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## Health behaviour information provided to clients during midwife-led prenatal booking visits: Findings from video analyses.

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### HIGHLIGHTS

- Basic to extensive information given about folic acid or smoking, when issue is relevant.
- Little prenatal information is provided on healthy nutrition and physical activity.
- Risks associated with certain health behaviours is emphasized more than benefits.
- Nulliparous women are provided somewhat more information than multiparous women.

### ABSTRACT

Objective: to quantify to what extent evidence-based health behaviour topics relevant for pregnancy are discussed with clients during midwife-led prenatal booking visits and to assess the association of client characteristics with the extent of information provided.

Design: quantitative video analyses.

Setting and participants:

173 video recordings of prenatal booking visits with primary care midwives and clients in the Netherlands taking place between August 2010 and April 2011.

Measurements: thirteen topics regarding toxic substances, nutrition, maternal weight, supplements, and health promoting activities were categorized as either 'never mentioned', 'briefly mentioned', 'basically explained' or 'extensively explained'. Rates on the extent of information provided were calculated for each topic and relationships between client characteristics and dichotomous outcomes of the extent of information provided were assessed using Generalized Linear Mixed Modelling.

Findings: our findings showed that women who did not take folic acid supplementation, who smoked, or had a partner who smoked, were usually provided basic and occasionally extensive explanations about these topics. The majority of clients were provided with no information on recommended weight gain (91.9%), fish promotion (90.8%), caffeine limitation (89.6%), vitamin D supplementation (87.3%), physical activity promotion (81.5%) and antenatal class attendance (75.7%) and only brief mention of alcohol (91.3%), smoking (81.5%), folic acid (58.4) and weight at the start of pregnancy (52.0%). The importance of a nutritious diet was generally either never mentioned (38.2%) or briefly mentioned (45.1%). Nulliparous women were typically given more information on most topics than multiparous women.

Key conclusions and implications for practice: although additional information was generally provided about folic acid and smoking, when relevant for their clients, the majority of women were provided with little or no information about the other health behaviours examined in this study. Midwives may be able to improve prenatal health promotion by providing more extensive health behaviour information to their clients during booking

## INTRODUCTION

Suboptimal maternal nutrition, high pre-pregnancy weight and weight gain, low physical activity, and exposure to alcohol and tobacco are associated with unfavourable pregnancy outcomes, such as preterm births and intra-uterine growth restriction, as well as an increased likelihood of ill-health throughout life (Banderali et al., 2015; Bloomfield, 2011; Greenwood et al., 2014; Merx et al., 2015; Pasternak et al., 2013; Pruett et al., 2013; Sanabria-Martinez et al., 2015; Starling et al., 2015). Education on nutrition and physical activity during pregnancy is associated with lower risk of adverse maternal health and pregnancy outcomes, such as excessive gestational weight gain, gestational diabetes, preterm birth and low birth weight (Girard and Olude, 2012; Gresham et al., 2014; Muktabhant et al., 2015; Oteng-Ntim et al., 2012; Sanabria-Martinez et al., 2015). Thus, pregnant women should be made aware of the impact of both beneficial and unfavourable health behaviours and encouraged and empowered to practice health promoting behaviours.

Midwives are considered to have an important role in promoting healthy behaviours during pregnancy (Beldon and Crozier, 2005; Biro, 2011). In the Netherlands, 85% of women start their pregnancy under primary care provided by midwives (Stichting Perinatale Registratie Nederland, 2013). The prenatal booking visit usually takes

place at around 8 weeks of pregnancy, during which the midwife collects information about the medical and obstetric history of her client and family, performs physical examinations, and provides information relevant for pregnancy. The most recent Royal Dutch Organization of Midwives guideline on providing prenatal support and education advises midwives to discuss health behavioural topics with pregnant women during the prenatal booking visit (De Boer and Zeeman, 2008). This Dutch guideline advises midwives to determine the clients' Body Mass Index (BMI) at the start of pregnancy, to give advice on nutrition and physical activity depending on weight status and to discuss recommended weight gain during pregnancy, but does not specifically explain what information to give. There is an additional guideline on how to respond to and advise clients who smoke during pregnancy (i.e. Minimal Intervention Strategy for smoking cessation) (Partnership Stop met Roken, 2009). Guidelines from other countries, including the British NICE protocol (2008) and Australian Clinical Practice Guidelines (2012) (Australian Health Ministers' Advisory Council, 2012; National Collaborating Centre for Women's and Children's Health, 2008), as well as many studies give more detailed recommendations on what health care providers should discuss with their clients during various stages of their pregnancy.

Although guidelines and leaflets containing information about health behaviours are generally handed out to women during the prenatal booking visit in the Netherlands (Zwanger!, 2015), there is no best practice guideline in place with recommendations for midwives on what to convey to their clients about health behaviours. It is unclear what information is being discussed with clients during prenatal booking visits. Some earlier studies from the Netherlands and other countries report that some health behaviour topics, such as alcohol consumption, physical activity and nutrition are minimally addressed by midwives during prenatal visits (Szwajcer et al., 2009; van der Wulp et al., 2013; Weir et al., 2010). In our previous interview study among pregnant women in prenatal primary care, most women believed that midwives tailored the amount of information they gave according to assessments of their clients' health and their prior knowledge based on some characteristics, such as their parity, their education, their weight status or appearing healthy (Baron et al., 2017). Many believed that this assessment had led to them not receiving much health education. There is, however, no empirical evidence demonstrating whether or not the amount of information provided to clients is associated with their characteristics. We aimed to assess the extent of information provided to clients by their midwives about various pregnancy-relevant health behaviour topics during their prenatal booking visit. We also aimed to explore any association of client characteristics (age, parity, education and BMI weight status) with the extent of information provided.

## **METHODS**

### **Study recruitment and population**

This current investigation is an observational video study undertaken as part of the DELIVER study. DELIVER, an acronym for **D**ata **E**erste**L**ijns **V**ERloskunde (translated as Data Primary Care Midwifery) was designed to examine the quality of prenatal primary care in the Netherlands (Mannien et al., 2012). Details on the design of the video study are reported elsewhere (Spelten et al., 2015). In brief, between August 2010 and April 2011, four of the twenty midwifery practices which had participated in the DELIVER study were invited to additionally have their clients'

prenatal booking visits video-recorded. These midwife practices were selected based on purposive sampling, which entailed taking into account their location and number of practicing midwives in the practice. These practices were first provided with written information and then visited in order to be provided with instructions about the various procedures. Participating midwives in these practices were asked to record ten to twenty visits each. Eligible clients who called the practices to make their first appointment were informed about the study and invited to participate in the video recording. Criteria for eligibility were being at least 18 years of age and able to understand Dutch or English.

Within these four midwifery practices, 229 clients of 352 (65.1%) who were invited to participate, agreed to be video-recorded and provided informed consent, which stated they could withdraw from the study at any time. Of these 229 participants, 173 video recordings were suitable for analyses (see Fig. 1).

#### [FIGURE 1]

#### **DATA COLLECTION AND HANDLING**

Several measures were taken to ensure client confidentiality during video recordings (Van Dulmen et al., 2012). Prior to the start of each prenatal visit, an un-manned video camera was placed so that the midwife's full face could be seen. Clients and their partners (if present) could not be seen in a recognizable way (i.e. from behind, from the side, or not at all). Clients were given anonymous identification numbers, which were used to link the videotapes to the questionnaire data provided by midwives and clients. The videotapes were securely stored at the 'Communication Databank' of the Netherlands Institute for Health Services Research (NIVEL) (Van Dulmen et al., 2012).

For the current study, a database was created to collect information about the clients and to code the extent to which health behaviour topics were discussed during each prenatal visit, using Microsoft Office Access 2013. No distinction was made between midwife and client initiated discussion of a health behaviour topic, as it was not possible to determine if the midwife would have discussed the subject, had it not been broached by the client. The database with video data was finally converted into IBM SPSS version 22 for statistical analyses.

One-hundred and seventy-three videos (four midwife practices and 15 midwives) were assessed by RB using an assessment guide to categorize the extent of information given on each topic. To establish reliability LM and JG reassessed 30 videos each and these were subsequently compared.

#### **STUDY MEASURES**

##### **Dependent variables**

In order to determine which health behavioural topics were relevant to assess, we reviewed Dutch and international evidence-based guidelines, recent systematic reviews and the website of the Netherlands Nutrition Centre Foundation, a national agency for nutrition advice and education (<http://www.voedingscentrum.nl>) (Australian Health Ministers' Advisory Council, 2012; De Boer and Zeeman, 2008; EFSA Dietetic Products, Nutrition and Allergies (NDA), 2014; National Collaborating Centre for Women's and Children's Health, 2008). The following

dependent variables, i.e. health behaviour topics, were identified: *Toxic substances*: ‘alcohol consumption’, ‘smoking’, ‘smoking in partner’ and ‘vitamin A limitation’; *Nutrition*: ‘general nutritious diet’, ‘promotion of fish’ and ‘caffeine limitation’; *Maternal weight*: ‘weight at start of pregnancy’ and ‘recommended weight gain’; *Supplements*: ‘folic acid’ and ‘vitamin D’; *Health promoting activities*: ‘physical activity promotion’ and ‘antenatal courses’. Each of these topics was scored based on the extent to which each was discussed, with four possible categories: ‘never mentioned’, ‘briefly mentioned’, ‘basically explained’, and ‘extensively explained’ (see Appendix A). Although every item was different, some consistency was sought in determining the criteria of each category. ‘Never mentioned’ was assigned if neither midwife nor client mentioned the topic during the video recording. The three categories ‘briefly mentioned’, ‘basically explained’ and ‘extensively explained’ generally followed a ‘what’, ‘how (often/much/long)?’ and ‘why’ structure. As an example, if folic acid was asked about using a close-ended question, such as ‘are you taking folic acid?’, it was coded as ‘briefly mentioned’. ‘Basically explained’ generally entailed giving some explanation on how to carry out a behaviour, such as ‘you can take folic acid until 10 weeks of pregnancy’. ‘Extensively explained’ was defined as explaining how, as well as why, a health behaviour should or should not be carried out, such as giving information about folic acid being protective against spina bifida.

#### Descriptive and Independent variables

Socio-demographics and information about the current pregnancy were obtained from questionnaires completed by the clients for an earlier study of these video recordings (Martin et al., 2013), as well as from the information exchange observed in the videos. Client questionnaires contained questions on the number of weeks they were pregnant, parity (dichotomized in ‘nulliparous’ or ‘multiparous’), and their date of birth (age). Clients were asked about their highest attained educational level, categorized for this study into ‘low/medium’ (none, primary education, high school, lower/medium vocational education), or ‘higher’ (college/university). They were also asked about their country of birth, as well as that of their parents (ethnicity), categorized as ‘Dutch’ (respondent and both parents born in the Netherlands), or ‘non-Dutch’ (respondent or at least one parent born abroad) (Statistics Netherlands, 2015).

Socio-demographic information was also collected from the videos to check or add to the information from the questionnaires. Other independent variables obtained from the videos were whether or not clients were taking folic acid, drinking alcohol during pregnancy, whether they or their partner were smoking during pregnancy, and the clients’ height and pre-pregnancy weight to calculate their Body Mass Index (BMI). If pre-pregnancy weight was not mentioned or unknown, but the client was weighed at the midwife practice, that current weight was used to calculate BMI. BMI was subsequently classified as ‘underweight’, ‘normal weight’, ‘overweight’ and ‘obese’. For the regression analyses, BMI was dichotomized into ‘not overweight’ versus ‘overweight/obese’.

#### STATISTICAL ANALYSES

We used quadratic weighted kappa using Altman's (1991) assessment of agreement scores, to assess the interrater reliability of each observed item in the 60 videos that

were analysed separately by two other researchers independently (30 each) (Altman, 1991).

Descriptive statistics were used to report socio-demographic and health characteristics of the clients. Frequencies of the four discussion categories of each health behaviour topic were calculated for an overall description of the extent of information provided. Frequencies were also calculated for the four categories of discussing folic acid, smoking and smoking in partner, in subgroups of clients who did not take folic acid, who smoked, or whose partner smoked, respectively. Before assessing the relationships between client characteristics (independent variables) and the extent of information provided on each topic (dependent variables), we calculated per item, the intra-class correlation coefficients (ICC) for midwives and practices to assess the degree of correlation within midwives and within practices. As there was evidence of some correlation, multilevel binomial logistic regression was conducted for each relationship, using Generalized Linear Mixed Modelling (GLMM), adjusting for the two levels practice and midwife. As some topics were part of a standard digital checklist (i.e. smoking and alcohol consumption) and others were not (i.e. recommended weight gain and fish promotion), we dichotomized each topic in this study in two ways: 'never mentioned' versus 'briefly mentioned/basicly explained/extensively explained' and 'never mentioned/briefly mentioned' versus 'basicly explained/extensively explained'. Odds ratios and 95% confidence intervals were reported to portray these relationships.

## FINDINGS

### **Characteristics of sample and interrater reliability**

Per practice 2-5 midwives recorded their prenatal visits, and on average each midwife recorded 11.5 (range 6-20) visits. The average client age in our study was 29 years old, 51.4% were nulliparous, 46.2% were of higher education and 22.0% were of non-Dutch ethnicity (Table 1). The median weeks of pregnancy was 8 at the time of the video recording. In our study, 14.5% reported smoking during pregnancy, 35.6% had a partner that smoked, 11.5% had not taken any folic acid supplementation, 38.2% were overweight/obese at the start of their pregnancy and 0.6% reported some alcohol consumption since knowing they were pregnant.

### **[TABLE 1]**

The median ICC was 0.15 (range 0–0.50) for midwives and 0.15 (range 0–0.64) for practice, indicating various levels of data correlation within midwives and practices, with respect to the extent of information given. The quadratic weighted kappa values determining the interrater reliability ranged between 0.52 (moderate) and 0.82 (very good), with the majority (12/13) of weighted kappa values representing 'good' agreement (alcohol, nutritious diet, weight at start of pregnancy, fish promotion, smoking, smoking in partner, folic acid, recommended weight gain) to 'very good' agreement (physical activity promotion, caffeine limitation, vitamin D, vitamin A limitation) (Altman, 1991).

### **Health behaviour topics; extent of information provision**

At least 75% of all clients were provided with no information on recommended weight gain, fish consumption promotion, caffeine limitation, vitamin D supplementation, physical activity promotion and antenatal class attendance (Table

2). Topics which were briefly mentioned in most videos were alcohol and smoking. Folic acid was mentioned briefly in just over half the visits and minimal explanations were given in just over another quarter of the visits. In about one third of the visits, general nutritious diet was never discussed; in just under half the visits, it was briefly mentioned and in the remaining videos it was basically discussed. For vitamin A, the proportions 'never mentioned', 'briefly mentioned', 'basically explained' comprised about one third of the visits each. Extensive explanations were rarely given about any topic.

#### [TABLE 2]

Some secondary results, which became apparent during the video analyses and development of the assessment guide, were that certain health behaviours important for pregnancy, were often discussed with respect to their risks, but not to promote their practice. Fruit and vegetable consumption, for instance, was often mentioned during the visits in terms of the need to wash them well and to make sure they were not out-of-date before eating, but not in terms of promoting the recommended intake. Similarly, fish consumption was often discussed in the context of needing to be careful with raw fish and avoiding vacuum-packed fish, but the benefits of regular fish consumption were not discussed and fish intake was not promoted. If physical activity was mentioned, it was usually in terms of it being fine to continue exercising, that clients had to listen to their own body and slow down if they experienced complaints, but again, not to actually promote physical activity.

#### **Associations of health behaviour topic discussion with client characteristics**

If a client did not take folic acid, smoked or had a smoking partner, a basic explanation would usually, and extensive explanation occasionally, be given about these behaviours. Basic and extensive explanations respectively, were provided as follows: not taking folic acid: 50%, 16.7%; smoking: 79.2%, 12.5%; smoking in partner: 90.2%, 3.1% (Table 3). Although little or no information was given to all women on most topics, nulliparous women were given significantly more information than multiparous women for recommended weight gain, general nutritious diet, limiting vitamin A, pre-pregnancy weight and antenatal class attendance (Table 4). Low/medium education was associated with at least some promotion of fish consumption, more information about antenatal classes and folic acid supplementation. Being overweight or obese was associated with more explanation about limiting vitamin A and less explanation about antenatal class attendance, but not associated with discussion of any nutritional topics, supplements, weight at the beginning of pregnancy, recommended weight gain, or physical activity.

#### [TABLE 3][TABLE 4]

## DISCUSSION

### **Main findings**

In this study we aimed to assess the extent of information provision on relevant health behaviours to clients by midwives during prenatal booking visits, as well their association with client characteristics. Topics were typically either 'never mentioned' or 'briefly mentioned', with at times basic explanations on folic acid, vitamin A,

nutritious diet, and weight at the start of pregnancy. Clients were rarely provided with more extensive explanations about any topics. Topics which were generally 'never mentioned' were recommended weight gain, benefits of fish consumption, caffeine limitation, vitamin D supplementation, benefits of physical activity, and antenatal class attendance. Fruit and vegetable consumption, fish intake and physical activity tended to be discussed with the focus on avoiding the possible risks associated with these health behaviours, rather than on promoting their benefits. Clients who did not take folic acid supplements, who smoked, or had a partner who smoked were given basic explanations and occasionally more extensive explanations about the relevant health topic. Nulliparous women were more likely to be given more information on most health behaviour topics than multiparous women, but there were generally few notable differences in the extent of information provided to women across other client characteristics.

### **Extent of information provision**

Our study showed that little to no information was provided to clients about many pregnancy-relevant health behaviour topics. Fruit and vegetable consumption, for instance, was usually not promoted, but mainly discussed in terms of avoiding infectious diseases (which is discussed thoroughly in an earlier study of the same sample (Pereboom et al., 2014)). Other studies have also reported that nutritional advice given to pregnant women tends to focus more on food safety, such as avoiding food poisoning or infections (Garnweidner et al., 2013; Szwajcer et al., 2009). It has been reported, however, that many pregnant women are not meeting the recommended requirements of vegetable and fruit consumption (Wen et al., 2010; Wilkinson et al., 2009). Fish intake and physical activity also tend to decline during pregnancy (Bloomingdale et al., 2010; Clarke and Gross, 2004; Oken et al., 2003), suggesting that more information should be given about the benefits of healthy nutrition and physical activity. Discussing the potential risks, rather than the health promoting properties of nutrition and physical activity may lead to a lower rather than higher practice of these health behaviours (Bloomingdale et al., 2010; Lucas et al., 2015; Oken et al., 2003; Stengel et al., 2012). Placing more emphasis on their contribution to health gain may encourage more pregnant women to practice these health behaviours.

### **Association with client characteristics**

In our study, clients who were not taking folic acid supplements typically were given some explanation about the timeframe in which to take folic acid and at times, why it was important; similarly clients and their partners who reported smoking were given more information about the consequences of smoking, and advice on smoking reduction or cessation. This shows that midwives respond to some specific health needs of their clients, by providing more tailored information and resources. As the women in our earlier interview study had perceived (Baron et al., 2017), multiparous women were provided with less information than nulliparous women about various health behaviour topics, but many of these topics were minimally discussed with nulliparous women as well. Besides parity, there were generally few notable associations of client characteristics with the extent of information provided. For instance, women who were overweight or obese in our study, did not receive more information about nutrition, recommended weight gain, or physical activity. Earlier studies have shown pre-pregnancy overweight and obesity to be associated with



lower fruit and vegetable intake, increased sugar and fat intake, and less physical activity (de Jersey et al., 2013; Shin et al., 2016), suggesting that eating patterns and exercise should ideally be discussed and advice given by midwives, taking Body Mass Index (BMI) into account. 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 (Sui et al., 2013), suggesting that explanations should be given about why certain health behaviours are beneficial for pregnancy. Women in general may be more likely to follow recommendations, if explanations are given about why they are important (Lucas et al., 2014).

Although almost all women were asked by their midwives whether they were drinking alcohol during pregnancy, only one woman in our study responded that she did so. Other studies in the Netherlands have estimated any alcohol consumption during pregnancy to be about 20% and 50% (Advies Stuurgroep Zwangerschap en Geboorte (Advisory Committee on Pregnancy and Childbirth), Dec 2009; Lanting et al., 2015). It may be that too few opportunities for alcohol consumption had occurred by the time the visit took place in our study (median 8 weeks), but women may also have under-reported their alcohol consumption, as has been reported in other studies (Crawford-Williams et al., 2015; van der Wulp et al., 2013). This advocates explaining possible risks of even small amounts of alcohol to all pregnant women. In another study, women reported that the relaxed attitude of their health care providers towards alcohol, led to them to believe alcohol was probably not that harmful (Meurk et al., 2014). This implies that midwives should not underestimate the possible effects their own attitudes and messages regarding various health behaviours have on their clients.

### **Health education by midwives**

The amount of information about various health behaviours that clients were given correlated somewhat within practices and within midwives, probably due to different attitudes, policies and procedures between midwives and practices towards promoting healthy behaviours. Efforts should be undertaken to enable all clients to be provided with this pregnancy-relevant information, and if possible, tailored to their specific needs.

There are several reasons why midwives may not discuss health behaviour topics more extensively. Routinely advising all pregnant women to take vitamin D, for instance, is still controversial, due to differing recommendations between the Royal Dutch Organization of Midwives and the Health Council of the Netherlands (De Boer and Zeeman, 2008; Health Council of the Netherlands, 2008). Prenatal health care providers may not always agree with weight gain recommendations, or feel that weight and weight gain are issues potentially too sensitive to discuss with their clients, as has been reported in studies outside of the Netherlands (Stotland et al., 2010; Whitaker et al., 2016). A previous interview study with midwives in the Netherlands on discussing alcohol revealed that, besides not always believing small amounts of alcohol would be harmful, some did not believe they had the right screening skills to identify women who drank alcohol, nor that they had sufficient knowledge on the adverse effects of alcohol (van der Wulp et al., 2013). Midwives may also feel that time constraints, or lack of self-efficacy in providing health promotion prevent them from spending more time and effort on health education (Stotland et al., 2010; Whitaker et al., 2016). The booking visit already consists of

many components besides health behaviour education, including collecting socio-demographic and medical information, prenatal anomaly counselling, as well as physical examinations, such as taking blood pressure, a blood sample and listening to the foetal heartbeat.

In the general population, including patients in primary care, there is varying evidence for the effect of interventions, such as health education on health behaviours (Eden et al., 2002; Nichols, 1994; Pignone et al., 2003; Vahamiko et al., 2013). It is generally accepted that people need motivation, abilities and opportunities for health behaviour change in order to make meaningful and lasting changes; good-quality health education may help to strengthen motivation and abilities (Brug, 2008). Although pregnant women may also experience barriers to healthy nutrition and physical activity, because of pregnancy complaints (Coad et al., 2002), they do tend to be more motivated to change their behaviours than non-pregnant people, due to knowing their health behaviours can also affect their unborn child (Edvardsson et al., 2011). When pregnant, women tend to reduce smoking, alcohol and caffeine intake, and most women in high income countries take folic acid supplementation, suggesting that women do respond to established pregnancy guidelines and are able to make changes, even to addictive habits (Crozier et al., 2009). However, Crozier et al. (2009) reported that fruit and vegetable intake do not tend to change from before to during pregnancy, suggesting that fruit and vegetable consumption are not emphasized enough in prenatal health education. Some evidence suggests that promoting increased fish and fruit/vegetable consumption and exercise during early pregnancy can influence the nutritional and physical activity behaviours of pregnant women (Bosaeus et al., 2015; Whitaker et al., 2016), as well as decrease the risk of suboptimal maternal health and pregnancy outcomes (Girard and Olude, 2012; Gresham et al., 2014; Muktabhant et al., 2015; Oteng-Ntim et al., 2012; Sanabria-Martinez et al., 2015). Pregnant women in an earlier interview study reported that the nutritional advice given to them by their prenatal care providers, influenced their own diets (Whitaker et al., 2016). If extensive health education does not have a notable impact on actual health behaviours, it should at least be a basic requirement of prenatal care, to ensure that women are well informed about the best possible health behaviours for their pregnancy and child.

Further research should explore midwives' experiences with, and the facilitators and barriers with respect to providing health education. It would be worthwhile to re-examine how prenatal visits could be structured to avoid an overload of information during the booking visit. The development of a standardized guideline for midwives with specific advice on what health behaviour information to convey to their clients may facilitate prenatal health education. Further research should also investigate how much influence extensive health education has on pregnant women's actual health behaviours, both during and after pregnancy.

#### **STRENGTHS AND LIMITATIONS**

This is the first study, as far as we know, which assesses the information provided to clients on a wide range of pregnancy-relevant health behaviours within actual midwife-client settings, giving a unique and perhaps more accurate portrayal of real life than self-reported assessments would.

The assessment guide was not a pre-validated instrument, but was created as a means to quantify the extent of information for the current study. The interrater reliability

was reasonably high for most items, indicating that the chosen categories were feasible and interpreted quite consistently by different experts.

Video recordings of actual midwife-client consultations could potentially lead to midwives and clients altering their behaviours while knowing they are being filmed, affecting the internal validity of the study (Coleman, 2000). The midwives in our study did not know which aspects of the visit would be examined, however, increasing the likelihood of carrying out care as usual. Clients were also informed that the research focused on their midwives' performance, not on their own behaviours, making the possibility that they modified their own behaviours less likely. The relatively high proportion of clients willing to participate, after being informed about the study (65.1%), suggests that the majority of clients did not consider the video camera to be intrusive. An earlier review of video recordings of physician-patient interactions also concluded that being filmed did not have much effect on the behaviours of physicians or patients (Themessl-Huber et al., 2008). Our sample size was large for a video study, but with 173 clients of four practices and 15 midwives, both clients and midwives may not have fully represented the general population, or they may have differed in relevant ways to those who chose not to participate in the study, affecting the external validity (Coleman, 2000). However, the socio-demographics were quite comparable to the general Dutch population of women. Compared to the population of pregnant women in 2010, there were somewhat more nulliparous women in our study (51.4% versus 47.5%) and they were somewhat younger (mean 29 versus 31 years of age) (Stichting Perinatale Registratie Nederland, 2013). Our study consisted of more highly educated women (46.2%), but contained a similar proportion of non-Dutch ethnicity (22.0%) compared to the 2010 reproductive population of women in the Netherlands (28.2% and 22.7% respectively) (Statistics Netherlands, 2010). It is also plausible that midwives who were confident about the way they provided prenatal health care were more likely to participate in this type of study; our results may therefore overestimate rather than underestimate the extent of health education in primary prenatal health care.

## CONCLUSION

Women who did not take folic acid, who smoked or had a partner who smoked, were typically provided basic and occasionally more extensive information about these topics during the prenatal booking visit. However, little or no information was given to all women for most other pregnancy-relevant health behavioural topics about how to carry out various health behaviours and why these behaviours were important for healthy maternal and pregnancy outcomes; there was a greater focus on the risks than on the benefits of various health behaviours. Midwives may be able to improve prenatal health promotion by providing more extensive health behaviour information to their clients during booking visits. The development of a guideline for midwives with specific information on what to convey to clients about health behaviours may be beneficial.

## CONFLICT OF INTEREST(S)

The authors declare no competing interests.

### **ETHICAL APPROVAL**

This study was approved by the Institutional Review Board and the Medical Ethical Committee of the VU university medical centre, Amsterdam on December 9th, 2009 (Ref. 2009/284).

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### **CLINICAL TRIAL REGISTRY AND REGISTRATION NUMBER (IF APPLICABLE)**

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## FIGURES AND TABLES

Fig. 1. Flow chart of the inclusion and exclusion of clients and video recordings.

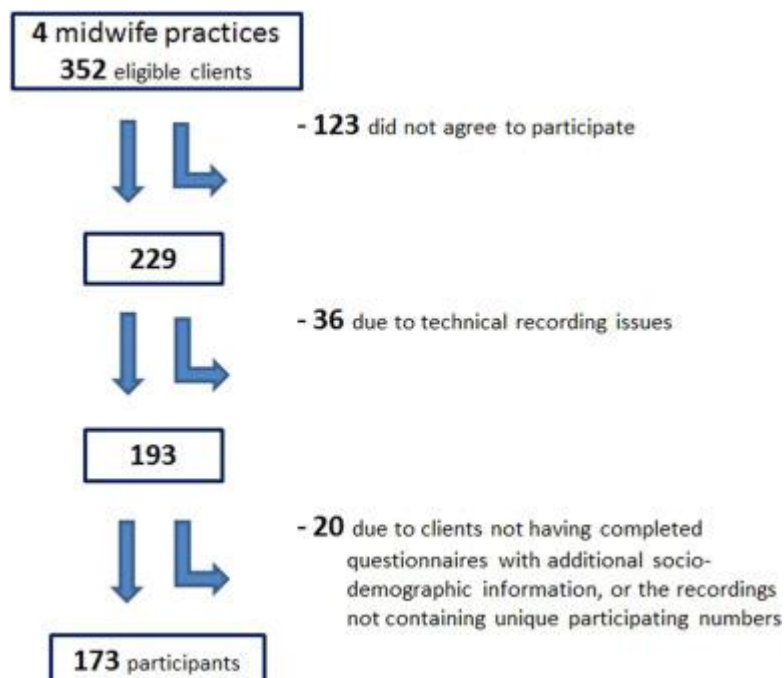


Table 1. General characteristics of our study population of clients (n = 173).

Client characteristics		N (%)
Gestational age (wks)	- Median (P5:P95)	8 (5:13)
	- Missing data	7
Age	- Mean(SD)	29.03 (4.03)
	- Range	20–40
	- Missing data	1
Education	- Higher	80 (46.2)
	- Low/medium	93 (53.8)
Parity	- nulliparous	89 (51.4)
	- multiparous	84 (48.6)
Ethnicity	- Dutch	135 (78.0)
	- Non-Dutch	38 (22.0)
Weight at start of pregnancy	- Normal	81 (56.3)
	- Underweight	8 (5.6)
	- Overweight	40 (27.8)
	- Obese	15 (10.4)
	- Missing data	29
Takes folic acid	- yes	138 (88.5)
	- no	18 (11.5)
	- Missing data	17
Smokes	- no	141 (85.5)



Client characteristics		N (%)
	- yes	24 (14.5)
	- Missing data	8
	- no	58 (64.4)
Partner smokes	- yes	32 (35.6)
	- Missing data	83
	- no	165 (99.4)
Consumes alcohol	- yes	1 (0.6)
	- Missing data	7
	- no	165 (99.4)

'Missing data' refers to information which could neither be obtained from the client questionnaires nor the videos.

Table 2. Frequencies (+%) of the extent of information on health behaviour topics, which clients were given by midwives during the prenatal booking visit.

Health behaviour topic (N = 173)	Never mentioned	Briefly mentioned	Basically explained	Extensively explained
	N (%)	N (%)	N (%)	N (%)
<i>Toxic substances</i>				
Alcohol	7 (4.0)	158 (91.3)	5 (2.9)	3 (1.7)
Smoking in client	8 (4.6)	141 (81.5)	20 (11.6)	4 (2.3)
Smoking in partner	83 (48.0)	59 (34.1)	30 (17.3)	1 (0.6)
Vitamin A limitation	53 (30.6)	62 (35.8)	50 (28.9)	8 (4.6)
<i>Nutrition</i>				
General nutritious diet	66 (38.2)	78 (45.1)	29 (16.8)	0
Fish promotion	157 (90.8)	13 (7.5)	3 (1.7)	0
Caffeine limitation	155 (89.6)	14 (8.1)	4 (2.3)	0
<i>Maternal weight</i>				
Weight at start of pregnancy	18 (10.4)	90 (52.0)	63 (36.4)	2 (1.2)
Recommended weight gain	159 (91.9)	8 (4.6)	6 (3.5)	0
<i>Supplements</i>				
Folic acid	17 (9.8)	101 (58.4)	48 (27.7)	7 (4.0)
Vitamin D	151 (87.3)	19 (11.0)	3 (1.7)	0
<i>Activities</i>				
Physical activity	141 (81.5)	22 (12.7)	10 (5.8)	0
Antenatal class attendance	131 (75.7)	32 (18.5)	9 (5.2)	1 (0.6)

Table 3. Frequencies and percentages of the extent of information provision about folic acid, smoking and smoking in partner, respectively when the client does not take folic acid, smokes or when her partner smokes.

Discussed and actual health behaviour	Information provision on folic acid, smoking and smoking in partner, respectively			
	Total N	Briefly mentioned N (%)	Basically explained N (%)	Extensively explained N (%)
No folic acid supplementation	18	6 (33.3)	9 (50)	3 (16.7)
Client smokes	24	2 (8.3)	19 (79.2)	3 (12.5)
Partner smokes	32	2 (6.3)	29 (90.6)	1 (3.1)

Table 4. Odds ratios (OR) and 95% confidence intervals (CI) depicting the univariable relationships between client characteristics and the extent of information about a health behaviour topic, using Generalized Linear Mixed modelling (GLMM,) adjusted for practice and midwife level. The odds ratios >1.0 indicate more information provision than the reference group. The odds ratios for two dichotomous outcomes are shown: briefly mentioned/basicly/extensively explained versus never mentioned: OR(1) and basically/extensively explained versus never/briefly mentioned: OR(2).

Health behaviour topics (N = 173)	Parity (Multi:Ref)		Education (High:Ref)		Age		BMI (Not overweight:Ref)	
	Nulli		Low/Medium		Continuous		Overweight/obese	
	OR (1) (95% CI)	OR (2) (95% CI)	OR(1) (95% CI)	OR (2) (95% CI)	OR(1) (95% CI)	OR (2) (95% CI)	OR (1) (95% CI)	OR (2) (95% CI)
<i>Toxic substances</i>								
Alcohol	NA	1.0 (0.4–2.8)	NA	1.7 (0.4–7.7)	NA	1.0 (0.9–1.2)	NA	0.9 (0.4–2.2)
Vitamin A limitation	1.7 (0.8–3.6)	<b>2.7 (1.6–4.5)</b>	1.2 (0.6–2.2)	1.0 (0.6–1.6)	1.0 (0.8–1.1)	<b>0.9 (1.9–1.0)<sup>†</sup></b>	0.8 (0.4–1.5)	<b>1.9 (1.1–3.5)</b>
<i>Nutrition</i>								
General nutritious diet	<b>2.5 (1.3–4.9)</b>	1.8 (0.9–3.6)	1.7 (1.0–2.9)	1.7 (0.9–3.3)	0.9 (0.9–1.0)	<b>0.9 (0.9–1.0)<sup>†</sup></b>	0.6 (0.3–1.2)	0.6 (0.2–1.6)
Fish promotion	1.1 (0.5–2.1)	NA	<b>5.4 (1.9–15.7)</b>	NA	1.0 (1.0–1.1)	NA	0.5 (0.1–2.5)	NA
Caffeine limitation	2.1 (0.9–4.6)	NA	1.3 (0.6–2.7)	NA	1.0 (1.0–1.1)	NA	2.0 (0.4–9.4)	NA
<i>Maternal weight</i>								
Weight at start of pregnancy	1.6 (0.4–6.6)	<b>2.1 (1.1–4.0)</b>	0.8 (0.5–1.2)	0.6 (0.3–1.1)	1.0 (0.9–1.1)	1.0 (0.9–1.1)	1.2 (0.6–2.4)	1.3 (0.4–4.3)
Recommended weight gain	<b>8.4 (8.0–8.8)</b>	NA	1.4 (0.2–9.4)	NA	<b>0.9 (0.8–1.0)<sup>†</sup></b>	NA	1.0 (0.6–1.7)	NA
<i>Supplements</i>								
Folic acid	NA	<b>0.7 (0.6–0.9)</b>	NA	<b>1.6 (1.2–2.0)</b>	NA	1.0 (1.0–1.1)	NA	0.6 (0.3–1.1)
Vitamin D	1.0 (0.5–2.2)	NA	0.5 (0.2–1.3)	NA	<b>1.1 (1.0–1.1)<sup>†</sup></b>	NA	0.6 (0.1–2.5)	NA
<i>Activities</i>								
Physical activity	1.8 (0.5–6.5)	NA	0.6 (0.2–1.6)	NA	1.0 (0.9–1.1)	NA	0.6 (0.3–1.2)	NA
Antenatal class attendance	<b>1.4 (1.0–2.1)<sup>†</sup></b>	1.0 (0.4–2.2)	<b>2.3 (1.5–3.8)</b>	<b>2.5 (1.4–4.4)</b>	1.0 (0.9–1.0)	<b>0.9 (0.9–1.0)<sup>†</sup></b>	0.7 (0.5–1.1)	<b>0.4 (0.2–0.9)</b>

**Bold:** significant.

Ref: reference.

NA: not applicable due to small numbers.

'Smoking' and 'smoking in partner' not included in table, as there was a strong correlation with smoking status of client or partner.

\* Significant: rounding error.

### APPENDIX A

Assessment guide for assigning the extent of health behaviour discussion during video-recorded prenatal booking visits to a category.

<i>Health behaviour topic</i>	<i>Briefly mentioned</i>	<i>Basically explained</i>	<i>Extensively explained</i>	<i>Source of information</i>
<b><i>Folic acid</i></b>	Midwife asks whether client is taking folic acid (and/or if she started before conception) Or Midwife recommends client to take folic acid Or Client mentions herself she is (not) taking folic acid	Mentions folic acid being important for healthy baby, but no mention of spina bifida, nor until which week folic acid should be consumed. Or Only mentions until which week folic acid should be consumed, but not why folic acid is important.	1. Asks about folic acid use 2. Mentions that folic acid is important for reducing the risk of spina bifida. 3. Needs to be taken for at least the first 10 weeks of pregnancy (and 4 weeks before conception, although this information comes too late for current pregnancy, so is not obligatory)	Zwanger! NOVG, KNOV et al. (2014)
<b><i>Alcohol</i></b>	Midwife asks whether client consumes alcohol while pregnant Or Midwife recommends client not to consume any alcohol Or Client mentions herself she is (not) consuming alcohol	Recommends avoiding alcohol, and mentions that alcohol can be harmful for the foetus, but no information on why. (Sometimes midwife explains there is no risk in the first weeks as there is no blood contact, will not include this as 'minimally explained', as this information is not totally up-to-date.)	1. Asks about alcohol use 2. Possible consequences of alcohol use during pregnancy (eg preterm birth, Foetal Alcohol Spectrum Disorders (FASD)) 3. Advises abstinence of alcohol consumption during pregnancy 4. If client says yes, offers advice/resources	Zwanger! NOVG, KNOV et al. (2014)
<b><i>Physical activity promotion</i></b>	Midwife asks if client is getting enough exercise Or Midwife recommends client to continue exercising Or	Recommends that client continues to exercise during pregnancy (eg more vigorous exercise up till 16 weeks) and which exercises are beneficial and less beneficial, but nothing about the benefits of doing exercises during	1. Asks about or recommends physical activity. 2. Mentions at least one benefit of exercise (eg. control weight gain, reduce chance of gestational diabetes) 3.	Clinical Practice Guidelines, Antenatal care-module 2, Commonwealth of Australia, 2012

<b>Health behaviour topic</b>	<b>Briefly mentioned</b>	<b>Basically explained</b>	<b>Extensively explained</b>	<b>Source of information</b>
	Client mentions herself she is continuing to exercise (in a positive sense) (Does not include special pregnancy classes for yoga, fitness and swimming)	pregnancy.	Differentiates between safe sports (eg. Swimming, cycling, walking, fitness) and less safe sports (Hockey, football, skiing), and advises to reduce if there are complaints.	
<b>Smoking</b>	Midwife asks whether client smokes Or Midwife recommends client not to smoke Or Client mentions herself she does (not) smoke	Mentions that smoking is harmful for the foetus (but not why, or does not offer resources/advice), and advises her to stop or at least reduce	1. Asks about current as well as past smoking. 2. Mentions possible consequences of smoking (eg. preterm birth, low birth weight, asthma) 3. If smoking, gives advice and refers to other resources for help in cessation or reduction	Zwanger! NOVG, KNOV et al. (2014)
<b>Smoking in partner</b>	Midwife asks whether partner smokes Or Midwife recommends partner not to smoke or not smoke inside Or Partner mentions himself that he does (not) smoke	Mentions that passive smoking is harmful for the foetus (but not why) and recommends that partner stops, reduces smoking, or only smokes outside.	1. Asks about current as well as past smoking in partner 2. Mentions possible consequences of passive smoking (eg. preterm birth, low birth weight, asthma) 3. If smoking, gives advice and refers to other resources for help	
<b>Pre-Pregnancy weight/ weight at start of pregnancy</b>	Midwife asks client about her height and pre-pregnancy weight, or weighs client in the midwife practice. Or Does not weigh or ask about weight, or mention her BMI, but mentions something about her weight status.	Ascertain client's BMI and mentions something about her weight status, such as telling her that her weight is normal, or that her BMI is too high and she will need extra glucose tests, or ultrasounds. Or Midwife asks client about her height and pre-pregnancy weight, or weighs client in the midwife office and without mentioning actual BMI, mentions something about her weight status.	1. Ascertain BMI before or at beginning of pregnancy 2. Depending on weight status of client, explains some risks of pre-pregnancy underweight (eg. preterm or SGA) or overweight/obesity (eg. pre-eclampsia, gestational diabetes, SGA, LGA) Or Mentions several benefits of normal weight at the start of pregnancy, (such as decreased risk of SGA, gestational diabetes, pre-eclampsia, etc)	Clinical Practice Guidelines, Antenatal care-module 1, Commonwealth of Australia, 2012
<b>Recommended weight gain</b>	Gives general recommended weight gain over pregnancy (eg. 12–15 kg)	Gives the recommended weight gain over pregnancy according to BMI, without any additional explanation or advice	1. Explains recommended weight gain over pregnancy according to pre-pregnancy BMI weight category	Clinical Practice Guidelines, Antenatal care-module 1, Commonwealth of

<b>Health behaviour topic</b>	<b>Briefly mentioned</b>	<b>Basically explained</b>	<b>Extensively explained</b>	<b>Source of information</b>
		Or General recommended weight gain, plus why it is important to maintain adequate weight gain, or advice on how to maintain adequate weight gain.	2. Gives at least one benefit of adhering to recommended weight gain 3. Gives advice on maintaining healthy weight gain during pregnancy.	Australia, 2012
<b>Nutritious diet</b>	Mentions that a healthy diet is important without examples of healthy nutrition or why it is important Or Only asks if client has a healthy diet without further explanation. Or Asks clients if she is eating enough fruits and vegetables without further explanation. Or Only advises eating a healthy and/or varied diet. (Does not include telling client to wash all fruits and vegetables, or not to let them expire)	Mentions it's important to eat a healthy and varied diet, and names at least fruits/vegetables, as well as another nutrition type, such as dairy products or meats to promote health (not to avoid infectious diseases). Or Mentions it's important to eat a healthy and varied diet and can supplement diet with extra nutrients from multivitamins for pregnant women.	1. Mentions at least one benefit of a nutritious diet during pregnancy. 2. Recommends not to eat too much (not for two) and less saturated fats/sugars (unhealthy foods). 3. Eat a varied diet, choose foods from these five different categories: 1.fruits and vegetables, 2. oils and fats, 3. liquids, 4. potatoes, beans and grains and 5. meats, fish and dairy products. (Can also refer to Schijf van Vijf on 'Voedingscentrum' website, and name a few food categories)	Zwanger! NOVG, KNOV et al. (2014) refers to voedingscentrum 'schijf van vijf'
<b>Caffeine consumption</b>	Advises client not to drink too much caffeine in the form of coffee, coke (cola), or tea. Or Does not mention where caffeine is found, but says only about coffee (for example) that client can have a max no. of cups per day.	Give advice about where caffeine is found (eg. coffee, tea, coke (cola)), and how much to drink/consume per day (eg. max four cups of coffee per day)	1. Explains which products contain caffeine 2. Gives some advice on how much per day (such as max 4 cups coffee) 3. Explains some of the risks associated with too much caffeine (such as low birth weight).	– Ree et al., 2015 – NICE Routine care for the healthy pregnant woman, Clinical guideline, 2008 – Voedingen Zwangerschap, 2015 (Voedingscentrum)
<b>Fish (to promote health)</b>	Advises client to eat fish Or Tells clients that fish is healthy during pregnancy Or	Tells clients that fish consumption is healthy during pregnancy (but not why) and names several fish which are good (and safe) to eat during pregnancy.	1. Explains why fish is beneficial (eg.contains omega 3 fatty acids which is beneficial for brain development of foetus, source of vitamin D) 2.	– Starling,2015 (systematic review) – EuropeanFood Safety Authority (2014) –

<i>Health behaviour topic</i>	<i>Briefly mentioned</i>	<i>Basically explained</i>	<i>Extensively explained</i>	<i>Source of information</i>
	Advises client to take fish oil (eg in capsules) (Not about avoiding pre-packaged fish, also does not include telling client she is allowed to eat fish)	Or Tells client that fish is healthy and advises how often to eat fatty fish per week (eg. twice)	Gives examples of good fish to eat and fish to be avoided (due to mercury) 3. Explains how much can be eaten (eg per week)	Voedingen Zwangerschap, 2015 (Voedingscentrum)
<i>Vitamin A</i>	Mentions that the client needs to avoid or minimize consumption of vitamin A or liver products. Or Asks client if she is avoiding or minimizing consumption of vitamin A or liver products. Or Mentions she should avoid liver products as well as how much per day, without mentioning 'vitamin A'.	Mentions only 2 out of 3 of the criteria of 'extensively explained', such as which products contain vitamin A and how much one can have per day, but not explaining why it is dangerous for the unborn baby.	1. Explains that Vitamin A supplementation can cause birth defects 2. Avoid consumption of Vitamin A tablets, liver and liver products 3. Liver products such as liverpaté, limit to one sandwich a day	Zwanger! NOVG, KNOV et al. (2014)
<i>Vitamin D</i>	Mentions that supplementary vitamin D is recommended Or Asks if client is taking supplementary vitamin D (within a multivitamin). (This does not include asking if the client is taking a multivitamin, without mentioning vitamin D)	Recommends taking extra vitamin D (in a multivitamin supplement) with brief explanation why. Or Recommends taking extra vitamin D (in a multivitamin supplement), and explains which sources contain vitamin D.	<i>Gives at least 3 of these explanations:</i> 1. No agreement on routine Vitamin D supplementation, NICE guidelines and Dutch Health committee advise 10 mg of vitamin D each day during pregnancy 2. Explain the importance of vitamin D during pregnancy and one or more possible consequences of vitamin D deficiency (such as bone/teeth development in child, pre-eclampsia in mother) 3. General consensus: advise Vit D supplementation in women with limited sun exposure, BMI>30, or dark skin 4. Food sources containing vit D (eg salmon, mackerel, meat and eggs)	Zwanger! NOVG, KNOV et al. (2014)  Clinical Practice Guidelines, Antenatal care-module 1, Commonwealth of Australia, 2012
<i>Benefits of</i>	Asks if client is taking/	Recommends or mentions at	1.	Zwanger! NOVG,

<b>Health behaviour topic</b>	<b>Briefly mentioned</b>	<b>Basically explained</b>	<b>Extensively explained</b>	<b>Source of information</b>
<b>antenatal class attendance</b>	will take any antenatal classes Or Recommends that client takes antenatal classes Or Only refers to website or folders for antenatal classes.	least one type of antenatal class and refers client to website or other sources where antenatal classes can be found, but no mention of benefits of taking antenatal classes.	1. Mentions at least one type of antenatal class 2. Mentions one or more benefits of antenatal classes 3. Refers to resources (eg folders, websites) about antenatal classes (Does not include breastfeeding classes; If this is about a regular non-pregnancy class which promotes physical activity, such as swimming, categorize under 'physical activity'.)	KNOV et al. (2014)

Assessment guide with criteria for assigning the extent of discussion of relevant health behaviour topics during the prenatal booking visit to the four categories 'never mentioned', 'briefly mentioned', 'basically explained' and 'extensively explained'. The category 'never mentioned' is not included here, as its sole criteria entails the topic never arising at all during the prenatal visit.