Chapter 7: General Discussion
This chapter first summarizes the main findings of all the studies presented in this thesis. We then proceed to discuss the main methodological issues encountered during our research, discuss the implications of our findings for practice and then give some recommendations for further research. This chapter ends with the general conclusions from the studies which are presented in this thesis.

1. Main findings

The research questions investigated in this thesis were embedded within two central objectives. The first was to examine the health status and health behaviours of pregnant women in primary care, as well as characteristics associated with these health indicators. The second was to examine the prenatal health education provided by primary care midwives, as perceived by pregnant women and through video observations of actual health education provision during prenatal booking visits. This section describes the main findings of the studies in this thesis.

1.1. Prevalence and characteristics of maternal/perinatal health and maternal health behaviours

**Chapter two:** In our study investigating the relationships of various maternal health behaviour and psychological characteristics with spontaneous preterm birth in nulliparous women, we found only health control beliefs to be significant. Women with lower health control beliefs during pregnancy were twice as likely to have a spontaneous preterm birth after adjusting for socio-demographic characteristics, anthropometrics and other health behaviour characteristics. Heavy smoking had a significant univariable relationship with preterm birth, but once we adjusted for socio-demographic characteristics, the relationship was no longer statistically significant.

**Chapter three:** This study provided an overview of self-reported health status indicators and health behaviours during pregnancy under primary care and showed that there were still substantial socio-demographic inequalities in maternal health and health behaviours, to the disadvantage of those with lower education and immigrants (in particular non-Western immigrants). In general, almost one third of pregnant women started their pregnancies being overweight or obese, 15.1% had low health control beliefs, 19.9% currently felt somewhat to very depressed or anxious, 9.2% reported smoking, 11.0% reported drinking alcohol at least once during pregnancy, 8.6% did not take folic acid supplements, 54.3% did not attend any antenatal classes, 18.6% reported not eating fresh vegetables daily, 14.7% did not eat fruit daily, 11.1% did not have breakfast daily and 3.2% did not eat a hot meal daily. For 17.6% of women, the pregnancy was unplanned. Given the extent of socio-demographic inequality we found
in many of these health indicators, and the fact that ethnicity was somewhat and low education very underrepresented in our study sample, the percentages of many of these adverse health indicators are likely to be considerably higher in the general population.

Strong inequalities according to educational level were apparent in health behaviours such as smoking, passive smoking, not attending antenatal classes, not taking folic acid, unplanned pregnancy and skipping meals. Substantial inequalities according to educational level with regard to health status included lower health control beliefs, depressed/anxious mood and obesity as well as underweight. Ethnic disparities were also apparent: non-Western women were more likely to experience passive smoking, not take folic acid supplements and not attend antenatal classes. They also more frequently reported having lower health control beliefs, being depressed or anxious, and having nausea and back pains.

Chapter four: In this study, we investigated the socio-demographic and lifestyle-related characteristics which were most strongly associated with any, daily and occasional self-reported smoking during pregnancy. In our population 9.2% of all respondents reported smoking (5.4% daily and 3.8% occasionally). Educational level was the characteristic most strongly associated with any smoking, with those of lower education being ten times more likely to smoke than those of higher education. Other characteristics strongly associated with any smoking were having no religion compared to identifying with a religion, being of Turkish or Dutch origin compared to any other origin, and having no partner, compared to having a partner or spouse. Characteristics somewhat associated with any smoking were being underweight, being depressed or anxious, having a lower neighbourhood SES, not taking folic acid, any alcohol consumption, unplanned pregnancy, and low health control beliefs. Focusing only on daily smokers, we found that those of lower education were 20 times more likely to smoke daily than those of higher education. Other strongly associated characteristics of daily smokers were having no partner, being of Turkish or Dutch origin, having no religion and being underweight.

1.2. Prenatal health education provided by primary care midwives

Chapter five: This interview study explored the experiences, wishes and needs of pregnant women with respect to the health education provided by their midwives. Our findings showed that women considered the midwife to be the designated health provider for health education and most women appreciated the amount of information they had received. They generally recalled receiving basic information on how to avoid infectious diseases, e.g. by means of safe nutrition. They recalled being asked whether they smoked or drank alcohol, but most women did not recall receiving verbal information during prenatal visits on nutrition for promoting good health, benefits of
physical activity, recommended weight gain and on why alcohol was harmful. Some expressed the wish for more extensive health education on various topics, and others, despite having reported being satisfied with the health education provided by their midwives, reported having questions and uncertainties about various health behaviours, including nutrition, weight gain and physical activity. Women assumed that midwives provided individualized care according to their parity, educational level or general health status, and according to questions posed by the women. Some women were concerned that this assessment may have led to incorrect assumptions about their needs and wishes for health education. Nulliparous women generally had more of a need for additional health education and often expressed wishing they could have more contact with their midwives during the first trimester. Women generally believed that there should be a relationship of trust with their midwives and that midwives should make them feel at ease.

Chapter six: The aims of this video analysis study were to quantify the extent to which evidence-based health behaviour topics relevant for pregnancy were discussed with clients during the prenatal booking visit and to assess the association of client characteristics with the extent of information provided to them. The majority of clients were provided with no information on recommended weight gain, fish promotion, caffeine consumption, vitamin supplementation, physical activity promotion and antenatal class attendance. Brief mention was made of alcohol, smoking, folic acid, and weight at the start of pregnancy. The importance of having a nutritious diet was either never mentioned or briefly mentioned. Women who did not take folic acid, who smoked or who had a partner who smoked, were usually provided basic explanations and occasionally more extensive explanations about these topics. Nulliparous women were typically given more information on most topics than multiparous women. There were no other notable differences in client characteristics regarding the extent of information provided.

2. Methodological issues

This section describes some methodological strengths and limitations we encountered while conducting the various studies. For each of the various studies, we discuss issues regarding the study design, sample, measures and analyses. A main strength of this thesis involved the use of various study designs and methods to investigate maternal health and prenatal health education from different angles. The characteristics of maternal health and health behaviours were investigated quantitatively using a prospective cohort study. Prenatal health education in primary care was investigated qualitatively (interview study), as well as quantitatively (video study).
2.1. Observational cohort studies (chapters 2, 3 and 4)

**Study design**
Three of our studies were obtained from the observational cohort study DELIVER, which consisted of 7865 pregnant women who had completed at least one of three online or written questionnaires [1]. Women were recruited from 20 midwife practices throughout different regions of the Netherlands. To improve the participation of non-Dutch speaking women, written questionnaires were also available in English. As the largest minority groups in the Netherlands are from Moroccan and Turkish descent, the questionnaire was translated into Arabic and Turkish for those who did not speak Dutch or English and the questionnaires were administered by means of telephone interviews. Women were able to complete online or written questionnaires in Dutch or English. Recruiting women throughout the Netherlands, and facilitating the response of non-Dutch speaking residents, contributed to a rich database of self-reported information provided anonymously to be able to assess women’s experiences with primary maternity care. Our study investigating the relationships between various maternal characteristics and spontaneous preterm birth was prospective, which limited recall bias, and enabled the identification of relationships between various factors over time (chapter 2). As it was observational, we could indicate, but not prove any direct or indirect causal relationships. Two of our studies were cross-sectional (chapters 3 and 4), giving relevant information about the association of various factors with each other at one moment in time (i.e. social demographic factors and health behaviours), but we could not imply any causality.

**Study sample**
Although average age and parity of the DELIVER study sample were similar to the general population of pregnant women, it contained a much larger proportion of highly educated women than the general population of women living in the Netherlands. Among respondents to the main questionnaire used in this thesis (questionnaire 1), 48.8% had a high educational level compared to 28.2% in the general population of women between 15 and 54 years of age in 2010 [2]. As higher education tends to be advantageous for more beneficial health [3, 4], the prevalences we report of adverse health-related issues are likely to be underestimated. Although the proportion of women with ethnic minority origin was still smaller than in the general population of women in 2010 between the age of 15 and 54 (16.2% versus 22.7%, [2], the measures taken to increase the participation of women of non-Dutch origin in the Netherlands still led to a reasonable proportion of ethnic minority respondents. Our study sample in general was large enough to contain sufficient numbers of people in different sociodemographic categories for demonstrating differences between groups and magnitudes of
associations between various factors.

The participants were also only recruited from midwife practices in primary care, meaning that our conclusions cannot automatically be extended to women who start their pregnancies in secondary care, and who may have different characteristics of importance when assessing their health and health care. However in the Netherlands, the majority of women start their pregnancy under primary care midwives (83.3% in 2010, 86% in 2014 [5]), making the study representative of the experiences of most pregnant women in the Netherlands.

Study measures
The data of three of our studies (chapters 2, 3 and 4) were obtained from self-reported client questionnaires; the responses are therefore subjective and possibly inaccurate. It is possible that due to social desirability, data on suboptimal health behaviours (i.e. smoking and alcohol consumption) were under-reported, and data on optimal health behaviours (i.e. daily fruit and vegetable consumption) were over-reported. These possible inaccuracies in self-reported items would affect the population frequency rates of health behaviours. The women participating in the DELIVER study were told that their data would remain anonymous and that no information would be passed on to their health care providers, however, possibly decreasing the need for social desirability. By using self-reported data, women also had to rely on their memory, leading to the possibility of recall bias. The majority of the questions, however, asked them to report their current health and health behaviours at the moment of questionnaire completion. An advantage of using self-reported data to carry out research relevant for health care providers is that health care providers often have to rely on self-reported information that they receive from their clients in order to plan and provide health care; this information is also relatively easy to obtain.

The DELIVER study contained three questionnaires for clients to complete about a wide range of topics regarding their own health, health care usage and experiences of their birth and prenatal health care. The purpose was to obtain a broad overview of the health and health care of pregnant women in primary prenatal care the Netherlands. The items were not all developed with our specific research questions in mind, and therefore our studies can be considered as relying on secondary data analyses. We had to make use of non-optimal measures or operationalisations at times for the purpose of our research questions. The health control belief item, for example, was a unidimensional single-item assessment, due to limited space in the questionnaire for more items about perceived health control. To measure health control beliefs, we may have included the items developed by Wallston, (1978) [6], which measure not only internal locus of control of health, but also the extent of the belief that powerful others and chance determine one’s health. The items to assess nutrition behaviour were general questions (e.g. do
you eat fruit daily? ‘yes’ or ‘no’), and it was not possible to include a more comprehensive validated food frequency questionnaire. To answer our research questions, we would have included a validated food frequency questionnaire, such as the one adapted by Meltzer et al., (2008) for pregnancy [7] to assess the type, amount and frequency of various types of foods consumed, including coffee and fish consumption. Besides the EuroQol questions [8], the items measuring health and health behaviours were not pre-validated. We would likely also have included validated items measuring stress and depression (i.e. from the Edinburgh Depression scale (EDS) [9]), social support (i.e. Multidimensional Scale of Perceived Social Support [10]) and physical activity (i.e. Pregnancy Physical Activity Questionnaire (PPAQ) [11]) during pregnancy. Nevertheless, the items included in the questionnaire were still able to provide us with an indication of the prevalence and socio-demographic inequalities of self-perceived health and health behaviours. There may have been other confounding factors which we did not account for; low income, for instance, is likely to contribute to poorer health and suboptimal health behaviours. As we did not have a clear variable reporting income, we did not include this in our studies.

**Study analyses**

Our studies using the DELIVER cohort study combined various statistical techniques, such as multiple imputation (to estimate the missing data) and Generalized Estimating Equations (GEE) (to adjust for possible correlation of data within midwife practices). There were some limitations depending on the study design.

When applying multiple imputation, new datasets with estimated missing data are generated and the data presented in the pooled dataset are used to report. The pooled data do not report the p-values for categorical variables, however, which is necessary for backward or forward logistic regression (chapter 4). In our study described in chapter four, we carried out a single stochastic regression imputation which produced a single dataset with estimated values; this was not as reliable as multiple imputation, but still acceptable considering the low numbers of missing data. Our study described in chapter two did not apply forward or backward logistic regression, so this was not an issue. In our study described in chapter two, we did have a relatively large number of missing data about spontaneous preterm birth (20.8%), which was based on data collected by the National Midwifery Registry (LVR1). Although performing multiple imputation is still somewhat controversial, the technique is increasingly being used. There is sufficient evidence using simulations of datasets with different types of missing data, to show multiple imputation to be reliable, and that it can decrease bias in datasets with high proportions of missing data [12, 13]. We chose to include estimations of missing data in the analyses in order to increase the sample size and therefore its statistical power, and to diminish the bias that can occur due to high numbers of missing data.
2.2. Qualitative interview study (chapter 5)

**Study design**
One of the best ways to evaluate prenatal health education is to understand it from the point of view of the recipients, i.e. pregnant women in primary care living in the Netherlands. We chose a qualitative interview study design for this purpose, allowing us to have direct contact with pregnant women, and enabling them to share their opinions and experiences freely without the boundaries of specific questions in a survey. The qualitative interview study allows more complex issues to be explored and subtle and unique perspectives to be captured in a way that quantitative questionnaires cannot. These findings can also provide input for new pathways of research.

**Study sample**
Our interview sample consisted of 22 pregnant women, whose experiences we cannot generalize to the whole population of pregnant women in primary care in the Netherlands. However, there was enough variation in the characteristics of the women we interviewed to be able to explore a wide range of possible experiences and views, and to therefore make an approximate representation of pregnant women in primary prenatal care in the Netherlands.

Our study contained a greater proportion of highly educated women than other educational levels, all the women could speak sufficient Dutch for an interview and most women appeared to be in reasonably good health. We do not know if immigrants who did not speak Dutch or women with more serious health issues, would have responded differently. Women with serious health issues, such as diabetes or extreme obesity, would more likely have been under the care of obstetricians in secondary care; we do not know how the experiences of the women in our study compare to those in prenatal care with a general practitioner, clinical midwife or obstetrician. It is also possible that the women we interviewed had a greater interest in health, were more outspoken or differed in other ways to women who were aware of our request for interviewees, but did not respond.

This possible selection bias is partly likely to be due to our recruiting method, which involved encouraging pregnant women to respond voluntarily to our request for participants in various locations unrelated to midwives and midwife practices. As is seen in most scientific studies with voluntary respondents, higher educated people are more likely to participate. We considered recruiting women through midwife practices and even through midwives themselves, which may have been beneficial with respect to facilitation of recruitment, and may have ensured we would have a maximum variation of women, of different educational levels, ethnicity and health (behaviours). If our interviews had focused solely on women's experiences of their own health and
health behaviours, this may have been the better option. However since a large part of our interviews also focused on how they viewed the prenatal health education provided by their own midwives, we felt recruiting women separately from their prenatal care providers would increase the chance of women feeling they could express their opinions objectively and freely, without any concern of audio-recorded or written information being transferred to their health care providers. We did of course assure all women anyway, that their details and responses would remain anonymous. We believe that we had sufficient variation in participants to gain a better understanding of the views of women towards prenatal health education with primary care midwives in the Netherlands.

Study measures
The semi-structured interviews were carried out using a topic list with accompanying questions, that we believed to be of importance after reviewing the relevant scientific literature. Our intention was to explore the experiences of women regarding their own health behaviours during pregnancy and their views of the prenatal health education that was provided by their midwives. The focus of the study in this paper was on prenatal health education. Open-ended questions were used to embark on new topics allowing women to freely discuss health topics of personal importance to them. Close-ended questions were generally used to obtain background information, or to confirm our understanding of what the participant had said. The flexibility of the qualitative interview study allowed us to explore new, relevant aspects of the various topics, as the interviewing process progressed.

With our general research goal of investigating maternal health and health promotion, different methods and perspectives were sought and applied to obtain comprehensive information from various perspectives. It is not always clear at the start of a research project with which method or study one should start. Each subsequent study has the advantage of having the knowledge obtained in earlier studies. Our interview study was carried out before our video study of prenatal booking visits, but in hindsight it may have been more useful to investigate the video recordings of the prenatal booking visits first. This would likely have led us to focus more on the specific topics examined in the videos during the interviews. We may have asked the women about their views regarding the manner, the contents and extent of topics discussed during the prenatal visit -as indicated by the video analysis study-, such as which topics they would have preferred to have had more information on, and whether they believed this information could influence their own health behaviours. Nevertheless, although our approach was somewhat more general in this interview study, we did obtain valid and useful information for the evaluation and improvement of prenatal health education. Some of the findings obtained in this interview study, such as the women’s report of
having received limited information about alcohol, physical activity, recommended weight gain and nutrition, were in line with the findings in our video study of actual prenatal booking visits.

**Study analyses**

We used thematic analysis for this study, which is a qualitative method using the same procedures for coding data as grounded theory, but its aim is not to generate a new theory [14]. Its aim is to identify patterns and themes as well as contrasting ideas across all of the interviews. It is more flexible, as it allows the usage of both deductive themes (based on previous research and previous theories) and inductive themes (based on the analysis of the data itself).

Qualitative studies will always have a degree of interpretation on the part of the researchers, both in determining what participants mean when they speak, as well as in deciding which findings of the vast amount of rich data collected, should be prioritized and presented in the study. We endeavoured to decrease this researcher bias and make these interpretations more objective, by having all the interviews transcribed verbatim, by reading the transcripts several times and by attempting to stay as close as possible to the text when coding. Codes were merged into categories, still staying close to the text and these categories were then combined into more interpretive themes. RB and QH independently coded the first six transcripts and then compared their coding schemes. As the interviews continued they discussed their impressions and interpretations in light of the interviews carried out earlier. The remaining transcripts were coded with these themes as a framework, but we still allowed some adjustment of themes as we gained new insights during the interview process. Our interpretations and themes were discussed with other members of the research group, who provided input on how to structure the findings in a legible and coherent way. We added citations to illustrate and provide evidence for the themes we had identified. Besides identifying recurrent patterns, we also sought and reported contrasts and exceptions in the participants’ responses, in order to increase the objectivity of our findings. During the latter interviews we observed that much information provided by the participants was illustrative of the various themes we had identified earlier, showing we had likely reached data saturation.

Another issue potentially affecting validity is the possible influence of the researchers’ presence in the interview. The women knew that the researchers were not midwives themselves, and were told that they could provide no right or wrong answers, which may have reduced the tendency to want to give socially desirable information.

We did not perform member checks, such as sending the participants a summary of our impressions and our understanding of the information they had shared with us after the interviews; this may have been beneficial to increase the validity of the study.
It may not have been ideal for all of the women, however, as some of them were already at a late stage of their pregnancy, and a member check would therefore have required a relatively quick recap from us and feedback from them. The conversations were audiotaped, therefore we were able to go back and check what had literally been said.

2.3. Observational video study (chapter 6)

**Study design**
Actual prenatal booking visits of midwives and clients were video-recorded and analysed for the extent of information given about a range of health behaviour topics. This provided unique and possibly more accurate data about health behaviour education than relying on self-reports of midwives or clients. Self-reported assessments are more likely to be affected by recall bias and social desirability bias depending on the topics being researched. There may still have been social desirability bias regarding the health educational behaviour observed, however, due to the midwives knowing they were being filmed, observed and assessed. The whole prenatal booking visit, containing many different health care components was video-recorded however, and the midwives did not know which aspects of the booking visit would be studied. Also, the midwives all recorded on average 11.5 videos each; there were no obvious changes in the way they provided prenatal health care between their first recording and later recordings [15].

**Study sample**
We had a large video sample of 173 real-life prenatal booking visits. The results of our video analyses are based on the prenatal visits carried out by 15 midwives in four practices, therefore they may not be representative of all midwives and practices. It is possible that participating midwives were different to non-participating midwives, such as possibly having more confidence about their performance than non-participating midwives. Although client socio-demographic characteristics were quite similar to the Dutch population, we also do not know if the clients who participated were different in other ways to those who did not want to be filmed, possibly eliciting a different health educational performance from their midwives.

**Study measures**
The health behaviour topics selected to be examined were based on a review of literature of important behaviours for pregnancy. We did not include some important health behavioural topics, such as those necessary to prevent infectious diseases, as these are covered in a previous video study of the same midwife-client population [15]. That study showed that the health behaviours for avoiding infectious diseases which were mentioned most frequently were to avoid raw meats (78.5%) and unpasteurized dairy products (76.2%). Health behaviours to avoid infectious diseases which were
mentioned least were to thoroughly reheat food (0.6%) and to not share eating utensils with small children (0.0%). In hindsight, we could have made the topics more exhaustive, for example, looking at more nutrition or dietary behaviours separately, such as eating fruits and vegetables, and consuming more fibres and calcium during pregnancy. We believe the variables that we included still provide a good indication of the extent of health education that is being provided.

Most topics in general were initiated by midwives, with clients just listening to the information provided by the midwife, or answering questions. Occasionally, a client would ask for more information about a topic, such as vitamin D or physical activity, to which the midwife would provide more information. When this occurred, we still coded it as information provided by the midwife, as it would be impossible to know whether or not the midwife would have broached the subject anyway. It can be argued that it is reasonable to expect that all relevant topics are covered adequately with each client during the prenatal visit, irrespective of who initiates the discussion of a topic. It is possible, therefore, that the assessment of the information provision of some topics, was somewhat overestimated, making the conclusions stronger, rather than weaker.

**Study analyses**

Although our sample size was large for a video study (n=173), it was small for carrying out statistical analyses, in particular when also needing to adjust for possible correlations at practice level (n=4) and midwife level (n=15). In reporting the prevalence of the different categories of information provision, no distinction was made at midwife and practice level. The results can still be considered as indicative of the extent of information that was provided to those 173 clients. We calculated the intra-class correlation coefficient (ICC) for each item we assessed at midwife and practice level; this indicated there was some correlation within those two levels and therefore we performed Generalized Linear Mixed Modelling (GLMM), which can adjust for correlation at multiple levels of data. Univariable logistic regression using GLMM was performed to estimate the relationships between client characteristics and the extent of information provided. Due to the small sample, we dichotomized all variables and we did not adjust each relationship for various other characteristics, therefore these results were also interpreted as indicative.
3. Implications for practice

Health education and promotion is a task that tends to be underestimated in general by health care providers. A study analysing videos of physicians during consultations with their clients in the Netherlands, for instance, also concluded that the health education they provided was limited [16]. This section describes some implications of our findings for prenatal health education, policy and midwife knowledge about health education.

3.1. Implications for prenatal health education

Prenatal health care givers, such as midwives, are often the only health care providers that women see during their pregnancy, making them important sources of information and care. As women are generally motivated to have a healthy child and to make lifestyle changes to promote their child's health [17], pregnancy provides a unique opportunity to encourage and promote healthy behaviours, with a possible long-term impact on both mothers and children [18]. Pregnant women tend to be very receptive to information about health behaviours that influence their pregnancy and their child, and are more interested in information about nutrition, for example, than non-pregnant women [19]. Women appreciate health education by their midwives, and midwives are considered to be reliable sources of information (chapter 5). Health care providers should therefore take advantage of this willingness to learn and change, by providing effective health education.

Several women in our interview study (chapter 5) expressed a need for more extensive information from their midwives; other women reported having uncertainties about various topics (i.e. on nutrition, weight gain and physical activity). Our video analyses of the health behavioural information given by midwives during the prenatal booking visit, the designated time for health education, also showed that general healthy nutrition, fruit, vegetable, fish consumption and physical activity were only occasionally promoted (chapter 6). Although fruit, vegetable and fish consumption were often discussed during the intake, the focus was typically on reducing the risks of infection, i.e. advising clients to wash fruit and vegetables thoroughly, and to avoid vacuum-packed fish. Similarly, the focus of the discussion on physical activity was generally that it was fine to continue doing safe exercise, and to slow down if they experienced complaints, but it was not to promote the benefits of physical activity. Earlier studies have shown that focusing on the risks and dangers of fish consumption and physical activity during pregnancy can lead to a decline of fish consumption or physical activity [20, 21]. An interview study with obese and overweight women revealed that although they were aware that healthy nutrition and physical activity were beneficial for pregnancy, they were not able to name any specific reasons why
Women may also be more likely to adhere to advice if explanations are given about the relevance and consequences of health behaviours. As pregnant women have reported being influenced by their health care providers’ advice on nutrition, it would be worthwhile for midwives to invest more time and effort in nutritional and physical activity health education.

**Standardized prenatal health education**

Ideally prenatal health behaviour education may consist of standardized as well as tailored components. In his book *Preventive Medicine* (1992), G. Rose describes population-based interventions as generally being advantageous over high-risk population interventions. As determinants of health and health outcomes both tend to be continuous, it is unclear where the cut-off points are for those who are at risk and those who are not; everyone will benefit to a certain degree, and the whole population will benefit greatly. This may also apply to providing the essentials of prenatal health behaviour education to all pregnant women of varying socio-economic and health statuses, where some may ‘need’ it more than others.

It is difficult to determine how much a woman really knows about all pregnancy-relevant health behaviours, therefore it is advisable to provide more extensive health education to all clients. As our overview of maternal health indicators during pregnancy showed, there is still much room for improvement in beneficial health behaviours during pregnancy in the Netherlands. Ideally, pregnant women should all be encouraged to have healthy diets in general and be given dietary recommendations for specific food groups and nutrients, abstain from any alcohol consumption, practice health-enhancing physical activity, and be encouraged to attend antenatal classes. This information should be complemented with explanations on why these health behaviours are beneficial for mother and child. Providing all pregnant women with the essential information on all pregnancy-relevant health behaviours (by explaining what (not) to do, how (not) to do this, and why they are advised (not) to do this) will at the very least ensure that everyone is informed.

**Tailored prenatal health education**

Besides the provision of standardized prenatal health behaviour education on all relevant health behaviours, a complementary tailored component would also be beneficial, which would involve adapting the information and advice to the specific needs of individual clients. The Marmot review (2010), speaks of ‘proportionate universalism’, which describes interventions that are applied universally, ‘but with a scale and intensity that is proportionate to the level of disadvantage’. It may be appropriate to apply proportionate universalism to prenatal health education.

Tailoring prenatal health education effectively may start with the awareness
of evidence-based findings on the various types of determinants influencing maternal health and health behaviours: first, as our study (chapter 3) revealed, socio-demographic inequalities persist in many health indicators among pregnant women in the Netherlands, theoretically implying that the health of the whole pregnant population could improve substantially if everyone had the average health of the most advantaged. This may entail assessing their clients’ health literacy, so that information can be provided in a manner that is understood well [27]. Encouraging the attendance of antenatal classes may benefit all women, but especially those who are at a social disadvantage (ie women of lower education, or of non-western ethnic descent). However, socially disadvantaged women are much less likely to attend such classes (chapter 3), so spending time encouraging, explaining the benefits of attending, and discussing and providing solutions for possible barriers may help more women to reap the benefits of these classes.

Second, it is also important for prenatal health care providers, such as midwives, to be aware of the fact that many risk factors for adverse health are associated with other risk factors. A poor diet in the first trimester of pregnancy, for instance has been found to be associated with other risk factors, such as depression, stress and low social support [28]. Similarly, as we found in our study (chapter 4), women who smoke during pregnancy are also more likely to have other risk factors for adverse health outcomes, such as being underweight, not taking folic acid, being depressed or anxious, and drinking alcohol. Having multiple risks may require more all-round health promotion, where multiple risk factors are addressed.

Third, it is advisable to spend time assessing the clients’ current health behaviours, as well their attitudes towards various health behaviours, and possible barriers to improving health behaviours. Health promotion could then focus on changing attitudes, increasing self-efficacy, or diminishing barriers, to facilitate the desired health behaviours. Our study (chapter 3) showed that 15.1% (998/5996) of women had low health control beliefs, meaning they did not believe they could influence their health much, by their own behaviours. As our study had a much greater proportion of higher educated women than in the general population of pregnant women (chapters 2, 3 and 4) and lower health control beliefs is associated with lower education, the actual proportion of women with lower health control beliefs is likely to be much higher. Our study (chapter 2) also showed low health control beliefs to be related to spontaneous preterm birth, possibly due to the relationship of low health control with stress [29], which in turn is related to preterm birth [30]. A component of health promotion could be to show women that their health behaviours can influence their own health, and ultimately the health of their child. Exploring with women the barriers they experience in practicing beneficial health behaviours, such as being too nauseous, exhausted or having no time for physical activity [31], will enable the midwife to work with the women...
to set goals, explore resources and develop strategies to overcome these barriers.

**Midwife relationship with client**

Maintaining a positive relationship of trust with the client may be beneficial for obtaining accurate information from the client, as well as motivating health behaviour change if necessary (chapter 5). It would be beneficial for midwives to take into consideration the sensitivity of certain health issues for certain clients, such as weight gain (chapter 5) and to be aware of how their own attitudes towards certain issues, such as alcohol consumption, may influence their clients' views [32]. Other studies on physician-patient relationships also emphasize that empathy, good communication skills and the ability to build client-friendly relationships are important qualities for providing effective health education [33, 34].

### 3.2. Implications for policy

During the video observations of the prenatal booking visits (chapter 6), it became clear that each midwife practice has a somewhat different ordering and content of the components in their prenatal care. It may be worthwhile to re-examine and possibly restructure the information and other prenatal care components provided during the prenatal visit, so that they are most relevant for that phase of pregnancy. There are topics routinely discussed which may not be necessary for the first booking visit. Discussing post-partum life issues, such as breastfeeding, or the dangers of the herpes virus when kissing the baby, may be issues that could be postponed to later prenatal visits. Many practices also provide prenatal counselling about testing for anomalies during this booking visit. It has been recommended to book a separate session somewhere in early pregnancy to dedicate enough time to fully discussing this [35]. This would free up more time for providing health education.

A division of tasks is also a possibility to lighten the load of the midwife somewhat, where another health professional also working at the midwife practice performs part of the booking visit tasks, such as the physical examinations (i.e. weighing the client, taking her blood pressure and a blood sample). As pregnant women may often have multiple health care needs, it may be beneficial for midwives to work more closely together with professionals from other fields, such as social workers, nutritionists, psychologists and physiotherapists.

A large part of the prenatal visit is used for the collection of the medical anamnesis of the client, her partner and their families; it may be worthwhile to explore client and midwife-friendly ways in which this information can be provided before the visit begins, such as by developing online questionnaires for clients which are directly linked to the midwives’ database of client information. Although some of the information may need
to be briefly reviewed during the visit, asking the clients to complete this information before coming to the prenatal visit, could potentially save a great amount of discussion and typing time.

There are written guidelines with basic information on all pregnancy-relevant health behaviours for clients to read themselves, and these are generally handed out to women during the booking visit. However, not all women read or remember the information in written guidelines, or only read them for reference if they have a question. In order to ensure that all women are sufficiently informed, a guideline should be developed for midwives (for instance by the Royal Dutch Organisation of Midwives (KNOV)) containing the essential up-to-date information about each health behaviour topic that should be discussed with each client.

3.3. Implications for health behavioural knowledge of prenatal care providers

Conveying information on evidence-based health topics to clients requires that midwives and other prenatal care providers have access to this knowledge themselves. Educational courses during and after completion of their midwife training should cover all the latest information on evidence-based health behaviours affecting a woman and her child’s current and future health, teach skills about how to assess and respond to different levels of client health literacy, teach how to provide solutions to barriers preventing beneficial health behaviours, and teach how to remain up-to-date with evidence-based findings on maternal health behaviours throughout their career.

4. Further Research

Our research findings have led to further study questions for investigation in various areas (table 2).

Prenatal health education
From our findings, it appears that midwives could play a much larger role in health education than they do. Although various studies have reported reasons why midwives do not spend more time on health education [24, 36], it would be beneficial to carry out interviews or focus groups with midwives in the Netherlands to gain further insight into their attitudes towards health education or barriers that they may encounter. These determinants of health education provision could then be addressed to facilitate and improve prenatal health education. More research should be done not only examining the contents of prenatal health education, but also the manner in which this is done, as this of importance to clients and possibly also for actual health behaviour change [33,
It is known that health education in the general population does not usually lead to behavioural change [38], but pregnant women appear to be more willing to change health behaviours for the sake of their unborn child [17]. There is evidence that prenatal health education does have an effect on pregnant women's attitudes towards and their actual health behaviours [24, 39], but more research is needed, especially randomized controlled trials, to examine this relationship more clearly.

**Effects of prenatal healthy nutrition and physical activity**

Various international studies from high income countries indicate that healthy nutrition, in particular fruit, vegetable and fish consumption can lower the risk of preterm birth [40-43]. There is some evidence that physical activity during pregnancy may help to prevent gestational diabetes, excessive weight gain and preterm birth [44-46]. There is also substantial evidence demonstrating the effects of prenatal nutrition and physical activity on the longer-term health of the child [47, 48].

Although the Netherlands appears to be a relatively well-off and healthy population, we know from the Netherlands National Institute for Public Health and the Environment (RIVM) that most people do not meet the recommendations for healthy nutrition (including fruit, vegetable and fish intake) and physical activity [49]. Given the relatively high prevalence of preterm birth, the increasing prevalence of chronic diseases and their substantial impact on the quality of life, as well as on health care costs, non-medical preventive interventions which aim to increased maternal healthy nutrition and physical activity are worth investigating. More observational and randomized controlled trials are needed, using well thought out and validated questionnaires which can measure type, frequency and amount of relevant nutritious foods consumed as well as physical activity practiced during pregnancy.

**Health control beliefs**

Our study (chapter 2) showed low health control beliefs to be associated with spontaneous preterm birth. It would be worthwhile measuring this relationship again with a more multidimensional scale of health control beliefs, such as the one originally developed by Wallston, 1978 [6]. Our study presented in chapter 3 showed low health control beliefs to be very strongly associated with lower education, which in turn is associated with preterm birth [50]. Research is needed to determine what other maternal characteristics are associated with health control beliefs. Stress is a possible factor of relevance, as it is related to low health control beliefs as well as to preterm birth [51], and could therefore be a confounder or mediator in this relationship. It would be of value to examine through which pathways maternal health control beliefs may affect birth outcomes and ways in which health control beliefs could be modified.
Table 1. Recommendations for midwives/other prenatal health care providers

**Recommendations for health education**

| Awareness by the midwives | - of the suboptimal maternal health and health behaviours still prevalent in the Netherlands  
| - of the short and long-term impact that maternal health behaviours can have on a mother and child’s health  
| - of persisting socio-demographic disparities in these health issues  
| - of the environmental and personal factors influencing maternal health and health behaviours  
| - that women with risk factors for suboptimal outcomes are more likely to have other risk factors for suboptimal outcomes  
| - of the influence their own attitudes and messages can have on clients’ attitudes and health behaviours  
| - that their assumptions about what clients need and wish for regarding health behaviours may be incorrect  
| - that clients look to them for reliable and accurate information  
| - that women are often uncertain about issues regarding weight gain, nutrition, and physical activity  
| - of the importance of forming a relationship of trust with their clients |

| Provision of standard health education to all women | - recommend the specifics of healthy nutrition, such as increased fruit, vegetable and fatty fish consumption  
| - recommend health promoting activities such as physical activity and antenatal classes  
| - provide advice on how to carry out pregnancy-relevant health behaviours  
| - provide information on the possible benefits and consequences of carrying out pregnancy-relevant health behaviours for maternal and child health |

| Provision of tailored health education to individuals | - assess the health literacy of each client to tailor health education accordingly  
| - assess each client’s attitudes and possible barriers regarding relevant health behaviours  
| - offer additional or adjusted information to more disadvantaged social groups  
| - provide additional advice and resources according to clients’ health, such as their smoking status or weight status  
| - offer information, advice and resources for facilitating positive health behaviours |

Table 2. Summary of recommendations for further research

**Recommendations for further research**

| Prenatal health education | - What are the best strategies to reach pregnant women with health education before conception, or as early as possible in pregnancy?  
| - What are midwives’ experiences with and views towards providing health education to women?  
| - What advice and information is given by midwives to clients who say they smoke, and in what manner is this done?  
| - What are the effects of extensive health education by midwives on actual health behaviours of women, both during and after pregnancy? |

| Effects of healthy nutrition and physical activity during pregnancy | - What are the effects of healthy nutrition (such as increased fruit, vegetable and fish consumption) and physical activity before and/or during pregnancy on birth outcomes, such as preterm birth?  
| - What are the effects of maternal healthy nutrition and physical activity during pregnancy on the nutrition and health of the growing child after birth? |

| Health control beliefs | - What is the relationship of health control beliefs measured with a multidimensional scale associated with spontaneous preterm birth?  
| - To what extent are health control beliefs related to other maternal characteristics such as socio-demographics and health behaviours? |

| Practice policy | - How can the prenatal visits be structured, so that sufficient time is dedicated to health education?  
| - For the purpose of developing a health education guideline for midwives, what information on which health behaviour topics should be provided to all clients during the booking visits? |
**Practice policy**

It is important that women are given the relevant information regarding health behaviours as soon as possible in pregnancy, and that there is time and space within the prenatal visit to provide this information. More research needs to be done to make recommendations on what health educational advice to provide to each pregnant woman, so that this can be incorporated into midwife training and into protocols. It is also important to research how the prenatal health care components during prenatal visits can best be structured to enable each pregnant woman to receive the necessary prenatal health care at appropriate stages of her pregnancy.

**5. General conclusions**

There is still much room for improvement in the health status and health behaviours of pregnant women living in the Netherlands. Large sociodemographic inequalities still persist in health behaviours (such as smoking, passive smoking, folic acid supplementation and attending antenatal classes) and health status indicators (such as health control beliefs, depression/anxiety, overweight and underweight). Women who smoke are also more likely to experience other risk factors for adverse health, such as having no partner, being underweight, depressed or anxious and not taking folic acid supplements. Pregnant women report that they appreciate receiving verbal health education from their midwives, but relatively little information (such as the benefits of healthy nutrition and physical activity) is currently provided to them during pregnancy. Midwives have the opportunity to improve prenatal health promotion and possibly short-term and long-term maternal and child health by providing more extensive health behaviour education to all their clients.
References


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