

Why pregnant women eat what they eat –

Factors influencing dietary intake
among pregnant women
from low SES groups



Master Thesis Health & Society
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Preface

I'm proud to present to you my master thesis: "Why pregnant women eat what they eat – Factors influencing dietary intake among pregnant women from low SES groups", as part of my master: Health and Society at Wageningen University and Research.

Immediately after reading about the opportunity to write my thesis about the diet of pregnant women with a low socio-economic status to help Yvette Beulen with her PhD research: Why pregnant women eat what they eat, I was enthusiastic about it. It sounded very interesting and new to me.

In the beginning I was a bit nervous to start my thesis. However, it was so much better than I expected. During the process, I found out that I did learn a lot of skills and knowledge in my bachelor and master which I could use in my thesis. I worked hard and I really enjoyed the writing and the research in my thesis.

I would like to thank my supervisors, Yvette Beulen and Annemarie Wagemakers helping me through writing my thesis and always supporting me. I would like to thank Yvette for always being available for questions and help. I enjoyed interviewing together. I would like to thank Annemarie for her feedback, tips and creative ideas.

Furthermore I would like to thank the people who supported me during my thesis, Jasper Wouters in special. Furthermore I would like to thank my family and friends. In the beginning, working together in one little room with Auke Rothoff and Cheryl Pasman on our theses, made it much easier. Later on, Charlotte Stam, Rianne van Zandbrink and Dorien de Haan replaced them and made writing my thesis a lot more fun. I am very thankful for your company during these past months.

Hopefully you will enjoy reading my thesis!

Steffie Loenen

Wageningen, 05-07-2018

Abstract

Background: Pregnant women with low socio-economic status (SES) often do not meet the recommended daily intakes, which makes them more at risk for maternal complications and adverse pregnancy outcomes. Existing methods to improve the dietary intake are inappropriate because they are often very general and not tailored to specific groups.

Aim: This study aims to gain insight in factors influencing why pregnant women with low SES eat what they eat, to contribute to the improvement of nutrition of low SES groups.

Method: A systematic literature study was used to investigate the factors influencing the diet of pregnant women. Complementary, in-depth interviews with 14 pregnant women with a low SES were performed to check whether these factors also apply for pregnant women with a low SES and to discover additional influencing factors.

Results: All pregnant women with a low SES in this study indicated to make changes in their diets for the health of the baby. Other factors influencing dietary intake in pregnant women are opinion towards own diet, psychological factors, knowledge, motivation, control, familiarity and self-efficacy. Besides that, physical factors, dietary habits, responsibilities and information search are influencing the diet. Furthermore, the social environment, including received information, and culture play a role in dietary intake in pregnant women with a low SES. Lastly, the physical environment and the midwife are influencing the diet of pregnant women with a low SES.

Conclusion: Individual and collective factors influencing dietary intake among pregnant women coming forward in both interviews and literature, differ a lot among the women.

Implications: Because of varying influencing factors among women with a low SES, interventions or method should be tailored more specifically. Further research should investigate how to motivate these women to improve their diets during pregnancy and how to overcome their barriers.

Key words: Pregnancy, socio-economic status, diet

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1. Introduction and relevance

1.1 Introduction

In this study, factors influencing dietary intake of pregnant women with low socio-economic status (SES) in the Netherlands will be investigated.

Socio-economic status (SES)

SES is the position of persons and households in the system of social stratification (Kunst, Bos, Mackenbach, 2001), which is often defined in income level, occupational status and/or educational level (Baker, 2014). Income indicates material aspects (Lahelma, Martikainen, Laaksonen, & Aittomäki, 2004), occupation determines the aspects power and prestige (Kunst, Dalstra, Bos, Mackenbach, Otten, & Geurts, 2005) and education is seen as determining cultural, intellectual and behavioural aspects (Lahelma et al., 2004).

Worldwide, differences in socio-economic status exist. The situation in Netherlands is as follows: 28% of the women in the working population is highly educated (bachelor or master degree), 37% of women is middle educated (4th-6th grade HAVO/VWO or MBO level 2-4), lastly, 34% of women is lowly educated (VMBO, 1st-3rd grade HAVO/VWO or MBO level 1). 1% is unknown according to the Dutch agency for statistics (CBS) (CBS Statline, 2017).

Differences in socio-economic status, for example educational level, are related to health inequalities (Baker, 2014). The lower the socio-economic position, the worse the health (WHO, 2008). These health inequalities still exist worldwide (Mackenbach, 2012; World Health Organization (WHO), 2008), also for women in the Netherlands (figure 1). The worse the health, the lower the life expectancy and the lower the expected amount of years feeling healthy (National Institute for Public Health and the Environment (RIVM), 2014).

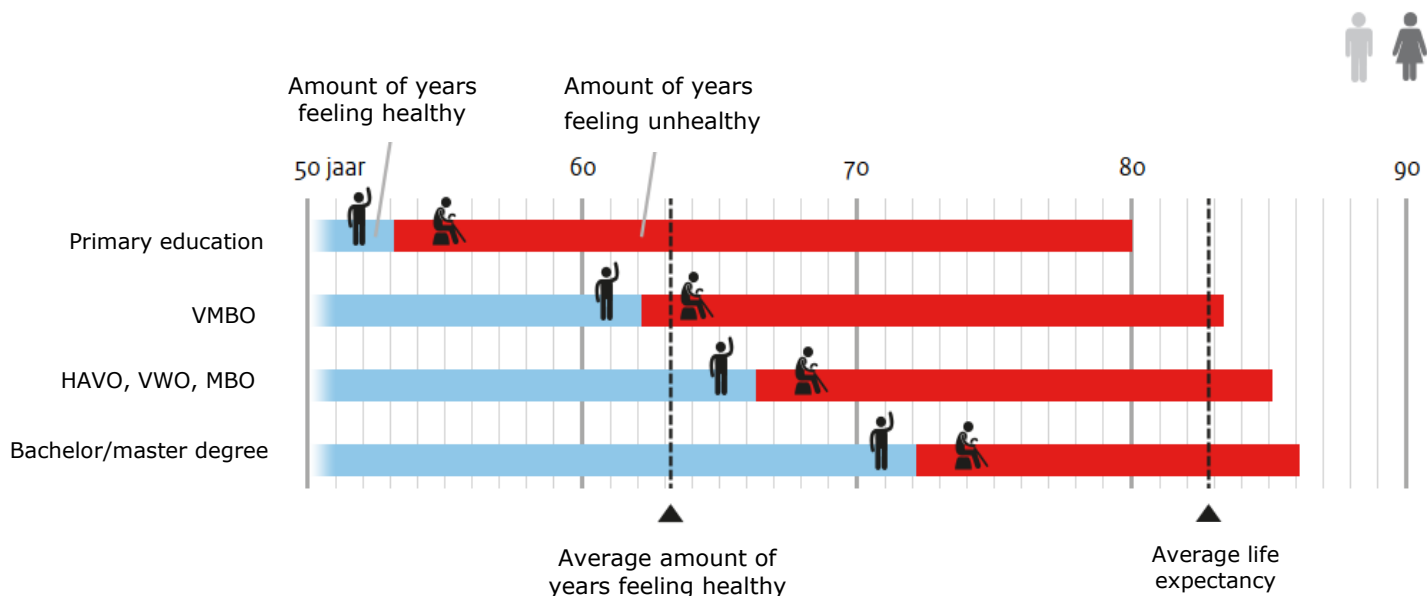


Figure 1: Correlation education and health for women (RIVM, 2014)

Health inequalities are also the case in health related issues during and after pregnancies. Although, the perinatal mortality did decline worldwide in the past decades due to improved welfare, improved living conditions and improved perinatal healthcare (Oestergaard et al., 2011), inequalities in perinatal mortality and morbidity still exist within countries. Also in relatively low risk pregnancies in the Netherlands (Schaaf, Mol, Abu-Hanna, & Ravelli, 2011). Especially in the larger

cities in the Netherlands, the perinatal mortality and morbidity is high. The deprived areas of these cities have the highest numbers of perinatal mortality and morbidity (de Graaf, Steegers, & Bonsel, 2013). According to the Dutch ministry of housing, spatial planning and environment (VROM) (2006), the deprived neighbourhoods in the Netherlands are defined based on collective SES; among others education, income and employment. Most of the deprived areas are located in the four biggest cities. The perinatal mortality rate in these cities compared to the rest of the Netherlands can be seen in figure 2 (Bonsel, Birnie, Denktas, Steegers, & Poeran, 2010). In these deprived neighbourhoods, socio-economic status, ethnical background and the organisation of obstetric care have an important influence on these inequalities in pregnancy outcomes (de Graaf, 2013). Women from immigrant groups and low SES groups do more often have suboptimal maternal health conditions and poorer health behaviour, which can lead to the social inequalities in general and during pregnancy (de Graaf et al., 2013; Poeran et al., 2013).

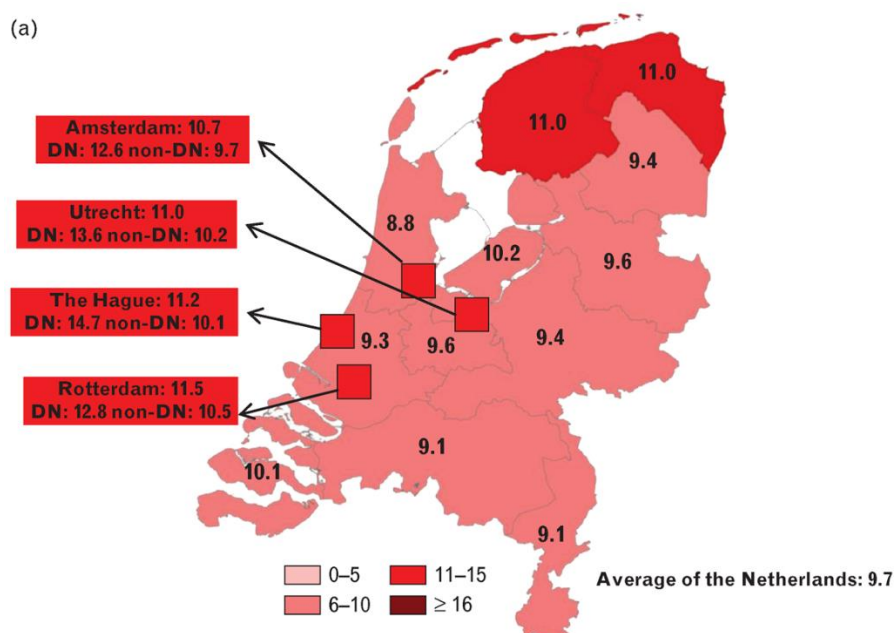


Figure 2: Perinatal mortality (per 1000 births) in the Netherlands in period 2000-2007. DN: deprived neighbourhood (Bonsel et al., 2010)

Dietary intake is one of the health behaviours that can cause inequalities in pregnancy outcomes (Barger, 2010). According to the Netherlands Nutrition Centre (the Netherlands Nutrition centre, 2015), the Nutrition guidelines during pregnancy are similar to the general nutrition guidelines with some additional attention points.

Attention points during pregnancy (the Netherlands Nutrition centre, n.d.a)

- Stop drinking alcohol
- Take folic acids and vitamin D supplements
- Take in enough Iron and calcium
- Eat enough fish
- Not too much vitamin A
- Avoid risk products
 - o Raw or dried meat
 - o Liver products
 - o Raw or prepackaged fish
 - o Raw eggs and milk (cheeses with raw milk)
 - o Dried superfoods
 - o Raw sprout vegetables
 - o Calabash chalk
- Eat varied
- Ensure a healthy weight
- Do not eat for two

Proper dietary intake is favourable for the child to grow and develop physically and mentally and to prevent premature birth, congenital malformations and low birth-weight. Furthermore, it is also beneficial for the mother. Proper nutrition provides energy for birth and breastfeeding practice (Jackson & Robinson, 2001; van Teijlingen et al., 1998). Besides that, proper nutrition can help to avoid maternal complications such as nausea, vomiting, diabetes, hypertension, eclampsia, bone demineralisation and obesity (Ortega, 2001).

In general, women in transition to pregnancy and motherhood are motivated to change health-related behaviour, such as dietary intake, that is difficult to change at other times (Szwajcer, 2007). According to the life-course perspective, people have a relatively stable lifestyle pattern. This pattern is shaped over time by many influencing factors (cultural, contextual and social factors). Because of these factors, it is hard to change the lifestyle pattern, such as nutrition behaviour (Wethington, 2005). Another factor why lifestyle behaviour is difficult to change is because most human behaviour is not rational or emotional, but controlled by habits (de Vries, 2000). However, in certain points in life, there is a higher likelihood to influence and change a lifestyle pattern. These points in life are called transitions or turning points (Wethington, 2005). Pregnancy can be such a point in life. In this period, women find themselves in a new context with physical, psychological and social changes; the pregnancy brings new responsibilities and social expectations. Because nutrition is important during pregnancy, this can be a period in which women consider how their nutrition behaviour should be (Aarts & Dijksterhuis, 2000), which can lead to women being more sensitive to healthy diet promotion activities and seeking nutrition related information (Szwajcer, Hiddink, Maas, Koelen, & Van Woerkum, 2008). Changing nutrition behaviour during pregnancy can result into new nutrition habits which remain also after pregnancy because of the repetition which turns them into automatic responses (Aarts & Dijksterhuis, 2000).

Studies did indeed find changes in dietary intake in pregnant women. The consumption of fruit, beef, milk and dairy desserts increased while the consumption of all products with high safety-related health risks such as alcohol, soft cheeses and pâté, decreased (Verbeke and de Bourdeahuij, 2007; Takimoto, Yoshiike, Katagiri, Ishida, & Abe, 2003). Women are more aware of their nutrition during pregnancy. However, there is also still evidence that pregnant women do not meet the recommended daily intakes (Blumfield, Hure, MacDonald-Wicks, Smith, & Collins, 2012; Blumfield, Hure, MacDonald-Wicks, Smith, & Collins, 2013; Malek, Umberger, Makrides, & Zhou,

2015). This is indeed especially the case in pregnant women with lower SES (de Castro et al., 2016; Pouchieu et al., 2013). Research has been done into nutrition behaviour among groups of different socio-economical levels. Women of low socio-economic status are less likely to attend antenatal classes and to take folic acid supplement and more likely to skip breakfast, eating no hot meals and not eating fruit on a daily basis (Baron et al., 2015).

Midwives can be important in improving this dietary intake. They are seen as a trustworthy source by pregnant women and pregnant women have frequently contact with health care providers (Garnweidner, Pettersen, & Mosdøl, 2013; Fowles, 2004). In the Netherlands these health care providers are the midwife in normal pregnancies and the gynaecologist in high risk pregnancies according to the Royal Dutch Organisation of Midwives (KNOV) (2016). These frequent contact moments with health care providers are opportunities to promote the health of the pregnant women and the child (Hanson, VandeVusse, Roberts, & Forristal, 2009). However, there is a lack of appropriate tools for these health care providers for assessment and improvement of dietary intake in pregnant women (Fowles, 2004; Widen, & Siega-Riz, 2010). Tools and methods are often not tailored to specific groups (such as low SES groups), but are very general. Many of the methods do not take cultural or individual differences into account (Ferrari, Siega-Riz, Evenson, Moos, & Carrier, 2013; Garnweidner et al., 2013). General nutritional counselling on its own can, because of this, be inappropriate for women with specific (cultural) needs (Fowles, 2004).

1.2 Relevance

Dietary intake has an influence on both mother and child. Poor dietary intake can lead to maternal complications and health problems for the child (Kaiser, & Allen, 2002; Ortega, 2001). Studies have been performed on dietary intake among pregnant women from different socio-economic groups. It is known that pregnant women of low SES often have a poorer dietary intake (Baron et al., 2015; Freisling, Elmadfa, & Gall, 2006). As a result, these groups are more at risk for maternal complications and adverse pregnancy outcomes (Barger, 2010). To close the gap in pregnancy outcomes between socio-economic groups due to dietary intake, methods should assess and improve the dietary intake of women with a low socio-economic status. Existing methods are not appropriate because they are often very general and not tailored to specific groups (Ferrari et al., 2013; Garnweidner et al., 2013). To tailor these methods specific to women with low SES, it is important to take underlying factors influencing low SES pregnant women's dietary intake into account (Baron et al., 2015). Nutrition behaviour is influenced by multiple individual and environmental factors (Fitzgerald, & Spaccarotella, 2009). Unfortunately, relatively little is known about the motivations women have for their nutrition behaviour during pregnancy (Szwajcer, 2007). It is important to gain insight in these underlying factors influencing the dietary intake of pregnant women with low socio-economic status to tailor methods for improving maternal health and pregnancy outcomes for low SES groups.

1.3 Research aim and research questions

The aim of this research is to gain insight in factors influencing why pregnant women of low socio-economic status eat what they eat to contribute to the improvement of nutrition during pregnancy of low SES groups. This aim leads to the following research question:

What are factors influencing pregnant women's dietary intake in low SES-groups?

2. Theoretical framework

This research will be guided by the integral map for determinants of health, well-being & development (Lundy, 2010). This model is based on Ken Wilber's Integral Framework. The model includes subjective and objective dimensions of human experience which are displayed in individual and collective context. This results in four interconnected dimensions of life, the four quadrants. Lundy adapted this framework for health promotion (figure 3).

This model can be used to map the determinants of health, well-being and development. It reflects the complexity and interrelation of the health problem. It is a multidisciplinary approach, which is important in the field of health promotion because health and well-being are multidimensional in nature and promotion should act on both individual and social determinants (Deschesnes, Martin & Hill, 2003).

The first quadrant is the I quadrant. It is the subjective and individual dimension (the inner individual), which includes characteristics of the mind and spirit (beliefs, values, intention, etc.). The second quadrant is the IT dimension, which is the objective and individual dimension (the outer individual). This includes the body and actions of a person (nutrition, skills, participation, etc.). The Third quadrant is the WE quadrant. This is the subjective and collective dimension (the inner collective). This dimension includes the culture (community values, social capital, peer influence, etc.). The last quadrant is the ITS quadrant. This is the objective and collective dimension (the outer collective). The ITS dimension includes social and ecological systems influencing health (Built environment, family systems, governance systems, etc.).

The map shows that every health change has four dimensions and attention should be paid to all four quadrants. Mapping determinants of a specific health behaviour in this model shows to which quadrants attention is paid and where more attention is needed. The four dimensions are interrelated, they have an influence on one another. Healthy behaviour is for example linked to healthy minds, which are connected to a healthy culture and to healthy systems. Leaving one of the dimensions out or taking only one into account decreases the capacity to attack health promotion problems (Lundy, 2010).

Determinants of Health, Well-Being & Healthy Human Development

An Integral Map



Figure 3: The Integral map for determinants of health, well-being & healthy human development (Lundy, 2010)

3. Methods

In this chapter, the method for gaining insight in factors influencing what pregnant women of low socio-economic status eat is explained. A systematic literature review and qualitative in-depth interviews were performed. Firstly, a systematic literature review was performed to give a picture of the existing literature about factors influencing dietary intake among pregnant women. This picture of influencing factors was then used to develop the topic guide for semi-open in-depth interviews to check whether these factors also apply to pregnant women of low SES groups in the Netherlands and to discover additional influencing factors. The methods for both the literature review and interviews are explained below.

3.1 Method systematic literature review

A systematic literature review was performed to investigate what information is present about the underlying factors influencing pregnant women's dietary intake in low SES-groups.

For this literature review the databases Scopus and Web of Science were selected because these are the broadest databases on multiple scientific fields, which are often used for literature searching (Guz, & Rushchitsky, 2009). The search string was based on concepts of the research question; *influencing factors; pregnant women; dietary intake and low SES-groups*. Low SES was excluded from the search string as little relevant articles came forward using this term. Only synonyms, and not the concepts itself, were used for the concept *influencing factors* as factors and influence are terms mentioned in almost every article. Also for the remaining concepts, synonyms were included to broaden the search string (table 1). Lastly, multiple individual and environmental factors were included to specify the determinants. This led to the following search string:

TITLE-ABS-KEY

(pregnan* OR antenatal) AND (diet* OR nutrition* OR eat*) AND (determinant OR predictor) AND (individual OR personal OR cultural OR environmental OR collective OR social OR ecological OR psychological)

Table 1: Concepts and synonyms search string

Synonym	Pregnan*	Antental						
Synonym	Diet*	Nutrition*	Eat*					
Synonym	Determinant	Predictor						
Sorts of factors + Synonyms	Individual	Personal	Cultural	Environmental	Collective	Social	Ecological	psychological

Articles before 2000 were excluded to include only relatively recent articles. Afterwards, duplicates were excluded.

After that, titles and abstracts of the articles were judged. The inclusion criteria were

- Articles about pregnant women
- Articles about pregnant women in developed countries
- Articles about individual and collective factors that influence dietary intake in pregnant women

Exclusion criteria were:

- Articles not in English or Dutch
- Articles without results
- Articles about animals

- Articles from developing countries
- Articles about men
- Articles about dietary intake of children
- Articles about dietary intake not during pregnancy
- Articles not about nutrition
- Articles in which influencing factors are given by health care providers
- Articles about famine during World War II
- Articles that do not study the actual intake (intentions/goals)
- Articles that measure health behaviour in general
- Non-representative study population (Inuit/indigenous/native/aboriginals)
- Articles without underlying factors influencing dietary intake

Exclusion criteria added in reading full articles were:

- Literature reviews
- Articles that only measure specific food groups of the diet
- Articles that only investigate unchangeable factors
- Quantitative studies with a non-comprehensive assessment of diet

Implementing the search string in Scopus and Web of Science resulted in a total of 1373 articles (figure 4). After excluding the duplicates, 1056 articles remained for title screening. Of these 1056 articles, 316 articles were excluded based on their titles. Studies about animals, studies performed in developing countries, studies about men and studies with an (another) unrepresentative study population were excluded at this stage. These criteria were created because factors found in other samples than pregnant women in developed countries do not have much relevance for investigating factors influencing dietary intake in pregnant women in the Netherlands.

The remaining 740 articles were screened on abstract. An additional 374 articles were excluded. Studies about animals, studies performed in developing countries, studies with an unrepresentative study population were criteria that were used again. Furthermore, studies investigating the dietary intake of children, articles that did not study women during their pregnancy and articles not about nutrition were additionally used criteria.

Next, the remaining 366 articles were left to be judged based on the full article. However, 31 articles were not available and 4 articles were in another language than English or Dutch, these articles could not be read and were excluded because of that. Furthermore, articles that did not show results, often study proposals, were excluded. The remaining articles were judged based on the existing criteria. Studies about animals, developing countries, the dietary intake of children, articles not during pregnancy, and not about nutrition were exclusion criteria used again in this phase. In reading the full articles, some additional criteria were created. Articles with underlying factors influencing dietary intake only mentioned by health care providers and not by women themselves, articles about pregnancy during famine, articles that did not study the actual dietary intake (intentions, goals or motivation) and articles measuring health behaviour in general instead of the specific dietary intake were excluded. These last criteria were used to assure the most reliable selection of articles studying factors influencing dietary intake in pregnant women. Furthermore articles without underlying factors influencing dietary intake were excluded.

However, before excluding articles without underlying factors, it was decided not to include literature reviews because this would have as result that studies could be both included in those literature reviews and in the current study which would mean a double impact of factors mentioned in these articles. Nevertheless, these 117 literature reviews were not removed but were read and references were screened to make sure new articles with (new) influencing factors would be included. Factors influencing dietary intake of pregnant women mentioned in these literature reviews were selected. The corresponding references were judged with the same exclusion and inclusion criteria. 78 articles after 2000, that were not already included, with a title meeting the

criteria were screened. 67 of these articles were excluded, which resulted in 11 included articles from literature review for the current study

Because of the large amount of remaining articles after excluding literature reviews and articles without underlying factors, three additional exclusion criteria were added for the selection of full text articles. Studies about specific food groups were excluded; only studies investigating the whole diet were included. Besides that, studies only investigating unchangeable factors influencing dietary intake and quantitative studies without a comprehensive assessment of the diet in were excluded to include only the most relevant articles. In total, 353 articles were excluded after reading the full articles. This resulted in another 13 included articles after judging the whole article. In total this made 24 included articles in the current literature review.

Lastly, a critical appraisal was performed for each article to check the validity of the research findings, its trustworthiness, value and relevance. Different checklists from the Joanna Briggs Institute were used for the different study designs (Joanne Briggs Institute, n.d.). The checklists can be seen in appendix I. Studies scoring less than half of the points would be excluded. However, this did not occur. Scores of the critical appraisal can be seen in Appendix V.

The results of the current literature review were categorised in the Integral model (figure 5) to determine the current focus regarding factors influencing dietary intake in pregnant women with low SES and where more attention should be going. The mapping was done by two researchers and discussed afterwards to enhance the reliability.

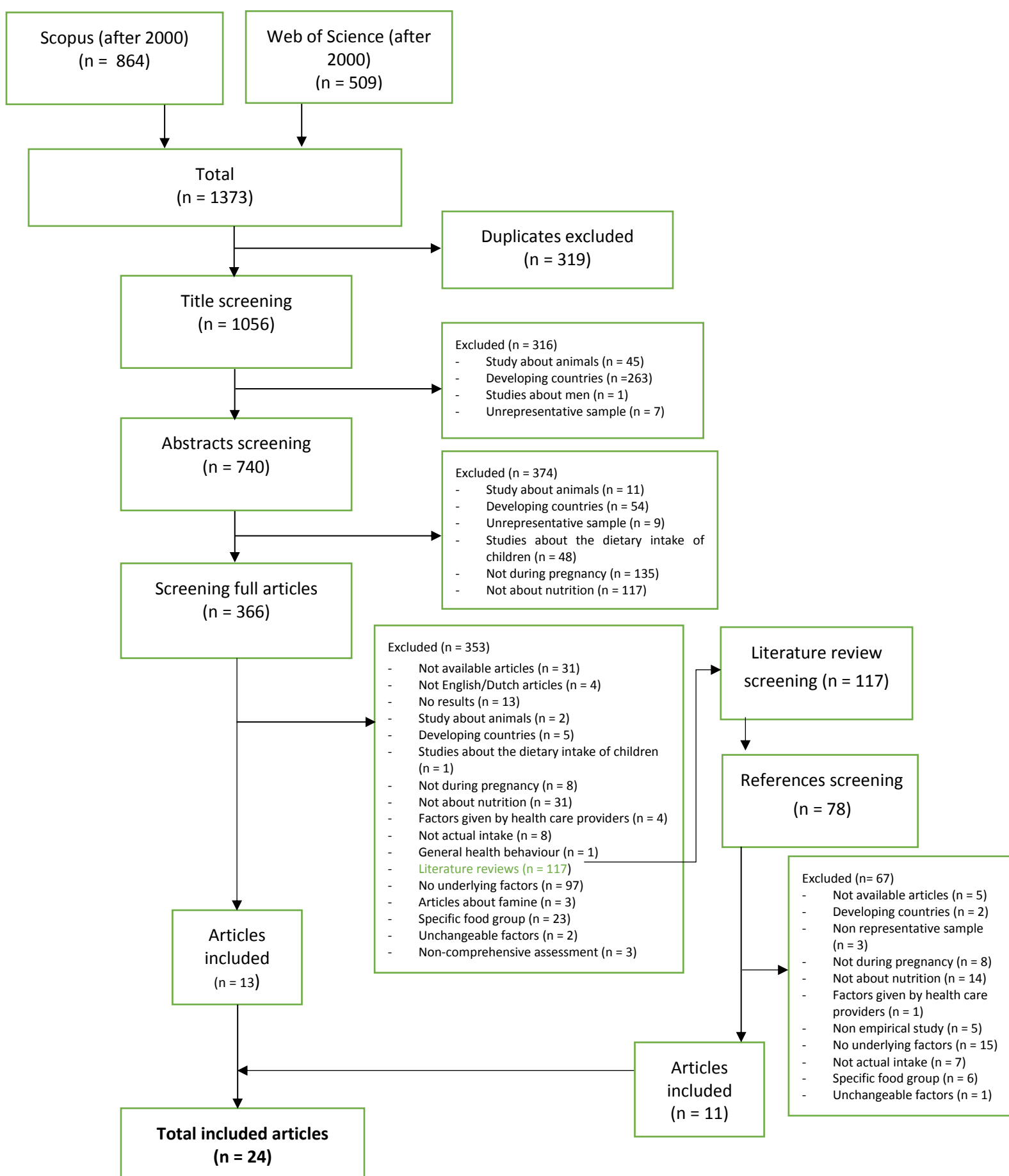


Figure 4: Flow chart literature review

3.2 Method semi-structured interviews

Interviews were used to answer the question: What are the underlying factors influencing pregnant women's dietary intake in low SES-groups, a semi-open in-depth interview approach was used to get the underlying picture of the views about these topics. Recruitment, the topic guide, interview procedure and analysis are discussed below

3.2.1 Recruitment

To recruit pregnant women with a low socio-economic status, 43 midwife practices in the Netherlands were contacted to ask these women whether they want to participate in interviews into factors influencing their dietary intake. 20 Midwifery practices agreed to participate in recruiting women with low SES. These midwife practices selected pregnant women with educational level as guideline for the socio-economic status as this information was already available in the midwife practice. Pregnant women should have senior secondary vocational education and training (MBO) or lower for participation. Furthermore, a snowball method was used to recruit additional pregnant women from low SES groups; participating pregnant women were asked if they knew any other pregnant women that would like to participate. Eventually, 14 participants were recruited for the interviews.

3.2.2 Topic guide

The topic guide (appendix II) for the semi open in-depth interview was based and inspired on three elements: Photovoice, the systematic literature review and Appreciative Inquiry. Firstly, to start the interview positive and open, the topic guide started with a question based on Photovoice about an important factor in their diet during pregnancy: "Can you tell something about this picture; Why is this important to you?"

Photovoice

Photovoice is a participatory research method. The technique is based on the belief that people are experts of their own lives and they should participate in creating and defining the images that shape the public discourse. Participants discuss a specific theme, receive cameras with explanation and get time to take pictures that represent their everyday lives (Wang, & Burris, 1997; Wang, 1999).

Afterwards, participants select one or two photographs that are most important. These photographs will be framed by the participants in stories. Themes, issues and theories can be discovered in their photographs. It is a way to give women the opportunity to express, reflect and communicate on their everyday lives (Wang, 1999).

Second, factors found in the literature influencing the diet of pregnant women were used to develop questions to study whether these factors also applied to pregnant women with low SES in the Netherlands. An example of a question checking the factors of the literature review was: "Do certain traditions play a role in what you eat?" Furthermore some additional questions were asked to investigate what other factors are influencing dietary intake of pregnant women with a low SES such as: "Are there any other physical factors that have an influence on your diet?"

These questions were further developed using the third element: Appreciative Inquiry, to let the women talk openly about their own stories and to seek for the best in pregnant women. Especially the Discovery (what works in the current situation) and Dreaming phase (how do you want the future to be?) were studied here. An example of a question using the discovery phase was: "What are you most proud of (regarding your dietary intake)?" A following question in the Dreaming phase was: "What does your ideal diet during pregnancy look like?"

Appreciative Inquiry (AI).

The AI framework is a positive change framework which is looking for the best in people and heightens human potential instead of using a problem-focused approach. The aim is to generate new knowledge and helps to envision a desired future. AI follows the 4D model; Discovery – Dreaming – Designing – Destiny. It starts with discovery which is about discovering the situation how it currently is, focussing on peak times. Next, dreaming is the imagination what could be in the future. Designing is the organisational future, how should it be done. What is the potential? Finally, Destiny is the final phase where completion is done with learning and a shared positive image of the future as result (Cooperrider, Whitney, & Stavros, 2003). According to Michael (2005) an AI approach resulted in interviewees being eager to tell stories, offering dynamic information and speaking more openly and fearless.

An evaluation of the topic guide took place after 1 and 4 interviews. Some adjustments in the questions were made such as changing the wording of some questions because some questions were not totally clear. An example of this is changing: "Are there any other physical factors that influence your diet during pregnancy?" into "Are there any other changes of your body that influence your diet?"

Furthermore, some questions were added to the list, for example questions about motivation and changing emotions during pregnancy, because these appeared to be interesting themes in the first couple of interviews.

3.2.3 Interview procedure

In total 14 interviews were conducted with 2 researchers and 1 participant. Before each interview, a general introduction was given about the procedure of the interview and participants were asked to sign an informed consent (appendix III) for permission of recording and to ensure anonymity. During the interview, one researcher had the role of the leading interviewer. This interviewer started the interview, asked the questions and had the conversation with the participant. The other researcher checked whether all topics had been discussed and complemented the leading interviewer when topics were not addressed.

Each interview started with the Photovoice inspired assignment. Prior to the interview, explanation for this assignment was given through the phone in which participants were asked to take a picture with their mobile phones of something they think is important regarding their diet. At the start of the interview, participants were asked to show this picture and to tell the story behind it. When participants forgot to take the picture, this was solved by asking them what picture they would have taken.

During the interview, factors were visualized for the participant by cards. For each factor the participant mentioned to have an influence on her diet, a corresponding card was placed on the table. For new factors that were not found in the literature review or that had not appeared in previous interviews, new cards were made during the interview. At the end of each interview, the cards formed a mind map to make the results visible. The participant was asked to make a top 3 for most important factors influencing their diet during pregnancy. The role of the leading interviewer shifted between the two researchers. Lastly, the participants received a voucher of 15 euros for participation.

3.2.4 Analysis

After the interviews were conducted, they were analysed using the thematic analysis method of Braun and Clarke (2006) for identifying, analysing and reporting patterns or themes within data in relation to the research question. Six phases were followed during the analysis.

Firstly, the interviews were transcribed to become familiar with the data. It was chosen to not transcribe vocalizations other than speech (e.g. laughing, stuttering) and non-verbal signals due to the fact that meanings and perceptions, not the mechanics of speech, were most important in this study (Oliver, Serovich, & Mason, 2005). This improves the readability of the transcripts (MacLean, Meyer, & Estable, 2004). In this step, first interesting features were noted.

Second, initial codes were created. Codes represented a feature of the data that appeared interesting. The codes that were used in this phase were created both top down, using the themes of the literature review (figure 5), and bottom-up, creating new themes from the data. Atlas.ti was used to code the interviews. Parts of the text were selected after which they were tagged and named with a code name. In this phase, as many potential themes were coded. An extract could be uncoded, coded once or coded multiple times.

The third phase began when all data had been coded once with a long list of identified codes as result. In this phase, the codes were analysed and sorted into broader themes. A visual map of the codes was made to organise the codes and to start thinking about the relationships between different codes, themes and about the level of themes. Some codes were main themes such as the categories found in the literature review (e.g. social environment), while other were sub-themes (e.g. partner). Nothing was removed at this stage.

In the fourth phase, themes were refined. The data in each theme was read and judged whether they formed a coherent theme. If this wasn't the case, it was considered if some extracts did not fit in there or whether the theme itself should be adjusted. Themes were combined or separated in this stage. Furthermore, the relation of the separate themes to the whole data set was considered, the thematic map being a representation of the whole data set. In this phase additional data was coded that had been missed in earlier coding stages.

In this fifth phase, the themes were defined and further refined. This involved identifying what each theme is about and determining what aspect of the data each theme represents. Data extracts in each theme were organised in a coherent and consistent manner and a detailed analysis was done for each theme. It was identified what is interesting about the content of each theme and why. Also the relation of the theme to other themes and to the research question were identified. Sub-themes were identified in this phase as part of the refinement. Sub-themes could give structure to a complex theme. Finally, the themes were given final names. As result, a final codebook was finished. 15 Main themes were identified: Photovoice, Pregnancy complaints, Physical factors, Psychosocial factors, Social environment, Habits, Responsibilities, Physical environment, Comparing, Control, Personal factors, Pregnancy, Diet factors, Information, and Mindmap. All including multiple sub-themes which can be seen in the codebook (Appendix IV).

Phase 6 was writing the final analysis according to the (sub-)themes. This can be seen in the results of the interviews. The evidence of the themes and subthemes are illustrated by data and quotes.

Multiple interviews were coded by two researchers and also the codebook is evaluated by a second researcher. Both strengthen the accuracy and the reproducibility of the interviews (Campbell, Quincy, Osserman, & Pedersen, 2013).

4. Results literature review

In this chapter, the results of the literature study will be explained (Appendix V). 24 articles were included (table 2). 12 articles are from the United States, 5 from Canada, 2 from New-Zealand and 5 from European countries. From all 24 studies, 13 use questionnaires for data collection, 2 use interviews and 4 use focus groups. 5 studies use multiple data collection methods such as combining interviews and questionnaires. Results of the literature study were mapped the Integral model (Lundy, 2010) (figure 5). Demographic variables and factors influencing and not influencing dietary intake in pregnant women are explained for each quadrant in the following paragraphs.

Table 2: Articles included in literature

Reference	Country	Number of participants	Method of data collection
1. Bassett-Gunter et al., 2013	Canada	94 individuals with no children 138 individuals expecting a child 74 individual with children	Questionnaires
2. Bianchi et al., 2016	France	40 pregnant women	Focus groups
3. Copelton, 2007	United States	55 pregnant women	Interviews
4. Cuco et al., 2006	Spain	80 women	Dietary record (pre)conception visit data
5. Derbyshire et al., 2006	United Kingdom	72 women	Questionnaire Food diary General Practitioner records
6. Fowles, bryant et al., 2011	United States	118 low-income women in their first trimester of pregnancy	Questionnaires
7. Fowles, Murphey et al., 2011	United States	18 low-income, pregnant women	Questionnaires
8. Fowles et al., 2012	United States	71 low-income, pregnant women	Questionnaires Anthropometric measures
9. Herring et al., 2012	United States	31 low-income pregnant women	Focus groups
10. Hurley et al., 2005	United States	134 women	Questionnaires
11. Jelsma et al., 2016	Austria, Belgium, Denmark, Ireland, Italy, Netherlands, (Poland), Spain, and the UK	92 women pregnant/0-12 months after delivery	Questionnaires Interviews
12. Laraia et al., 2004	United States	973 pregnant women	Questionnaires Telephone interview Geographic data technology
13. Laraia et al., 2007	United States	2394 women	Questionnaires
14. Morisset, 2016	Canada	1186 mothers	questionnaires
15. Nash et al., 2013	Canada	2282 pregnant women	Personal variables from the prenatal health project Geographic information system Questionnaire
16. Northstone et al., 2008	United Kingdom	12053 pregnant women	Questionnaire
17. O'brien et al., 2017		22 overweight/obese pregnant women	Interview study
18. Paul et al., 2012	United States	15 low income pregnant women 11 high income pregnant women	Focus groups
19. Thornton et al., 2006	United States	10 postpartum/pregnant women 10 people influencing them	Focus groups Semi-structured interviews

20. Tovar et al., 2009	United States	29 pregnant women	Focus groups
21. Tsigga et al., 2010	Greece	100 pregnant women	Weighing scale Telephone interviews
22. Wall et al., 2016	New-Zealand	5664 pregnant women	Questionnaire
23. Watson, & McDonald, 2009	New-Zealand	196 pregnant women	Questionnaires Anthropometric measurements
24. Watts et al., 2007	United States	5862 pregnant women	Questionnaires

Inner individual <ul style="list-style-type: none"> - Health of the baby (2, 3, 9, 11, 17, 18) - Knowledge (2) - Self-efficacy (18) - Control over food preparation (8) - Familiarity with food/cooking techniques (3) - Psychological state (6, 7, 8, 10, 15, 16) - Comparing with other women (3) 	Outer individual <ul style="list-style-type: none"> - Physiological changes (2, 3, 9, 10, 11, 20, 22, 23) - Dietary habits (3, 6, 8) - Business (3, 11, 20) - BMI (13, 14, 16, 21, 23) - Health behaviour during pregnancy (2, 4, 15, 16, 22, 23, 24) - Height (23) - Pre-pregnancy BMI (5, 21, 22) - Pre-pregnancy health behaviour (13, 22) - Working during the final trimester (16) - Own health (2, 9, 22)
Inner collective <ul style="list-style-type: none"> - Partner influence (6, 7, 15, 17, 18, 19) - Family influence (2, 8, 11, 15, 17, 19, 20) - Friends influence (2, 8, 11, 15, 17, 19) - Cultural beliefs (3, 19) 	Outer collective <ul style="list-style-type: none"> - Food guidelines (2, 3) - Distance to stores (12) - Living environment (16, 21) - Obesogenic environment (17)

Figure 5: Integral model based on literature review

4.1 Demographic factors

Demographic factors of pregnant women play a role in their diets. These factors do not fit in one of the quadrants. Age is one important factor associated with dietary intake in pregnant women mentioned in 8 articles (Cuco et al., 2006; Fowles, Bryant et al., 2011; Laraia, Bodnar, & Siega-Riz, 2007; Morisset et al., 2016; Northstone, Emmett, & Rogers, 2008; Wall et al., 2016; Watson & McDonald, 2009; Watts, Rockett, Baer, Leppert, & Colditz, 2007). Higher age is associated with higher dietary quality in 3 articles (Fowles, Bryant et al., 2011; Laraia et al., 2007; Watson & McDonald, 2009). In one article, higher age is associated with higher iron intake (Morisset et al., 2016). In three articles, age differences are associated with different dietary patterns. Younger age is associated with lower levels on vegetarian diet and with higher scores on the junk food pattern and the confectionery diet (snack foods, high sugar content). Increasing age scored higher on the health conscious pattern, the vegetables and meat pattern and fusion/protein pattern (noodles, rice, pasta, chicken, vegetables). Results do not agree on the influence of age on the traditional diet score (Cuco et al., 2006; Northstone et al., 2008; Wall et al., 2016). In contrast, higher age is associated

with lower dietary quality in one article (Watts et al., 2007) and according to Nash, Gilliland, Evers, Wilk, & Campbell (2013), age is not associated with dietary intake.

Next to age, parity, previous pregnancies and amount of children in the household are similar factors influencing dietary intake in 8 articles (Bianchi, Huneau, Le Goff, Verger, Mariotti, & Gurviez, 2016; Jelsma et al., 2016; Laraia et al., 2007; Nash et al., 2013; Northstone et al., 2008; O'Brien et al., 2017; Wall et al., 2016; Watson & McDonald., 2009). Having more children or previous pregnancies has a healthier diet as result in three articles (Jelsma et al., 2016; O'Brien et al., 2017; Nash et al., 2013). Women with children found it easier to maintain a healthy diet (Jelsma et al., 2016; O'Brien et al., 2017). However in three articles, having more children or previous pregnancies has a negative effect on dietary intake (Bianchi et al., 2016; Laraia et al., 2007; Watson & McDonald, 2009). Having children leads to a lower overall diet quality according to Laraia et al. (2007) and a lower total energy intake according to Watson and McDonald (2009). Lastly, according to Bianchi et al. (2016), multiparas justified deviance of nutritional norms relying on experiences of previous pregnancies. In two articles, previous pregnancies are associated with different dietary patterns (Northstone et al., 2008; Wall et al., 2016). Increasing parity was associated with lower scores on the health conscious and vegetarian diets and higher scores for the traditional and processed diets. Women who are primiparous score lower on the fusion/protein pattern. In the article of Tsigga, Filis, Hatzopoulou, Kotzamanidis, & Grammatikopoulou (2011), parity does not influence dietary intake. Reasons for the influence of children will be discussed in the following quadrants.

Furthermore, marital status is another influencing factor (Laraia et al., 2007; Nash et al., 2013). In these two articles, being married is positively associated with a higher diet quality.

Ethnicity and birthplace are mentioned in 4 articles as influencing factors (Laraia et al., 2007; Northstone et al., 2008; Wall et al., 2016; Watts et al., 2007). In these articles, different ethnicities or birth countries have different influence on dietary intake. In two articles, compared to white ethnicity, non-white ethnicity has a lower overall dietary quality (Laraia et al., Watts et al., 2007). In the other two articles, different ethnicities (European, Maori, Asian, Pacific, white, non-white) were associated with different dietary patterns (Northstone et al., 2008; Wall et al., 2016). Amount of time living in a country is also associated with diet quality according to Nash et al. (2013). Living 1-5 years in a country is positively associated with diet quality.

Lastly four other factors are investigated; season of participation, week of gestation, housing tenure and embryo's sex. Seasonality is associated with different dietary patterns according to Northstone et al. (2008). Participating in winter months was associated with higher scores on the traditional diet, while participation in summer months was associated with higher scores on the health conscious diet and lower scores on the confectionery diet. Housing tenure was also associated with different dietary patterns (Northstone et al., 2008). Council/rented housing compared to owning a house was associated with higher scores on the vegetarian and processed pattern and with lower scores on the health conscious and confectionary pattern. Furthermore week of gestation influences dietary quality (Tsigga et al., 2011). Higher week of gestation was associated with worse dietary quality. Sex of the baby was not an influencing factor in the study of Tsigga et al (2011).

4.2 The Inner individual

In the inner individual quadrant, health of the baby including beliefs about nutrition, psychological state, knowledge, control over food preparation, familiarity with food, comparing with other women and self-efficacy will be discussed.

From the factors in the inner individual quadrant, health of the baby including beliefs about the influence of nutrition is most often investigated as factor influencing diet during pregnancy. The importance of the health of the baby influences dietary intake in pregnant women. Pregnant

women felt responsible for the health of the baby, so they try to improve their diet (Bianchi et al., 2016; Copelton, 2007; Jelsma et al., 2016; O'Brien et al., 2017). They have certain beliefs what is good for the baby. Pregnant women believe that excessive food intake was needed for the health of the baby according to Herring, Henry, Klotz, Foster, & Whitaker (2012), and Paul, Graham, & Olson (2013). However, in the study of Copelton et al. (2007), pregnant women understand eating for two as eating for one (the baby) by prioritizing the health of the baby over their own preferences. Moreover, according to Bianchi et al. (2016), women attribute eating for two to an old misconception and turn this into eating for two in quality but not in quantity. Furthermore eating fruit and vegetables is good for the baby according to the women in the study of Paul et al. (2013). In contrast, according to another study attitudes and perceptions regarding healthy eating do not influence dietary intake (Bassett-Gunter et al., 2013). Lastly, the women did not see pregnancy as permission to eat unhealthy foods (Copelton et al., 2007).

Next to beliefs and perceptions about nutrition, knowledge about nutrition and pregnancy is a factor influencing nutrition during pregnancy. In the study of Bianchi et al. (2016), pregnant women do have basic knowledge of the components of a healthy diet already before pregnancy, they translate this into their behaviour. However, according to Fowles, Bryant et al. (2011), knowledge is not directly associated with a higher diet quality.

Barriers for healthy eating are found too. Pregnant women from low income groups have low self-efficacy regarding their nutrition. This means that they believe they are unable to reach a better dietary intake. High income groups do have more self-efficacy, they, for example, believe they can soothe cravings a healthy way (Paul et al., 2013). Besides that, inadequate control over food preparation is mentioned to lead to a lower overall diet quality (Fowles, Stang, Bryant, & Kim, 2012). Also familiarity with food or cooking techniques is mentioned to be influencing dietary intake in pregnant women. If the recommended food was unfamiliar, women do not incorporate it into their diets (Copelton, 2007).

Furthermore, psychological factors such as stress, depression, anxiety and emotional factors are often investigated as determinant influencing dietary intake during pregnancy. Stress experience is mentioned to have a negative impact on dietary intake in 3 articles. Stress leads to a lower diet quality (Fowles, Bryant et al., 2011; Fowles, Stang, Bryant, & Kim, 2012), to a higher macronutrient intake and a lower micronutrient intake (Hurley, Caulfield, Sacco, Costigan, & Dipietro, 2005).

Besides stress, anxiety is also mentioned in 3 articles as having a negative impact on dietary intake during pregnancy. Higher anxiety levels lead to a lower quality diet (Hurley et al., 2005; Nash, Gilliland, Evers, Wilk, & Campbell, 2013; Northstone, Emmet, & Rogers, 2008). Furthermore, according to Fowles, Murphey and Ruiz (2011), emotional eating also plays a role in dietary intake during pregnancy. Emotional eating in response to higher anxiety and anger leads to less folate rich foods. However, anger does not influence the diet according to Hurley et al. (2005).

Depression is investigated multiple times. In 2 studies, depression does influence diet. It leads to increased calcium rich foods according to Fowles, Murphey et al. (2011) and according to Fowles et al. (2012) it leads to a decreased overall diet quality. However in 3 other studies, depression is not influencing dietary intake (Hurley et al., 2005; Nash et al., 2013; Northstone et al., 2008). The last psychological factor influencing dietary intake is feeling energetic. According to Northstone et al. (2008), not feeling energetic is associated with lower scores on the confectionary pattern.

Additionally, pregnant women use comparing themselves with others as method to eat certain foods. When they know that other pregnant women eat snacks, they can see that as an excuse to eat snacks themselves too (Copelton, 2007).

Some factors that were investigated in the inner individual quadrant do not influence dietary intake in pregnant women. One factor that does not influence dietary intake according to the literature is perceptions of their appearance (Bianchi et al., 2016; Northstone et al., 2008; O'Brien et al., 2017). Pregnant women do not let concern about their appearance influence their

dietary intake. Also fixation on calories is not an influencing factor in pregnant women (O'Brien et al., 2017).

4.3 The outer individual

Physiological factors, dietary habits, health behaviour, business, work and self-rated health are factors in the outer individual quadrant that will be discussed.

Physiological changes are important factors influencing dietary intake during pregnancy. These physiological factors during pregnancy include: changes in nausea severity, morning sickness, fatigue, appetite, hunger, cravings, weight gain, food preferences and gastroesophageal reflux (Bianchi et al., 2016; Copelton, 2007; Herring et al., 2012; Hurley et al., 2005; Jelsma et al., 2016; Tovar, Chasan-Taber, Bermudez, Hyatt, & Must, 2010; Wall et al., 2016; Watson & McDonald, 2009). These physiological factors have a negative impact on dietary intake according to 8 articles (Bianchi et al., 2016; Copelton, 2007; Herring et al., 2012; Hurley et al., 2005; Jelsma et al., 2016; Tovar et al., 2010; Wall et al., 2016; Watson & McDonald, 2009). Nausea or morning sickness makes eating more problematic and restricts their food choices (Bianchi et al., 2016; Tovar et al., 2010) and food intake (Watson & McDonald, 2009). Moderate nausea was also negatively associated with a health conscious diet. Persistent hunger and increased appetite leads to overeating (Herring et al., 2012). Besides that, cravings are often for fried or fatty foods, which is a barrier for healthy eating and leads to higher weight gains (Copelton, 2007; Herring et al., 2012; Jelsma et al., 2016). Being more fatigued leads to consuming more foods, a higher macronutrient intake and lower micronutrient intake (Hurley et al., 2005). However, in a few studies, Nausea is not found to be influencing dietary intake during pregnancy (Derbyshire, Davies, Costarelli, & Dettmar, 2006; Nash et al., 2013).

Next to these physiological factors, own (self-perceived) health is influencing dietary intake in pregnant women. Own health is important for them too. When own nutrient intake is worse, this could lead to complications during and after delivery in women themselves (Bianchi et al., 2016). Furthermore, poor health outcomes motivate some overweight women to limit food intake (Herring et al., 2012). Lastly, a better self-rated health is related to the health conscious pattern and to the fusion/protein pattern (Wall et al., 2016).

Besides physiological changes, health behaviour during and before pregnancy is an important factor in influencing dietary intake during pregnancy. Smoking, exercise, food group intake and alcohol use are factors that are associated with dietary intake (Cuco et al., 2006; Laraia et al., 2007; Nash et al., 2013; Northstone et al., 2008; O'Brien et al., 2017; Wall et al., 2016; Watson, & McDonald, 2009; Watts et al., 2007). Smoking is found to be an influencing factor in 6 articles. Women who do not smoke during pregnancy are more likely to have a better overall diet quality (Nash et al., 2013; Watts et al., 2007). Furthermore, women who do smoke have a lower total energy intake (Watson & McDonald, 2009). Smoking is associated with lower scores on the health conscious diet (Northstone et al., 2008) and the fusion/protein pattern (Wall et al., 2016). Moreover, smoking is associated with higher scores on the sweetened beverages and sugars pattern (Cuco et al., 2006), the processed diet (Northstone et al., 2008), the junk food pattern and the traditional pattern (white bread, peanut butter, etc.). Also stopping to smoke is associated with higher scores on the last two patterns compared to non-smokers (Wall et al., 2016).

Physical activity is the next factor in the outer individual quadrant. According to Nash et al. (2013) exercising during pregnancy improves the likelihood of having a better diet quality. Furthermore, more physical activity is associated less sweetened beverages and sugars (Cuco et al., 2006) and with the fusion/protein diet (Wall et al., 2016). In contrast, activity level was not an influencing factor according to Watson & McDonald (2009).

The next health behaviour in the outer individual quadrant is alcohol use. Compared to woman that were non-drinkers, pregnant women stopping to drink during pregnancy have a higher

scores on the junk food pattern and lower scores on the traditional pattern. Also continuing to drink leads to higher scores on the traditional pattern (Wall et al., 2016).

Furthermore, dieting during pregnancy is associated with lower scores on the confectionary diet (Northstone et al., 2008).

The last health behaviour having an influence on dietary intake during pregnancy is supplementation. Supplementation during pregnancy is associated with lower scores on the fusion/protein pattern and a higher score on the Junk pattern.

Additionally, prepregnancy health promoting behaviour is also investigated and found to have an effect on dietary patterns during pregnancy. Exercising prior to pregnancy is associated with the health conscious pattern and the fusion/protein pattern and not exercising prior to pregnancy is associated with the traditional pattern. Dieting prior to pregnancy is positively associated with the junk food pattern and negatively with the traditional diet (Wall et al., 2016).

Lastly, less supplementation before pregnancy is also associated with the fusion/protein diet and the Junk food pattern (Wall et al., 2016). According to Laraia et al. (2007), prepregnancy leisure activity and vitamin use are associated with a higher diet quality.

Next to these health behaviours, dietary habits among pregnant women have an influence on dietary intake (Copelton, 2007; Fowles, Bryant et al., 2011; Fowles et al., 2012). These dietary habits include rewarding (Copelton, 2007), meal skipping (Fowles, Bryant et al., 2011; Fowles et al., 2012), snacking and eating fastfood (Fowles, Bryant et al., 2011). All of these have a negative impact on the diet of pregnant women.

Furthermore, BMI and prepregnancy BMI have an impact on dietary intake (Derbyshire et al., 2006; Laraia et al., 2007; Morisset et al., 2016; Northstone et al., 2008; Tsigga et al., 2011; Wall et al., 2016; Watson, & McDonald, 2009). In 3 articles, higher BMI is negatively associated with overall dietary quality (Derbyshire et al., 2005; Laraia et al., 2007; Watson & McDonald, 2009). In 2 studies BMI was associated with different dietary patterns. Higher BMI was negatively associated with the fusion/protein pattern and the health conscious diet (Northstone et al., 2008; Wall et al., 2016), and positively with the traditional diet and the confectionary diet (Northstone et al., 2008). In 1 study higher BMI is associated with lower iron intake (Morisset et al., 2016). In the article of Cuco et al. (2006), BMI is not an influencing factor. Moreover, weight status is found as non-influencing factor in 2 articles (Tsigga et al., 2011; Watson & McDonald, 2009). Also sum of skinfolds is not an influencing factor (Watson & McDonald, 2009). Height is mentioned as influencing factor in one article (Watson & McDonald, 2009).

Lastly, time constraints have an influence on dietary intake (Copelton, 2007; Jelsma et al., 2016; Tovar et al., 2010). Being busy leads to a lower dietary quality in pregnant women in all three articles. Reasons of business can be children or work. Not working during the final trimester is associated with lower scores on the health conscious diet according to Northstone et al. (2008).

One factor in this quadrant does not influence diet in pregnant women. According to Nash et al. (2013), difficulty affording food is not an influencing factor (Nash et al., 2013).

4.4 The inner collective

This quadrant especially includes the social environment including partner, family and friends, and cultural influence influencing dietary intake.

Firstly, the partner is an influencing factor. Support from the partner is mentioned to have a positive influence on diet in 3 articles (Fowles, Bryant et al., 2011; Fowles, Murphey et al., 2011; Nash et al., 2013). Partner support is positively related to vegetable intake (Fowles, Bryant et al., 2011) and overall diet quality (Fowles, Bryant et al., 2011; Nash et al., 2013). However, according to 2 studies (Fowles et al. 2012; Hurley et al., 2005), support from the partner is not influencing dietary intake in pregnant women. Besides through support, the partner can have influence in other ways. According to Thornton et al. (2006), pregnant women want to please their husbands and take their food preferences into account and according to Paul et al. (2013), partners support

to eat for two. Lastly, women tend to mirror behaviour by eating similar quantities when eating together with their partner (O'Brien et al., 2017).

Besides the partner, family influence is a factor in the inner individual quadrant. Families give them food and encourage the women to eat even when the women are not hungry (Herring et al., 2012; Tovar et al., 2010). Also Paul et al. (2013), found that family support to 'eat for two'. Besides that, some women regularly rely on their family for food instead of getting food for themselves. The family also has an influence on dietary intake through habits and rituals (Bianchi et al., 2016; Thornton et al., 2006). This includes cooking and eating habits, and food modelling. Furthermore, support from family and also friends influences dietary intake positively according to three articles (Fowles, 2012; Nash et al., 2013; Thornton et al., 2006). However, two studies find that social support from others is not influencing dietary intake (Fowles, Murphey et al., 2011; Hurley et al., 2005). Besides support, the social environment can also influence dietary intake of pregnant women in different ways. Social gatherings with friends or family can influence what pregnant women eat. Social occasions in these studies have a negative impact because of mirroring, perceived observation or pleasing others (Jelsma et al., 2016; O'Brien et al., 2017; Thornton et al., 2006). Lastly, women receive information from their social environment (Bianchi et al., 2016; Thornton et al., 2016). In the article of Thornton et al. (2016), this information helps women to adopt a healthier diet. However in the article of Bianchi et al., 2016, the social environment is not seen as reliable source of information, except from their mothers.

Next to the family influences, culture influences the dietary intake of pregnant women. For example through the cultural beliefs of good and bad foods in diets (Bianchi et al., 2016; Copelton, 2007; Thornton et al., 2006) and cultural food preferences (Paul et al., 2013).

4.5 The outer collective

In the literature, not many factors from the outer collective quadrant are investigated. General food guidelines and the physical environment will be discussed.

Women mention general food guidelines in two articles (Bianchi et al., 2016; Copelton, 2007). They tried to follow these norms, however the norms are perceived to be confusing or unrealistic. Because of this reason, women allow themselves some deviance to the norms. Furthermore, nutrition is only discussed by health professionals very general about the restrictions. Women find it inappropriate to ask questions to health professionals except about health problems (Bianchi et al., 2016).

Besides this, the physical environment can be a factor influencing dietary intake in pregnant women in multiple ways (Laraia, Siega-Riz, Kaufman, & Jones, 2004; Northstone et al., 2008; O'Brien et al., 2017; Tsigga et al., 2011). The living environment is one factor influencing dietary intake, urban residence has a negative impact on healthy eating (Tsigga et al., 2011). Besides that, the obesogenic environment at home (salience of food) and outside can have an impact. In an obesogenic environment, unhealthy food is more easily accessible than healthy food. This can lead to a worse dietary intake (O'Brien et al., 2017). Distance to stores is the last factor influencing dietary intake during pregnancy. Further distance to stores lowers diet quality (Laraia et al., 2004). However, according to Nash et al. (2013), the food environment does not influence dietary intake in pregnant women.

5. Results interviews

In this chapter, the results of the interviews are described. Firstly, the characteristics of the pregnant women will be described. After that, factors influencing the dietary pattern of pregnant women with a low are described according to the (sub-)themes, following the integral model (Lundy, 2010) (figure 6). Also factors not influencing dietary intake according to the pregnant women will be discussed. At the end, figure 7 shows which factors pregnant women think are most important in influencing their diet.

Inner individual <ul style="list-style-type: none"> - Health of the baby - Perception own diet - Psychological state - Knowledge - Motivation - Self-efficacy - Familiarity of products 	Outer individual <ul style="list-style-type: none"> - Physiological changes - Dietary habits - Business - Care for other children - Work - Information search
Inner collective <ul style="list-style-type: none"> - Family influence - Partner influence - Friends influence - Social gatherings - Culture influence 	Outer collective <ul style="list-style-type: none"> - Midwife - Physical environment

Figure 6: Integral model in-depth interview

5.1 Characteristics

14 Pregnant women with a low socio-economic status participated in this study (table 3). All women lived in different regions in the Netherlands (Rotterdam, Nijmegen, Wageningen, Mill, Dieren, Doesburg, Laag-Soeren and Ellecom). Furthermore, four women indicated having parents with another cultural background. Four women were religious. The age of these women ranged from 17 years old to 37 year old. Most of these women already had one or more children and were living together with their partner. Only four of them are nulliparous.

Table 3: Participant characteristics

Pregnant woman	Age	Living situation	gestational age (weeks)	Religion	Working during pregnancy
1	37	Partner & 2 children	16	-	Yes
2	20	Partner & child	19	-	No
3	20	Partner & child	22	-	No
4	32	Children	30	Islam	Yes
5	20	Family in law	9	Christianity	No
6	33	Partner & child	11	-	No
7	29	Partner & child	17	-	Yes
8	26	Partner & child	10	-	Yes
9	23	Partner	10	-	Student
10	17	Parents	15	-	Student
11	19	Partner	12	Islam	No
12	33	Partner & child	21	-	Yes
13	29	Partner & child	29	-	Yes
14	27	Partner & child	15	Christianity	No

5.2 The inner individual

In this paragraph, the factors from the inner individual quadrant, which are (sub-)themes from the interviews are described. Importance of diet to participants and perception of own diet, will be explained first. Afterwards knowledge, motivation, feelings of control and psychological factors will be described as influence on the dietary pattern of pregnant women with a low SES.

5.2.1 Importance

Twelve women do think nutrition is important. Own health, the need to eat, avoiding complaints and mostly, health of the baby were given as reasons for the importance of nutrition. Health of the baby was most mentioned. They feel the responsibility for two instead of one:

"I'm not eating alone, so I am thinking more about what is good for him too." (pregnant women 14)

Moreover, health of the baby was mentioned by all women as reason to make some changes in their dietary pattern during pregnancy. All but one woman skip some products (partly) out of their diet, because they are advised not to eat these during pregnancy. These products are risks for the health of the baby, raw meat mostly mentioned (table 4). Most women clearly do not want to take these risks for the sake of their baby:

"I'm not going to eat things that are not allowed, because it is just not allowed. Then, that is for the safety of my child, so." (pregnant woman 12, age 33, living with partner & child)

Only one woman did not skip products out of her diet because she already did not eat the products that are not allowed during pregnancy. The three women who do not completely follow the advice to skip some risk products often have the same argument. They are convinced that eating the product in moderation will not have a negative impact on the baby, for example based on their previous pregnancy:

"It went well with my first one so why not this time?" (pregnant woman 2, age 20, living with partner & child)

Most pregnant women make some changes in their diet to eat healthier during pregnancy (table 4). Only two women do not do this. Furthermore, seven women believe they are conscious about their diet during pregnancy:

"I tried it [eating healthy] then [before pregnancy] but I wasn't very conscious about it, now I really am. Because I have to eat very healthy now." (pregnant woman 5, age 20, living with family in law)

Pregnant women define healthy eating often as eating the fruits and vegetables and having structure in the diet; eating multiple times a day. Furthermore, some women mentioned having strategies in their diet. Compensation is most mentioned (4 women); when women had the idea that they ate unhealthy or not healthy enough, they ate something healthy afterwards.

Table 4: Changes in diet – Health of the baby

Pregnant woman	Changes in diet because of risks	Eating healthier during pregnancy (according to themselves)	How
1	No raw meat	No	-

2	No Filet American Other things that are not allowed in moderation (e.g. liver pate)	No	-
3	No filet American No salami <i>Every food that can be a risk</i>	Yes	Other products and more portions
4	No raw meat No pre-packaged fish <i>Every food that can be a risk</i>	Yes	Eating certain products (fish, smoothies, water instead of juices)
5	No raw foods	Yes	Not skipping meals
6	No raw meat No pre-packaged fish	Yes	More fruits and vegetables
7	No raw food <i>Looking out in general</i>	Yes	More fruits, not getting a lot of things outdoor
8	No raw meat Less energy drinks	Yes	More fruits and vegetables Not too much fat and sugar
9	Already did not eat raw cheese etc.	Yes	More fruits and vegetables, drinking more water
10	No filet American No steak	Yes	More fruits and vegetables, juices instead of coke.
11	No red meat No soft boiled eggs No Soft cheeses No liver pate	Yes	Eating more
12	No carpaccio No canned tuna No linseed	Yes	More fruits and vegetables, less snacks, drinking more
13	No raw products	Yes	More fruits and vegetables, more jus d'orange
14	Less energy drinks No black pudding	Yes	Eating more Less fried foods

The two women who do not think nutrition is important believe that nutrition does not play a big role in their lives.

5.2.2. Perception own diet

In general, women are content with their diet. Table 5 shows the marks women gave to their diet. The marks range from 6 to 8. To achieve a higher mark or their ideal diet, women have to make some changes. Changes women think they need to make for a better diet can be seen in table 5. Examples of changes that are mentioned several times are: cooking more often, achieving a more stable eating pattern and skipping certain things out of their diets. Furthermore, six women have ideas about what can help them achieve a higher mark or to eat healthier. One woman thinks her partner can help her by supporting her. However, the other five women believe nothing can help them and/or that changes need to be made on their own:

"Actually, it depends on myself. My own motivation." (pregnant woman 12, age 33, living with partner & child)

Table 5: Changes needed, motivation to change and reasons

Pregnant woman	Mark diet	Changes needed	Motivation to change during pregnancy	Reasons
1	7	Eating everything	No	It is fine this way Not liking all products
2	7	Amount of food and kind of products	No	It is fine this way. Glad I can eat in the first place It went well with the first one
3	7.5	Not eating unhealthy products (Fries and chips)	No	No self-efficacy because of appetite for unhealthy products (fries and chips) Fine this way. Too healthy is also possible; it can be exaggerated
4	8	Less snacking	No	It is healthy enough this way Do not want to constantly focus on eating healthy
5	7	Cooking more Eating less unhealthy (Fries) More fruit and vegetables	Yes	Health of the baby
6	7,5	Do not know what to change	No	It is fine this way
7	7	Eating no more meat Not getting food outdoors	No	Self-efficacy no: Appetite for meat during pregnancy
8	6	More structure (eating breakfast, lunch, dinner) Eating fruit everyday	No	Takes time, comes after pregnancy
9	6	More eating moments a day	Yes	Already working on this, because overweight before pregnancy, but it is hard Also hoping to get more energy this way
10	7	More vegetables	No	No need to eat more healthy; Baby is healthy, own health is good.
11	8	Eating more healthy	No	No self-efficacy, otherwise end up worse than it is now. Can continue to do this and that is good for me and the baby.
12	7.5	More fruit and vegetables Drinking more	Yes	Always points for change
13	7	Eating more healthy during diner	No	Would like to eat more healthy but no self-efficacy; Gave up Time cooking healthy Not liking a lot of healthy products ⁷ It is not harming the baby this way
14	6.5	Cooking more Not being lazy and getting something outdoors	No	It is fine this way, already eating more fruit

5.2.3 Knowledge

As is mentioned above, most pregnant women do know which changes they need to make to improve their diets. All women but one perceive that they have enough knowledge to eat healthy during their pregnancy. Six out of the ten women who were pregnant before indicate that they gained knowledge in their first pregnancy through information and personal experiences. They got information from different sources in their first pregnancy which they took with them and use in this pregnancy. The different information sources will be discussed later. Besides that, four women gained knowledge from negative physical experiences and how to handle that, which will be discussed in the outer individual paragraph.

Furthermore, six women think it is basic knowledge how to eat healthy and that everybody knows that you cannot eat certain products, for example raw meat. Because of this, they already knew which things are not allowed to eat during pregnancy before they got the information from the midwife. According to them it is logic that raw products are not allowed.

"You just know, when you are pregnant, you should just avoid raw products and no pre-packaged fish and those kinds of things." (pregnant woman 6, age 33, living with partner & child)

5.2.4 Ideal and motivation

When asked to describe their ideal diet, half of the women imagined their ideal as a healthier diet. Two women indicate that their ideal would be eating without the complaints they have now. Four of the women mention that they already eat how they want it, this is already their ideal. Those women are not motivated to eat healthier or in another way than they are doing now. The last woman indicates her ideal is eating foods that are easy to prepare and eat. Although women have the knowledge how to eat healthy during pregnancy and know which changes to make to improve their diet (table 4), eleven of them are not motivated to make these changes or achieve their ideal or a healthier diet. Different reasons are given for this. Motivation and reasons for this motivation are shown in table 5. Overall they think their diet is fine the way it is, especially with the changes they already made:

"I try to eat more fruit and all that now, so I think it is fine how it is now actually." (pregnant woman 14, age 27, living with partner & child)

This is the case for nine out of fourteen women. There can always be improvement but they think it is okay the way it is now and that it is healthy enough:

It is not that I eat really good, that everybody thinks wow, wow, wow, but it is just good enough, it is good for me, it is good for the child so it is fine. (pregnant woman 11, age 19, living with partner)

Besides that, half of the women do not even think they could achieve a healthier diet. They see different barriers in achieving a better diet. Perceived barriers that are mentioned are business, laziness, experiencing an appetite for unhealthy food and not liking a lot of healthy foods. The lack of motivation is a factor why most women do not experience the need for additional information or an information tool to eat healthier, next to the perception of pregnant women that they already know enough. The motivation after pregnancy is a little bit different. Half of the women say now that they are motivated to lose the weight they gained in their pregnancy afterwards.

5.2.5 Feelings of control

All women perceive they have control over what they eat during their pregnancy. Women do the groceries and cook themselves or the grocery list is made together with partner and sometimes children. It is often decided together what the meals will be. Another factor why women feel they have control over what they eat is consciousness. They feel in control because they think consciously about what they can and want to eat.

5.2.6 Psychological factors

Psychological factors can play a role as well in the diet of pregnant women. This differs among the women. Half of the women perceive they are influenced by their feelings and emotions. Different emotions can play a role. Stress, anger, happiness, boredom, feeling rushed, having a bad mood and just not feeling well in general are all mentioned by the women to influence their diet. When experiencing these emotions, women often tend to eat, sometimes unhealthy:

"Then you think too much about stress and then you think, I'm not feeling like eating together at the table and you walk quickly to the cafeteria again." (pregnant woman 10, age 17, living with parents)

Some women perceive a different influence of feelings on their diet during pregnancy. Either because the effect of emotions is different or because emotions themselves change. Firstly, some women believe that feelings do not influence them in the same way as before pregnancy. This is the case for sadness, boredom and anger. Four women mention that they normally do not eat (enough) when they are sad, but during pregnancy, they do eat:

"When I am not pregnant it [sadness] does [have an influence], because then I just do not eat, when I am sad, I do not eat anything, I do not care then. But now, even though I am sad, I eat, yes, just eat because the little one is here of course." (pregnant woman 3, age 20, living with partner & child)

One woman indicates that boredom does not influence her anymore and another woman indicates that she snacks when being angry, while she did not do that before pregnancy. Secondly, two women experience other emotions, pregnancy grumpiness and feeling rushed, during pregnancy. Experiencing these emotions often leads to eating according to these women. In this case it can also be the other way around, sometimes food can have an influence on the feelings. Eating something can make someone feel better.

5.2.7 Comparing

Twelve pregnant women indicate they do not compare themselves with other (pregnant) women. They believe for example that everybody is different. They focus on themselves:

"I'm not looking at what others do a lot, one does his own way right?" (pregnant woman 13)

Three women do compare themselves with other women sometimes but that this does not influence their diet. Two women perceive this changed during pregnancy; they compared themselves more with other women before they were pregnant.

5.2.8 Familiarity

The influence of familiarity on diet differs between pregnant women. Three of the women mention they would not eat unfamiliar products even when it would be healthy for the baby:

"When I think it really does not look tasty or it really smells, well, sorry, then I do not eat it, whether it is healthy or not." (pregnant woman 11)

Four other women think they would only eat it when it is tasty.

5.3 Outer individual

Factors influencing dietary intake in pregnant women with a low SES in the outer individual quadrant will be explained in this paragraph. Physical factors, habits and responsibilities are themes belonging to this quadrant. The influence of these factors will be described below

5.3.1 Physical factors

Many of the pregnant women have physical complaints, especially in the beginning of their pregnancy. Nausea and tiredness are mostly mentioned as complaints. Other complaints are vomiting, dizziness, constipation, being bloated and dyspnoea. These complaints can have impact on their diet. The complaints for each woman can be seen in table 6 with its impact. In general it can be seen that the impact on diet for most women are changes to avoid or reduce the complaints. According to the women with nausea and who are vomiting, it is more difficult to eat when being nauseous, so they try to avoid the products that make them nauseous and eat something else. When they are nauseous in general, they try to eat anyway:

"Yes, you feel less like eating but you still eat, even though you are nauseous because you need to, for the little one." (pregnant woman 3, age 20, living with partner & child)

The influence of tiredness on diet differs a lot among the women. Sometimes tiredness does not influence diet at all, some women try to eat something from which they can get energy to feel better and others eat less healthy when they are tired. For other complaints, constipation, being bloated and dizziness, women try to eat (other) things that will reduce the complaints. Besides the presence of complaints influencing what pregnant women eat and trying to reduce these

complaints with changes in diet, pregnant women often want to avoid physical complaints beforehand. By eating particular products or at particular times, they try to avoid the complaints:

"When I do not eat, I will become nauseous again. In the beginning, I did not do that, but now I do. They said you have to eat otherwise you will become more nauseous and that is true. So now I eat quite a lot." (pregnant woman 10, age 17, living with parents)

Table 6: Physical complaints + impact

Pregnant woman	Complaints	Impact
1	Tiredness	-
2	Nausea Vomiting Dizziness Tiredness	Avoiding complaints by eating every hour. Not eating less because of complaints.
3	Constipation Nausea Heartburn Less air Tiredness	Eating products to avoid constipation and more portions Less appetite because of nausea, but still eat for the baby (small portions) Eating more portions to avoid nausea - - -
4	Tiredness Nausea Dizziness	- Eat something to reduce nausea -
5	Nausea Tiredness	Cannot eat that much, but tries to Eating something natural to get energy
6	Nausea Tiredness	Eating less and other products -
7	Nausea fatigue	Avoiding products and eating lighter products Eating a bit less
8	No (only first pregnancy: Heartburn)	- (Avoiding jus d'orange, oranges and mandarins)
9	Nausea Stomach pain Tiredness	Hard to eat Drinking hot water to reduce stomach pain -
10	Nausea	Avoiding products (sausages) Eating more to avoid nausea
11	Tiredness Nausea Vomiting Fainting Tiredness	Eating less healthy (fries and snacks) Could not eat breakfast Could not eat breakfast Eating enough to avoid fainting -
12	Heartburn Less air Back problems (Nausea first pregnancy)	Trying different products to reduce this - - (Eating every hour to avoid nausea)
13	Heartburn Tiredness	Drinking less jus d'orange Not feeling like cooking extensive
14	Feeling bloated Nausea Dizziness Dyspnoea Tiredness	Lighter food and drinking water Eating something salty to avoid dizziness - Less healthy, easy foods

Another physical factor that changes during pregnancy is weight. Most women do gain weight during their pregnancy. However, two do not know whether they gained weight yet. Two women even lost weight in the beginning of in their pregnancy. Pregnant women believe that weight gain is part of pregnancy, but they differ a lot in their further perception of weight gain. Six of the women mention it is important to watch their weight. They take this into account in their diet. Other

women do not worry about their weight gain during pregnancy and this does not influence what they eat:

"I honestly do not know whether I gained any weight. I mean, [...] I am not going to eat less or healthier or whatever because I am afraid that I will gain more weight. I mean you gain what you gain." (pregnant woman 2, age 20, living with partner & child)

Furthermore, some women have had negative experiences in their first pregnancy which involved physical factors and their diets. Two women gained for example a lot of weight in their first pregnancy, learned from it and now try to eat healthier:

"My first pregnancy, I have definitely learned some things from that, which I used this time immediately, from the moment I knew I was pregnant, just to avoid even more complaints." (pregnant woman 2, age 20, living with partner & child)

Two other women had physical complaints, they learned how to avoid or reduce these complaints involving their diet in their first pregnancy. They still use these strategies in their second pregnancy

Next to complaints, other physical factors can have an influence on diet during pregnancy too. In general, appetite, hunger and preferences have influence on the diet. Almost all women indicate that when they are hungry, they eat. They mostly eat what they like to eat and when they feel like eating. During pregnancy, twelve of fourteen women experience a change in appetite, hunger, preferences or experience cravings. How these factors are changing differs among the women and its impact can be seen in table 7. Three women experience a change in hunger. One woman is less hungry and two are more hungry than before. Being more hungry leads to eating more, being less hungry leads to eating less in those women. This also applies for appetite (for certain products). Eight women experience change in appetite; Less appetite for certain products leads to lower consumption of these products, while more appetite leads to higher consumption. However, two women mention not letting appetite make them eat unhealthy products. Furthermore, preferences for certain products change for four of the women during pregnancy. This leads to eating more of certain products or avoiding other products for three women. For one woman this does not influence her diet. Besides that, four pregnant women have cravings which influence their diet:

"Well, since I am pregnant, I am totally addicted to ice lollies. I do not know how it happened, but I can eat them all day long." (pregnant woman 6, age 33, living with partner & child)

Table 7: Changes in physical factors

Pregnant woman	Changes in physical factors	Impact
1	No	-
2	Preference change More appetite for varying products	No influence on diet Taking these products from the supermarket
3	Preference change; liking healthy products more More hunger	Eating more healthy Eating more in total
4	Appetite/ craving for different products Appetite change while eating/drinking the product	Eating those products easier Stop eating the food and save it for another day. Eating something else
5	More hunger and appetite Cravings (Bifi sausages)	Try to eat something healthy when being hungry (e.g. apple) Eating this a lot
6	Cravings ice lolly's Appetite change savoury to Sweet	Eating more ice lolly's Eating more sweet products instead of savoury (e.g. sprinkles instead of chicken on a cracker)
7	Cravings watermelon + meat Appetite for childhood meals	Eating more watermelon and meat. Cannot stop eating this. Eating those meals
8	Appetite orange	Eating orange a lot
9	Preference change, not liking products anymore. E.g. yoghurt	Avoiding these products
10	Preference change sausage	Avoiding sausage
11	-	-
12	Hunger change (less) Appetite change (less)	Eating less Less eating and less snacking
13	Appetite changes (more)	First pregnancy eating more, now not trying to eat too much
14	Appetite for ice cream and milk	Eating more ice cream and drinking more milk

Lastly, feeling healthy in general can change during pregnancy. Half of the women felt less healthy before pregnancy because their diet was less healthy. They feel more healthy now because they changed this during pregnancy. Three women did change their diet because of this reason before pregnancy already. For the other half, it did not change before and during pregnancy. Feeling healthy or not does not influence the diet for eleven of the women.

5.3.2 Habits

None of the women drink alcohol during pregnancy and most women never smoked or stopped smoking when they knew they were pregnant. However, still five of the pregnant women smoke during pregnancy. They all indicate that they smoke less during pregnancy but they still did not completely stop. Most women who stopped smoking or smoke less during pregnancy think smoking does not have an influence on their diet. The other two think it may have a small impact because they eat a bit more now. Exercise differs a lot among the pregnant women. Three pregnant women still exercise during pregnancy, but almost every woman indicates moving enough during the day. Most women do not think physical activity has an impact on their diet. All women do have eating habits, but did not see them as eating habits in the beginning of the interview because they are normal to them. They do it every day or every week. For example: having brunch together in the weekends.

5.3.3 Responsibilities

Pregnant women differ a lot in how busy they are due to work, care for children and other responsibilities. In table 3 can be seen that some women have jobs and children. Other women do not work, do not have children and for example divide the household tasks. For nine of the women, business has an influence on their diet. The business influences diet in several ways. Firstly, business can lead to eating less for three women. Because of the things they are doing at home or at work, they forget to eat or feel having no time to eat. Another way how business impacts diet is that women do not feel like cooking after a busy day or feel they do not have time anymore to

cook an extensive meal. In this case, three women indicate they choose for something quick and easy, which is often a less healthy option according to them:

"When I have been very busy, I have the tendency to order something or to get something somewhere. Make something quickly." (pregnant woman 14, age 27, living with partner & child)

Furthermore, two women mention eating more at home when they are not busy. They indicate they are going to eat to have something to do. Lastly one woman mentions that she eats later when she is busy.

Besides this, taking care for the other child(ren) at the household influences the diet for six out of the ten multiparas. They believe their diet changed after they had their first child. They have to take care of their child(ren) and feed them healthy foods. As result, they eat healthier themselves too. They eat less take-away foods and less other easier, less healthy options. They try to cook most of the time for the sake of their child(ren). The born child has to eat healthy so they eat healthier themselves too. They feel for example they are a model for their children. In this way, children have a big influence on their parents:

"We have to give the right example so because of that it changes a lot and that is good" (pregnant woman 13, age 29, living with partner & child)

Lastly, structure at work also influences how they eat for four of the six working women. Because there are breaks in between, they will eat something then. For two of them women, this is a healthy influence because they will eat enough or something healthy. For the other two women, this is unhealthy because they choose something to snack in the breaks.

5.3.4 Search for information

The last factor that influences what pregnant women with a low SES eat during pregnancy is their information search about healthy eating during pregnancy. Twelve out of fourteen pregnant women do search themselves for information about nutrition during pregnancy sometimes but that is again mostly done for avoiding or reducing complaints and checking whether certain products are allowed to eat during pregnancy. When they want information, internet is often the first source they use for searching this information. Part of the pregnant women think that internet is a trustworthy source. However, two other pregnant women do not agree with that:

"In the beginning really did it [searching] from internet, but there are so many things on there that it is really 9 of the 10 things are really nonsense. The midwife told me so too, so I do not do that anymore." (pregnant woman 10, age 17, living with parents)

Women also feel they can go to the midwife for questions. Part of the women do this and go to the midwife for more information. Just like searching on the internet, these questions are mostly about risks and complaints. Next to this, some women use apps or magazines to find more information. However, most women do not experience the need for additional information or a new information tool to eat healthier, because of the lack of motivation and the perception that they already know enough. Only three women would definitely be interested in a new information tool:

"I think it is useful to find information easily in the app indeed, so not in a brochure, I think that is something of the past" (pregnant woman 14, age 27, living with partner & child)

These women differ in opinion what they want to see in this tool. For example: information in categories or information for each week. Three other women would maybe use a new information tool when this can overcome the barriers they experience. An example of this is a tool with easy and quick recipes with ingredients they like.

5.4 The inner collective

In this paragraph factors belonging in the inner collective quadrant will be explained. The (sub-) themes discussed are the social environment including received information, and cultural influence on the diet of pregnant women with a low SES. These will be described below.

5.4.1 Social environment

Eleven women were asked directly whether their diet is influenced by anyone. Eight of them firstly stated that they aren't influenced by anyone. They determine themselves what they eat and what they do not eat:

"No I do what I want, I have always done that." (pregnant woman 3, age 20, living with partner & child)

However, progressing in the interview, it turns out that they are in fact all influenced by other people. They can be influenced by their partner, family, friends or children (table 8). According to ten of fourteen women, the partner (sometimes) has an influence on their diets. The partner can influence them in the case of eating together. Most women believe it is important to eat together with partner and children, when they have children:

"I do not like it when one eats at that time and the other at that time. Just one time, fixed time. At the table. 'gezellig' [cosy]." (pregnant woman 1, age 37, living with partner & children)

When eating at home together with partner (and children), five women tend to eat a more extensive meal than when not eating together:

"When we are home alone, [...], when X [partner] does not join for dinner, then we eat indeed something more simple together [with daughter], [...], not necessarily fresh" (pregnant woman 12, age 33, living with partner & children)

In two cases, women are encouraged to eat enough by their partners. Besides the partner, other family members are influencing the diet of all pregnant women. The family is more often an influence compared to the partner according to the pregnant women. This can happen in multiple ways. First of all, nurture plays a role. Most women believe that their diet is influenced by their nurture. They still eat the same way as they did when they were younger and lived with their parents. Besides that, they use their mother's recipes but also adjust it their own way:

"I did learn cooking mostly from my mother, but there are definitely things I do very different." (pregnant woman 2, age 20, living with partner & child)

Another way how family has influence in pregnant women's diet is in eating together. Women refer to this when they talk about eating with family. This can both result in healthier or less healthy eating, because they often do not determine what they will eat or are distracted by the people around them. Some women think their family plays a role in other ways. Two women for example sometimes call their mothers for tips when cooking. Two other women mention their family paying attention to them and making sure they are eating the right way during their pregnancy:

"She (grandmother of her partner) says okay, you can have that, you cannot have that, so I am not going to give you that." (pregnant woman 11, age 19, living with partner)

Friends are not a big influence in what they eat according to most women. Often these women do not spend a lot of time with friends or are not eating together with friends. However, for five women, friends do have a small impact, for example when eating together.

Table 8: Influences social environment

Pregnant woman	Partner influence	Family influence	Friends influence
1	Sometimes Sometimes partner chooses what to eat	Sometimes <i>Help</i> : Tips for cooking	No
2	No Partner is not deciding what to eat	Yes <i>Eating together</i> : Eating from Monday until Friday with family. They decide what to eat (sometimes together) <i>Nurture</i> : Learned how to cook from mother, father and grandmother	No
3	No Same preferences	Yes <i>Nurture</i> : Same eating pattern as mother and learned what is healthy eating from her. Eating healthy because raised that way.	No
4	Sometimes Getting something because he likes it	Yes <i>Nurture</i> : Same manners. Have to eat vegetables.	Sometimes Recipes from friends
5	Sometimes Same preferences, but sometimes when he takes some foods, wanting that too	Yes <i>Eating together</i> : Little brother does not like a lot of vegetables, so less vegetables <i>Nurture</i> : Learned from mother how to eat healthy and still uses this.	No Not eating with friends
6	Yes Having brunch together only when he feels like brunching.	- (Did not want to talk about family)	No Only advice
7	Yes Cooking more extensive. Would not do that otherwise.	Yes <i>Eating together</i> : Family changes in eating healthy. Giving comments on eating certain products which leads to not eating those products in their presence Always meat when eating with family <i>Nurture</i> : Learned how to cook from mother. Learned about meat from father.	Yes Friends
8	Yes Because need to cook for partner. Not forgetting to eat when eating together. Partner encourages to eat.	Yes <i>Nurture</i> : Recipes from mother (with own touch) <i>Help</i> : Mother brings fruits from the market	No
9	Sometimes Partner eats all the candy so nothing is left	Yes <i>Nurture</i> : Mother always got meat from the butcher and vegetables and fruit from the market. Do this the same. Recipes from mother	Yes One friend always eats fries. Eating fries to when eating with her.
10	-	Yes <i>Eating together</i> : Eating more extensive with family. Take more times. Take something extra.	Only before pregnancy One friend always in the gym and could wear skirts. Wanted that too, so dieting
11	Yes Partner cooks often. Encourages to eat all the time. Giving hints which leads to eating.	Yes <i>Eating together</i> : Eating more extensive when eating together with grandmother	No

	His culture does not eat horse meat	<i>Nurture:</i> Eating manner and recipes from father Eating worse (less) when having no contact with family	
12	Yes Partner likes to eat and cook more extensive so eating more extensive When eating alone, making something simple	Yes <i>Eating together:</i> Eating more extensive (Yugoslav) when eating with family <i>Nurture:</i> Yugoslav influences in own cooking.	No
13	Only previous pregnancy	Yes <i>Eating together:</i> Day out with family, family takes/gets unhealthy food which leads to eating less healthy <i>Help:</i> before, mother cooks a meal every week which was always healthy	Sometimes Eating together with them. They decide what to eat, but they do know the preferences Getting something more easy when it is on the table when visiting someone
14	Sometimes Partner smokes, eating something when he does	Yes <i>Eating together:</i> Eating very healthy when eating with mother in law <i>Nurture:</i> mother eats not very healthy too <i>Help:</i> Tips for cooking from mother Mother makes sure eating good by making special food	Friends smoke, getting something to eat when they smoke

Other aspects in the social environment that can influence the diet of pregnant women are: Days out, visits and birthdays. In these cases most women say they eat different from what they would eat at home. When going a day out, they, or other people, take some (unhealthy) foods with them or they go together to another eating facility instead of eating at home. At birthdays and visits, most women mention eating different from what they would do at home, for example because they eat the foods that are offered or what is on the table, which is often unhealthy. Only 4 women mention they do not eat different at birthdays or visits from what they would do eat home.

5.4.2 Receiving information

Next to these influences pregnant women also get information and advice from people in their social environment which can influence their diet. All women have received information from their social environment during their pregnancy. There are a lot of different information sources. The first information source from the social environment which is mentioned is the family. Seven women get information from their family members about nutrition during pregnancy. In six of the cases this is information from female family members which have advices for them, often based on their own pregnancies. They do not always take these advices with them because it was already a long time ago:

"That was maybe the case when you were pregnant, but it is 2018 now, maybe it is very different now." (pregnant woman 5, age 20, living with family in law)

Other less mentioned information sources in the social environment from which they get information are the partner, neighbours, and friends. Furthermore, in four cases, women do not exactly know how they got certain information about healthy eating during pregnancy. They knew it already from hearing it somewhere when they were younger. Four women also indicate they learned in school how to eat healthy.

In general, advices about the risks in nutrition and avoiding or reducing complaints during pregnancy are often used. However, because of most women feel they know what they can and cannot eat and how they can eat healthy, they do not feel the need for additional information. Another reason why some women do not want additional information is that they want to do their own thing. They want to find out themselves what works for them and what does not:

"That can be healthy for somebody but maybe I do not like to eat that way. Then I can better try to eat just as healthy in another way." (pregnant woman 5, age 20, living with family in law)

5.4.3 Culture

Four of the pregnant women see culture as an influence on their diet. Two women do not eat pork because of their religion. Another woman does not eat horse meat because of her partner's culture. Besides that, these women eat typical products and recipes from their culture:

"Meat is just a hot topic, it is number 1 actually." (pregnant woman 7, age 29, living with partner & child)

The other women who do not see culture as an influence, often do have some aspects of culture in their diet. Often typical Dutch diet aspects come forward:

"I am raised totally Dutch, so for me it is no different than just 'stampot' and that kind of things" (pregnant woman 2, age 20, living with partner & child)

5.5 The outer collective

The outer collective quadrant will be explained in this paragraph. The first factor in this quadrant is the midwife. Furthermore, the theme physical environment including supermarkets, other eating facilities and the salience of food will be described as influence on the diet of pregnant women with a low SES.

5.5.1 The midwife

The midwife is the most mentioned information source. The GP and a dietician are mentioned only a few times as health professional from which they get information. It differs a lot among the women what kind of information they get from their midwife. Twelve of the fourteen women did get a written information but in only 6 cases, oral information about nutrition during pregnancy is given. Two women state that their midwives do tell extensively about diet during pregnancy. However when nutrition is discussed it is mostly standard information about the risks in nutrition during pregnancy:

"It is nothing new or something, I actually knew it already before I went to the midwife." (pregnant woman 9, age 23, living with partner)

However, eight women explain that when they have questions about nutrition, they ask the midwives and then get more information. The questions are usually about reducing or avoiding complaints or about risks in diet during pregnancy. Besides that, most women do read the written information they often get from the midwife.

Most of them only follow up the information about reducing or avoiding complaints and about what is advised not to eat during pregnancy because of the risks:

"No because I do my own thing. Only what is really not allowed, then yes, I do not eat that."
(pregnant woman 4, age 32, living with children)

5.5.2 Physical environment

Also the physical environment can have an impact on the diet of pregnant women with a low SES. Supermarkets are always nearby according to all pregnant women. Also other eating facilities like take-aways and restaurants are close. Because of this, pregnant women feel they have access to both healthy and unhealthy food in their neighbourhoods. In supermarkets, half of the women indicate they are tempted, sometimes because of advertisements in supermarkets, to take other things with them than only things they need. Often these choices are the unhealthy choices but it can also be healthy products. This can be different during pregnancy because appetite and preferences for certain products can change:

"You see something tasty and you take it more easily than before you were pregnant. Because somehow, you feel the need for it." (pregnant woman 4, age 32, living with children)

Besides supermarkets, other eating facilities are also nearby. They are used for several reasons. When women are a day out, five mention going to an eating facility more often, for example a snack bar. As mentioned before, reasons for using other eating facilities are being busy or tired or not feeling like cooking. However, because of costs, the health of their children and because they make it themselves, other eating facilities are not used that much.

"No I think it is a waste of money to go out for dinner and all." (pregnant woman 13, age 29, living with partner & child)

Two women believe that they would eat less unhealthy foods when supermarkets and other eating facilities would not be around. However five women do not think they would eat healthier when these other eating facilities were not around. They point out the delivery services that can deliver these meals. Or they would make it themselves. Besides influence of supermarkets and other eating facilities, the salience of food can influence what pregnant women eat. This differs among the women. Five women indicate they eat healthy or unhealthy food when it is nearby, for five others, this is not an influence because they can easily stay away from the unhealthy food and also do not eat healthy food more when it is nearby. Lastly, the place where women are matters in what they eat. When being outdoors, eight women indicate eating other things than at home. This is often also the case when going a day out as was mentioned earlier.

5.6 Top 3

Women were asked to make a top 3 of most important factors influencing their diet during pregnancy. In figure 7, the number of women mentioning a factor in the top 3 can be seen. Health of the baby is mentioned in almost every top 3. Also family is important for the pregnant women. Factors belonging to 'others' are knowledge, preferences, supermarkets, control over food preparation and feeling healthy, which are all mentioned only once in a top 3.

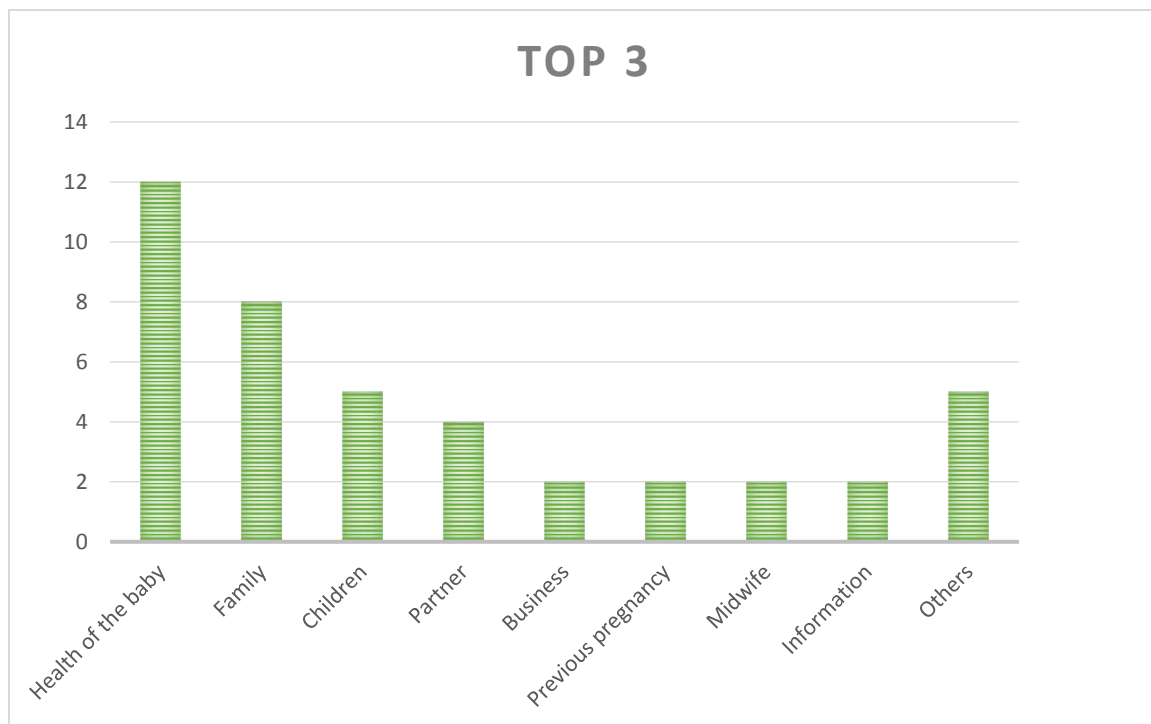


Figure 7: Number of women with factor in top 3

6. Discussion

In this chapter, answer to the research question is given using the in-depth interviews and literature review. Explanations will be given for contradictory results. Furthermore strengths and limitations of this study are acknowledged, implications for research and practice are discussed and lastly, a final conclusion of this study is given.

Inner individual <ul style="list-style-type: none"> - Health of the baby - Opinion own diet - Psychological state - Knowledge - Motivation - Self-efficacy - Familiarity of products - Comparing with other women - Control over food preparation 	Outer individual <ul style="list-style-type: none"> - Physiological changes - Dietary habits - Business - Care for other children - Work - Information search - Own health - Weight - Health behaviour
Inner collective <ul style="list-style-type: none"> - Family influence - Partner influence - Friends influence - Social gatherings - Culture influence 	Outer collective <ul style="list-style-type: none"> - Midwife - Food guidelines - Physical environment

■ Factor both in literature and interviews ■ Factor only in interviews ■ Factor only in literature

Figure 8: Comparison literature and interviews

6.1 Answer to research question and comparison interviews and literature review

The research question was: What are the factors influencing dietary intake of low SES pregnant women? Influencing factors found in the literature and in interviews are compared (figure 8). Most important findings will be discussed and explanations will be given for contradictory results. One of the most important factors in both the literature and interviews is health of the baby. When the risks are clear, pregnant women are likely to skip risk products out of their diet. Furthermore women indicate eating a bit healthier during pregnancy. They mention for example eating more fruits and vegetables. This is in line with Verbeke and De Bourdeaudhuij (2007), showing changes in dietary behaviour, such as increased fruit and vegetable intake during pregnancy. Furthermore, women indicate that they are more conscious in their dietary behaviour. Besides avoiding risks, changes in diet are also made to reduce or avoid physical complaints during pregnancy according to both the literature and interviews.

Unfortunately, Other than these changes in diet, most pregnant women with a low SES in the interviews are not motivated to improve their diets more. Even though they know which changes they would have to make and having basic knowledge of a healthy diet according to both the literature and interviews, this does not lead to action. They perceive their diet is fine the way it is and/or they have no self-efficacy in achieving a better diet because of barriers (business, laziness, experiencing an appetite for unhealthy food and not liking a lot of healthy foods). This corresponds with the literature mentioning pregnant women with a lower SES have less self-efficacy (Paul et al., 2013). Lower motivation to improve their diets next to the risk products and

avoiding complaints among pregnant women is not mentioned in the literature. A reason for this could be that women with low SES are less motivated to change their diets compared to women with higher SES. For example due differences in opinion and less satisfaction towards their own diet, which is also addressed in the literature.

A possible explanation for low motivation in general to improve the diets can be that small adjustments in diet are easier to achieve (Hill, 2008). It may thus be that case that some changes such as skipping specific products and eating more fruits and vegetables, are perceived as small changes and are therefore easier to change than improving the whole diet. Improving the whole diet may be perceived as a big change because of multiple factors and barriers influencing (healthy) eating behaviour in general (Fitzgerald, & Spaccarotella, 2009; Eikenberry, & Smith, 2004).

The same phenomenon focussed on risks and complaints comes back in information search and use; pregnant women do search and receive information about risks and complaints, but barely about eating healthier during pregnancy. The most important information source for this according to the interviews is the midwife, which is a big difference between the literature and the interviews. The midwife is not mentioned as much in the literature. Only general confusing food guidelines by (varying health professionals) are mentioned in the literature. In the Netherlands, the midwife is the usual health professional and information source for nutritional information during pregnancy (Szwajcer, Hiddink, Koelen, De Graaf, & Van Woerkum, 2005), which can explain the difference between literature and interviews. Most women in the interviews do not mention confusing guidelines and know which products they cannot eat during pregnancy. Furthermore, in the literature, asking questions to the health professional is seen as inappropriate except from questions about health problems (Bianchi et al., 2016; Copelton, 2007), while most women in the interviews did mention the possibility to ask questions to their midwives, which some of them did. However, the information they get from the midwife is often also general and about the negatives in nutrition (risks and complaints) during pregnancy. Healthy eating and the risks of not eating healthy are not discussed by midwives or only very general, even though, knowledge of risks is a precondition for behaviour change (Bandura, 2004).

Most pregnant women are not interested in a tool or more information to eat healthy during pregnancy. They often have the perception that they already know enough about (healthy) nutrition during pregnancy. Furthermore, most of them feel they do not need additional information because they are not motivated to eat healthier as explained before; they think their diet is fine the way it is.

Nonetheless, There is one motivator that does lead to eating healthier for most women in the interviews; Caring for their first child. They feel their daughter/son should eat healthy, so they eat healthier too. This corresponds with the literature (O'Brien et al., 2017), which found that nulliparous women are eager to be role models for their children.

Furthermore, some conflicting results are found in the interviews. A remarkable point in the interviews is that a lot of pregnant women with a low SES do mention at first that no one has an influence on their diet, while progressing in the interview, it is acknowledged that this actually is the case. The reason for this can be that people underestimate the role that others play in their choices (Cialdini, 2005) or they maybe do not want to admit it.

A similar conflicting result is found for culture. Culture has an influence too in both interviews and literature, for example, cultural beliefs and preferences play a role (Bianchi et al., 2016; Copelton, 2007; Paul et al., 2013; Thornton et al., 2006). However culture from other countries than the Netherlands is seen as cultural influence in the interviews by the interviewees, while Dutch culture is not seen as cultural influence. This can be the case because the established culture in a country is seen as the norm (Volpp, 2000).

Lastly, some factors were mentioned in the literature as influencing factors but were not found in the interviews. Comparing with other women is mentioned in the literature as factor which influences the diet of pregnant women (Copelton, 2007). However, this is not the case for most

pregnant women with a low SES in this study. They mostly do not compare themselves with others or it does not influence their diets. They are often focussed on themselves. It might be the case that women from low SES groups are more self-focussed compared to women from higher SES groups.

Another factor found in the literature as influencing factors but not in the interviews is having less control over food preparation. When women have less control over their food preparation (cooking and groceries), they have a lower quality diet (Fowles et al., 2012). However, in the interviews it is found that pregnant women with a low SES often do have control over food preparation. Because of this, this is not a big influence in their diets. This can be the case because a lot of women in the interviews do not work and have time to cook and do groceries.

Furthermore, psychological factors differ a lot between interviews and literature. In the literature, stress, anxiety, depression and anger and their role in the diet of pregnant women is often investigated with varying results (Fowles, Bryant et al., 2011; Fowles, Murphey et al., 2011; Fowles et al., 2012; Hurley et al., 2005; Nash et al., 2013; Northstone et al., 2008). For almost all women in the interviews, stress, anxiety, depression and anger do not have an impact on the diets of pregnant women with a low SES. This can be the case because women do not experience these emotions, they do not notice differences in diet while experiencing these emotions, or they may be ashamed to talk about these emotions. Moreover, in the interviews, additional emotions influencing on the diet of pregnant women were found (Happiness, boredom, feeling rushed, having a bad mood and just not feeling well in general) which differ a lot among the women.

Lastly, other health behaviour (smoking, drinking alcohol, exercise and intake of specific food groups) has an impact on the diets of pregnant women according to the literature are (Cuco et al., 2006; Laraia et al., 2007; Nash et al., 2013; Northstone et al., 2008; O'brien et al., 2017; Wall et al., 2016; Watson, & McDonald, 2009; Watts et al., 2007). However, in the interviews, the impact of these types of health behaviour is not recognized as influence on their dietary pattern. It can again be the case that women do not notice impact on diet caused by (changes in) health behaviour. Besides this, it is remarkable that still five of the pregnant women in the interviews still smoke during pregnancy.

6.2 Strengths and limitations

Strengths and limitations concerning the literature review and interviews in this study need to be acknowledged. The first strength of this study is combination of the systematic approach of the literature review and the qualitative in-depth interviews. The systematic approach of the literature review gives a completer picture of the existing literature as result compared to a non-systematic literature review (Grant, & Booth, 2009). Results and conclusions about the literature using this method are more reliable because of this (Weber, 2011). Besides that, advice for the search strategy is sought from an expert in the field of literature search. The strength of a comprehensive picture of existing literature was used to form the foundation for the qualitative in-depth interviews to check whether these factors also applied to pregnant women from low SES groups in the Netherlands and to search for additional influencing factors. In-depth interviews are often the most effective and convenient method to gather qualitative information (Kvale, & Brinkmann, 2009). It can provide detailed information about the perceptions and experiences of the participants (Adams, & Cox, 2008). This combination of methods included a top down and bottom-up approach for a more accurate picture of factors influencing the diet of pregnant women from low SES groups.

A second strength is the summary given at the end of the interviews about what has been talked about, which contributes to the validity of this research because the participant can give feedback when interpretations are not correct (Fylan, 2005). Another advantage is the presence of two interviewers in each interview. The second interviewer could check and complement missed topics, assuring each topic had been discussed. Besides that, multiple interviews are coded twice and the coding tree is evaluated by two researchers, both to increase the intercoder reliability.

Which strengthens the accuracy and the reproducibility of this study (Campbell, Quincy, Osserman, & Pedersen, 2013).

Another strength is the number of interviews, which is fourteen. According to Guest, Bunce and Johnson (2006), an amount of twelve interviews is often enough for saturation to understand common perceptions and experiences. This contributes to the content validity of this study (Francis et al., 2010). Lastly, the integral model (Lundy, 2010) made it possible to have a complete picture of factors influencing the diets of pregnant women with a low SES for each dimension. As result it is visible where most attention is going.

Also some limitations of this method need to be acknowledged. Multiple biases can occur using in-depth interviews, which can threat the validity of this study. The social desirability bias is the first type of bias that could have occurred in this study, which is the tendency of participants to present a favourable image of themselves matching the social norms in society (King, & Bruner, 2000).

Furthermore a researcher bias may have played a role, the influence of the researcher in the interviews. The researcher is the instrument in qualitative research (Patton, 2002) and the approach in semi-structured interviews is flexible. The interviewer should let the interview develop naturally, questions can be changed during the interviews (Fylan, 2005). Because of this, the wording of the questions can differ per researcher and per interview. This has as consequence that a different tone or wording can influence the answer of the participants (Kvale, 1994). In this study, questions with the word 'influence' could have led to a different reaction than questions without this word. Furthermore, own personal perspectives can influence how results are interpreted. However, it has been tried to reduce this by using multiple researchers in analysing the results (Johnson, 1997).

Thirdly, a selection bias can occur. This is the case when a sample is not representative of the whole study population (Ellenberg, 1994). In this study, pregnant women with a low SES were asked to participate in the study by their midwives. It can be the case that only those women who already were interested in diet during pregnancy signed up or midwives selected only extreme low SES which could have led to a less representative sample. However, this is not seen during the interviews and analysis. Different educational levels and interest levels come forward in the interviews.

A last limitation to this research is lack of time. Due to lack of time, multiple decisions needed to be taken such less detailed transcription method. It may be the case that transcribing the interviews with all details other than speech (non-verbal signals, emotions and silences), would have resulted in discovering underlying meanings (Graneheim, & Lundman, 2004).

6.3 Implications for research and practice

This research contributes to the field of knowledge about factors influencing the dietary intake of pregnant women. Especially for the low SES groups, because little was known about factors influencing the dietary intake in this group. Implications for research and practice are suggested in this paragraph. As can be seen in the answer on the research question, the factors influencing dietary intake of pregnant women with a low SES differ a lot among the women. A few factors such as the health of the baby and (lack of) motivation apply for almost all women as influencing factors in the same way. However, most individual and collective factors are more varying among the women in how and whether they influence the diet of pregnant women with a low SES.

This information can be used for the improvement of the dietary quality of pregnant women with a low SES. Because the midwife is clearly an important information source for the women, they would be an important actor in this improvement. At this moment, healthy nutrition during pregnancy is not discussed a lot next to the risk products and avoiding and reducing complaints. Yet, as mentioned before, knowledge of risks is a precondition for behaviour change. Furthermore, the risks should be perceived as severe enough (Bandura, 2004). When the impact of the diet and

the risks are clearly understood in their own context, women will be more likely to change their diets. This is the case in the risks products women avoid during pregnancy according to the interviews. Women do understand the risks and do not want to harm their unborn baby. Making the risks and effects of unhealthy eating during pregnancy clear too may thus help to drive pregnant women with a low SES to improve their diets. Risks and benefits of unhealthy eating should thus been emphasised more by the midwife and in nutrition communication during pregnancy in general.

Furthermore, women in the interviews indicate that they do achieve small changes in their diets, but that they are not motivated to improve their diets. A small changes approach to healthy eating during pregnancy could help pregnant women change their diets.

Next to this, it is clear that the factors influencing dietary intake differ among the pregnant women with a low SES. Consequently, it is important to contextualize information, communication or intervention to improve the diet of pregnant women with a low SES.

Lastly, it is striking that still a remarkable number of the pregnant women with a low SES in this study smokes. This corresponds with a research of Trimbos institute (2017), still part of the women continue to smoke during pregnancy, especially women with a low SES. This problem should not be neglected and should be taken together in an intervention or method to improve the health of pregnant women with a low SES and their babies.

Next to these practical implications, some further research is necessary. An important point that comes forward in the interviews is the motivation of the women. Overall, pregnant women with a low SES in this study are not motivated to change their diets and do not feel the need for additional information, especially because they perceive their diets as fine the way it is and they do not have self-efficacy because of different barriers. Further research should investigate how these women can be motivated to improve their diets during pregnancy or how to get them to change their diets anyway. This can be both consciously and unconsciously. Next to this, it should be investigated how women can be empowered to improve their self-efficacy and can overcome their barriers.

Furthermore, the outer collective quadrant from the integral model (Lundy, 2010) needs more investigation. The physical environment and the midwife are studied only in a limited extent in both the literature and the interviews, more research should be done into factors influencing dietary intake in this quadrant. For example policies regarding nutrition communication and improving diets of pregnant women (with a low SES).

Combining these practical and research implications can eventually result in an approach that can lead to the improvement of the diets of pregnant women with a low SES.

6.4 Conclusion

All pregnant women with a low SES in this study mention they changed some aspects of their diets. They all avoid risk products for the health of the baby and mentioned eating healthier during pregnancy. However, pregnant women with low SES indicate not being motivated to further improve their diets more during pregnancy. They perceive their diets as fine the way they are and/or they encounter multiple barriers. Furthermore, other individual and collective factors influencing dietary intake among pregnant women coming forward in both interviews and literature (Psychological factors, knowledge, control, familiarity, physical factors, habits, responsibilities, the social environment, culture, the physical environment and the midwife), differ a lot among the women. The lack of motivation and the differentiating factors should be taken into account in the development of methods or interventions to improve the dietary intake of women with a low SES. Interventions and methods should focus on motivating pregnant women with a low SES and tailor interventions and methods to each group of women.

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8. Appendix

Appendix I: Critical appraisal articles

Appendix IA: Critical appraisal cross-sectional study

Reviewer_____Date_____

Author _____Year_____Record Number _____

	Yes	No	Unclear	Not applicable
1. Were the criteria for inclusion in the sample clearly defined?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Were the study subjects and the setting described in detail?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Was the exposure measured in a valid and reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Were objective, standard criteria used for measurement of the condition?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Were confounding factors identified?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Were strategies to deal with confounding factors stated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were the outcomes measured in a valid and reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

Appendix IB: Critical appraisal cohort study

Reviewer _____ Date _____

Author _____ Year _____ Record Number _____

	Yes	No	Unclear	Not applicable
1. Were the two groups similar and recruited from the same population?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Were the exposures measured similarly to assign people to both exposed and unexposed groups?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Was the exposure measured in a valid and reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Were confounding factors identified?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Were strategies to deal with confounding factors stated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were the outcomes measured in a valid and reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Was the follow up time reported and sufficient to be long enough for outcomes to occur?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Was follow up complete, and if not, were the reasons to loss to follow up described and explored?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Were strategies to address incomplete follow up utilized?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

Appendix IC: Critical appraisal qualitative study

Reviewer _____ Date _____

Author _____ Year _____ Record Number _____

	Yes	No	Unclear	Not applicable
1. Is there congruity between the stated philosophical perspective and the research methodology?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Is there congruity between the research methodology and the research question or objectives?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Is there congruity between the research methodology and the methods used to collect data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Is there congruity between the research methodology and the representation and analysis of data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Is there congruity between the research methodology and the interpretation of results?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Is there a statement locating the researcher culturally or theoretically?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Is the influence of the researcher on the research, and vice- versa, addressed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Are participants, and their voices, adequately represented?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

Appendix II: Topic guide with justification

Topic	Question	AI	Integral model	Explanation/literature
<u>Photovoice</u>	1. Can you tell something about this picture? (Why is this important to you?)	Discovery	-	Photovoice can be used to give women the opportunity to express, reflect and communicate on their everyday lives (Wang, 1999). In this case women can make a picture about something important in their nutrition during pregnancy and reflect on why they made this picture to get a first impression about what is important for them
<u>Introduction</u>	2. How are you feeling (now you are pregnant)? What is pregnancy doing with you?	Discovery	-	Curious how the pregnant women in this study are feeling in general
<i>What is going well?</i>	3a. What is going well regarding your diet? 3b. What are you most proud of?	Discovery	-	Curious what they think goes well in their eating behaviour
<i>Differences in diet</i>	4a. Are there any differences in your diet before and during pregnancy 4b. When yes, can you explain how this happened?	Discovery	-	What changed in their dietary intake during pregnancy? Multiple factors can influence this change in nutrition with the onset of pregnancy (Fitzgerald, & Spaccarotella, 2009). Can they indicate themselves already which factors are responsible for this change?
<u>Importance and beliefs/perceptions</u>	5a. Is nutrition important to you? 5b. What makes nutrition (not) important to you? 5c. Does that have any influence on your diet? (How?)	Discovery	Inner individual	Women indicate that the importance of the health of the baby is influencing their nutrition (Bianchi et al., 2013; Copelton, 2007; Jelsma et al., 2016; O'brien et al., 2017). Is this the same for low SES pregnant women and do other factors make nutrition important for them?
<i>Health of the baby</i>	6. Are there any things you do or do not eat for your baby?	Discovery	Inner individual	As mentioned above, women indicate that the health of the baby is an important factor influencing their nutrition (Bianchi et al., 2013; Copelton, 2007; Jelsma et al., 2016; O'brien et al., 2017). They have certain beliefs about whether certain food has an impact and how they should eat (Copelton, 2007;

				Herring et al., 2012; O'brien et al., 2017; Paul et al., 2013) What are their beliefs and how does this influence what they eat?
<i>Ideal</i>	7a. How does your ideal diet during pregnancy look like? 7b. Does this ideal have an influence on your diet?	Dream	Inner individual	Beliefs about nutrition are mentioned as an important factor influencing their dietary intake (Copelton, 2007; Herring et al., 2012; O'brien et al., 2017; Paul et al., 2013). What do pregnant women perceive as ideal nutrition and how does this influence their dietary intake.
<i>Current diet</i>	8a. Are you eating now as you would like? (Are there any things you do eat now, but do not want to eat? Or the other way around?) 8b. Why?			Curious whether the pregnant women in this study would like to change certain aspects in their dietary intake now they are pregnant.
<i>Mark diet</i>	9. What mark (on a scale of 1 to 10) are you giving your diet now?	Discovery	Inner individual	Perceptions about nutrition influence the nutrition for pregnant women (Copelton, 2007; Herring et al., 2012; O'brien et al., 2017; Paul et al., 2013). How do they perceive their own nutrition at this moment?
<i>Self-efficacy</i>	10a. Do you think you could get a higher mark? 10b. What should happen according to you to get a higher mark? 10c. What could help you with that?	Dream	Inner individual	Pregnant women from low income groups have low self-efficacy regarding their nutrition. This means that they believe they are unable to reach a better dietary intake (Paul et al., 2013). Is this also the case in Dutch pregnant women with low SES and does this influence what they eat? Curious about what women think should happen to reach a higher grade for their nutrition.
<i>Motivation</i>	11a. Are you motivated to get a higher mark/eat healthier?	Discovery	Inner individual	
<i>Control</i>	12a. Do you feel having control about what you eat during pregnancy? (Cooking, groceries) Heb je het idee dat je controle hebt over wat je eet tijdens je zwangerschap? (koken, boodschappen) 12b. Is this influencing your diet? (How?)	Discovery	Inner individual	Inadequate control over food preparation is mentioned to influence dietary intake in low income pregnant women (Fowles et al., 2012). Do women in this study also perceive they have inadequate control over their food?
<i>Knowledge</i>	13a. Do you feel knowing enough to eat healthy during pregnancy?	Discovery	Inner individual	Knowledge is known to influence dietary intake in pregnant women (Fowles, Bryant et al., 2011). Do

	13b. Is that influencing your diet? (How?)			pregnant women with low socio-economic status perceive they have enough knowledge and how does this influence their intake?
<u>Guidelines/norms</u> <i>Information sources</i>	14a. Do you use specific information about nutrition during pregnancy? 14b. Where do you get your information about nutrition? 14c. What do you think of these (different kinds of) information? (Is it influencing your diet?)	Discovery	Inner/outer collective Inner individual	Pregnant women indicate that guidelines are often unrealistic/contradicting (Bianchi et al., 2013; Copelton, 2007). How do the pregnant women in this study perceive this in the Netherlands? What sources give information to pregnant women Different information sources can have different impact on pregnant women. Some of them are seen as more credible than others (Bianchi et al., 2013). Information about this can be used for developing a new tool/method to improve nutrition among pregnant women with a low SES.
<i>Most used information source</i>	15a. Now you are getting most information from ...? 15b. Do you think that should be the case or do you prefer something else?	Discovery	Inner collective	Curious whether women are pleased with the current situation. Also this information can be used for a new tool to improve dietary intake in pregnant women from low SES groups.
<i>Manner of information</i>	16a. In what way do you get information? (paper, online?) 15b. What do you think of this way? (Is it influencing your diet?)	Discovery	Inner collective	In what way do pregnant women (from a low ses) receive their information and what do they think about this manner. Information about this can be used for developing a new tool to improve nutrition
<i>Tools</i>	17a. What tools do you know toe at healthier during pregnancy? (What apps, websites or brochures did you get/encountered?) 17b. Do you use these? 17c. Which? 17d. What do you think of these tools (What could be improved?)	Discovery Design	Outer individual	What tools/methods for healthier nutrition do pregnant women already know and use. What do they think about these tools. Information about the use and opinion of pregnant women with low SES can help to develop a new tool/method to improve nutrition in pregnant women from low SES groups.
<u>New tool</u>	18a. Imagine, a new tool would be made to help you eat healthier during pregnancy, would you be interested in it? 18b. Why (not)?	Discovery Design	Outer individual	Curious whether pregnant women with a low SES would be interested in a tool for healthy eating during pregnancy. Information about this can help to develop a new tool/method to improve the diet of pregnant women with a low SES.

	18c. In what way would you use it (What do you expect of such a tool?)			
<i>Midwife</i>	19a. Did you receive information from your midwife? 19b. Yes? What information did you get?	Discovery	Outer collective	Midwives are the main health care providers during pregnancy in the Netherlands (Szwajcer et al., 2005). Do pregnant women get information from the midwife and what kind of information?
<i>Centre for nutrition</i>	20a. Did you receive information from the Nutrition Centre? 20b. Yes? What information did you get?	Discovery	Outer collective	The nutrition centre gives information and education about nutrition since 1941 in the Netherlands (the Netherlands Nutrition centre, n.d.b). Also information during pregnancy is given. Do pregnant women receive information from the Nutrition Centre?
<i>Following advices</i>	21a. Do you use new information you receive? 21b. What advice do you (not) follow 21c. Why (not)?	Discovery	Outer collective	Food guidelines influence dietary intake in pregnant women (Bianchi et al., 2013; Copelton, 2007). What guidelines do they follow and which do not they follow and why?
<i>Familiarity</i>	22a. Are you familiar with the food you are receiving advice about? 22b. Is this influencing what your diet?	Discovery	Inner individual	Familiarity with food or cooking techniques is mentioned to be influencing dietary intake in pregnant women (Copelton, 2007).
<u>Psychological state</u>	23a. Is your diet influenced by how you are feeling (For example when feeling happy/sad)? 23b. Yes? By which feelings? 23c. What is different in your diet when your are feeling ...?	Discovery	Inner individual	Psychological state is an important factor influencing dietary intake in pregnant women. Stress, anxiety, depression and emotions are known to have an impact on what pregnant women eat (Fowles, Bryant et al., 2011; Fowles, Murphey et al., 2011; Fowles et al., 2012; Hurley et al., 2005; Nash et al., 2013; Northstone et al., 2008). Do pregnant women in this study experience differences in their dietary intake when they have certain emotions?
<i>Difference psychological state during pregnancy</i>	24a. Is this any different during pregnancy compared with before? 24b. Which feeling do you experience less/more often during pregnancy? 24c. Is the influence of these emotions on your diet different during pregnancy?	Discovery	Inner individual	Added because one women mentioned in the interview experiencing other emotions during pregnancy and emotions having a different influence. Curious whether other women in this study experience differences in influencing emotions during pregnancy.
<u>Person influence</u>	25a. Do others have influence on your diet? (partner, family, friends) (When you would live on your own, would you eat different than what you are doing now) 25b. Which people do have an influence on your diet?	Discovery	Inner collective	The social environment is often mentioned as an important factor influencing dietary intake. This can be positive (support from partner, family and friends), but also negative (Bianchi et al., 2016; Fowles, Bryant et al., 2011; Fowles, Murphey et al., 2011; Fowles et al., 2012; Nash et al., 2013; O'brien et al.,

	25c. In what way do these people influence your diet? (presence, support, advice)			2017; Thornton et al., 2006; Tovar et al., 2010). How do pregnant women from low ses groups experience the social environment regarding their dietary intake?
<i>Situation healthy eating</i>	26a. Can you tell me in which situations you eat most healthy? 26b. Why do you think that is?	Discovery	-	Curious whether in which situation women themselves think they eat the most healthy? Do they know what factors are responsible for this?
Social gatherings	27a. Are there any days you eat differently than normally? (Parties, birthdays?) 27b. Yes? When or where does that happen? (How often?) 27c. What do you eat then? (What is different?)	Discovery	Inner collective	Social gatherings have an influence on the dietary intake of pregnant women (Jelsma et al., 2016; O'brien et al., 2017; Thornton et al., 2006). How do women in this study experience the influence of social gatherings on their diet? Besides that other factors influencing the diet on different days can come forward in this topic.
<u>Culture</u>	28a. Do certain traditions play a role in your diet? 28b. Yes, in what way? (In what extent?)	Discovery	Inner collective	Culture is also mentioned as an influencing factor. Cultural beliefs/traditions influence the dietary intake of pregnant women (Copelton, 2007; Thornton et al., 2006). Do traditions influence the dietary intake of pregnant women with a low SES in the Netherlands and in what way?
<u>Comparing</u>	29a. Do you compare yourself with other women regarding your diet? 29b. Does this influence your diet?	Discovery	Inner individual	Pregnant women use comparing themselves with others as method to eat certain foods. When they know that other pregnant women eat snacks, they can see that as an excuse to eat snacks themselves too (Copelton, 2007). Is this the case for these pregnant women? Do they compare themselves with other women?
<u>Nurture</u>	30a. Does your nurture has an influence on what your are eating nowadays? 30b. Yes? In what way?	Discovery	Inner collective	Food modelling is mentioned as a factor influencing dietary intake. Parents are in this case the models and influence what their children eat when they are adults (O'brien et al., 2017). Did food modelling or other aspects of nurture of these low SES women influence what they are eating now?
<u>Physiological changes</u>	31a. (If applicable) You indicated before you were nauseous/had complaints, how is this going now? 31b. Does this influence your diet? 31c. Yes? In what way?	Discovery	Outer individual	Physiological changes during pregnancy are important factors for pregnant women influencing their dietary intake. These include: changes in nausea severity, morning sickness, fatigue, appetite, hunger, cravings, weight gain, food preferences and gastroesophageal reflux (Bianchi et al., 2016; Copelton, 2007; Herring et al., 2011; Hurley et al.,

				2005; Jelsma et al., 2016; Tovar et al., 2010; Wall et al., 2016; Watson & McDonald, 2009). Which changes do they experience and how do these factors influence what Dutch pregnant women in low SES groups eat?
<u>BMI/weight(gain)</u>	32a. Does weight(gain) has an influence on your diet? 32b. Yes? How?	Discovery	Outer individual	BMI has an influence on dietary intake (Derbyshire et al., 2006; Laraia et al., 2007; Morisset et al., 2016; Northstone et al., 2008; Tsigga et al., 2011; Wall et al., 2016; Watson, & McDonald, 2009). Do the pregnant women from low SES groups perceive weight gain and BMI as influencing factors on their dietary intake?
<i>Other physical factors</i>	33a. Are there any other changes of your body that influence your diet? 33b. Yes? In what way?	Discovery	Outer individual	What other physiological factors that are not mentioned in the literature have an influence on what these pregnant women eat?
<i>Self-rating health</i>	34a. Did you feel healthy before pregnancy? 34b. Do you feel healthy now? 34c. What does health mean to you? 34d. Does feeling healthy or not influence your diet?	Discovery	Inner individual	Self-rated health before pregnancy is mentioned as influencing factor for dietary intake (Wall et al., 2016). How do women in this study perceive their health before pregnancy and now? Does this influence their nutrition at this moment?
<u>Eating habits</u>	35. Do you have certain habits in your diet that make you (un)happy? (e.g. snacking, skipping breakfast)	Discovery	Outer individual	Literature indicates that pregnant women have certain eating habits that influence what they eat, for example: meal skipping and indulgence (Copelton, 2007; Fowles, Bryant et al., 2011; Fowles et al., 2012). Do the women in this research also have eating habits and how does this influence their dietary intake?
Food groups	36a. Do you notice eating less /more of certain products when eating less/more of other products? 36b. Yes, what are you noticing?	Discovery	Outer individual	Eating of certain foodgroups/diet influences the intake of other food during pregnancy (Cuco et al., 2006; Northstone et al., 2008; Wall et al., 2016). Do the women in this research also notice this?
<u>Health behaviour</u>	37a. Do other habits (smoking, drinking, physical exercise) influence your diet? 37b. Yes, how?	Discovery	Outer individual	Besides eating habits, articles mention other health habits (smoking, exercise and alcohol) before and during pregnancy to influence their dietary intake (Cuco et al., 2006; Laraia et al., 2007; Nash et al., 2013; Northstone et al., 2008; Wall et al., 2016; Watson, & McDonald, 2009; Watts et al., 2007). Is this also the case in Dutch pregnant women from low SES groups?

<u>Business/time-constraints</u>	38a. Are there any other tasks/work that influence you diet? (When you are busy, do you eat differently?) 38b. Yes? In what way?	Discovery	Outer individual	Business and time-constraints can have impact on dietary intake in pregnant women (Copelton, 2007; Jelsma et al., 2016; Tovar et al., 2010). Do these women also have other responsibilities/work that impact their nutrition?
<u>Other children</u>	39a. Do other children influence your diet? (<i>Only for women with children</i>) 39b. Yes? In what way?	Discovery	Outer individual	Other children in the household and parity in general can be an important influencing factor in dietary intake for pregnant women (Jelsma et al., 2016; Laraia et al., 2007; Northstone et al., 2008; O'brien et al., 2017; Watson, & McDonald, 2009). Do the pregnant women who already have children experience that the other children have an impact on their dietary intake?
<u>Physical environment</u>	40a. Do you eat differently in other places? (At home, work, neighbourhood/city/village). 40b. Yes? How?	Discovery	Outer collective	The physical environment can be a factor influencing dietary intake in pregnant women (Laraia et al., 2004; Northstone et al., 2008; O'brien et al., 2017; Tsigga et al., 2011)
Salience of food	41. Do you eat something (un)healthy more easily when it is nearby (When you have it at home/can get it easily?)	Discovery	Outer collective	Besides this, the obesogenic environment plays a role in influencing what pregnant women eat. This includes the salience of food (O'brien et al., 2017).
Supermarkets	42a. Are there any supermarkets in the neighbourhood? 42b. How often do you go there? 42c. When being in the supermarket, are you ever tempted to take other things than needed? 42d. Yes? How does that happen? In what situations is that the case?	Discovery	Outer collective	Distance to supermarkets is one factor influencing dietary intake in pregnant women (Laraia et al., 2004). How is this experienced in the Netherlands.
Other eating facilities	43a. What eating facilities are in your neighbourhood? (e.g. restaurants, snackbars) 43b. How often do you go there? 43c. Do you think you eat this kind of foods more easily because it is nearby?	Discovery	Outer collective	Besides this, the obesogenic environment plays a role in influencing what pregnant women eat. This includes the salience of food (O'brien et al., 2017). Curious whether the perceive other eating facilities as influence on their diet.
<u>Access to healthy food</u>	44a. Is is easy to get healthy food in your environment? ? 44b. Why (not)? 44c. Does this influence your diet?	Discovery	Outer collective	In an obesogenic environment, unhealthy food is more easily accessible than healthy food (O'brien et al., 2017). How do pregnant women with a low SES experience the access to healthy and does it influence their dietary intake?

Access to unhealthy food	45a. Is it easy to get unhealthy food in your environment? 45b. Why (not) 45c. Does this influence your diet?	Discovery	Outer collective	In an obesogenic environment, unhealthy food is more easily accessible than healthy food (O'Brien et al., 2017). How do pregnant women with a low SES experience the access to unhealthy food and does it influence their dietary intake?
<u>Costs</u>	46a. Do you pay attention to the price of products? 46b. Yes? Do you ever leave something that you would have bought when it was cheaper?	Discovery	Outer individual	Because the women in this study have a low SES, they have in general a lower income. Costs of products could influence their food choices (Darmon, Ferguson & Briand, 2002).
<u>Previous pregnancies</u>	47a. You already have been pregnant before, did you take something from that pregnancy that helps you during this pregnancy? 47b. Yes? What?	Discovery	Inner individual	Previous pregnancies and parity in general play a role in influencing dietary intake (Bianchi et al., 2016; Jelsma et al., 2016; Laraia et al., 2007; Nash et al., 2013; Northstone et al., 2008; O'Brien et al., 2017; Wall et al., 2016). This can be the case because women who were pregnant before learnt some things about dietary intake in their previous pregnancies or have knowledge they can adapt that easily again now. How is this experienced by pregnant women in this study who already have been pregnant before?
<u>Additional factors</u>	48a. Do you think there are any other factors influencing your diet during pregnancy? (Are there any other things that change your diet during pregnancy?) 48b. Yes? What factors?	Discovery	-	Curious whether other factors, not in the topic list or not mentioned yet, are influencing the diet of pregnant women with a low SES. Give women time to think about this.
<u>Most important factor</u>	49. What factors are most important in influencing your diet during pregnancy? Can you make a top 3?	Discovery	-	Curious what factors are the most important influencing factors according to the pregnant women in this study

Appendix III: Informed consent

Toestemmingsformulier

Titel onderzoek: 'Why pregnant women eat what they eat'

Verantwoordelijke onderzoeker: Yvette Beulen

Bedankt dat u opnieuw wilt deelnemen aan een interview voor het promotieonderzoek 'Why pregnant women eat what they eat'. In een eerder interview gebruikten we een vragenlijst om na te vragen **wat** u eet tijdens de zwangerschap. Vandaag zullen we bespreken **waarom** u tijdens de zwangerschap eet wat u eet.

Voorafgaand aan het interview heeft u de opdracht gekregen een foto te maken van iets wat u belangrijk vindt als het gaat over voeding tijdens de zwangerschap. Deze foto zouden wij graag van u ontvangen (per mail of WhatsApp).

Tijdens het interview zullen wij u vragen stellen over alles wat (mogelijk) invloed heeft op wat u eet. Met behulp van kaartjes proberen we zichtbaar te maken waarom u eet wat u eet.

Het interview zal naar schatting ongeveer 1 uur duren, hiervoor ontvangt u een tegoedbon ter waarde van €15,-.

In te vullen door de deelnemer

Ik verklaar op een voor mij duidelijke wijze te zijn ingelicht over het onderzoek. Mijn vragen zijn naar tevredenheid beantwoord.

Ik verleen toestemming aan Wageningen University & Research om geanonimiseerde, niet-herleidbare citaten te gebruiken in wetenschappelijke artikelen en presentaties. Ik weet dat mijn gegevens, geluidsopnames en de toegezonden foto vertrouwelijk zijn en niet aan derden verspreid zullen worden.

Ik stem geheel vrijwillig in met deelname aan dit onderzoek. Ik weet dat ik op ieder moment kan besluiten om het interview te beëindigen.

Naam deelnemer:

Datum: Handtekening deelnemer:

In te vullen door de uitvoerende onderzoeker

Ik heb een mondelinge en schriftelijke toelichting gegeven over het onderzoek. Ik zal resterende vragen over het onderzoek naar vermogen beantwoorden.

De deelnemer zal van een eventuele voortijdige beëindiging van deelname aan dit onderzoek geen nadelige gevolgen ondervinden.

Naam onderzoeker:

Datum: Handtekening onderzoeker:

Appendix IV: Codebook

Theme	Subtheme	Codes
Photovoice	Photovoice	Photovoice Photovoice - why
Pregnancy complaints	In general	Pregnancy complaints - yes
		Pregnancy complaints - no
		Pregnancy complaints - influence yes
		Pregnancy complaints - influence no
	Nausea	Nausea - yes
		Nausea - no
		Nausea - influence yes
		Nausea - influence no
	Tiredness	Tired - yes
		Tired - no
		Tired - influence yes
		Tired - influence no
	Constipation	Constipation - yes
		Constipation - no
		Constipation - influence yes
		Constipation - influence no
	Avoiding complaints	Avoiding complaints - Nausea
		Avoiding complaints - Tiredness
		Avoiding complaints - Constipation
		Avoiding complaints - in general
Physical factors	Appetite	Appetite - yes
		Appetite - no
		Appetite - change yes
		Appetite - change no
		Appetite - influence yes
		Appetite - influence no
	Binge eating	Binge eating - yes
		Binge eating - no
		Binge eating - change yes
		Binge eating - change no
		Binge eating - influence yes
		Binge eating - influence no
	Cravings	Cravings - yes
		Cravings - no
		Cravings - change yes
		Cravings - change no
		Cravings - influence yes
		Cravings - influence no
	Food preferences	Preferences - change yes
		Preferences - change no
		Preferences - influence yes
		Preferences - influence no
	Hunger	Hunger - yes
		Hunger - no
		Hunger - change yes
		Hunger - change no
		Hunger - influence yes
		Hunger - influence no
	Tendency to eat	Tendency to eat - yes
		Tendency to eat - no
		Tendency to eat - influence yes
		Tendency to eat - influence no
	Weight gain	Weight gain - yes
		Weight gain - no
		Weight gain - influence yes

		Weight gain – influence no
		Perception – weight gain
	Appearance	Appearance – influence yes
		Appearance – influence no
	Breastfeeding	Breastfeeding – yes
		Breastfeeding – no
		Breastfeeding – influence yes
Psychosocial factors		Breastfeeding – influence no
	Others	Others – no
	Boredom	Others – yes
		Feelings influence no – Boredom
	Sadness	Feelings influence yes – Sadness
		Feelings influence no – Sadness
	Happiness	Feelings influence yes – Happiness
		Feelings influence no – Happiness
	Anger	Feelings influence yes – Anger
		Feelings influence no – Anger
	Bad mood	Feelings influence yes – Bad mood
		Feelings influence no – Bad mood
	Hormones	Feelings influence yes – hormones
		Feelings influence no – hormones
Social environment	In general	Feelings influence yes
		Feelings influence no
	Partner	Partner influence – yes
		Partner influence – no
		Partner support
	Family	Family influence – yes
		Family influence – no
		Family support
	Mother	Mother influence – yes
		Mother influence – no
		Mother support
	Friends	Friends influence – yes
		Friends influence – no
		Friends support
	People in general	Person influence – yes
		Person influence – no
		Person support
		Perception – support
		Talking with others about pregnancy – yes
		Talking with other about pregnancy – no
		Perception – other opinion eating
	Eating together	Eating together – yes
		Eating together – no
		Eating together – influence yes
		Eating together – influence no
		Differences when eating alone – yes
		Differences when eating alone – no
		Same preferences – yes
		Same preferences – no
	Social gatherings	Social gatherings – influence yes
		Social gatherings – influence no
	Holidays	Holidays – influence yes
		Holidays – influence no
	Visits	Visits – influence yes
		Visits – influence no
	Birthdays	Birthday – influence yes
		Birthday – influence no
	Party	Party – influence yes
		Party – influence no
	Day out	Day out – influence yes
		Day out – influence no
	Other way around	Influencing others
		Giving information to others

	Culture	Culture influence – yes
		Culture influence – no
	Nurture	Nurture influence – yes
		Nurture influence – no
	Hype	Hype
	Gezelligheid	Gezelligheid
Habits	Not bothering others	Not bothering others
	Smoking	Smoking – yes
		Smoking – no
		Smoking – less
		Smoking – change yes
		Smoking – change no
		Smoking – influence yes
		Smoking – influence no
	Drinking	Drinking – yes
		Drinking – no
		Drinking – change yes
		Drinking – change no
		Drinking – influence yes
		Drinking – influence no
	Exercise	Exercise – yes
		Exercise – no
		Exercise – change yes
		Exercise – change no
		Exercise – influence yes
		Exercise – influence no
	Physical activity (moderate)	Physical activity – yes
		Physical activity – no
		Physical activity – change yes
		Physical activity – change no
		Physical activity – influence yes
		Physical activity – influence no
	Eating habits	Eating habits – yes
		Eating habits – no
		Food group – influence yes
		Food group – influence no
Responsibilities	Work	Work – yes
		Work – no
		Work – change yes
		Work – change no
		Work – influence yes
		Work – influence no
	Other responsibilities	Other responsibilities – yes
		Other responsibilities – no
		Other responsibilities – influence yes
		Other responsibilities – influence no
	Other children	Children – yes
		Children – no
		Children – influence yes
		Children – influence no
		Modelling
	Business	How feeding child
		Business – yes
		Business – no
		Business – change yes
		Business – change no
		Business – influence yes
		Business – influence no
Physical environment	Supermarkets	Supermarkets close – yes
		Supermarkets close – no
		Supermarkets frequency
		How in supermarkets

		Offers
		Temptation
	Other eating facilities	Other eating facilities – close yes
		Other eating facilities – close no
		Other eating facilities - use
		Other eating facilities – frequency
		Other eating facilities – why
		Other eating facilities – why not
		Why no other eating facilities – make it myself
		Why no other eating facilities - costs
	Market	Market close - yes
		Market close - no
		Market influence – yes
		Market influence - no
	Place	Place influence – yes
		Place influence - no
		Day out – influence yes
		Day out – influence no
	Salience food	Salience food – influence yes
		Salience food – influence no
	Accessibility	Environment healthy food – yes
		Environment healthy food – no
		Environment unhealthy food – yes
		Environment unhealthy food - no
	General	Close – influence yes
		Close – influence no
Comparing	Other women	Comparing with other women - yes
		Comparing with other women - no
	Previous pregnancy	Comparing first pregnancy - yes
		Comparing first pregnancy - no
	Own experience	Comparing own experience - yes
		Comparing own experience - no
Control	Feelings of control	Control – yes
		Control – no
		Control – why
		Control – why not
		Control – influence yes
		Control – influence no
	Cooking	Cooking - yes
		Cooking - no
		Perception - cooking
	Groceries	Groceries – yes
		Groceries - no
		Perception - groceries
	Together	Deciding together
		Cooking together
		Groceries together
Personal factors	Knowledge	Knowledge – yes
		Knowledge - no
		Knowledge – everybody knows
	Self-efficacy	Self-efficacy – yes
		Self-efficacy – no
		Self-efficacy – why
		Self-efficacy – who not
		Self-efficacy - smoking
	Familiarity	Familiarity – influence yes
		Familiarity – influence no
	Feelings healthy	Feeling healthy before pregnancy – yes
		Feeling healthy before pregnancy - no
		Feeling healthy during pregnancy - yes
		Feeling healthy during pregnancy - no
		Feeling healthy influence - yes
		Feeling healthy influence - no
	Motivation	Motivation eating healthy – yes

		Motivation eating healthy - no
		Motivation after pregnancy - yes
		Motivation after pregnancy - no
Pregnancy	Daily life	Daily life
		Structure
	Perception pregnancy	Pregnancy - going well
		Pregnancy - not going well
		Take it easy
		Not making pregnancy harder
Diet factors	Gestation week	Gestation week
	Diet	Nutritional values
		Consciousness
		Unconsciousness
	Mark diet	Mark diet
		Mark diet - why
		Changes needed for higher mark
	Differences diet	Differences diet during pregnancy - yes
		Differences diet during pregnancy - no
		Differences diet during pregnancy - why
		Differences diet during pregnancy - onset
		Differences diet - years ago
	Perception diet	Perception - eating
		Perception - need
		Perception - what is healthy eating
		Perception - forbidden foods
		Own way
	Ideal	Ideal
		Why not ideal
		Ideal - influence yes
		Ideal - influence no
		Motivation achieving ideal - yes
		Motivation achieving ideal - no
		Motivation achieving ideal - why
		Motivation achieving ideal - why not
	Importance diet	Importance - yes
		Importance - no
		Importance - why
	Strategies	Compensating
		Other strategies
	Why not eating healthy?	Late
		Not feeling like cooking
		Ease
Information	Information	Different information
		Information second child
		Information standard
	Perception information	Opinion information
		No need extra information
	Information use	Information use
		Not following advice - yes
		Not following advice - no
		Not following advice - why
		Information search
	Information sources	Information source - family
		Information source - friends
		Information source - Facebook
		Information source - midwife
		Information source - GP
		Information source - heard it somewhere
		Information source - internet
		Information source - school
		Information source - social environment
		Information source - partner
		Information source - first pregnancy
		Information source - Voedingscentrum

		Information source – work
		Information source – unknown
		Different information sources
		Most important information source
		Most used information source
	Information manner	Information - oral
		Information - paper
	Information tool	Information tool - knowledge
		Information tool – use
		Information tool new - yes
		Information tool new – no
		Information tool new - why
Mindmap	Insight	Insight – yes
		Insight – no
	Recognizable	Recognizable - yes
		Recognizable – no
	Top 3	Top 3
		Most important

Appendix V: Table articles literature review

Authors, year + country	Title	Method of data collection + Number of participants	Number of participants	Factors influencing dietary intake/quality or supplement use	Impact Positive (+) / Negative (-)/ No predictor (x) / Ambiguous (±) Impact can be positive/ negative/ neutral (*)	Critical appraisal scores in points (minimum: half of the points Cohort max 11p. Cross- sectional max 8p. Qualitative max 10p.)
1. Bassett- Gunter et al., 2013 Canada	Oh baby! Motivation for healthy eating during parenthood transitions: a longitudinal examination with a theory of planned behavior perspective	Questionnaires	94 individuals with no children 138 individuals expecting a child 74 individual with children	<ul style="list-style-type: none"> - Attitudes - Perceived behavioural control - Intentions - Subjective norms 	X X X X	6.5/11
2. Bianchi et al., 2016 France	Concerns, attitudes, beliefs and information seeking practices with respect to nutrition-related issues: A qualitative study in French pregnant women	Focus groups	40 pregnant women	<ul style="list-style-type: none"> - Knowledge - Health of the baby - Food guidelines - Confusing (food) norms - Physiological changes 	+ + * * *	7/10

				(nausea, gastroesophageal reflux, loss of appetite, food aversions, changes to food preferences or food cravings) * - Food indulgences * - Transmission of health/cooking habits from their mothers - - Previous pregnancies X - Appearance X - Perceptions of nutrition during pregnancy	
3. Copelton, 2007 United States	"You are What You Eat": Nutritional Norms, Maternal Deviance, and Neutralization of Women's Prenatal Diets	Interviews	55 pregnant women	- Cultural distinction between good and bad foods * - Cravings * - Denials of injury for the foetus of bad food - - Argumentation that other women consume worse - - Time constraints - - Unrealistic nutritional standards - - Unfamiliarity with recommended food/cooking techniques - - Rewarding themselves - - Prioritizing the needs of the foetus + - Perception of pregnancy as permission to eat nutritionally deficient food X -	5.5/10
4. Cuco et al., 2006 Spain	Dietary patterns and associated lifestyles in preconception, pregnancy and postpartum	Dietary record (pre)conception visit data	80 women	- Food group intake * - Smoking * - Physical activity * - Age * - BMI X	7/11

5. Derbyshire et al., 2006 United Kingdom	Pre-pregnancy body mass index and nutrient intakes in the first trimester of pregnancy	Questionnaire Food diary General Practitioner records	72 women	<ul style="list-style-type: none"> - Pre-pregnancy BMI - Nausea/vomiting 	<ul style="list-style-type: none"> * X 	5/8
6. Fowles, Bryant et al., 2011 United States	Predictors of dietary quality in low-income pregnant women: A path analysis	Questionnaires	118 low-income women in their first trimester of pregnancy	<ul style="list-style-type: none"> - Support from a partner - Age combined with nutrition knowledge and education - Stress - Poor eating habits - Knowledge 	<ul style="list-style-type: none"> + + - - X 	5.5/8
7. Fowles, Murphy et al., 2011 United States	Exploring Relationships Among Psychosocial Status, Dietary Quality, and Measures of Placental Development During the First Trimester in Low-Income Women	Questionnaires	18 low-income, pregnant women	<ul style="list-style-type: none"> - Emotions - Depression - Partner support - Support from others 	<ul style="list-style-type: none"> * * * X 	4.5/8
8. Fowles et al., 2012 United States	Stress, Depression, Social Support, and Eating Habits Reduce Diet Quality in the First Trimester in Low-Income Women: A Pilot Study	Questionnaires Anthropometric measures	71 low-income, pregnant women	<ul style="list-style-type: none"> - Low psychosocial state - Stress - Depression - Inadequate control over food preparation - Meal-skipping - Support from others - Partner support 	<ul style="list-style-type: none"> - - - - + ± X 	7.5/8

9. Herring et al., 2012 United States	Perceptions of Low-Income African-American Mothers About Excessive Gestational Weight Gain	Focus groups	31 low-income pregnant women	<ul style="list-style-type: none"> - Persistent hunger * - Increased appetite * - Belief excessive food intake is good for the baby) - 	6/10
10. Hurley et al., 2005 United States	Psychosocial Influences in Dietary Patterns During Pregnancy	Questionnaires	134 women	<ul style="list-style-type: none"> - Stress - - Fatigue - - Anxiety - - Anger X - Depressed mood X - Social support X - Maternal perception of social desirability X 	5/8
11. Jelsma et al., 2016 Austria, Belgium, Denmark, Ireland, Italy, Netherlands, (Poland), Spain, and the UK	Beliefs, Barriers, and Preferences of European Overweight Women to Adopt a Healthier Lifestyle in Pregnancy to Minimize Risk of Developing Gestational Diabetes Mellitus: An Explorative Study	Questionnaires Interviews	92 women pregnant/0-12 months after delivery	<ul style="list-style-type: none"> - Cravings - - Social gatherings - - Being busy - - Health of the baby importance + - Women with children + 	8/10

12. Laraia et al., 2004 United States	Proximity of supermarkets is positively associated with diet quality index for pregnancy	Questionnaires Telephone interview Geographic data technology	973 pregnant women	- Increasing distance from supermarket	-	7/8
13. Laraia et al., 2007 United States	Pregravid body mass index is negatively associated with diet quality during pregnancy	Questionnaires	2394 women	- Ethnicity - Marital status - Age - Children - Higher BMI - Prepregnancy leisure activity - Prepregnancy vitamin use	* * * - - + +	6.5/8
14. Morisset et al., 2016 Canada	Rankings of iron, vitamin D, and calcium intakes in relation to maternal characteristics of pregnant Canadian women	questionnaires	1186 mothers	- Born outside of Canada - BMI - Age	- ± ±	5.5/8
15. Nash et al., 2013 Canada	Determinants of diet quality in pregnancy: Sociodemographic, pregnancy-specific, and food environment influences	Personal variables from the prenatal health project Geographic information system Questionnaire	2282 pregnant women	- Not smoking - Anxiety - Residency in Canada 1-5 yrs - Being married - Previous pregnancies - Exercise - Social support from family, friends and partner - Age - Planned pregnancy	- - + + + + + X X	4/8

				<ul style="list-style-type: none"> - Perceived difficulty affording food - Nausea severity - Depression - Food environment 	<ul style="list-style-type: none"> X X X X 	
16. Northstone et al., 2008 United Kingdom	Dietary patterns in pregnancy and associations with socio-demographic and lifestyle factors	Questionnaire	12053 pregnant women	<ul style="list-style-type: none"> - Age - Ethnicity - Parity - Marital status - Smoking - Overweight pre-pregnancy - Feeling energetic - Activity level - Vegetarian - Anxiety - Diet during pregnancy - Season - Housing - Working during final trimester - Depressed - Weight/shape concern 	<ul style="list-style-type: none"> * * * * * * * * * * * * * * * X X 	4/8
17. O'Brien et al., 2017	Influences on the food choices and physical activity behaviours of overweight and obese pregnant women: A qualitative study	Interview study	22 overweight/obese pregnant women	<p>Overweight/obese women:</p> <ul style="list-style-type: none"> - Food quality/properties beliefs - Social occasions - Food modelling - Food salience - Obesogenic environment - Health of the baby - Multiparous women - Social support - Fixation on calories - Aesthetic appearance 	<ul style="list-style-type: none"> * * * * - + + + X X 	8/10

18. Paul et al., 2013 United States	The Web of Risk Factors for Excessive Gestational Weight Gain in Low Income Women	Focus groups	15 low income pregnant women 11 high income pregnant women	<ul style="list-style-type: none"> - Normative beliefs * - Behavioural beliefs * - Self-efficacy * 	6/10
19. Thornton et al., 2006 United States	Weight, Diet, and Physical Activity-Related Beliefs and Practices Among Pregnant and Postpartum Latino Women: The Role of Social Support	Focus groups Semi-structured interviews	10 postpartum/pregnant women 10 people influencing them	<ul style="list-style-type: none"> - Husbands' preferences * - Traditional cultural beliefs * - Family rituals * - Emotional support from husband * - Importance to please husband * - Events with friends * - Lower husbands' instrumental support - - Small network of female relatives and friends in the U.S support + 	6/10
20. Tovar et al., 2010 United States	Knowledge, Attitudes, and Beliefs Regarding Weight Gain During Pregnancy Among Hispanic Women	Focus groups	29 pregnant women	<ul style="list-style-type: none"> - Morning sickness - - Busy lives - - Family influence + 	5/10
21. Tsigga et al., 2011 Greece	Healthy Eating Index during pregnancy according to pre-gravid and gravid weight status	Weighing scale Telephone interviews	100 pregnant women	<ul style="list-style-type: none"> - Gestational BMI * - Pregestational BMI * - Week of gestation * - Urban residence - - Embryo's sex X - Gravidity X - Weight status X 	5.5/8
22. Wall et al., 2016 New-Zealand	Dietary Patterns in Pregnancy in New	Questionnaire	5664 pregnant women	<ul style="list-style-type: none"> - Age * - Pre-pregnancy BMI * - Country of origin * - Ethnicity * 	6/11

	Zealand—Influence of Maternal Socio-Demographic, Health and Lifestyle Factors			<ul style="list-style-type: none"> - Smoking * - Previous pregnancies * - Dietary pattern * - Supplementation before/during pregnancy * - Alcohol consumption * - Nausea * - Pre-pregnancy health rating * 	
23. Watson, & McDonald, 2009 New-Zealand	Major Influences on Nutrient Intake in Pregnant New Zealand	Questionnaires Anthropometric measurements	196 pregnant women	<ul style="list-style-type: none"> - Lower age - - Smoking - - Higher severity of morning sickness - - Height - - BMI - - Number of children in the household - - 24 h activity level in MET X - Sum of skinfolds X - Weight at fourth month X 	5.5/8
24. Watts et al., 2007 United States	Assessing Diet Quality in a Population of Low-Income Pregnant Women: A Comparison Between Native Americans and Whites	Questionnaires	5862 pregnant women	<ul style="list-style-type: none"> - Race * - Higher age - - Smoking - 	4.5/8