynaecology[10] (see annex).

Differences between migrant and native women remained when maternal age, parity and gravidity were taken into account, except in Surinamese-Hindustani and Turkish women. Antenatal care use was especially inadequate among multiparae Surinamese-Creole women and among all Moroccan women. The main reason for inadequate use in our study was a first antenatal visit after a gestational age of 14 weeks. Contrary to the situation in the United States, where the Kotelchuck index shows reasonable distributions over its categories, this was not the case in our study population. Some categories were scarcely represented, especially those representing few visits. In our study, differences between native Dutch and migrant pregnant women pertained to the timing of entrance, not to the number of visits. Our study confirmed previous findings in Amsterdam[11] (the Netherlands) and in other European countries such as Germany[12] and the United Kingdom.[13]

2. How can differences in the use of antenatal care provided by community midwives between migrant and native women be explained?

There is no consensus about the required number of antenatal visits as appears from a comparison of different guidelines, but the necessity of an as early as possible entrance is unquestioned among obstetricians and midwives. Women entering too late cannot benefit from the opportunities of screening tests for the early detection and prevention of adverse pregnancy outcomes, which take place largely in the first trimester of pregnancy. Neither can they receive timely health educational advices, adaptation of medication, or timely referral.
Therefore, **chapter 3** focused on a further explanation of the differences between migrant and native Dutch women in timely use. Many studies explaining differences in antenatal care include possible determinants on a rather ad hoc basis of available information. In this thesis, point of departure was the Andersen's[14] model to study differences in health care use. Andersen distinguishes between three groups of determinants of use: (1) need factors (perceived health of the mother), (2) predisposing factors, reflecting the propensity to use services, and (3) enabling factors, reflecting opportunities to use services. In our study, the latter included two indicators of socio-economic position: educational level and having a paid job. Regarding the predisposing factors, we did not only include classical ones (age, parity, concerns regarding the pregnancy, household arrangement, planned pregnancy) but also considered it interesting to investigate whether late entry was associated with other adverse health behaviours such as the use of tobacco and alcohol, and the use of folic acid supplements.
Among Dutch women included in our study 10.6% entered antenatal care late, which was significantly lower than among Moroccan women (33.2%), Turkish women (20.8%), Cape Verdean women (24.1%), Dutch Antillean women (25.7%), and Surinamese Creole women (28.9%). The difference with Surinamese Hindustani women (15.1%) was not significant. Higher educational level and having a paid job were associated with timely entry. They could fully explain the difference between native Dutch and Turkish women. The difference between native Dutch and

Cape Verdean women could be fully explained when taking all independent variables into account simultaneously. The difference with Moroccan and Surinamese-Creole women were explained partially, but remained significant.
The behavioural factors were strongly associated with early/late entry. Those never using folic acid – not before and not during pregnancy – entered antenatal care late. Those who stopped smoking and quit alcohol use during pregnancy were those who also went to the midwife in time.
These results suggest an underlying adverse pattern of behaviour, including both late entry and adverse health behaviours. Behavioural factors also explained a considerable amount of the ethnic differences. In case of Moroccan women this mainly pertained to the use of folic acid, in case of the Turkish women besides folic acid use, quitting tobacco use was also relevant. In case of the other women refraining alcohol use may also be involved.

3. What is the role of generational status in explaining ethnic differences in the use of antenatal care provided by community midwives?

In **chapter 4** of this thesis we concentrated on differences in antenatal care use between first and second generation migrant groups and their explanation. Most studies that investigate ethnic differences in timely attendance for antenatal care compare native and non-native women. Therefore, the role of generational status has seldom been assessed, because generational status is a characteristic not applicable within the native population. It could be expected that first generation migrants are less acquainted with the Dutch health care organisation as well as with the benefits of early antenatal care, simply because of their – in most cases – shorter stay in the Netherlands, and also because of less proficiency in Dutch, which is the language of the host country.

Similar to chapter 3, our analysis was guided by the conceptual framework of Andersen.[14] Proficiency in Dutch speaking was included as an enabling factor. We found that first generation pregnant women entered later in antenatal care than second generation pregnant women (28.1% versus 18.7%) except among Surinamese-Hindustani. By taking into account all independent variables simultaneously, we could explain the difference between both generations. Notwithstanding large differences in enabling variables (educational level, proficiency in Dutch speaking) between first and second generation migrants, somewhat surprisingly they did not contribute to the explanation of the difference in timing of entry into antenatal care between both groups. The behavioural variables were again important: women who were likely to adopt healthy behaviour – especially folic acid intake – were also inclined to enter antenatal care early.

4. Are there differences in the quality of antenatal care as provided by community midwives between native Dutch and migrant pregnant women? And if there are differences, how can they be explained?

Adverse pregnancy outcomes are traditionally considered as outcome indicators of the quality of antenatal and maternity care. This raised the question of whether there were ethnic differences in the quality of the antenatal care provided (process). Studies into antenatal care have focused primarily on use, while the content and quality of care have received less attention. Existing studies usually assess quality of antenatal care by means of satisfaction reports of the pregnant women. A few studies have assessed obstetric-technical aspects of care, also based on reports by women. However pregnant women may not always be aware of the technical procedures carried out. Therefore, assessment of compliance with guidelines based on registration data is preferable but rarely carried out. Moreover, existing studies are unable to provide information not biased by whether or not pregnant women showed up for the scheduled appointments.

In **chapter 5** of this thesis, quality of antenatal care has been defined as the extent to which midwives adhered to antenatal care guidelines. Many western countries, including the Netherlands, have developed clinical practice guidelines for the content of antenatal care. These guidelines aim to improve effectiveness of care, rationalize the use of resources and promote consistent quality care, which is evidence based. They aim to play an important role in improving the quality of antenatal care and in reducing adverse pregnancy outcomes.

In order to evaluate the quality of antenatal care, we assessed whether midwives adhered to the guideline of the Dutch Society for Obstetricians and Gynaecologists (NVOG) for *basic* antenatal care.[10] Assessment included the following examinations and tests: length and weight, blood pressure, ABO blood group and Rhesus D (RhD), screening for irregular erythrocyte antibodies (IEA), screening for HbsAg, screening for anaemia (Hb) and screening for syphilis, fundus height, fetal heart rate and fetal presentation and engagement.

We found few differences in quality of antenatal care between native and migrant women in our study population. This applied for both nulliparae and multiparae women, although more differences were found in multiparae. Regarding most tests and examinations, midwives adhered well to the clinical guideline irrespective of ethnic background. When differences between migrant and native Dutch women were present these were not systematically less favourable for non Dutch pregnant women. Surprisingly, for all women, both native Dutch and migrant, haemoglobin at 30 weeks gestation was poorly determined or documented; the situation was especially unfavourable in Turkish and Moroccan women and in Surinamese-Creole multiparae. In case of migrant women this is surprising and indicates a possible quality problem, because they are more at risk for haemoglobinopathies.[15,16] The midwives did not describe the fetal position in all cases. The Surinam–Hindustani nulliparae had the lowest score. Finally, fetal heart tones were

not always described when scheduled, especially in multiparae.
In view of these results, there was no further need to investigate factors that might have affected differences in quality of care provided to migrant and native Dutch pregnant women.

*Differences in obstetric outcomes*

5. Are there differences in obstetric outcomes between migrant and native Dutch pregnant women who start antenatal care at community midwifery practices? And if so, how can they be explained? Can some of these differences be related to differences in utilisation of antenatal care as delivered by midwives?

In **chapter 6** it appeared that migrant women were not disadvantaged regarding *gestational hypertension*; Moroccan and Turkish women even had a decreased risk. Regarding *preeclampsia* no significant differences were found, although the prevalence was clearly elevated among Turkish women and even more among Surinamese-Hindustani. As compared to Dutch women, Moroccan women had a significantly higher *gestational age at birth*. Cape Verdean and Surinamese women had a significantly lower gestational age at birth. Differences were explained mostly by taking into account socio-demographic and obstetric differences. Regarding *birth weight*, all migrant groups were disadvantaged. Again, differences became smaller but remained significant when taking into account socio-demographic and obstetric differences, except in Turkish newborns where life style factors contributed most to a reduction in difference with native Dutch newborns. Early antenatal care did not contribute to a reduction of ethnic differences in gestational age at birth or birth weight.
Our study adds to the doubts based on studies in the United States on the role of early antenatal care in reducing preterm delivery and low birth weight[17,18] and in reducing ethnic differences in this respect.[19] In a previous analysis of birth weight in the total study population that did not exclude women that only received antenatal care by gynaecologists, mean birth weights were not different from the ones we found in our selected population. Also the ethnic differences were the same.[20] This suggests that the risk selection typical for Dutch obstetric care does not result in differences in birth weight between those that only receive secondary antenatal care and those that receive at least part of antenatal care in community midwife practices.
However, our results regarding preeclampsia clearly differed from those in the previous analysis by Troe[21,22] on the total Generation R Study population. First, he found higher levels of preeclampsia among Cape Verdean, Antillean and Surinamese Creole women. Contrary to our findings, the prevalence of preeclampsia in that previous study was also higher in these groups than in the Dutch. Subject to relatively small numbers, this suggests that the selection in Dutch antenatal care by midwives in this respect functions fairly as intended, although we cannot assess to what degree.

## 7.2 Methodological issues

The strengths and limitations of each study in this thesis have been described in the previous chapters. In this section, we discuss more general methodological considerations pertaining to the study as a whole. We first consider the main *strengths* of our study. Subsequently, we deal with *possible limitations*, all related to the study design in various respects.

## Main strengths of our study

1. Notwithstanding the absence of financial barriers, migrant pregnant women in Rotterdam enter antenatal care later than native women. A first strength of our study consists of the fact that we further investigated the background of these differences (chapter 3). This was possible because the questionnaire women filled out at the beginning of their pregnancy included a wide array of factors that might influence antenatal care entrance. We included these possible factors in a more systematic way by applying the model of Andersen. Depending on the migrant group, it appeared that the differences between Dutch and migrant women could be fully or partly explained (see summary above).

2. Related to the foregoing, we were able to investigate the role of generational status and of mastery of the Dutch language (chapter 4). From a policy perspective this is important. Indeed, second generation migrants take an intermediate position regarding timely entry into antenatal care: they are doing better than first generation women but worse than their Dutch counterparts. The difference with the native Dutch women was reduced by nearly half when we compared the second generation with the first generation (17.5% versus 8.1%).

3. Our study of the quality of antenatal care (chapter 5) is, to our knowledge, novel in two respects. It is the first European study that assessed adherence to antenatal care guidelines on the basis of registration data rather than by means of self-reports. Also, quality scores were only determined by the actual care that midwives could give, and were not confounded by whether or not women actually attended the visits as scheduled. Indeed, we adjusted the quality scores for attending at the appropriate gestational age by the women. Thus, we assessed the quality of the care as provided by community wives, as far as they *could* within the limits provided by the showing up of the pregnant women. In theory this choice also has limitations, which we will discuss in a further paragraph. Also, this study was the first to investigate differences in the technical quality of antenatal care between migrant and native women. Previous studies investigated perceived quality of care.

4. Contrary to most research in the field of obstetric care, we distinguished ethnic groups such as recommended for health (care) research[23], and in accordance with practice of Statistics

Netherlands.[24] This issue will be discussed in more detail further in this final chapter.

5. New is also that Surinamese-Creole and Surinamese-Hindustani people could be distinguished. They have different origins, namely African and Asian. As has been described in the previous chapters, we have observed many differences between the two groups, e.g. in antenatal care use, but also in outcomes and risk factors. We thus may conclude that it is sensible to distinguish between both groups in future research whenever there are opportunities to do so. Similar conclusions have been drawn regarding the combination of ethnic groups in the United States (see e.g. Sarnquist et al[25]). Furthermore, our study is also the first to include Cape Verdean pregnant women, which are a large migrant group in Rotterdam. It appeared from our study that they share many, but not all characteristics with migrant women from the Dutch Antilles and with women with a Surinamese Creole background.

## Study design

The Generation R Study in general has an observational prospective design. However, most of the empirical studies described in this thesis – except the last one in chapter 6 - can be considered as cross-sectional rather than longitudinal, given the short time-interval between measurement of the determinants and the outcomes. An important issue in observational studies is causal inference.[26] Especially in the chapters 3 and 4 this is an issue. Chapters 2 and 5 only aimed at describing ethnic differences in antenatal care use and quality, so causal interpretation was not an issue.

Whether an observed association is causal, temporality is an important criterion: an observed association between determinant and outcome only allows causal inference if the presumed cause precedes the presumed effect in time.[27] However, it is not always straightforward to establish temporal precedence. This is particularly the case in the chapters 3 and 4. In these chapters the outcome measure was timely entry into antenatal care, which we derived from Micronatal®, and which was recorded by the midwives at the first antenatal visit. Most independent variables were derived from the questionnaires pregnant women filled out when they entered antenatal care. Thus, the determinants and the outcome measure were measured in close temporal proximity. This made it impossible to assess temporal precedence with respect to a number of the independent variables. Most enabling factors – such as educational level, having a paid job and mastery of Dutch language – precede pregnancy and thus entry into antenatal care, but this is not the case regarding the so-called predisposing factors. In chapter 3 and 4, we concluded that late antenatal care entry was strongly associated with those behavioural factors. The causal sequence is questionable, because it could be the case that these women adapted their behaviour after they were advised to do so by the midwives during their first contact in early pregnancy. Unfortunately, we do not know whether the behavioural adaptation during pregnancy took place as a response to such advice. Future studies should address this question. Even in a cross-sectional design

amelioration is possible regarding this issue, by means of improvements in the questionnaire.
In chapter 6 we investigated the relationship between antenatal care use and pregnancy outcomes (gestational age at birth and birth weight) of women that started antenatal care at community midwife practices. This part of our study had a prospective character, and the pregnancy outcomes occur later in time than our independent variables. But even then causality is not guaranteed. Indeed, women attending antenatal care early in pregnancy may have better outcomes not because they receive timely care, but because they in general were more directed towards healthier behaviour, during but also already before pregnancy, and even because they selected care providers that provide high quality of care.

## Study population

*Size of the study population*
For this study, not all women participating in the overall Generation R Study were included. Only those that received (at least part of their) antenatal care at the practices of 23 midwives and those who had an expected date of delivery between April 2002 and December 2004 were included. This was the only period in the Generation R Study for which all necessary data – more precisely the Micronatal® data – were available. As a consequence, the number of women in some of our migrant groups was rather small. Besides, these small numbers were the consequence of the lower response rates of migrant pregnant women, a more general problem in the Generation R Study. These numbers were lower than could be expected based on the population figures of Rotterdam.[28] Enrolment of migrant groups was more difficult due to language and cultural barriers. This may have affected the reliability of our estimates, especially in the two Surinamese groups.
Because of the limited size of our study population, we also experienced limitations in the analysis of the differences in antenatal care use between first and second generation migrants (chapter 3). Moreover, it was not feasible to assess the – possible – role of our explanatory variables within the distinct migrant groups in our study. Although this was not an explicit aim of this study, it might have been of interest. Thus, we did not investigate the role of the selected independent variables in differences within the different migrant groups, and within first and second generation migrants in our study (effect modification).

*Selection bias*
Selection bias occurs when the relation between the independent variables and an outcome variable is different in those who participated in the study and those who were eligible for participation but did not participate. It occurs when the actual study population differs from the target population as a consequence of selective non response.
Pregnancy outcomes are yet unknown at the entry into the study and therefore less likely related to participation. However, many of the independent variables in our study may well be associated

with participation. This applies especially to our central independent variable: ethnic background (see further).
Selection bias in this thesis can be the consequence of circumstances that apply to the Generation R Study as a whole and of circumstances specific for our study.

Considerations pertaining to the Generation R Study in general

The Generation R Study aimed to include all eligible pregnant women living in Rotterdam with an expected delivery date between April 2002 and January 2006. The proportion of eligible women that participated in the study, the initial response rate, was estimated at 61%.[8] Non-participation was not random. We already mentioned the more difficult enrolment of migrant groups due to language and cultural barriers. This made it likely that migrant groups with a higher socio-economic position were overrepresented in the Generation R Study. This was indeed the case as appeared from a comparison of the distributions of educational level and income level in the Generation R Study and in the population of Rotterdam.[8] Since a higher socio-economic position is associated with several of our outcome variables, such as antenatal care use and pregnancy outcomes, the differences we found between native and migrant women probably were an underestimation of true differences.

Specific considerations with regard to our study
We excluded three midwife practices that participated in the larger Generation R Study, since they did not use electronic antenatal charts. An additional analysis did not provide indications for differences in the ethnic composition of the participating and non-participating practices, nor for differences in pregnancy outcomes.
Also we excluded pregnant women of which the migrant background was unknown. We analysed whether their antenatal care use differed from the antenatal care use of the women included, and this was not the case.
Finally, we only included the largest migrant groups in Rotterdam, which implies that the results cannot be generalised to differences between native Dutch women and migrant women in general.

## Information bias

Information bias occurs during the data collection and results from *systematic* errors in measurement or classification. Such errors may result in inadequate estimates of the associations between independent variables in our study and the outcome measures (false associations, failure to detect true relationships).
Part of the variables in the studies presented in this thesis were assessed through questionnaires. Self-reported data are particularly prone to information bias.

In survey research *recall* bias is a very common form of information bias, especially with respect to past behaviour and with respect to attitudes. In our study, this concerns especially the use of folic acid, of alcohol and of tobacco, and pregnancy concerns. As recall usually deteriorates with time, we used data from the questionnaires that were filled out at the beginning of the pregnancy.
Another related form of information bias consists of *socially desirable* answers. This might have been the case with respect to the healthy behaviours. For example, women who knew that folic acid supplementation is important already before pregnancy, but who did not use it until they knew they were pregnant, may have reported use already before pregnancy. Regarding the reporting of mastery of Dutch language this might also have occurred.
In the case of alcohol use, bias might also have been differential between different migrant groups: indeed alcohol is seldom consumed among migrants with an Islamic background and therefore it is not something they have to refrain from using during pregnancy. Among Dutch women alcohol use is more prevalent and many know that the actual norm is to refrain from drinking during pregnancy: therefore it might be that social desirability is more an issue among Dutch than among Moroccan or Turkish pregnant women.
Also, differential classification of our independent variables derived from the questionnaire might be present, because data collection among the non-native Dutch pregnant women in some cases has been conducted in a different way than in the Dutch population (see the introduction). This has been introduced in order to reduce the already higher non-response rates among those groups, especially in case of highly illiterate women that were not able to read the written questionnaire. Although the questionnaires have been translated in several foreign languages, analysis may have been hampered by the lack of cross-culturally validated questionnaires. Unfortunately, we are not able to assess the impact of this issue.

## Other measurement issues

The measurement of *three central concepts* – migrant background, antenatal care use and quality of antenatal care – merits some separate reflection.

*Definition and classification of migrant background*
As stated in chapter 1, a lot of confusion exists in the scientific literature concerning concepts such as ethnic and migrant status. This thesis was confined to migrant mothers and their newborns, meaning that we included both first and second generation migrant women, but not pregnant women that only had one or more grandparents born outside the Netherlands. In the United States and other classic immigration countries, often the concepts of race and ethnicity are used, and the groups included in research often encompass divergent subgroups, including recent immigrants as well as descendants for generations from immigrants. Our approach has the advantage that the study population is more homogeneous.
Using the country of birth indicator also has the advantage of being objective and stable[23], contrary

to practice in the Dutch perinatal registration (PRN)[7], where ethnic background is assessed by care providers without clear criteria, because the categories are not well defined and at the same time very broad. Care providers probably make use of physical characteristics, language and last names.
Sometimes the country of birth criterion is criticised as being not valid, because it does not cover all dimensions of ethnicity, such as culture and ethnic identity. However, in our opinion it is preferable to assess cultural factors that might explain differences between migrant and native Dutch pregnant women separately. Only then it is possible to investigate their role in the explanation of the differences independently of other factors, such as the enabling and predisposing factors we investigated in chapter 3.
A second argument often mentioned against the use of country of the birth indicator is that people who are born in the same country might have a different background. This is indeed the case with respect to the Surinam population. This problem has been solved in our study by the use of an additional indicator, in this case geographical origin.

*Antenatal care use*
Regarding adequacy of antenatal care use we constructed an index, based on the principles of the Kotelchuck index, which is frequently used in the United States.[9] This index, which is often used in the United States, was less appropriate in our study (see above 7.1), and for that reason only used in chapter 2.
Many argue that timely entry is very important, however, there is no consensus on what constitutes 'early' and 'late' entry[29] and definitions applied in research vary from 12 to even 28 weeks. We defined late antenatal care entry as entry after 14 weeks of pregnancy. This was based on the recommendations for basic antenatal care developed by the NVOG which was the point of departure in this thesis. In most studies originating from other countries the time span established in guidelines is smaller, often 12 weeks and earlier.[30]
The importance of early antenatal care does not imply that visits later in pregnancy are unimportant, for example with respect to the follow-up of blood pressure in order to detect gestational hypertension and preeclampsia in the second part of the pregnancy, and also with respect to the possibility to instruct women about signs of preterm delivery. In any case, our aim was to investigate ethnic differences and because there were no significant differences in the number of visits, the actual number also was irrelevant when we investigated the role of antenatal care in the ethic differences in pregnancy outcomes.

*Quality of antenatal care*
In order to evaluate the quality of antenatal care, we assessed whether midwives adhered to the guideline of the Dutch Society for Obstetricians and Gynaecologists (NVOG) for *basic* antenatal care regarding more technical procedures (tests and examinations). However, we investigated antenatal care given by midwives, and at the time of our study, there were no comparable

recommendations by the Dutch Society of Midwives. In 2008, the Dutch Society of Midwives published a standard on prenatal midwifery supervision (KNOV standaard Prenatale Verloskundige Begeleiding).[31] This standard does not include comparable recommendations.

Also, we limited our study to ethnic differences in the care as far as it *could* be provided by midwives, taking into account the showing-up of the pregnant women at the required time (complying with the appointments at the scheduled time). This had the advantage that – if present – differences could be attributed to the professional behaviour of the midwives. The disadvantage was that we did not investigate differences in quality *received* by several migrant groups and native Dutch women. However, because we did not find ethnic differences in the number of visits, we are confident that in our study, on the technical aspects of quality, both perspectives correspond to a large degree.

Besides, *missing information* hampered our analyses in several of the previous chapters.

First, in our study of the determinants of antenatal care use (chapter 3), we missed information on the perceived quality of care of the pregnant women. Ethnic differences in perceived quality might explain part of the differences in use. Migrant women might value antenatal care less than Dutch women. We could not include the perceived quality of antenatal care as an explaining factor in our analysis. Although the subject was included in the questionnaire, this part of the questionnaire was not a validated instrument resulting in difficulties regarding the content validity. Also, the partial non response was very high in this part of the questionnaire, and even higher in the migrant groups. Similarly, we could not investigate the role of more cultural and psychosocial factors contributing to ethnic differences in antenatal care use.

Second, the assessment of mastery of Dutch language was limited to proficiency in speaking Dutch, because in our opinion oral communication between midwife and pregnant women is the most important aspect (chapter 4). We also disposed of information on proficiency in reading. Both indicators were heavily interrelated in our population. Recent literature suggests that it might be better to assess proficiency by asking for the language one actually speaks at home, thus focusing on actual use rather than on competence.[32] This may have masked the role of Dutch language mastery in our study.

In the third place, our study on the quality of antenatal care (chapter 5) also suffered from some limitations. We assessed ethnic differences in the adherence to antenatal care guidelines. We included only differences in examinations and tests, whereas an important part of antenatal care concerns health education and advice, e.g. regarding antenatal screening tests, regarding tobacco and alcohol use, medication use, folic acid use and regarding life style in general. All these issues are not registered in Micronatal®, and therefore not evaluated in this study. A Canadian study showed that health care providers did meet the clinical guidelines regarding the medical management, but that they did not adequately meet the needs for health education and advice of the pregnant women did not assess ethnic differences in the provision of health education.[33] Next, we included only those examinations and tests, which have to be carried out unconditionally. Subsequent therapy, diagnostic tests or referral required on the basis of previous test results have not been included in our study, since this information is not adequately registered in Micronatal®.

However, one could argue that there is little reason to assume that midwives would manage pregnancies differently in this respect. Also, we only focused on the quality of antenatal care from a professional point of view, whereas assessment of the quality by the pregnant women might reveal a different picture. Perceived quality is also an important although distinct quality aspect, as it may affect not only antenatal care use (especially among multiparous women), but also adherence to life style advices, including folic acid use.
A final example concerns the ethnic differences in gestational age at birth and birth weight (chapter 6). Differences between migrant and native Dutch women remained after taking into account a large number of known risk factors. This might be the consequence of the circumstance that we did not include all risk factors in an optimal way. For example, information on other life style factors such as physical activity and food habits were not available for analysis.

## 7.3 Discussion and conclusions

In order to obtain good pregnancy outcomes, adequate health behaviour and adequate antenatal care are considered as cornerstones in many guidelines both in the Netherlands and elsewhere. Regarding antenatal care, especially the importance of early entrance is often emphasised by obstetricians and midwives. In this thesis, we investigated ethnic differences in some important (intermediate) pregnancy outcomes that in turn influence perinatal and maternal mortality, and ethnic differences in the use and quality of antenatal care. This study has been carried out in a population of pregnant women that started antenatal care by community midwives. The results showed that migrant women enter antenatal care later than native Dutch, and that they are disadvantaged regarding some but not all outcomes. At the same time large differences *between* migrant groups appeared, with respect to pregnancy outcomes, and with respect to their social circumstances and life style factors. We therefore will discuss the results for each of the six migrant groups included in this thesis.
In table 1 we displayed the main results for each group in a synoptic way. The limitations of this table are listed at the bottom of the table. This table shows in a clear manner that the differences between migrant and native Dutch women are far from consistent, and that they are not always in disfavour of the migrant women that receive antenatal care by community midwives. We will conclude this chapter by discussing some overall conclusions and suggestions for further research.



*Moroccan women*
From our study it appeared that the pregnancy outcomes of Moroccan women were in many respects best of all (chapter 6). They had a low risk of *pregnancy related hypertension* (gestational hypertension and preeclampsia), lower also compared to the Dutch women. The prevalence of chronic hypertension among Moroccans in general was also lower than among native Dutch.[34] Their *gestational age at birth* in our study was a little higher and the *birth weight* of the Moroccan

new-borns was close to that of the Dutch children. These results are in line with other studies conducted in other large multioethnic cities, such as New York[35], Amsterdam[36], Barcelona[37] and Brussels.[38-40] Equally, a recent Dutch study did not find an increased risk for eclampsia.[41] Decreased risks for pregnancy related hypertension have also been found among Hispanic women in the United States.[42]

*Table 1. Migrant groups' characterisation of antenatal care use, life style factors, social circumstances and pregnancy outcomes*

| | Moroccans | Turkish | Cape Verdeans | Antilleans | Surinamese-Creole | Surinamese-Hindustani |
|---|---|---|---|---|---|---|
| Timely use | ↓↓↓ | ↓ | ↓↓ | ↓↓ | ↓↓ | - |
| Life style | | | | | | |
| BMI | ↓↓ | ↓ | - | ↓↓ | ↓ | - |
| Alcohol | ↑↑↑ | ↑↑↑ | ↑ | ↑ | ↑ | ↑↑ |
| Tobacco | ↑↑↑ | ↓↓↓ | ↓ | ↓↓ | ↓↓ | ↓↓ |
| Folic acid | ↓↓↓ | ↓↓↓ | ↓↓↓ | ↓↓ | ↓↓ | ↓↓ |
| Social circumstances | | | | | | |
| Paid job | ↓↓↓ | ↓↓ | ↓ | ↓↓↓ | ↓ | ↓↓ |
| Educational level | ↓↓↓ | ↓↓↓ | ↓↓ | ↓ | ↓ | ↓ |
| Single motherhood | ↑↑↑ | ↑↑↑ | ↓↓↓ | ↓↓↓ | ↓↓↓ | ↓ |
| Unplanned pregnancy | ↓ | ↓ | ↓↓ | ↓↓↓ | ↓↓ | ↓↓ |
| Outcomes | | | | | | |
| Gestational hypertension | ↑↑↑ | ↑↑↑ | - | - | - | ↑ |
| Preeclampsia | ↑ | ↓ | - | - | - | ↓↓ |
| Gestational age at delivery | * | - | ↓↓ | - | ↓↓ | ↓↓ |
| Birth weight | - | ↓ | ↓↓ | ↓↓ | ↓↓ | ↓↓↓ |

**Explanation:**

| | |
|---|---|
| **↓ and ↑** | **Arrows indicate (unadjusted) differences with native Dutch women. The number of arrows reflects the magnitude of the difference between the migrant groups relative to the Dutch** |
| **↓** | **Disadvantage compared to native Dutch women** |
| **↑** | **Advantage compared to native Dutch women** |
| **-** | **Indicates that there is no difference; in a limited number of cases non-significant differences nevertheless received an arrow (in these cases where power problems likely played a role)** |
| ***** | **Positive difference with native Dutch, without being an advantage** |

Our results do not imply that there are no Moroccan women at risk for negative obstetric outcomes. Indeed, perinatal mortality is rather high among Moroccan newborns (see chapter 1) and diabetes is more prevalent among Moroccans in the Netherlands, even when taking into account multiple risk factors.[43] Our results may be partly the result of the composition of our sample that only included women that received at least part of their antenatal care in community midwifery practices. Multiparous women with known risk factors for preeclampsia such as diabetes receive antenatal care by a gynaecologist according to the Obstetric Indication List. They thus – in principle – are not included in our study.

The foregoing does not signify that no improvement is possible, to start with because of their unfavourable perinatal and maternal mortality (see chapter 1). There was no other group in which so many women entered antenatal care too late than the Moroccan women (chapter 2 and 3). Overall app. 33% came too late, and this figure amounts to 37% among multiparous women. Since the new-born outcomes of Moroccans were not different or even a little better than those of the Dutch newborns, early antenatal care could not play a role in reducing ethnic disparities in these outcomes. Similar results were found in Belgium among infants of North African immigrants: despite their delayed entry into prenatal care, preterm birth was less prevalent and newborns were even heavier.[44] A recent study by Ravelli[45], investigated whether early booking (defined as before 18 weeks of pregnancy) had an influence on ethnic differences in stillbirth and early neonatal mortally, but in case of the Moroccan group – in combination with the Turkish group – this was not the case. We only assessed a few important pregnancy outcomes. Besides, congenital disorders resulting in infant mortality and morbidity are more frequent among Moroccan children.[21,46,47] In Brussels it appeared that the excess of perinatal mortality among Maghrebian women was caused primarily by congenital anomalies.[39] More awareness of the risk for congenital disorders as a consequence of consanguineous marriages requires early antenatal care in order to provide information on antenatal screening. Genetic counselling should be part of preconception care. The lower level of adherence to the anaemia guideline by the midwives also requires attention.

Improvement is also possible with respect to folic acid use, because among Moroccan women the numbers not using folic acid at all were much higher (63.5%) than in any other group (chapter 3). As folic acid use ideally should start before pregnancy, the question remains in which way this can be improved most effectively. Advice by midwives is necessary, because especially Moroccan women even did not use folic acid once they knew to be pregnant (chapter 3). Before pregnancy, Moroccan women used folic acid less frequently than any other group. Preconception care is often considered as an important instrument, but will require additional efforts because of the low educational level and the high number of women that have little mastery of Dutch language. Besides, our study also showed that among Moroccan women pregnancies were planned less often than among Dutch women.

In case of Moroccan women, advice regarding the reduction of alcohol use and the quitting of smoking are not the most important issues to address, at least not until now. Indeed, in our study the prevalence of tobacco and alcohol use were lower than in any other group (chapter 2). But at the same time smoking becomes more prevalent in the second generation (chapter 3), also among Moroccan women as appeared from a separate analysis (5% versus 15.4%).

Finally, late entry impedes a timely first ultrasound, and thus a precise assessment of the pregnancy duration. A precise assessment of the pregnancy term is necessary information when decisions have to be made e.g. to counsel for induction of labour in post-term pregnancies. As we have seen in our study, the gestational age at birth is higher in our Moroccan group.

*Turkish women*

Turkish migrants share their migration history and religion with Moroccan migrants. Perhaps this is one of the reasons why researchers often group them together into one category, sometimes even together with other migrants from the Mediterranean region. Our study shows that such practice may mask important differences between both groups.

In our studypopulation the prevalence of *gestational hypertension* was lower among Turkish than among Dutch pregnant women (chapter 6). A previous study similarly found lower levels of gestational hypertension among Turkish migrants in Germany.[12] However, and opposite to the Moroccan women, the prevalence of *preeclampsia* among Turkish women was higher, although not significant, probably because of a lack of power (chapter 6). Higher levels of preeclampsia were also found among Turkish migrants in Brussels.[38] The divergent results regarding gestational hypertension on the one side and preeclampsia on the other side in the Turkish women remain puzzling. In the study by Zwart et al[41], Turkish women were not at increased risk of severe acute maternal morbidity, including eclampsia. In general, and contrary to Moroccan migrants, Turkish migrants have an equal level of chronic hypertension than native Dutch women.[34]

In our study, Turkish women did not differ regarding *gestational age at birth* from Dutch women. The mean *birth weight* of the newborns was significantly lower. These results were not in line with those from the Brussels study, where low birth weight and preterm birth were less frequent among children of Turkish women.[39] In the ABCD study, the difference between Dutch and Turkish children was limited to the first generation.[36] In our study, the difference only decreased – but did not disappear – when we took into consideration life style factors, including maternal smoking.

Especially in this respect our study indicates that progress is possible. Turkish women were the group in which the prevalence of smoking was highest, even during pregnancy. Only Turkish migrant women used tobacco more than Dutch women, all other migrant groups did less so. This requires attention, because in our study population an additional analysis showed that the prevalence of tobacco use was even higher among second generation Turkish migrants (42.1% versus 64.2%). A recent study among Turkish migrants in Germany drew a similar conclusion regarding the second generation.[48] Similar to the Moroccan women, alcohol consumption during pregnancy is not yet an issue. Finally, progress is also possible with respect to folic acid use: Turkish women were doing hardly better than Moroccan women, with also high numbers that did not use folic acid at all (chapter 3).

Besides, infant mortality and morbidity associated with congenital malformations was also more frequent among Turkish children.[21,47] Also for Turkish women more awareness of the risk for congenital disorders as a consequence of consanguineous marriages requires genetic counselling that should be part of preconception care. Early antenatal care enables providing timely information on antenatal screening.

Concluding, Turkish women are different from Moroccan women especially regarding the birth weight of their newborns. The high prevalence of tobacco use among Turks requires additional attention.

*Surinamese-Hindustani women*

Hindustani women were in many respects different from the other migrant groups included in this thesis. They were the only group in our study population with an Asian descent. We did not find a difference with native Dutch women regarding *gestational hypertension;* the prevalence of *preeclampsia* was higher, although not significant, which might have been a power problem. Based on previous studies[41,49], it is unclear whether Surinamese-Hindustani in the Netherlands are at increased risk for maternal mortality and severe maternal morbidity, because in these studies all Surinamese are grouped together. In England maternal mortality among women of Indian and Bangladeshi descent was higher than among white women.[50] From previous studies it is well known that the Surinamese-Hindustani group as a whole is at increased risk of hypertension[51] and of diabetes.[52,53] The risk on diabetes is higher in this group than in any other of the migrant groups. Therefore, the higher risk of preeclampsia in our study was not surprising. Both diabetes and cardiovascular disease are associated with (maternal) endothelial dysfunction, which is associated with vascular pregnancy complications such as preeclampsia. Therefore, preeclampsia in Surinamese-Hindustani women might be an early warning for cardiovascular disease in later life.[54]

We found a lower *gestational age at birth* and a lower *birth weight* among Surinamese-Hindustani as compared to the native Dutch. Indeed, we found that their birth weights were lowest of all, even when taking into account all possible risk factors, including gestational age at birth (chapter 6). Similar results were previously found among so-called 'South Asian' or 'Hindustani' newborns in the Netherlands[45,55], among Asian women from the Indian sub-continent in Britain[56,57], and among Asian-Indians in the United States.[58]

In the total group of Surinamese-Hindustani women that participated in the Generation R Study – including also women that only received antenatal care by gynaecologists –, birth weight was also lower than in any other group, even when taking into account maternal and paternal height.[22] In combination with our own results, this suggests that the risk selection does not result in differences in birth weight between those that only receive secondary antenatal care and those that start antenatal care in community midwife practices.

Surinamese-Hindustani women were the only migrant group in which the percentage that entered into antenatal care before 14 weeks of pregnancy was as large as among the Dutch women (chapter 2). Therefore, the timing of antenatal care entry could not contribute to the differences in pregnancy outcomes between Hindustani and native Dutch women.

In our study, the differences in gestational age at birth and birth weight were mostly reduced by taking into account socio-demographic and obstetric characteristics, but they remained significant. The reasons for this difference are not yet well understood, and it remains unclear whether also genetic factors play a role. Low birth weight for gestational age may be either constitutional or pathological.[59]

A recent British study[57] did not find an increase in birth weights among the second generation of South Asians in Great Britain, rather the contrary. Therefore, they suggest that there might be a physiological tendency towards lower mean birth weights across generations.[57] In that case,

birth weights among Surinamese-Hindustani may be little amenable by antenatal care. Our study population was too small to investigate differences between children of first and second generation migrants.
Leon and Moser[57] also put forward another hypothesis that the birth weight of the second generation South Asians is slightly lower because of an increased prevalence of smoking. In their study this could only provide part of the explanation. In our study Surinamese-Hindustani women were performing second best – after the Moroccan women – regarding the use of tobacco; especially many never smoked. But the number of women that continued to smoke during pregnancy is as high as among Dutch women, so there is room for improvement. The number of second generation women was too small to assess convincingly whether the situation aggravated in the second generation as was the case among the Turkish women, but the figures point into the same direction. Therefore, preconception and antenatal care should take this into consideration.
With respect to the use of alcohol, only Moroccan and Turkish women performed better. Of those using alcohol few continued to do so during pregnancy. Regarding folic acid supplementation they performed better than Turkish and Moroccan women, but compared to Dutch women there is still room for a lot of progress (chapter 3).

*Surinamese-Creole women*
Surinamese-Creoles merely have a mixed African descent. As became clear in this thesis, it is often impossible in research to distinguish between both Surinamese groups, because they cannot be distinguished on the basis of country of origin only. From our study clear difference between both groups appeared.

*Gestational hypertension* and *preeclampsia* of Surinamese-Creole women were not different from the Dutch (chapter 6). In view of the increased risk on chronic hypertension and diabetes in the Surinamese-Creole population as compared to the native Dutch[51-53], at first sight these results were surprising.
A previous analysis based on Generation R data in which also women were included that received all antenatal care by gynaecologists, found different results. Indeed, the prevalence of preeclampsia among Surinamese Creoles was considerably higher in that study than in ours, and also, as compared to native Dutch women. This latter observation is in line with their overall increased risk on hypertension and diabetes mentioned above and with previous studies in the United States that also consistently found a higher risk in pregnant women of African descent.[42,60] Our results may indicate that the risk selection in this respect functions as intended at least to some degree.
Regarding *gestational age at delivery* and *birth weight* Surinamese-Creole pregnant women were disadvantaged, although to a lesser degree than the Surinamese-Hindustani women. Previous studies in the United Kingdom also found that gestational length was shorter and birth weights lower among Carribean and Black women.[50,56] The increased perinatal mortality rates in Blacks in

the Netherlands (comprising Surinamese-Creole) could be explained by higher rates of preterm birth.[45,61] The difference with respect to gestational age at birth between Surinamese-Creole and Dutch women could be fully explained by sociodemographic characteristics; regarding birth weight these characteristics explained part of the difference (chapter 6). The most striking difference pertains to the marital status of the women: among Surinamese-Creole the number of women without a partner was highest of all, both compared to Dutch and to Surinamese-Hindustani women. The situation is similar in the United Kingdom.[50,56] In our study they also had an elevated number of unplanned pregnancies. Other possible determinants – including life style differences and early antenatal care entry – did not reduce the difference in gestational age at birth and birth weight with the native Dutch women, although – compared to the native Dutch (and Surinamese-Hindustani) women – many more Surinamese-Creole women enter antenatal care late.

In the total group of Surinamese-Creole women that participated in the Generation R Study, including also women that only received antenatal care by gynaecologists, the mean birth weight was similar as in our selected population and also lower as compared to the native Dutch.[22] Again this suggests that risk selection does not result in differences in birth weight between women that only receive secondary antenatal care and those that start antenatal care in community midwife practices.

Regarding maternal drinking and smoking the situation was better than among the native Dutch, therefore these could not contribute to the disadvantage in gestational age at birth and birth weight (chapter 6). Yet, improvement is of course still possible. Among Surinamese-Creole women the percentage that used folic acid supplementation before pregnancy was lower than among any other group. However, as soon as they knew that they were pregnant, more women than in any other group started with supplementation (chapter 3).

*Antillean women*

Antillean women have a predominantly African descent. Therefore, they are often classified into one category together with Surinamese-Creole women and probably also with Cape Verdean women and then circumscribed as Blacks.

In our study, Antillean women only differed from the Dutch women with respect to *birth weight*: their mean birth weight was significantly lower. In the ABCD study this only was the case among the first generation Antillean women.[36] Very similar to the Surinamese-Creole women, the difference was mostly reduced by taking into account socio-demographic and obstetric characteristics (chapter 6). Of all migrant women, overall the Antilleans were most disadvantaged with respect to social circumstances: they were characterised by a low educational level, by a very limited labour participation, by a high level of single motherhood and the highest level of unplanned pregnancies. Although the number of Antillean women entering antenatal care late was high, late entry did not contribute to the difference in birth weight of their newborns as compared to that of the native newborns.

Again, in the total group of Antillean women that participated in the Generation R Study, the mean birth weight was similar as in our selected population and also lower as compared to the native Dutch.[22] So, again one might conclude that risk selection does not result in differences in birth weight between women that only receive secondary antenatal care and those that receive at least part of antenatal care in community midwife practices.
In our studypopulation Antillean women were not disadvantaged with respect to *gestational hypertension* and *preeclampsia* (chapter 6). Similar to the Surinamese-Creole women, this was at first sight surprising in the light of the many studies on migrants with an African descent that show increased levels of preeclampsia.[42,60] In the Netherlands, Antillean women have an increased risk on eclampsia but not on other acute maternal morbidity.[41]
Again, Troe[20] did find a higher preeclampsia rate among Antillean pregnant women as compared to native Dutch women, and as compared to the rate we found. So we may, similarly as was the case for Surinamese-Creole women, conclude that the risk functions as expected in this respect.
On the health status of Antilleans in the Netherlands, less information is available than on the larger groups, Moroccans, Turks and Surinamese. But regarding perinatal mortality separate figures recently became available (see chapter 1) and these were much higher compared to native newborns but also compared to most other migrant groups.
More Antillean[57] than Surinamese-Creole women started to use folic acid supplementation before pregnancy (chapter 3), but there is nevertheless room for improvement, because the number not using it at all or only fairly late in pregnancy was high. Regarding tobacco use, their situation was better than that of Dutch women, because of the large number that never smoked. But an equal amount continued to use tobacco during pregnancy, so antenatal care should take this into consideration. Finally, with respect to the use of alcohol, the situation is much better than that of the Dutch women.

*Cape Verdean women*
Cape Verdean migrants are very rarely included in health research, so little background information is available. They have a mixed African and Portuguese descent (and therefore also often circumscribed as Creole). Looking at table 1 they also resemble most of all the Surinamese-Creole women.

Our study did not find differences with respect to *gestational hypertension* and *preeclampsia* (chapter 6). Regarding preeclampsia we found the same difference with the analysis of Troe[20], as among Surinamese-Creole and we thus may draw similar conclusions.
Regarding *gestational age at birth* and *birth weight*, they were also comparable to Surinamese-Creole women; shorter gestational age and lower birth weight compared to native Dutch women. Sociodemographic characteristics could fully explain the difference with respect to gestational age at birth with the Dutch women; regarding birth weight they explained part of the difference (chapter 6). Similarly, especially the large number of single mothers is noteworthy, as well as the

high number of unplanned pregnancies. The educational level was even lower than that of the Surinamese-Creole (chapter 3).
Compared to the Dutch, also Cape Verdean women entered antenatal care late (chapter 2). Once more, taking into account early entry did not diminish the difference with the Dutch women regarding gestational age at birth and birth weight. Finally, and again similar to the Surinamese-Creole women, differences in life style factors did not contribute to a reduction in ethnic differences in gestational age at birth and birth weight (chapter 6).
The high number of Cape Verdean women that did not take folic acid supplementation even once they knew to be pregnant is striking. Alcohol use was better than among the native Dutch women, but at the same time worse than in all other migrant groups (chapter 3). High levels of alcohol use have been observed before.[62]

*General conclusions, policy implications and directions for further research*
Perinatal and maternal mortality of migrant women are worse compared to those of the native women, also in the Netherlands. Moreover, perinatal mortality is higher in the Netherlands as compared to the situation in many of the other western European countries. One of the possible explanations put forward is that migrant women receive less adequate obstetric care. The organisation of Dutch obstetric care is different from other European countries. An important difference is the division between primary care provided by community midwives and secondary (and tertiary) care provided by gynaecologists, which is based on risk selection. Particularly the functioning of community midwives is often questioned. Recently, *home deliveries* have been subject of debate and criticism (see chapter 1). In this thesis we investigated outcomes of pregnant women that started *antenatal care* in community midwife practices. Specifically, we looked at ethnic differences in antenatal care use and quality, and at ethnic differences in four pregnancy outcomes: gestational hypertension, preeclampsia, gestational age at delivery and birth weight.
Rotterdam is a large multi-ethnic city, where large numbers of migrants reside and where the perinatal mortality is even more elevated than on average in the Netherlands. It therefore offers good opportunities to investigate such ethnic differences.

<u>Entry into antenatal care</u>
Our study confirmed previous studies in Amsterdam[11] and in Brussels[40], also two large multi-ethnic cities with comparable migrant groups. More migrant than native Dutch women entered antenatal care after 14 weeks of gestation. Especially many Moroccan women entered too late (chapter 2). Because of methodological reasons (see paragraph 7.2) the difference between migrant and native Dutch women in reality will even be higher.
The delay could partly be explained by the lower socio-economic position of migrant women. In general, we also concluded that late entry is part of a more general adverse attitude with respect to prevention, as expressed by smoking during pregnancy, drinking alcohol and not using folic acid supplementation before and during pregnancy (chapter 3).

Some possible explanations for the delay could not be investigated because the information was not available. Migrant women may be less acquainted with the Dutch health care organisation and certainly with the specific obstetric organisation. This applies especially to first generation migrants, which were the majority in our study population. We do not know whether migrant women first make an appointment with their GP, who refers them to a midwife. If so, this is an obvious explanation for the delay, because often there is no room for an immediate appointment. In any case, we observed that less second generation women enter antenatal care late.

Quality of care

Midwives adhered well to the guideline of the NVOG regarding technical aspects in basic antenatal care, without distinguishing between native Dutch and migrant women (chapter 5). So, these differences could be excluded as an explanation for differences in pregnancy outcomes.

However, many other aspects of quality may be important, which we did not investigate but require further study. We only assessed basic antenatal care, but could not evaluate whether ethnic differences exist with respect to the follow-up of negative test results, including adequate referral without ethnic differences to secondary care if required according to the Obstetric Indication List (VIL). The main reason for these limitations is that the indications for further testing and (reasons for) referrals were not or not always registered in Micronatal®. If this and similar systems in secondary care have to allow us to obtain more insight in the care process, these difficulties have to be solved first. Studies based on data of the obstetric process until now are rare, probably because of this type of problems. A recent study on Dutch obstetrics from an organisational perspective encountered similar problems and had to engage in a time consuming process of data collection, because the electronic systems of the hospital and the midwifery practice were incommensurable and because not all data were stored electronically.[63] A web-based integral system could provide more insight in the whole system.

Future research should also investigate whether midwives adhere equally to the guidelines regarding health education in case of native and migrant women. Language problems may hinder the provision of adequate health education by midwives. Again Micronatal® does not allow to investigate this question. Also, it should be evaluated to what degree health educational messages are understood by migrant women with little mastery of Dutch language. In light of the number of women that continued smoking during pregnancy, it is worthwhile to evaluate whether such health educational advice is sufficient to result in actual behavioural change. Smoking cessation advices need to take into consideration that enhancing knowledge on the negative impact of tobacco use is not sufficient to effectively result in behavioural chance, as appears from socio-behavioural research.[64,65]

To finish with, also research into the perceived quality of care is required, because satisfaction with antenatal care may influence subsequent use. We already explained why especially in the Netherlands it is sensible to hypothesize that the expectations of migrant women regarding

antenatal care are different from those of native Dutch women. Research from the United Kingdom indicates that improvement is possible in this respect.[66]

Pregnancy outcomes

The picture with respect to ethnic differences in outcome measures in our study population is complicated (chapter 6). Regarding gestational hypertension and preeclampsia the few ethnic differences were in favour of Moroccans. Regarding preeclampsia, Turkish and Surinamese-Hindustani women seem to experience some disadvantage.

We did find ethnic disparities regarding gestational age at birth and birth weight, except among Moroccan migrants. Birth weights on average were lower in all ethnic groups as compared to native Dutch newborns. With respect to gestational age at birth only Cape Verdean and both Surinamese groups experienced disadvantage.

Timely antenatal care and gestational age at birth and birth weight

Because disparities were limited, both with respect to outcomes and with respect to migrant groups, the question raised which role timely antenatal care could fulfil. We only investigated the role of early antenatal care with respect to gestational age at birth and birth weight. We did not so for gestational hypertension and preeclampsia, not only because ethnic differences were so limited but also because their onset cannot be prevented by *early* antenatal care.

Notwithstanding the on average late entry into antenatal care by migrant women, our study showed that this did not provide an explanation for the disadvantages in gestational age at birth and birth weight (chapter 6). A small-scaled Italian study equally did not find an association between delayed access and preterm delivery.[67] Our study adds to the recent doubts based on studies in the United States on the role of early antenatal care in reducing preterm delivery and low birth weight, and in reducing ethnic differences in this respect (see below).

Birth weight and risk selection

Our results were comparable with previous studies in other countries that consistently found lower birth weights in migrants with a sub-Saharan African or South Asian descent. We compared our results with those from a previous analysis in the total Generation R Study population. Mean birth weights were not different and also the ethnic differences were the same: disadvantage in non Dutch newborns. This suggests that the risk selection does not result in differences in birth weight between those that only received secondary antenatal care and those that started antenatal care in community midwife practices.

Early antenatal care and other outcomes

The foregoing results may not in itself lead to the conclusion that timely entry after all is merely an ideology defended by both gynaecologists and midwives. Indeed, we only investigated the relationship between timely entry into antenatal care and gestational age at birth and birth

weight. We did not include congenital malformations which occur more often among Moroccan and Turkish newborns. Because some congenital malformations are not immediately manifested, we were not able to assess ethnic differences within the time available for this thesis. Besides, incidences are low, and therefore we would have encountered power problems.
Timely entry facilitates the provision of information on prenatal screening in case of risk on congenital abnormalities. Besides, among Turkish women tobacco use remains an issue that merits attention early in pregnancy. Preconceptional advice is preferable, certainly regarding folic acid use and improvement is necessary in all migrant groups. As we already mentioned, the actual impact of preconceptional and antenatal health care education has to be investigated, because other impeding factors may bring along advices that do not result in behavioural change.

Other explanations for ethnic differences in gestational age at birth and birth weight
Life style factors did not contribute to ethnic differences in gestational age at birth and birth weight in our study, except among Turkish women (chapter 6). This somehow surprising result may be partly attributed to measurement limitations. The use of tobacco and alcohol use were assessed by dichotomous variables (yes – no during pregnancy). Future research should pay more attention to more adequate questionnaires. Such questionnaires enable a more detailed classification that also takes into account life style before pregnancy, and enable distinction between those adapting life style independently or in response to advice by midwives or other health care providers. In addition, we did not have information on other life style factors, especially concerning nutrition and physical exercise.
Taking into account sociodemographic and obstetric characteristics did reduce ethnic disparities with respect to gestational age at birth to a non-significant level in Cape Verdean, Antillean and Surinamese-Creole women. Regarding birth weight sociodemographic and obstetric characteristics also reduced differences in birth weight in these groups, but they remained significant.

Why antenatal care does not seem to affect birth weight
Neither early antenatal care nor the risk selection appeared to influence birth weights. In the United States, expansion of access to antenatal care followed after a publication by the Institute of Medicine (IOM) in 1985. In that publication it was concluded that an increase of adequate antenatal care use had reduced low birth weight and infant mortality.[18] However, the subsequent increased access of antenatal care resulted in an increased use, but not in a decline of low birth weight in the United States.[18] Questions were raised regarding the validity of the earlier studies and the mechanism has been challenged. In their review, Lu et al[18] evaluated in a systematic way the evidence of the effectiveness of antenatal care regarding risk assessment, health education and interventions. It appeared that risk assessment, as carried out also by Dutch midwives (e.g. abdominal palpation and fundus height measurement - see chapter 4), will fail to indentify most pregnancies at risk for preterm delivery. Regarding health education, support for smoking

cessation might have some effect, but from the review it appeared that the effect of usual care as also provided by Dutch midwives by means of the provision of information, most likely is limited. They also concluded that there is little evidence in favour of medical and psychosocial interventions. The authors conclude that the actual content of antenatal care is not likely to play a role in the prevention of low birth weight. Because this review dates from 2003, and thus included evidence from earlier studies merely from the United States, it is advisable to repeat this study and focus on more recent evidence, in relation to current guidelines for basic antenatal care in the Netherlands. If evidence is too limited and not convincing, adherence to guidelines cannot result in more favourable outcomes.

A subsequent review by Walford et al[19] in addition showed that antenatal care in its actual form is not effective in reducing ethnic differences in low birth weight. This review also showed that enhanced antenatal care, such as home visits, preterm birth educational advices and additional support, was not effective in reducing ethnic differences in low birth weight.

Both authors[18,19] explicitly state that these results do not imply a rejection of antenatal care: indeed more research is needed on the effect on antenatal care on other pregnancy outcomes, on the outcomes of subsequent pregnancies and on subsequent participation in child health care services. At the same time, many authors state that it is unrealistic to expect too much of antenatal care regarding the prevention of outcomes such as birth defects, because their (primary) prevention requires interventions before pregnancy since they are affected by personal and (social and physical) environmental risk factors already present before conception.[68,69]

Explaining the lack of disadvantage with respect to gestational hypertension and preeclampsia in our migrant study population

Migrants with a (Black) African descent, but also with an Asian descent are at increased risk for gestational hypertension and preeclampsia, but - at first sight surprisingly - in our study we only observed an elevated risk among Hindustani women. Migrant groups also have an elevated risk on maternal mortality, and in the Netherlands preeclampsia is the most important cause of maternal mortality.[49,70] Therefore, risk selection among these groups is of high importance, and most important among primiparous women.-

A similar analysis on the total sample, including all pregnant women in the Generation R study, did find higher levels of preeclampsia among Cape Verdean, Antillean and Surinamese-Creole women.[20] The prevalence of preeclampsia was also higher in these groups than in the Dutch, which was not the case in our study. Therefore we hypothesise that the risk selection in this respect functions at least partly as intended, although we cannot assess to what degree.

Migrant groups at risk in our study

Although Turkish and definitely Moroccan migrants were at increased risk for perinatal and maternal mortality, other groups, Antillean and Surinamese migrants, were more at risk (chapter 1). Also, in our study we observed more adverse outcomes among these latter groups, as well as among Cape

Verdean women. Nevertheless, a lot of policy attention is given to Moroccan and Turkish women, probably because of their lower educational level and their limited mastery of the Dutch language. Policy measures directed at reducing perinatal and maternal mortality and at reducing ethnic disparities in these outcomes, should not neglect Antillean, Creole and Cape Verdean women. We found high levels of single mothers (above 50%) and of unplanned pregnancies in these groups. Single motherhood has been associated in previous studies with small for gestational age in newborns[71] and preterm birth.[72] Single motherhood may entail stressful situations, especially when the socioeconomic position – see their limited labour participation – is also less favourable, which is the case among these women. Maternal stress can lead to preterm birth and low birth weight.[73,74] This also applies to stress related to racism.[75] These social circumstances are difficult to change, because they are imbedded in persistent cultural patterns. Moreover they make that these groups are more difficult to reach for preventive care such as preconception advice, and they make them more prone to postpone antenatal care entry. Further research is needed to investigate whether and how these women can be supported. Taking into account their social situation, it therefore is not surprising that antenatal care did not contribute to a reduction in ethnic differences. In the United States, Black newborns are also at higher risk than any other group, and researchers conclude that it is hardly possible for antenatal care to reverse a life long impact of adverse social circumstances.[76] Besides, efforts by antenatal and preconception care, it is acknowledged that also strengthening of family and community support is required, including father involvement.[76,77]

Other groups at risk requiring research and policy attention

At the time of this study, the number of migrants from Central and Eastern Europe was still limited, but since then is increasing. The largest group consists of Polish immigrants. To what degree they are a risk group in obstetric and antenatal care is unknown. In the Netherlands, health insurance is obligatory for all residents, but it appeared that among this group a large number is uninsured[78], especially when they become unemployed.[79] Whereas even illegal pregnant women are entitled to free antenatal care, this does not apply to this group. No data are available on the size and eventual growth of the problem.

We did not include sub-Saharan African women that migrated directly to the Netherlands, and not via the Caribbean islands, except the Cape Verdeans. Unfortunately their number was too small in the Generation R Study. However, their risk on perinatal mortality and severe maternal morbidity and mortality is many times higher than among Dutch women, but also much worse than among the migrant groups included in our study (see chapter 1). Research in the United Kingdom[50,80], France[81] and Italy[82] points into the same direction.

Somali are also the largest sub-Saharan migrant group in the Netherlands. The majority resides in Rotterdam.[83] Their number again is increasing during the past few years.[84] Moreover, among them, relatively large groups of single mothers came to Western Europe during the civil war in which men disappeared. Their educational level is similarly low as that of Moroccan and Turkish migrants, and their labour participation is much lower. They experience a lot of problems with Dutch language.[83]

Also, many suffer from female genital mutilation, which increases the risk on many adverse obstetric outcomes.[85] Research based on pooled data from a number of European countries showed no excess of preterm births or low birth weights, but there was an excess of stillbirths among Somali-born women, for which no readily explanation could be provided.[86] Higher perinatal mortality among Somali was also found in other studies.[87-89] Future research could investigate pregnancy outcomes and antenatal/obstetric care in this high risk group. Such a study probably is difficult to conduct in the framework of a large scale study such as the Generation R Study. Indeed, including these women in research almost certainly would require more efforts.

One could also question whether actual projects to enhance a healthier start of life should not already now pay attention to this group of pregnant women by trying to reach them for preconception advice and for timely and probably more intensive antenatal care. Based on the results of an Italian study, the researchers presented a similar recommendation.[82]

Sub-Saharan African migrant likely arrived relatively recent in the Netherlands, and many are asylum seekers and refugees. Maternal mortality in the Netherlands is increased among asylum seekers as a result of deaths among African women.[90] It is not unlikely that part of the Sub-Saharan migrant women is residing illegally in the Netherlands, as it is the case in the United Kingdom.[50] We had not any information on the legal status of the migrant women included in the Generation R Study, although it is likely that only those with a legal status participated. Although illegal women are entitled to antenatal care in the Netherlands, it is probable that they seek care much later or only just before delivery out of fear to become known with official authorities.[91,92]

Concluding, without wanting to underestimate the antenatal and perinatal conditions of pregnant women belonging to the so-called classic and until now largest migrant groups in the Netherlands, it is advisable not to overlook eventual new risk groups in research and in policy measures. Especially the numbers of migrants, including young women from the sub-Saharan region and from Central and Eastern Europe have increased in recent years. We emphasize this also because we can see improvement in a number of respects – although not all – in the second generation migrants belonging to the four classic groups. Furthermore, within these classic groups, at least equal attention should be given to the care, including preconception care of women with an African-Creole background.

**References**


1. Simkhada B, Teijlingen ER, Porter M, Simkhada P. Factors affecting the utilization of antenatal care in developing countries: systematic review of the literature. J Adv Nurs 2008;61(3):244-260.
2. Anachebe NF, Sutton MY. Racial disparities in reproductive health outcomes. American Journal of Obstetrics and Gynecology, 2003 4;188(4):S37-S42.
3. Hessol NA, Fuentes-Afflick E. Ethnic differences in neonatal and postneonatal mortality. Pediatrics 2005;115(1):e44-51.
4. Bollini P, Pampallona S, Wanner P, Kupelnick B. Pregnancy outcome of migrant women and integration policy: a systematic review of the international literature. Soc Sci Med 2009;68(3):452-461.
5. Urquia ML, Glazier RH, Blondel B, Zeitlin J, Gissler M, Macfarlane A, et al. International migration and adverse birth outcomes: role of ethnicity, region of origin and destination. J Epidemiol Community Health 2010;64(3):243-251.
6. Foets M, Schuster J, Stronks K. Gezondheids(zorg)onderzoek onder allochtone bevolkingsgroepen. Een praktische introductie. 2007.
7. Nederland SPR. Perinatale zorg in Nederland 2005. Utrecht: Stichting Perinatale Registratie Nederland 2008.
8. Jaddoe VW, van Duijn CM, van der Heijden AJ, Mackenbach JP, Moll HA, Steegers EAP, et al. The Generation R Study: design and cohort update until the age of 4 years. Eur J Epidemiol 2008;23(12):801-811.
9. Kotelchuck M. The Adequacy of Prenatal Care Utilization Index: its US distribution and association with low birthweight. Am J Public Health 1994;84(9):1486-1489.
10. http://www.nvog-documenten.nl/uploaded/docs/basis%20prenatale%20zorg/Tabel%203.pdf.
11. Alderliesten ME, Vrijkotte TG, van der Wal MF, Bonsel GJ. Late start of antenatal care among ethnic minorities in a large cohort of pregnant women. BJOG 2007;114(10):1232-1239.
12. David M, Pachaly J, Vetter K. Perinatal outcome in Berlin (Germany) among immigrants from Turkey. Arch Gynecol Obstet 2006;274(5):271-278.
13. Loughnan BA, Robinson PN. Ethnicity and late booking in an urban obstetric population. Public Health 2009;123(11):723-724.
14. Andersen RM. National health surveys and the behavioral model of health services use. Med Care 2008;46(7):647-653.
15. Giordano PC, Harteveld CL. Prevention of hereditary haemoglobinopathies in The Netherlands. Ned Tijdschr Geneeskd 2006;150(39):2137-2141.
16. Modell B, Darlison M, Birgens H, Cario H, Faustino P, Giordano PC, et al. Epidemiology of haemoglobin disorders in Europe: an overview. Scand J Clin Lab Invest 2007;67(1):39-69.
17. Alexander GR, Kotelchuck M. Assessing the role and effectiveness of prenatal care: history, challenges, and directions for future research. Public Health Rep 2001;116(4):306-316.
18. Lu MC, Tache V, Alexander GR, Kotelchuck M, Halfon N. Preventing low birth weight: is prenatal care the answer? Journal of Maternal-Fetal and Neonatal Medicine 2003;13(6):362-380.

19. Walford HH, Trinh S, Wiencrot A, Lu MC. What is the role of prenatal care in reducing racial and ethnic disparities in pregnancy outcomes? Reducing racial/ethnic disparities in reproductive and perinatal outcomes 2011:151-179.
20. Troe EJWM. Ethnic differences in gestational duration, preterm and very preterm delivery. In: Troe, EJWM. Ethnic differences in fetal growth, birth weight and infant mortality. The Generation R Study [dissertation]. 2008.
21. Troe EJWM, Bos V, Deerenberg IM, Mackenbach JP, Joung IM. Ethnic differences in total and cause-specific infant mortality in The Netherlands. Paediatr Perinat Epidemiol 2006;20(2):140-147.
22. Troe EJWM, Raat H, Jaddoe VW, Hofman A, Looman C, Moll HA, et al. Explaining differences in birthweight between ethnic populations. The Generation R Study. BJOG 2007 12/33;114(12):1557-1565.
23. Stronks K, Kulu-Glasgow I, Agyemang C. The utility of 'country of birth'for the classification of ethnic groups in health research: the Dutch experience. Ethn Health 2009;14(3):255-269.
24. CBS [Statistics Netherlands]. Standaarddefinitie allochtonen. Voorburg: Centraal Bureau voor de Statistiek 2000.
25. Sarnquist CC, Grieb EM, Maldonado YA. How racial and ethnic groupings may mask disparities: the importance of separating Pacific Islanders from Asians in prenatal care data. Matern Child Health J 2010;14(4):635-641.
26. Grimes DA, Schulz KF. Bias and causal associations in observational research. Lancet 2002;359(9302):248-252.
27. Rothman KJ, Greenland S, Poole C. Causation and causal inference. Modern epidemiology 1998;2:7-28.
28. Van Lith H. Demografische gegevens 2003. Rotterdam: Center for Research and Statistics 2004.
29. Oakley L, Gray R, Kurinczuk JJ, Brocklehurst P, Hollowell J. A systematic review of the effectiveness of interventions to increase the early initiation of antenatal care in socially disadvantaged and vulnerable women. 2009.
30. National Institute for Health and Clinical Excellence Antenatal care. Routine care for the healthy pregnant woman. NICE clinical guideline 62. 2008.
31. KNOV. KNOV-standaard verloskundige begeleiding. 2008.
32. Cheng EM, Chen A, Cunningham W. Primary language and receipt of recommended health care among Hispanics in the United States. J Gen Intern Med 2007;22 Suppl 2:283-288.
33. White DE, Fraser-Lee NJ, Tough S, Newburn-Cook CV. The content of prenatal care and its relationship to preterm birth in Alberta, Canada. Health Care Women Int 2006;27(9):777-792.
34. Agyemang C, Ujcic-Voortman J, Uitenbroek D, Foets M, Droomers M. Prevalence and management of hypertension among Turkish, Moroccan and native Dutch ethnic groups in Amsterdam, the Netherlands: The Amsterdam Health Monitor Survey. J Hypertens 2006;24(11):2169-2176.
35. Stein CR, Savitz DA, Janevic T, Ananth CV, Kaufman JS, Herring AH, et al. Maternal ethnic ancestry and adverse perinatal outcomes in New York City. Obstet Gynecol 2009;201(6):584. e1-584. e9.
36. Goedhart G, van Eijsden M, van der Wal MF, Bonsel GJ. Ethnic differences in term birthweight: the role of constitutional and environmental factors. Paediatr Perinat Epidemiol 2008;22(4):360-368.

37. Garcia-Subirats I, Pérez G, Rodriguez-Sanz M, Salvador J, Jané M. Recent immigration and adverse pregnancy outcomes in an urban setting in Spain. Matern Child Health J 2010 May 4.
38. Haelterman E, Qvist R, Barlow P, Alexander S. Social deprivation and poor access to care as risk factors for severe pre-eclampsia. European Journal of Obstetrics & Gynecology and Reproductive Biology, 2003 11/10;111(1):25-32.
39. Racape J, De Spiegelaere M, Alexander S, Dramaix M, Buekens P, Haelterman E. High perinatal mortality rate among immigrants in Brussels. Eur J Public Health 2010 May 16.
40. Beeckman K, Louckx F, Putman K. Determinants of the number of antenatal visits in a metropolitan region. BMC Public Health 2010;10:527.
41. Zwart JJ, Jonkers MD, Richters A, Ory F, Bloemenkamp KW, Duvekot JJ, et al. Ethnic disparity in severe acute maternal morbidity: a nationwide cohort study in the Netherlands. Eur J Public Health 2010 Jun 3.
42. Miranda ML, Swamy GK, Edwards S, Maxson P, Gelfand A, James S. Disparities in maternal hypertension and pregnancy outcomes: evidence from North Carolina, 1994-2003. Public Health Rep 2010;125(4):579-587.
43. Ujcic-Voortman JK, Schram MT, Jacobs-van der Bruggen MA, Verhoeff AP, Baan CA. Diabetes prevalence and risk factors among ethnic minorities. The European Journal of Public Health 2009;19(5):511-515.
44. Vahratian A, Buekens P, Delvaux T, Boutsen M, Wang Y, Kupper LL. Birthweight differences among infants of North African immigrants and Belgians in Belgium. Eur J Public Health 2004;14(4):381-383.
45. Ravelli AC, Tromp M, Eskes M, Droog JC, van der Post JA, Jager KJ, et al. Ethnic differences in stillbirth and early neonatal mortality in The Netherlands. J Epidemiol Community Health 2010 Aug 18.
46. Anthony S, Kateman H, Brand R, den Ouden AL, Dorrepaal CA, van der Pal-de Bruin,K. M., et al. Ethnic differences in congenital malformations in the Netherlands: analyses of a 5-year birth cohort. Paediatr Perinat Epidemiol 2005 03/60;19(2):135-144.
47. Schulpen TWJ, van Wieringen J, van Brummen PJ, van Riel JM, Beemer FA, Westers P, et al. Infant mortality, ethnicity, and genetically determined disorders in The Netherlands. The European Journal of Public Health 2006;16(3):290-293.
48. Reeske A, Spallek J, Razum O. Changes in smoking prevalence among first- and second-generation Turkish migrants in Germany - an analysis of the 2005 Microcensus. Int J Equity Health 2009;8:26.
49. Schutte JM, Steegers EA, Schuitemaker NW, Santema JG, de Boer K, Pel M, et al. Rise in maternal mortality in the Netherlands. BJOG 2010;117(4):399-406.
50. Fisher S. Social inequalities in maternal and perinatal mortality: a summary of research. New Digest 2008;44:18-26.
51. Agyemang C, Bindraban NR, Mairuhu G, Van Montfrans G, Koopmans R, Stronks K. Prevalence, awareness, treatment and control of hypertension among black Surinamese, South Asian Surinamese and white Dutch in Amsterdam, the Netherlands: the Sunset Study. J Hypertens 2005;23:1971-1977.

52. Middelkoop B. Diabetes mellitus type 2 onder Hindostanen. Huisarts en Wetenschap 2002;45(10):243-248.
53. Bindraban NR, van Valkengoed IG, Mairuhu G, Holleman F, Hoekstra JB, Michels BP, et al. Prevalence of diabetes mellitus and the performance of a risk score among Hindustani Surinamese, African Surinamese and ethnic Dutch: a cross-sectional population-based study. BMC Public Health 2008;8(1):271.
54. Bellamy L, Casas JP, Hingorani AD, Williams DJ. Pre-eclampsia and risk of cardiovascular disease and cancer in later life: systematic review and meta-analysis. BMJ 2007;335(7627):974.
55. Visser GH, Eilers PH, Elferink-Stinkens PM, Merkus HM, Wit JM. New Dutch reference curves for birthweight by gestational age. Early Hum Dev 2009;85(12):737-744.
56. Patel RR, Steer P, Doyle P, Little MP, Elliott P. Does gestation vary by ethnic group? A London-based study of over 122 000 pregnancies with spontaneous onset of labour. Int J Epidemiol 2004;33(1):107-113.
57. Leon DA, Moser KA. Low birth weight persists in South Asian babies born in England and Wales regardless of maternal country of birth. Slow pace of acculturation, physiological constraint or both? Analysis of routine data. Journal of Epidemiology and Community Health .
58. Alexander GR, Wingate MS, Mor J, Boulet S. Birth outcomes of Asian-Indian-Americans. International Journal of Gynecology & Obstetrics 2007;97(3):215-220.
59. Kierans WJ, Joseph KS, Luo ZC, Platt R, Wilkins R, Kramer MS. Does one size fit all? The case for ethnic-specific standards of fetal growth. BMC Pregnancy Childbirth 2008;8:1.
60. Tanaka M, Jaamaa G, Kaiser M, Hills E, Soim A, Zhu M, et al. Racial disparity in hypertensive disorders of pregnancy in New York State: a 10-year longitudinal population-based study. Am J Public Health 2007;97(1):163-170.
61. Schulpen TW, van Steenbergen JE, van Driel HF. Influences of ethnicity on perinatal and child mortality in the Netherlands. Arch Dis Child 2001;84(3):222-226.
62. Pieterse ME. Gezondheid en Welzijn van Kaapverdianen in Rotterdam: inventarisatie van gezondheidsproblemen, oorzaken, en interventies ten behoeve van het community project Nôs Saúde. Woerden: NIGZ/Centrum voor Review & Implementatie 2002. NIGZ/ Centrum voor Review & Implementatie 2002.
63. Pieters A, van Oirschot C, Akkermans H. No cure for all evils: Dutch obstetric care and limits to the applicability of the focused factory concept in health care. International Journal of Operations & Production Management 2010;30(11):1112-1139.
64. Tombor I, Urbán R, Berkes T, Demetrovics Z. Denial of smoking-related risk among pregnant smokers. Acta Obstet Gynecol Scand 2010;89(4):524-530.
65. Buja A, Guarnieri E, Forza G, Tognazzo F, Sandona P, Zampeiron A. Socio-demographic factors and processes associated with stages of change for smoking cessation in pregnant versus non-pregnant women. BMC Womens Health 2011;11(1):3.
66. Puthussery S, Twamley K, Macfarlane A, Harding S, Baron M. 'You need that loving tender care': maternity care experiences and expectations of ethnic minority women born in the United Kingdom. J Health Serv Res Policy 2010;15(3):156.

67. Sosta E, Tomasoni LR, Frusca T, Triglia M, Pirali F, El Hamad I, et al. Preterm delivery risk in migrants in Italy: an observational prospective study. Journal of travel medicine 2008;15(4):243-247.
68. Bernstein PS, Merkatz IR. A life course perspective on women's reproductive health and the outcome of pregnancy. J Womens Health 2010;19(3):555-560.
69. Lu MC. We can do better: improving perinatal health outcomes in America. Journal of Women's Health 2010;19(3):569-573.
70. Zwart JJ, Richters A, Ory F, de Vries JI, Bloemenkamp KW, van Roosmalen J. Eclampsia in the Netherlands. Obstet Gynecol 2008;112(4):820-827.
71. Hanke W, Kalinka J, Sobala W. Single motherhood, urban residence and SGA babies in Central Poland. International Journal of Gynecology & Obstetrics 1998;61(3):289-291.
72. Zeitlin JA, Saurel-Cubizolles MJ, Ancel PY, EUROPOP Group. Marital status, cohabitation, and risk of preterm birth in Europe: where births outside marriage are common and uncommon. Paediatr Perinat Epidemiol 2002;16(2):124-130.
73. Lu MC, Halfon N. Racial and ethnic disparities in birth outcomes: a life-course perspective. Matern Child Health J 2003;7(1):13-30.
74. Vrekoussis T, Kalantaridou SN, Mastorakos G, Zoumakis E, Makrigiannakis A, Syrrou M, et al. The role of stress in female reproduction and pregnancy: an update. Ann N Y Acad Sci 2010;1205:69-75.
75. Dominguez TP, Dunkel-Schetter C, Glynn LM, Hobel C, Sandman CA. Racial differences in birth outcomes: the role of general, pregnancy, and racism stress. Health Psychol 2008;27(2):194-203.
76. Lu MC, Kotelchuck M, Hogan V, Jones L, Wright K, Halfon N. Closing the Black-White gap in birth outcomes: a life-course approach. Ethn Dis 2010;20(1 Suppl 2):S2-62-76.
77. Lu MC, Jones L, Bond MJ, Wright K, Pumpuang M, Maidenberg M, et al. Where is the F in MCH? Father involvement in African American families. Ethn Dis 2010;20(1 Suppl 2):S2-49-61.
78. CBS. Gezondheid en zorg in cijfers. Perinatale sterfte onder de loupe genomen. 2009:9-21.
79. Lötters FJB, Foets M, Burdorf A. Work and Health, a Blind Spot in Curative Healthcare? A Pilot Study. J Occup Rehabil 2010:1-9.
80. Knight M, Kurinczuk JJ, Spark P, Brocklehurst P. Inequalities in maternal health: national cohort study of ethnic variation in severe maternal morbidities. BMJ 2009;338.
81. Philibert M, Deneux-Tharaux C, Bouvier-Colle M. Can excess maternal mortality among women of foreign nationality be explained by suboptimal obstetric care? BJOG 2008;115(11):1411-1418.
82. Salvador S, Bertozzi S, Londero AP, Driul L, Da Riol R, Marchesoni D. Outcome of pregnancy for immigrant women: a retrospective study. Minerva Ginecol 2010;62(4):277-285.
83. Klaver J, Poel P, Schouten J. Somaliërs in Nederland. Een verkenning van hun maatschappelijke positie en aanknopingspunten voor beleid. Regioplan Beleidsonderzoek. 2010.
84. Dourleijn E, Dagevos J. Vluchtelingengroepen in Nederland. Over de integratie van Afghaanse, Iraakse, Iraanse en Somalische migranten. Den Haag: SCP 2011.
85. Bewley S, Creighton S, Momoh C. Female genital mutilation. BMJ 2010;340.
86. Small R, Gagnon A, Gissler M, Zeitlin J, Bennis M, Glazier RH, et al. Somali women and their pregnancy outcomes postmigration: data from six receiving countries. BJOG 2008;115(13):1630-1640.

87. Villadsen SF, Mortensen LH, Andersen AM. Ethnic disparity in stillbirth and infant mortality in Denmark 1981–2003. J Epidemiol Community Health 2009;63(2):106-112.
88. Malin M, Gissler M. Maternal care and birth outcomes among ethnic minority women in Finland. BMC Public Health 2009;9:84.
89. Carolan M. Pregnancy health status of sub-Saharan refugee women who have resettled in developed countries: a review of the literature. Midwifery 2010;26(4):407-414.
90. van Oostrum IEA, Goosen S, Uitenbroek DG, Koppenaal H, Stronks K. Mortality and causes of death among asylum seekers in the Netherlands, 2002–2005. J Epidemiol Community Health 2011;65(4):376.
91. Van Herten LM, Reijneveld SA. Gezondheidszorg voor illegalen en asielzoeker: resultaten van een literatuurstudie en een invitational conference. TNO Leiden 2002.
92. Schoevers MA, Loeffen MJ, van den Muijsenbergh ME, Lagro-Janssen AL. Health care utilisation and problems in accessing health care of female undocumented immigrants in the Netherlands. Int J Public Health 2010;55(5):421-428.

# Samenvatting

## Achtergrond, doel en onderzoeksvragen

Het primaire doel van prenatale zorg is gunstige zwangerschapsuitkomsten voor moeder en kind. Prenatale zorg geeft de gelegenheid voor tijdige preventie, opsporing en behandeling van potentiële tekenen van ongunstige zwangerschapsuitkomsten, alsook het verstrekken van gezondheidsvoorlichting.

Het merendeel van de onderzoeken op het gebied van de prenatale zorg is afkomstig van niet-geïndustrialiseerde landen en legt de focus op toegankelijkheid van de prenatale zorg om zodoende de zwangerschapsuitkomsten te verbeteren. Moedersterfte en perinatale sterfte en ziekte zijn hoger in deze landen dan in ontwikkelde landen. In ontwikkelde landen vormen allochtone vrouwen, vaak afkomstig uit niet-geïndustrialiseerde landen, een risicogroep in de prenatale zorg omdat onderzoek heeft laten zien dat allochtone vrouwen een hogere kans hebben op ongunstige zwangerschapsuitkomsten.

Hoe kunnen we verklaren dat allochtone groepen een verhoogd risico hebben op ongunstige zwangerschapsuitkomsten? Een mogelijke verklaring zou minder adequate prenatale zorg zijn. Daarom is er steeds meer belangstelling voor etnische verschillen in de prenatale zorg. Ongunstige uitkomsten onder allochtone vrouwen zouden het gevolg kunnen zijn van verschillen in risicofactoren, maar ook van etnische verschillen in prenataal zorggebruik en/of in de kwaliteit van zorg verstrekt aan allochtone, zwangere vrouwen.

Het merendeel van de onderzoeken op het gebied van prenataal zorggebruik in ontwikkelde landen is uitgevoerd in de Verenigde Staten. In tegenstelling tot de situatie in de Verenigde Staten, is prenatale zorg in de meeste West-Europese landen, formeel toegankelijk voor alle vrouwen wonend in deze landen, omdat er geen tot weinig financiële barrières zijn. Dit is ook het geval in Nederland. Desondanks blijven er vragen omtrent de werkelijke toegang en kwaliteit van de prenatale zorg zoals die door de verloskundigen aan allochtone vrouwen wordt verstrekt.

In Nederland heeft ongeveer 20 procent van de bevolking een niet-Nederlandse achtergrond; in de grote steden is dit percentage zelfs 50 procent. De grootste allochtone groepen zijn de Turken, Marokkanen, Surinamers en Antillianen. Turken en Marokkanen zijn gedurende 1960 en 1970 als arbeidsmigranten naar Nederland gekomen. Deze arbeidsmigratie werd later gevolgd door gezinsvormende en gezinsherenigende migratie. Suriname is een voormalige kolonie van Nederland die onafhankelijk werd in 1975. Tijdens de periode van dekolonisatie, zijn veel Surinamers gemigreerd naar Nederland. De Nederlandse Antillen waren tot voor kort deel van het Nederlandse Koninkrijk en de beschikbaarheid van opleidingsfaciliteiten is voor de Antillianen een belangrijke reden om naar Nederland te migreren. Over het algemeen worden al deze groepen gekarakteriseerd door sociaaleconomische- en taal gerelateerde achterstanden.

Prenatale zorg in Nederland is in een aantal opzichten uniek: eerstelijns verloskundigen hebben een centrale rol en alleen vrouwen met medische problemen of een gecompliceerd obstetrisch verleden worden verwezen naar de tweedelijnszorg, nl. de gynaecoloog in het ziekenhuis. In combinatie met het relatief hoge aantal thuisbevallingen, wordt het Nederlands systeem van

prenatale zorg vaak ter discussie gesteld. In Nederland start bijna 73,5 procent van alle zwangere vrouwen de prenatale zorg in de eerstelijns verloskundige zorg.

De algemene doelstelling van de studies in dit proefschrift was het verkennen en verklaren van etnische verschillen in het gebruik en de kwaliteit van de verloskundige zorg en etnische verschillen in zwangerschapsuitkomsten. Dit proefschrift had als doel om de volgende onderzoeksvragen te beantwoorden:

1. Zijn er verschillen in het gebruik van de verloskundige zorg verstrekt door verloskundigen, tussen allochtone en autochtone vrouwen? En zo ja, hoe kunnen deze verschillen worden verklaard?
2. Zijn er verschillen in de kwaliteit van de verloskundige zorg verstrekt door verloskundigen tussen allochtone en autochtone vrouwen? En zo ja, hoe kunnen deze verschillen worden verklaard?
3. Zijn er verschillen in obstetrische uitkomsten tussen allochtone en autochtone vrouwen die de prenatale zorg bij de eerstelijns verloskunde starten? En zo ja, kunnen deze verschillen worden gerelateerd aan de verschillen in gebruik en kwaliteit van de verloskundige zorg?

De antwoorden op de eerste onderzoeksvraag zijn beschreven in de hoofdstukken 2 tot en met 4. Onderzoeksvraag 2 wordt in hoofdstuk 5 besproken en onderzoeksvraag 3 in hoofdstuk 6.
Omdat perinatale sterfte in Nederland onderwerp is van continue maatschappelijke en wetenschappelijke discussies, vatten we dit debat samen in hoofdstuk 1. In dit hoofdstuk wordt ook additionele informatie verstrekt over het Nederlandse obstetrische zorgsysteem, basisinformatie over de belangrijkste etnische groepen in Nederland, hun migratiegeschiedenis en hun maatschappelijke positie, en tenslotte ook gegevens over de perinatale en maternale sterfte in deze groepen. Dit hoofdstuk bevat daarmee maatschappelijke en wetenschappelijke achtergrond informatie waarbinnen dit proefschrift kan worden geplaatst.

## Methoden

De studies beschreven in dit proefschrift maken deel uit van de Generation R Studie, een in Rotterdam (Nederland) uitgevoerd prospectief, populatiegebaseerd cohortonderzoek vanaf het foetale leven. Data voor dit proefschrift zijn verkregen uit de elektronische verloskundige database (Micronatal) van de deelnemende verloskundige praktijken, uit de vragenlijsten bij inclusie in de Generation R Studie en uit ziekenhuisregistraties.

## Resultaten

*Verschillen in gebruik van verloskundige zorg*

1. Zijn er verschillen in het gebruik van de verloskundige zorg verstrekt door verloskundigen tussen allochtone en autochtone vrouwen in Nederland?

In hoofdstuk 2 hebben we onderzocht in welke mate er verschillen tussen allochtone en autochtone vrouwen bestaan in het adequaat gebruik van de verloskundige zorg.
We construeerden een index van adequaat gebruik van verloskundige zorg, gebaseerd op de principes van de Kotelchuck index, die veel wordt gebruikt in de Verenigde Staten. Deze index combineerde het moment van starten met de zorg en het totale aantal consulten. We hebben deze index aangepast voor het gebruik in de Nederlandse situatie door uit te gaan van het aanbevolen schema van basis prenatale zorg van de Nederlandse Vereniging van Obstetrie en Gynaecologie.
Verschillen tussen allochtone en autochtone vrouwen bleven bestaan hoewel er rekening werd gehouden met de leeftijd van de moeder, pariteit en graviditeit. Alleen de Hindostaanse en de Turkse vrouwen verschilden dan niet meer van de Nederlandse vrouwen. Verloskundig zorggebruik was vooral inadequaat onder de multiparae Creoolse vrouwen en onder alle Marokkaanse vrouwen. De belangrijkste reden voor inadequaat gebruik in ons onderzoek was een eerste verloskundige consult na een zwangerschapsduur van 14 weken. In tegenstelling tot de situatie in de Verenigde Staten, waar de Kotelchuck index redelijk goed verdeeld is over de verschillende categorieën, was de verdeling in onze onderzoekspopulatie erg scheef. Sommige categorieën waren beperkt vertegenwoordigd, vooral deze die weinig consulten vertegenwoordigden. In ons onderzoek betroffen de verschillen tussen allochtone en autochtone vrouwen het moment van starten met de zorg en niet het aantal consulten. Dit bevestigde eerdere onderzoek in Amsterdam (Nederland) en in andere Europese landen zoals Duitsland en het Verenigd Koninkrijk.

2. Hoe kunnen verschillen in gebruik van verloskundige zorg verstrekt door verloskundigen tussen allochtone en autochtone vrouwen worden verklaard?

Over het optimaal aantal consulten is er geen overeenstemming, maar de noodzaak van op tijd starten met de zorg is onder verloskundigen en gynaecologen geen discussie. Vrouwen die te laat met de zorg starten, kunnen geen voordeel hebben van de mogelijkheden tot screening ten behoeve van de vroege opsporing van ongunstige zwangerschapsuitkomsten, die grotendeels plaatsvindt in het eerste trimester van de zwangerschap. Ook kunnen zij niet op tijd gezondheidsvoorlichting ontvangen, medicatie aanpassen of tijdig worden verwezen indien nodig.
Daarom richt hoofdstuk drie zich op een verdere verklaring van deze verschillen in tijdig gebruik van prenatale zorg tussen allochtone en autochtone vrouwen. Eerdere onderzoeken probeerden deze verschillen te verklaren op basis van wat er toevallig aan informatie beschikbaar was. In dit proefschrift was het model van Andersen het uitgangspunt om verschillen in zorggebruik

te onderzoeken. Andersen onderscheidt drie groepen determinanten van gebruik: (1) noodzaakfactoren (ervaren gezondheid van de moeder), (2) factoren die de neiging weergeven om gebruik te maken van voorzieningen, en (3) factoren die de mogelijkheid aangeven om gebruik van voorzieningen te maken. De laatste groep omvatte in ons onderzoek twee indicatoren van sociaaleconomische positie, namelijk opleidingsniveau en inkomen. Inzake de geneigdheidfactoren, hebben we niet alleen de klassieke factoren (leeftijd, pariteit, zorgen tijdens de zwangerschap, samenstelling huishouden, geplande zwangerschap) meegenomen, maar we vonden het ook interessant om te onderzoeken of laat binnenkomen in de zorg geassocieerd was met andere gezondheidsgerelateerde gedragingen zoals roken en alcoholgebruik en het gebruik van foliumzuur.
10.6% van de autochtone vrouwen in ons onderzoek komen laat de verloskundige zorg binnen, wat significant lager is dan onder de Marokkaanse vrouwen (33.2%), Turkse vrouwen (20.8%), Kaapverdianen (24.1%), Antillianen (25.7%) en Surinaams-Creolen (28.9%). Het verschil met de Surinaams-Hindostaanse vrouwen (15.1%) was niet significant. De verschillen tussen de autochtonen en de Turkse en Kaapverdiaanse vrouwen konden volledig worden verklaard wanneer met alle onafhankelijke variabelen rekening werd gehouden. De verschillen met de Marokkaanse en Surinaams-Creoolse vrouwen werden voor een deel verklaard, maar bleven significant.
Een hoger opleidingsniveau en het hebben van een betaalde baan waren geassocieerd met een tijdige intake bij de verloskundige zorg. Deze determinanten konden het verschil verklaren tussen de autochtone en Turkse vrouwen.
De gedragsfactoren waren sterk geassocieerd met tijdig/laat de zorg binnenkomen. Vrouwen die nooit foliumzuur hadden gebruikt, niet voor en niet tijdens de zwangerschap, kwamen laat de zorg binnen. De vrouwen die gestopt zijn met roken en alcoholgebruik tijdens de zwangerschap zijn tevens vrouwen die op tijd de zorg binnenkomen. Deze resultaten suggereren een onderliggend globaal ongunstig gezondheidsgerelateerd gedragspatroon. Gedragsfactoren verklaren ook een aanzienlijk deel van de verschillen in tijdig de verloskundige zorg binnenkomen. In het geval van de Marokkanen heeft dit vooral betrekking op het gebruik van foliumzuur. In het geval van de Turkse vrouwen was naast het gebruik van foliumzuur, ook het stoppen met roken van belang.

3. Zijn er verschillen in tijdig gebruik van de verloskundige zorg tussen eerste en tweede generatie migranten en hoe kunnen deze verklaard worden?

De meeste studies die onderzoek doen naar etnische verschillen in gebruik van de verloskundige zorg vergelijken allochtone met autochtone vrouwen. De rol van generatie is zelden onderzocht. Men kan verwachten dat eerste generatie migranten minder op de hoogte is van het Nederlandse gezondheidszorgsysteem en van de voordelen van tijdige prenatale zorg, gewoonweg door hun relatief korte verblijfsduur in Nederland en vanwege een mindere beheersing van de Nederlandse taal.

In hoofdstuk 4 van dit proefschrift richtten we ons op verschillen in gebruik van verloskundige zorg tussen de eerste en tweede generatie allochtone vrouwen en de verklaring hiervan. Evenals in hoofdstuk drie, is onze analyse gebaseerd op het conceptuele model van Andersen. Spreekvaardigheid in het Nederlands was meegenomen als mogelijkheidsfactor. We vonden dat eerste generatie zwangere vrouwen de verloskundige zorg later binnenkomen dan de tweede generatie zwangere vrouwen (28.1% versus 18.7%), behalve bij de Surinaams-Hindostaanse vrouwen. Indien rekening werd gehouden met alle onafhankelijke variabelen, konden we de verschillen tussen de generaties verklaren.
Hoewel er grote verschillen zijn in mogelijkheidsfactoren (opleidingsniveau, beheersing Nederlandse taal) tussen de eerste en tweede generatie allochtonen, was het wat verbazingwekkend dat deze niet bijdroegen aan de verklaring van het verschil in tijdig gebruik van de verloskundige zorg tussen de eerste en tweede generatie allochtonen. Opnieuw leken de gedragsfactoren belangrijk: onze analyses laten zien dat ze veel van de verschillen tussen de eerste en tweede generatie zwangere vrouwen verklaarden. Vooral vrouwen die tijdig beginnen met het gebruik van foliumzuur zijn ook meer geneigd om vroeg de verloskundige zorg binnen te stromen.

*Verschillen in kwaliteit van de verloskundige zorg tussen allochtone en autochtone vrouwen.*

4. Zijn er verschillen in de kwaliteit van de verloskundige zorg verstrekt door de eerstelijns verloskundigen tussen autochtone en allochtone zwangere vrouwen? En als er verschillen zijn, hoe kunnen deze worden verklaard?

Ongunstige zwangerschapsuitkomsten worden traditioneel beschouwd als indicatoren voor de kwaliteit van prenatale en maternale zorg. Dit roept de vraag op of er etnische verschillen zijn in de geleverde verloskundige zorg. Studies over prenatale zorg richten zich voornamelijk op het gebruik van de zorg, vooral op de initiatie en timing, terwijl de inhoud en kwaliteit van zorg onderbelicht zijn gebleven. Bestaande onderzoeken betreffen vaak de kwaliteit door middel van tevredenheidenquêtes van zwangere vrouwen. Een aantal studies hebben de obstetrisch-technische aspecten van zorg onderzocht gebaseerd op rapportage door vrouwen. Echter, zwangere vrouwen zijn niet altijd op de hoogte van de technische handelingen die uitgevoerd worden. Daarom verdient onderzoek naar de naleving van de richtlijnen gebaseerd op registratiedata de voorkeur, maar dit is nog zelden uitgevoerd. Bovendien zijn bestaande studies niet in staat om informatie te verschaffen die niet is vertekend door het wel of niet komen opdagen voor ingeplande afspraken.
In hoofdstuk 5 van dit proefschrift is kwaliteit van de verloskundige zorg gedefinieerd als de mate waarin verloskundigen zich houden aan de verloskundige richtlijnen. Veel westerse landen, inclusief Nederland, hebben richtlijnen voor de verloskundige klinische praktijk ontwikkeld. Deze richtlijnen hebben tot doel het verbeteren van de effectiviteit van zorg, rationaliseren van het gebruik van middelen en het bevorderen van consistente, evidence-based kwaliteitszorg.

Hun doel is het bevorderen van de kwaliteit van de verloskundige zorg om zo ongunstige zwangerschapsuitkomsten te verminderen.
Om de kwaliteit van zorg te toetsen, onderzochten we of verloskundigen zich aan de richtlijnen houden van de Nederlandse Vereniging voor Obstetrie en Gynaecologie (NVOG) voor de basis prenatale zorg (www.nvog.nl, 1-1-2006). De evaluatie betrof de volgende testen en onderzoeken: meten van lengte en gewicht, bloeddruk, bloedgroep en Rhesusfactor, screenen voor irregulaire antistoffen, screenen voor HbsAg, screenen voor anemie (Hb) en screenen voor syfilis, fundushoogte, foetale harttonen en foetale ligging.
We vonden weinig verschillen in kwaliteit van de verloskundige zorg tussen allochtone en autochtone vrouwen in onze onderzoeksgroep. Dit is het geval voor zowel nulliparae als voor multiparae vrouwen, hoewel er meer verschillen werden gevonden in multiparae vrouwen. Met betrekking tot de meeste testen en onderzoeken, houden de verloskundigen zich goed aan de richtlijnen onafhankelijk van etnische achtergrond. Wanneer er verschillen tussen allochtone en autochtone vrouwen geconstateerd werden, waren deze niet steeds minder gunstig voor de allochtone vrouwen. Verbazingwekkend was dat voor alle vrouwen, het meten van Hemoglobine (Hb) op 30 weken van de zwangerschap te wensen overliet; de situatie was vooral ongunstig voor de Turkse, Marokkaanse en Surinaams-Creoolse multiparae vrouwen. De verloskundigen beschrijven ook niet in alle gevallen de foetale ligging. De Surinaams-Hindostaanse nulliparae hadden hierbij de laagste score. Tenslotte werden foetale harttonen niet altijd beschreven wanneer het zou moeten, vooral bij de multiparae.
In het licht van deze resultaten was het niet zinvol te onderzoeken of etnische verschillen in kwaliteit van zorg konden bijdragen tot etnische verschillen in uitkomstmaten.

*Verschillen in obstetrische uitkomsten*

5. Zijn er verschillen in obstetrische uitkomsten tussen allochtone en autochtone vrouwen die zorg door de eerstelijns verloskundigen ontvangen? Zo ja, kunnen deze verschillen worden verklaard door verschillen in gebruik van verloskundige zorg?

In hoofdstuk 6 van dit proefschrift beschreven we dat de allochtone vrouwen in onze onderzoekspopulatie geen ongunstig beeld vertonen wat zwangerschapshypertensie betreft; Marokkaanse en Turkse vrouwen hebben zelfs een lager risico. Met betrekking tot preeclampsie werden geen significante verschillen gevonden, hoewel de prevalentie duidelijk hoger was onder de Turken en de Hindostanen. In vergelijking met de autochtone vrouwen, hebben Marokkaanse vrouwen een significant langere zwangerschapsduur bij de bevalling. Kaapverdiaanse en Surinaamse vrouwen hebben echter een significant kortere zwangerschapsduur bij de bevalling. De verschillen werden meestal kleiner door te corrigeren voor sociodemografische en obstetrische factoren. Wat geboortegewicht betreft, vertonen alle allochtone groepen een nadelig beeld. Opnieuw werden na correctie voor sociodemografische en obstetrische factoren de verschillen

kleiner, maar ze bleven significant. Uitzondering vormden de Turkse pasgeborenen, waar leefstijlfactoren de grootste bijdrage hadden in de verklaring van het verschil met de autochtone pasgeborenen. Vroeg de verloskundige zorg binnenkomen leverde geen bijdrage aan de vermindering van etnische verschillen in zwangerschapsduur bij de bevalling of geboortegewicht. Onze studie sluit aan bij de twijfels die de onderzoeken in de Verenigde Staten hebben over de rol van op tijd gebruik maken van de verloskundige zorg op het verminderen van een vroeggeboorte, laag geboortegewicht en op het verminderen van etnische verschillen hierin.
Onze resultaten op het gebied van preeclampsie verschillen duidelijk met een eerdere studie, die vrouwen die de gehele prenatale zorg van een gynaecoloog, in de tweedelijnszorg, hebben ontvangen, niet heeft geëxcludeerd. Deze studie vond een hogere prevalentie van preeclampsie onder Kaapverdianen, Antillianen en Creoolse vrouwen, wat niet in ons onderzoek het geval was. Dit suggereert dat de selectie in de Nederlandse verloskundige zorg door de eerstelijns verloskundigen aan het begin van de zwangerschap redelijk functioneert, hoewel we niet kunnen aantonen in hoeverre dat het geval is. In tegenstelling tot onze resultaten, was de prevalentie van preeclampsie in de eerdere studie ook hoger in deze groepen dan bij de autochtonen. Dit laatste maakt duidelijk dat de risicoselectie een deel van de etnische verschillen verklaren.

Hoofdstuk 7 bevat een samenvatting van de belangrijkste bevindingen. Tevens worden methodologische kwesties besproken die mogelijkerwijs invloed hebben gehad op onze bevindingen. Daarna volgt een discussie van de onderzoeksbevindingen. Tenslotte volgen een aantal aanbevelingen voor vervolgonderzoek en een aantal implicaties voor beleid.

# Appendices

**I Dankwoord**

**II About the author**

III **NVOG-schema voor basis prenatale zorg**

# I Dankwoord

*'When you believe, you will achieve. When you get there, you will believe'*

Naast geloof, vertrouwen en natuurlijk hard werken ligt dit proefschrift er nu. Natuurlijk heb ik dit niet alleen gedaan en wil ik een aantal mensen bedanken die een directe of indirecte bijdrage geleverd hebben aan de totstandkoming van dit proefschrift:

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## II About the author

Anushka Choté was born on February 3rd 1976 in The Hague in the Netherlands. She is the daughter of Surinam immigrants and has a Hindustani ethnic background.

She passed secondary school at the Emmaus college in Rotterdam and studied Health Policy and Management at the Erasmus University Rotterdam. During her study she developed an interest in quality of health care for migrant groups, writing her master thesis on how to reach Hindustani people with diabetes information and education. She was able to pursue this interest further when she started working at the institute of Health Policy and Management of the Erasmus University Rotterdam in 2002 where she started the research project presented in this thesis. Also she did a project on structural funding and organizational embedding of intercultural mediators. In addition she also teaches and coordinates courses such as sociomedical sciences. She is also coordinator of the premaster programme at this institute.

Besides her work, Anushka has her own dance school where she teaches different Indian dance styles. Anushka is married with Sudesh and they have two children, Armaan and Jiya.

## III NVOG-schema voor basis prenatale zorg

Tabel 3

| Week | Nulli- en multiparae | Extra voor nulliparae |
|---|---|---|
| 1e trim. | o anamnese (zie tabel 2), RR, lengte, gewicht<br>o echoscopisch verifiëren zwangerschapsduur<br>o Hb, MCV<br>o bloedgroep/rhesus + IEA, HbsAg en luesserologie, HIV (risicofactoren, voorlichting, serologisch Onderzoek aanbieden)<br>o gezondheidsvoorlichting/-opvoeding<br>o ouderschapsvoorbereiding/kindzorg/kraamzorg | |
| 15-20 | o uterusgrootte/fundushoogte, fht<br>o eventueel serumscreening ds/nbd en/of (structurele) echoscopie afspreken<br>o afspreken zwangerschapsvoorlichting/instructie<br>o voorlichting/instructie over klachten/stoornissen (bloedverlies, contracties) | |
| 26-27 | o rr, uterusgrootte/fundushoogte/foetale groei, fht<br>o voorlichting/instructie over klachten/stoornissen (foetaal leven voelen, bloedverlies, klachten pre–eclampsie)<br>o ouderschapsvoorbereiding/kindzorg/kraamzorg | |
| 29-30 | o rr, uterusgrootte/fundushoogte/foetale groei, fht<br>o iea/RhDAI, Hb, mcv | o rhesus(D)profylaxe |
| 33-34 | | o rr<br>o uterusgrootte/fundushoogte/foetale Groei/fht<br>o voorlichting/instructie over bevalling en Kraam-/kindzorg |
| 36-37 | o rr, uterusgrootte/fundushoogte/foetale groei, fht<br>o aard/indaling voorliggend deel<br>o voorlichting/instructie over bevalling en kraam/-kindzorg | |
| 39-40 | | o RR, uterusgrootte/fundushoogte/foetale groei/FHT<br>o aard/indaling voorliggend deel |

**RR = bloeddruk, Hb = hemoglobine, MCV – mean corpuscular volume van erytrocyten, DS = Downsyndroom, NBD = neurale-buisdefect, FHT = auscultatie foetale harttonen, IEA = irregulaire erytrocytenantistoffen; RhDAI = rhesus(D)antistoffen.**