

Born into Inequality

Organizational and Environmental Influences
on Reproductive Health



Vera L. N. Schölmerich

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**Organizational and Environmental Influences
on Reproductive Health**

Vera Schölmerich

Born into Inequality: Organizational and Environmental Influences on Reproductive Health
PhD thesis, Erasmus University Rotterdam, The Netherlands

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Born into Inequality

Organizational and Environmental Influences on Reproductive Health

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op reproductieve gezondheid

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Chapter 1



Introduction

There are high rates of inequality between birth outcomes across wealthy and impoverished neighborhoods in the Netherlands [1, 2]. These inequalities are particularly high in the four largest cities of the Netherlands (Amsterdam, Rotterdam, the Hague, Utrecht). The most pronounced inequalities can be found in Rotterdam. Here, perinatal mortality (deaths from 22 weeks of gestation until 7 days postpartum) can be as low as 2 per 1,000 births in affluent neighborhoods and as high as 34 per 1,000 births in poor neighborhoods [3]. Moreover, neighborhood-specific preterm birth rates range from 34 to 153 per 1,000 births [3]. With such high rates of inequality, the Netherlands is home to one of the highest recorded disparities in birth outcomes across neighborhoods in any developed country [3].

Substantial inequalities are not only found across neighborhoods, but also across different social groups. Women of a low socio-economic status typically show worse birth outcomes than women of a higher socio-economic status. Moreover, women with a non-Western ethnic minority background tend to have more adverse birth outcomes than native Dutch women [1, 4]. Two recent studies, however, have shown that the latter relationship is reversed in the most impoverished neighborhoods. Here, Western women are at higher risk for adverse birth outcomes than their non-Western ethnic minority counterparts. This means that poverty seems to have a stronger negative effect on Western women than on non-Western women [1, 4].

Adverse birth outcomes place a high emotional, medical, and financial burden on involved individuals and the health care system [5, 6]. This burden is not only limited to the time of birth, but often prevails in the long-term. Babies born prematurely, for example, are at a substantially increased risk for medical and social disabilities in adulthood [5]. Therefore, reducing inequalities in birth outcomes has become a primary concern for the Dutch government. A number of large research programs were established, most notably 1) “Ready for a Baby”, a 10- year program to improve perinatal health and to reduce perinatal mortality in Rotterdam [7], 2) ZonMw (The Netherlands Organisation for Health Research and Development) program “Pregnancy and Birth”, and 3) “Healthy Pregnancy 4 ALL”, a national program to improve risk-selection and preconception care [8].

In parallel to the establishment of research programs, three key policy reports were published indicating priority setting of perinatal health research [9-11]. These reports have made recommendations to redress perinatal inequalities, including a) improving pregnancy-related health behaviors (such as time of entry into care and alcohol consumption) and b) closer coordination between midwives and obstetric caregivers.

Pregnancy-related health behaviors such as the time of entry into care are major predictors of birth outcomes [12, 13]. This relationship between health behaviors and health outcomes can also be found in other areas. Obesity and cardiovascular disease, for example, are largely attributed to health behaviors [14]. The strong role of health behaviors suggests that a large portion of adverse health outcomes could be prevented by improving these health behaviors, for example by improving people's health care usage or nutritional intake. Interventions to improve health behaviors have, however, shown disappointing effectiveness [14, 15]. At the same time, the global burden of diseases attributable to health behaviors is rising. The capacity to understand and modify (pregnancy-related) health behaviors is therefore not only of interest for Dutch policy-making, but has become a primary goal of health promotion efforts across the globe [14].

Mirroring a general trend in public health, Dutch studies trying to understand which factors influence pregnancy-related behavior and birth outcomes mainly consider individual-level factors such as health literacy or socio-economic status [16-18]. However, two recent Dutch studies suggest that variations in pregnancy-related behavior and birth outcomes cannot solely be explained by individual risk factors, and seem to also be influenced by neighborhood-level socio-economic status [4, 19]. International studies on pregnancy-related behavior and birth outcomes have identified a wide range of other neighborhood influences, such as crime rates, level of urbanization, ethnic minority density, and social capital [20-22]. This means that pregnancy-behavior cannot solely be understood by considering individual-level factors, but needs to be understood in the light of the social environments in which these behaviors take place.

Besides efforts to understand and modify pregnancy-related behaviors of women, the Dutch policy reports suggest that strengthening coordination between community midwives and obstetricians is key for improving birth outcomes [9-11]. Indeed, several studies in health care have found a relationship between coordination and performance outcomes in the area of efficiency (e.g. length of hospitalized stay, costs) and effectiveness (e.g. patient satisfaction, clinical outcomes) [23, 24].

The Dutch midwifery and obstetric system is imbued with inherent coordination challenges. This is because community midwives and obstetricians are autonomous professionals and yet interdependent on each other in order to deliver optimal care. They are interdependent on each other as they need to coordinate activities to support women during their pregnancy and labor/birth (e.g., sharing information related to pregnant women). The challenge of

coordination is not unique to Dutch midwifery and obstetrics and is also present in other health care sectors in the Netherlands and abroad, where different professionals struggle to integrate their contributions in order to deliver optimal care [25].

AIM OF THIS THESIS

The aim of this thesis is to increase our understanding of reproductive health inequalities (with an emphasis on inequalities of birth outcomes) and to propose ways for reducing them. This thesis addresses this aim in three parts.

Part I and **Part II** seek to contribute to the key policy recommendation of improving pregnancy-related health behaviors (as outlined above). Part I investigates the influence of social environments and individual characteristics – and the interaction between these factors – on pregnancy-related behavior and birth outcomes. The studies in Part II explore how knowledge of the influence of social environments on health behaviors can be used to ameliorate interventions gearing to improve reproductive health-related behavior.

Part III seeks to contribute to the key policy recommendation of improving coordination between community midwives and obstetric caregivers. We do this by empirically assessing how coordination between midwives and obstetric professionals could be strengthened and by proposing a new organizational model for Dutch midwifery and obstetrics.

Research questions

Part I – Understanding pregnancy-related behavior and birth outcomes: the influence of social environments

1. What is the association of neighborhood social capital and ethnic minority density with birth weight (adjusted for gestational age) and rates of premature births in the Netherlands? (Chapter 2)
2. What is the association of neighborhood ethnic minority density with time of entry into care in the Netherlands? (Chapter 3)
3. How do women deal with the pregnancy-related advice they receive, and how does this influence their pregnancy-related behavior? (Chapter 4)

Part II – Vertical integration of reproductive health interventions: Integrating the influence of social environments to improve reproductive health behaviors

1. Which recruitment methods were most successful in targeting ethnic minority groups from low socio-economic status neighborhoods for reproductive health promotion? (Chapter 5)
2. To what extent have family planning interventions adopted a social-ecological framework, and how could this framework be improved? (Chapter 6)

Part III – Horizontal integration of midwifery and obstetrics: Improving coordination between community midwives and obstetric professionals

1. What are current barriers to coordination between midwives and obstetricians in Rotterdam, and how could these barriers be addressed? (Chapter 7)
2. How could the Dutch organizational model for midwifery and obstetrics be revised in order to strengthen coordination between the involved professionals? (Chapter 8)

In order to answer the research questions of these three parts, we have made use of both quantitative and qualitative methods, spanning ethnographic techniques to advanced multilevel modeling. Moreover, we have combined theory and empirical investigation and covered the disciplines of obstetrics, midwifery, medical sociology, social epidemiology, organization science, and public health. This multi-method and interdisciplinary approach reflects the viewpoint that reproductive health inequalities pose a multifaceted problem, which needs to be addressed by an equally multifaceted research strategy.

REFERENCES

1. de Graaf JP, Ravelli ACJ, Visser GHA, Hukkelhoven C, Tong WH, Bonsel GJ, et al. Increased adverse perinatal outcome of hospital delivery at night. *BJOG*. 2010;117(9):1098-107.
2. Vos AA, Posthumus AG, Bonsel GJ, Steegers EA, Denktas S. Deprived neighborhoods and adverse perinatal outcome: a systematic review and meta-analysis. *Acta Obstet Gynecol Scand*. 2014.
3. Poeran J, Denktas S, Birnie E, Bonsel GJ, Steegers EA. Urban perinatal health inequalities. *J Matern Fetal Neonatal Med*. 2011;24(4):643-6.
4. Poeran J, Maas AF, Birnie E, Denktas S, Steegers EA, Bonsel GJ. Social deprivation and adverse perinatal outcomes among Western and non-Western pregnant women in a Dutch urban population. *Soc Sci Med*. 2013;83:42-9.
5. Moster D, Lie RT, Markestad T. Long-term medical and social consequences of preterm birth. *N Engl J Med*. 2008;359(3):262-73.
6. Marlow N, Wolke D, Bracewell MA, Samara M. Neurologic and developmental disability at six years of age after extremely preterm birth. *N Engl J Med*. 2005;352(1):9-19.
7. Denktas S, Bonsel GJ, Van der Weg EJ, Voorham AJ, Torij HW, De Graaf JP, et al. An urban perinatal health programme of strategies to improve perinatal health. *Matern Child Health J*. 2012;16(8):1553-8.
8. Denktas S, Poeran J, van Voorst SE, Vos AA, de Jong LC, Waelput AJM, et al. Design and outline of the healthy pregnancy 4 all study. *BMC Pregnancy Childbirth*. In press.
9. Een goed begin, veilige zorg rond zwangerschap en geboorte [A good start, safe care for pregnancy and birth. Advice of the Committee on Good care during pregnancy and child birth]. Utrecht: geboorte SZe; 2009.
10. Nederland SPA. A terme sterft 2010. Perinatale audit: eerste verkenningen [Term mortality 2010. Perinatal audit: The first explorations]. Utrecht: 2011.
11. Bonsel G, Birnie E, Denktas S, Poeran J, Steegers E. Lijnen in de perinatale sterfte, signalementstudie zwangerschap en geboorte 2010 [Priorities in research to reduce perinatal mortality, signalement-study pregnancy and birth 2010]. . Rotterdam: Erasmus MC, 2010.
12. Timmermans S, Bonsel GJ, Steegers-Theunissen RP, Mackenbach JP, Steyerberg EW, Raat H, et al. Individual accumulation of heterogeneous risks explains perinatal inequalities within deprived neighbourhoods. *Eur J Epidemiol*. 2011;26(2):165-80.
13. Rowe RE, Magee H, Quigley MA, Heron P, Askham J, Brocklehurst P. Social and ethnic differences in attendance for antenatal care in England. *Public Health*. 2008;122(12):1363-72.
14. Huang TT, Drewnoski A, Kumanyika S, Glass TA. A systems-oriented multilevel framework for addressing obesity in the 21st century. *Preventing chronic disease*. 2009;6(3):A82.
15. Swinburn BA, Sacks G, Hall KD, McPherson K, Finegood DT, Moodie ML, et al. The global obesity pandemic: shaped by global drivers and local environments. *Lancet*. 2011;378(9793):804-14.

16. Mook-Kanamori DO, Steegers EA, Eilers PH, Raat H, Hofman A, Jaddoe VW. Risk factors and outcomes associated with first-trimester fetal growth restriction. *Jama*. 2010;303(6):527-34.
17. Buitendijk SE, Nijhuis JG. [High perinatal mortality in the Netherlands compared to the rest of Europe]. *Ned Tijdschr Geneesk*. 2004;148(38):1855-60.
18. Mohangoo AD, Buitendijk SE, Hukkelhoven CW, Ravelli AC, Rijninks-van Driel GC, Tamminga P, et al. [Higher perinatal mortality in The Netherlands than in other European countries: the Peristat-II study]. *Ned Tijdschr Geneesk*. 2008;152(50):2718-27.
19. Agyemang C, Vrijkotte TG, Droomers M, van der Wal MF, Bonsel GJ, Stronks K. The effect of neighbourhood income and deprivation on pregnancy outcomes in Amsterdam, The Netherlands. *J Epidemiol Community Health*. 2009;63(9):755-60.
20. Masi CM, Hawkey LC, Piotrowski ZH, Pickett KE. Neighborhood economic disadvantage, violent crime, group density, and pregnancy outcomes in a diverse, urban population. *Soc Sci Med*. 2007;65(12):2440-57.
21. Buka SL, Brennan RT, Rich-Edwards JW, Raudenbush SW, Earls F. Neighborhood support and the birth weight of urban infants. *Am J Epidemiol*. 2003;157(1):1-8.
22. Pickett KE, Wilkinson RG. People like us: ethnic group density effects on health. *Ethn Health*. 2008;13(4):321-34.
23. Gittel JH, Fairfield KM, Bierbaum B, Head W, Jackson R, Kelly M, et al. Impact of relational coordination on quality of care, postoperative pain and functioning, and length of stay: a nine-hospital study of surgical patients. *Med Care*. 2000;38(8):807-19.
24. Gittel JH. Coordinating mechanisms in care provider groups: relational coordination as a mediator and input uncertainty as a moderator of performance effects. *Manage Sci*. 2002;48(11):1408-26.
25. Gittel JH, Weinberg D, Pfefferle S, Bishop C. Impact of relational coordination on job satisfaction and quality outcomes: a study of nursing homes. *Human Resour Manage J*. 2008;18(2):154-70.



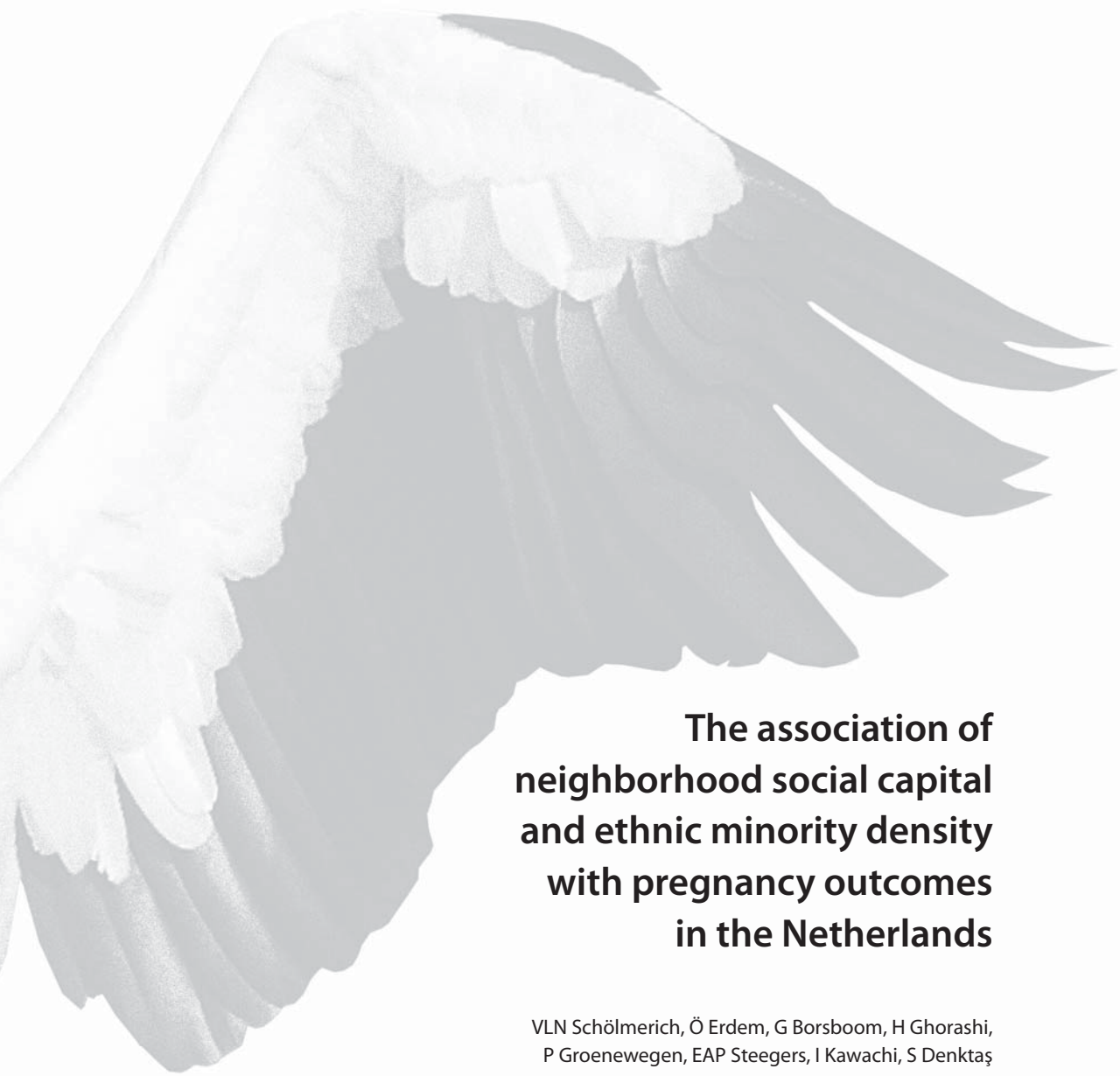


Part I

Understanding pregnancy-related
behavior and birth outcomes:
the influence of social
environments



Chapter 2



The association of neighborhood social capital and ethnic minority density with pregnancy outcomes in the Netherlands

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ABSTRACT

Background Perinatal morbidity rates are relatively high in the Netherlands, and significant inequalities in perinatal morbidity and mortality can be found across neighborhoods. In socioeconomically deprived areas, 'Western' women are particularly at risk for adverse birth outcomes. Almost all studies to date have explained the disparities in terms of individual determinants of birth outcomes. This study examines the influence of neighborhood contextual characteristics on birth weight (adjusted for gestational age) and preterm birth. We focused on the influence of neighborhood social capital – measured as informal socializing and social connections between neighbors – as well as ethnic (minority) density.

Methods Data on birth weight and prematurity were obtained from the Perinatal Registration Netherlands 2000-2008 dataset, containing 97% of all pregnancies. Neighborhood-level measurements were obtained from three different sources, comprising both survey and registration data. We included 3,422 neighborhoods and 1,527,565 pregnancies for the birth weight analysis and 1,549,285 pregnancies for the premature birth analysis. Linear and logistic multilevel regression was performed to assess the associations of individual and neighborhood level variables with birth weight and preterm birth.

Results We found modest but significant neighborhood effects on birth weight and preterm births. The effect of ethnic (minority) density was stronger than that of neighborhood social capital. Moreover, ethnic (minority) density was associated with higher birth weight for infants of non-Western ethnic minority women compared to Western women (15 grams; 95% CI 12.4-17.5) as well as reduced risk for prematurity (OR 0.97; 95% CI 0.95-0.99).

Conclusions Our results indicate that neighborhood contexts are associated with birth weight and preterm birth in the Netherlands. Moreover, ethnic (minority) density seems to be a protective factor for non-Western ethnic minority women, but not for Western women. This helps explain the increased risk of Western women in deprived neighborhoods for adverse birth outcomes found in previous studies.

INTRODUCTION

Despite free and high quality perinatal health care in the Netherlands, perinatal morbidity and mortality rates in this country remain relatively high compared to other European countries [1]. There are also large perinatal health inequalities between poor and wealthy urban neighborhoods [2]. In the second largest city, Rotterdam, neighborhood-specific preterm birth rates range from 34 to 153 per 1,000 births, and perinatal mortality ranges from 2 to 34 per 1,000 births [3]. These are among the highest recorded disparities in birth outcomes across neighborhoods in any developed country.

On average, Western women show better birth outcomes than non-Western ethnic minority women, many of whom are first or second generation immigrants [4]. However, in 2008 a study indicated that in poor neighborhoods in the Netherlands, Western women appear paradoxically to be at higher risk for adverse birth outcomes compared to non-Western immigrant women [5]. These results were recently confirmed by a study on social deprivation and adverse perinatal outcomes among Western and non-Western pregnant women in Rotterdam [6].

Previous studies conducted in the Netherlands on birth outcome inequalities across neighborhoods and ethnic groups have mostly focused on *individual-level* determinants. Factors such as increased maternal age, non-Western ethnicity, and unhealthy lifestyle have been shown to be associated with adverse birth outcomes [7]. However, these individual factors cannot fully account for the between-neighborhood variation observed in birth outcomes. In other words, area-level disparities in birth outcomes are not purely attributable to compositional effects, i.e. the result of clustering of people with certain health characteristics in certain neighborhoods. There may be also contextual effects of neighborhood characteristics affecting health outcomes over and beyond the influence of individual determinants.

One study considered the effects of neighborhood income and deprivation on birth outcomes in Amsterdam, the largest Dutch city. This study only found 'small-for-gestational age' (SGA) to be associated with neighborhood income and deprivation [8]. Outside of the Netherlands, studies have found associations between a variety of neighborhood characteristics (including neighborhood socioeconomic status, social capital, and crime rate) and birth weight [9-11], preterm birth [12-14] and small-for-gestational-age [8,15,16].

Neighborhood social capital, ethnic (minority) density and birth outcomes

An important source of resilience for residents of deprived neighborhoods is the level of 'social capital'. The social capital of a neighborhood is measured by a) the extent of reciprocal exchanges between residents (i.e., the willingness of neighbors to help each other in times of need), b) the ability of residents to undertake collective action for mutual benefit (i.e., collective efficacy), c) the extent of social connections between members of a community, and d) trust. Trust is either seen as a component of social capital or as a result of social capital. Either way, trust is viewed as critical because without trust it is difficult to exchange favors or solve collective problems [17,18]. For example, if **A** asks **B** to do a favor for her (e.g., look after her young children while she attends the prenatal clinic), **B** is more likely to agree to help if she trusts that **A** will repay the favor at a later date. Similarly, residents of a community are more likely to volunteer their time and effort to solve collective problems if they trust that their neighbors will also make an effort (as opposed to free-riding on the hard work of others). A neighborhood that is high in social capital is therefore one in which residents are constantly helping one another, with the result that some of the stresses associated with material disadvantage can be overcome or mitigated.

Past studies have repeatedly demonstrated an association between neighborhood social capital and adult morbidity and mortality [19-21]. Literature on neighborhood social capital and birth outcomes is scarce. Buka et al. and Morenhoff et al. found that neighborhood social capital is associated with higher birth weight [9,10].

Another potentially relevant neighborhood attribute in the context of population health is the proportion of non-Western ethnic minority residents [22] – commonly referred to as 'ethnic density'. In this study, we prefer to use the term 'ethnic minority density'. This is because the usage of the term 'ethnic density' reflects a limited definition of ethnicity – namely as a characteristic that only applies to minority groups, assuming that majority groups do not have any ethnicity.

In theory, neighborhoods with high ethnic minority density could exert divergent effects on the health of residents. On the one hand, a high spatial concentration of ethnic minorities could boost residents' sense of solidarity and cohesion, whilst minimizing contact with the majority group in society and thereby possibly reducing exposure to discrimination. This predicts that living in an area with high ethnic minority density might be protective for the health (and particularly the mental health) of residents. On the other hand, the presence of high ethnic minority density also suggests a spatial concentration of disadvantage (residential

segregation and ‘ghettoization’). This may be harmful to health because of the lack of services and amenities, or the high prevalence of crime and other pathologies of poverty [22].

Studies of ethnic minority density and birth outcomes remain scarce and have found conflicting results. Some studies found that ethnic minority density was protective for certain ethnic minority groups for birth weight [16,23] and preterm delivery [14,16]. Other studies did not find ethnic minority density to be protective for ethnic minorities [9,24,25].

To our knowledge, all of the studies on neighborhood social capital and/or ethnic minority density on birth outcomes have been conducted in English-speaking countries, predominantly in the United States, Canada, and to a lesser extent the UK. However, as it has been argued by Poeran et al., the majority and minority groups in these countries are quite different to those in Europe in terms of ethnic origin and migration histories [6]. Moreover, the previous literature almost exclusively focuses on single urban populations, therefore using a much smaller individual and neighborhood sample size. Another limitation of the previous studies is that they often fail to adjust for all of the known relevant neighborhood level variables. Lastly, only one previous study by Buka et al. assessed the joint effect of ethnic minority density and neighborhood social capital with birth weight [9].

Aim of this study

We sought to explore the association of neighborhood social capital and ethnic minority density with birth weight (adjusted for gestational age) and rates of premature births in the Netherlands. We assessed whether these associations persist after accounting for individual risks and other relevant neighborhood economic and environmental conditions. Lastly, we examined if neighborhood social capital and ethnic minority density can help to explain the increased risk of adverse birth outcomes among Western women living in deprived neighborhoods (compared to non-Western ethnic minority women).

METHODS

Ethics and consent

The Perinatal Registration Netherlands committee approved this study. Written consent from pregnant women was not needed as the database protects their anonymity.

Data sets

We combined four national data sets in the Netherlands on the basis of four-digit zip codes. Data on birth outcomes were obtained from the Netherlands Perinatal Registry, and data for neighborhood characteristics were derived from a) the Housing & Living Survey [26], b) the Netherlands Institute for Social Research, and c) Statistics Netherlands. These latter three data sets were open-source and based on survey and civil registration data. All of the data sets used in this study were nationally representative and covered the vast majority of inhabited four-digit zip codes areas (neighborhoods) in the Netherlands. The individual perinatal data was collected from 2000-2008, whilst the neighborhood characteristics were collected during 2005-2006.

In our final analysis we included 3,422 neighborhoods and 1,527,565 and 1,549,285 singleton pregnancies for the birth weight analysis and the preterm birth analysis, respectively. Figure 2.1 shows the exclusion process for the neighborhoods. We excluded 580 neighborhoods (about 14% of total number of neighborhoods in the Netherlands) because not all of the six neighborhood characteristics used in our study were available for them. Most of these neighborhoods are industrial or rural areas with no or few residents. Figure 2.2 shows the exclusion process for the pregnancy cases. 57,235 pregnancies were excluded for the birth weight analysis and 35,515 for the premature birth analysis due to missing individual values (3.5% and 2.1% of total registered pregnancies, respectively).

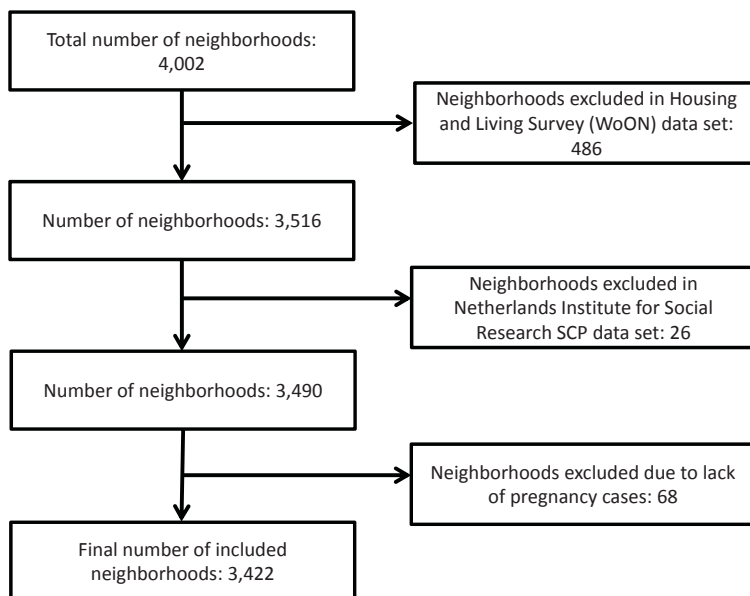


Figure 2.1 Exclusion of neighborhoods.

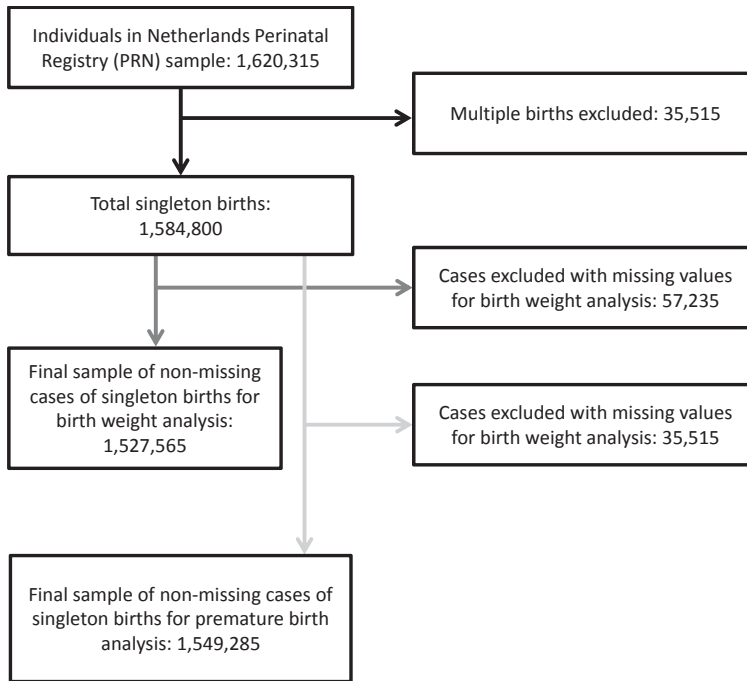


Figure 2.2 Exclusion of pregnancies.

Neighborhoods were defined as four-digit zip code areas. In 2006, the year that the data of the neighborhood characteristics was collected, an average of 4,080 individuals lived in each four-digit zip code area. This geographical unit is comparable to the size of a US ‘census tract’ that is defined for the purpose of taking a census and often used in comparable studies. The four-digit zip code geographical unit we used is considered suitable for contextual studies in the Netherlands as they show enough sociocultural homogeneity [5].

Individual characteristics

Data on singleton pregnancies were obtained from the Netherlands Perinatal Registry in the 2000-2008 dataset (www.perinatreg.nl). This registry contains 97% of all pregnancies in the Netherlands and has been collected by 94% of midwives, 99% of obstetricians, and 68% of pediatricians (including 100% of Neonatal Intensive Care Unit pediatricians). The two outcome measures are birth weight (in grams) and premature birth (gestational age before 37 weeks). We included the following maternal covariates for both analyses: maternal age, parity and ethnicity. For the birth weight analysis we also adjusted for sex of infant and gestational age (see Table 2.3 and 2.4 for more details).

We focus on low birth weight (adjusted for gestational age) and preterm births as these are the two most prevalent forms of perinatal morbidity and also the two most important predictors of perinatal mortality in the Netherlands. Low birth weight and preterm birth are also associated with important adverse physical and psycho-social long-term effects [27-29].

Ethnicity

Dutch law does not permit the routine utilisation or registration of ethnic origin in clinical settings. As yet, The Netherlands Perinatal Registry is exempt from this restriction. The classification of the Netherlands Perinatal Registry defines ‘ethnicity’ along seven categories: Western Dutch, Western other (including women from other European countries, Australia, and the US), Mediterranean, (East) Asian, African, South Asian, or other non-Western. The African and South Asian groups are mainly composed of women from the former Dutch colonies Suriname and the Netherlands Antilles. The group of East Asian women mainly originates from Indonesia, which is also a former Dutch colony. The classification of ethnicity is made by the healthcare professional. This method of registering ethnicity is problematic in several ways (see ‘discussion/limitations’). From a methodological standpoint, it is likely to produce classification error. As we were primarily interested in examining why Western women are at higher risk for adverse perinatal outcomes in poor neighborhoods, we opted for a crude binary classification of Western versus non-Western ethnic minority women. To do this, we defined the first two classes of the original classification as “Western” women and the other five classes were together defined as “non-Western ethnic minority” women. By collapsing into these simplified two categories, we sought to circumvent the misclassification introduced by the method of ethnicity ascertainment on the registry records. Another advantage of this dichotomy is that it makes the results comparable to previous studies [5,6]. The limitations of such a dichotomous representation will be discussed later.

Neighborhood characteristics

We included neighborhood characteristics that have been shown to be associated with birth weight and/or preterm births (social capital, ethnic minority density, socioeconomic status and feeling of safety in neighborhood). Two other characteristics that have been shown to influence general health outcomes were also included (urbanity of neighborhood and home maintenance) [20].

Neighborhood home maintenance (data source: Housing & Living Survey): We used home maintenance as a proxy for the environmental condition of a neighborhood. Maintenance was assessed with the question “Is your house in a bad condition?” Answer categories were on a 5-point scale from ‘I totally agree’ (1) to ‘I totally do not agree’ (5). Higher values thus indicate better maintenance.

Urbanity (data source: Housing & Living Survey): This variable indicates the degree of urbanity of the municipality of a neighborhood, measured by numbers of addresses per km²: 5) urban, more than 2,499 addresses/km²; 4) semi-urban, 1,500-2,499 addresses/ km²; 3) intermediate urban-rural, 1,000-1,499 addresses/km²; 2) semirural, 500-999 addresses/ km²; 1) rural, up to 499 addresses per km².

Feeling of safety (data source: Housing & Living Survey): This variable was addressed with the statement “I am scared of being harassed or assaulted in this neighborhood”. Answer categories were on a 5-point scale from ‘I totally agree’ (1) to ‘I totally do not agree’ (5). Higher values thus indicate higher feeling of safety.

Socioeconomic status (data source: Netherlands Institute for Social Research): This is a composite measure for socioeconomic status. It provides information on average income, the percentage of people with low income, a low education, and the percentage of unemployed. A higher score indicates higher socioeconomic status.

Ethnic minority density (data source: Statistics Netherlands): This variable provides the percentages of different non-Western ethnic minority people per neighborhood. For the purpose of this study, we grouped together the non-Western ethnic minority groups into the ‘non-Western’ category, as was done for the perinatal registry data (see section above ‘ethnicity’).

Neighborhood social capital (data source: Housing & Living Survey): We used five items to construct this scale:

- a. contact with direct neighbors
- b. contact with other neighbors
- c. whether people in the neighborhood know each other
- d. whether neighbors are friendly to each other
- e. whether there is a friendly and sociable atmosphere in the neighborhood

Response categories were on a 5-point Likert scale from ‘I totally agree’ (1) to ‘I totally do not agree’ (5) and were coded in such a way that higher values indicate higher social capital.

We applied the ‘ecometrics’ methodology in order to calculate a neighborhood social capital score for each neighborhood (see the following section). More detailed information about the data sets is provided in Appendix 2.1.

Ecometrics

We used an ecometrics analysis in order to aggregate social capital items at the individual level to the neighborhood level [30,31]. As Mohnen et al. (2011) outline, this approach accounts for: 1) between-neighborhood differences in individual characteristics that influence responses to items, 2) differences in numbers of respondents per neighborhood, and 3) nesting of the items within individuals (dependency between items on the individual level) as well as individuals within neighborhoods [20].

To calculate the neighborhood social capital score, we used a linear multilevel model with three levels: items, individuals, and neighborhoods. This 3-level analysis allowed us to take the nesting of social capital items within individuals and neighborhoods into account. The five items measuring social capital formed the dependent variables. The model was adjusted for eight individual characteristics that may influence respondents’ perception of social capital: sex, age, ethnicity, education, income, employment status, home ownership, and years of residence in neighborhood. The variation in numbers of respondents per neighborhood is accounted for in the model by shrinking deviating neighborhoods with smaller number of respondents to the general average [32].

The model used is as follows:

$$Y_{ijk} = \gamma_{000} + \sum_{m=1}^4 \alpha_m D_{mijk} + \sum_{q=1}^8 \delta_q X_{qjk} + \nu_{00k} + u_{0jk} + e_{ijk}$$

Y_{ijk} is the response of item i of respondent j in neighborhood k , γ_{000} is the grand mean of neighborhood social capital, m is the number of social capital variables (5, one being the reference category), D are item dummies, q is the number of individual-level adjusters (8), X are the adjusters, ν denotes the neighborhood variance, u denotes individual variance and e denotes item variance. The neighborhood level residuals (ν) from this model constitute the neighborhood social capital scores that are then used in the main analysis of this study (see below), with a higher value indicating a higher level of neighborhood social capital.

In this analysis, an average of 18.3 individuals were nested within a total of 3,495 neighborhoods. The reliability of ecometric calculations depends on the variance at all three

levels [32]. Based on the estimator found in Hox [32], the reliability of our neighborhood social capital scale is acceptable at 0.595. This value can be interpreted in a similar manner as Cronbach's alpha in psychometrics. Finally, the correlation between the straightforward aggregated measure of neighborhood social capital and that derived with the econometrics approach is 0.77. The econometrics analysis was performed using MLwiN 2.02.

Analytical strategy

We performed two separate multi-level analyses: a linear regression for birth weight (in grams) and a logistic regression for preterm birth defined as <37 weeks of gestation (0=not preterm, 1=preterm). We performed seven model specifications following the same pattern for both analyses. First, we estimated an empty model including only a random intercept for neighborhoods to assess the clustering of the outcome across neighborhoods. Then we sequentially added the individual and neighborhood characteristics as fixed effects. The seven models are presented in Table 2.3 and 2.4. The interaction terms non-Western ethnicity*neighborhood social capital and non-Western ethnicity* ethnic minority density are included in the fifth and sixth models. Model 7 shows the full model with all individual and neighborhood level variables. We plotted the interaction terms for ethnicity and birth weight to further assess this result. In addition to these main analyses, we ran the same analysis as for birth weight using 'small-for-gestational-age' as the outcome, defined as birth weight below the 10th percentile for gestational age. Moreover, we also ran the main analyses using the aggregated neighborhood social capital score. All of these analyses were performed in SPSS 20.

The intraclass correlation for the logistic models was calculated using the following formula [33]:

$$ICC = \frac{\sigma^2}{\sigma^2 + 3.29}$$

RESULTS

The average birth weight of infants in the Netherlands from 2000-2008 is 3446.8 grams (SD=594.3), and the prevalence of preterm births is 6.1%. More detailed descriptive statistics on the population are given in Table 2.1. As can be seen in Tables 2.3 and 2.4, the estimates for all individual-level variables are in the expected direction and remain relatively stable

Table 2.1 Descriptive statistics of individual variables and perinatal outcomes, source = Perinatal Registration Netherlands, 2000-2008

| | N | Percentages |
|--|-----------|-------------|
| Total singleton births | 1,584,800 | 97.8 |
| Maternal age | | |
| <25 yrs | 188,795 | 11.9 |
| 25-29 yrs | 456,742 | 28.8 |
| 30-34 yrs | 621,528 | 39.2 |
| 35-39 yrs | 276,944 | 17.5 |
| >40 yrs | 40,791 | 2.6 |
| Parity | | |
| Primiparous (first birth) | 729,943 | 46.1 |
| Multiparous (second or higher birth) | 854,424 | 53.9 |
| Ethnicity | | |
| Western ethnicity | 1,358,355 | 83.8 |
| Non-Western ethnicity | 261,771 | 16.2 |
| Sex infant | | |
| Male | 814,117 | 51.4 |
| Female | 769,959 | 48.6 |
| Small-for-gestational-age (SGA)* | 152,848 | 9.6 |
| Premature births (<37 week of gestation) | 97,353 | 6.1 |
| Birthweight in grams (mean, SD) | 3446.81 | 594.3 (SD) |

* SGA = birth weight below 10th percentile for gestational age (Kloosterman, 1970).

across the models. Women who are under 25 or above 40 years of age, primiparous, and who belong to a non-Western ethnic minority group, tend to have infants with a lower weight and a higher risk for preterm birth. Moreover, female infants are likely to have lower birth weight.

Table 2.2 indicates that neighborhoods with higher socioeconomic status tend to have lower ethnic minority density (corr. -0.57, $p < 0.001$) and higher neighborhood social capital (corr. 0.35, $p < 0.001$). The empty models of both regression analyses (results not shown) indicate that average birth weight and risk for preterm birth varies significantly across neighborhoods (1.0% and 0.7%, respectively, results not shown). The results of the regression models are shown in Table 2.3 and 2.4. Even after controlling for individual compositional characteristics, we found a small but significant clustering of birth weight outcomes and prevalence of prematurity within neighborhoods.

Model 3 of both regression models (Table 2.3 and 2.4) shows that ethnic minority density is associated with a decrease in birth weight and an increase in risk for preterm births. As seen in models 4, the effect of ethnic minority density remains significant when controlling for other relevant neighborhood characteristics for both analyses.

Table 2.2 Correlations of neighborhood variables

| nj=3422 | 1 | 2 | 3 | 4 | 5 | 6 |
|--------------------------------|---------|---------|---------|---------|--------|---|
| 1. Ethnic minority density | 1 | - | - | - | - | - |
| 2. Neighborhood social capital | -.565** | 1 | - | - | - | - |
| 3. Socio-economic status | -.562** | .346** | 1 | - | - | - |
| 4. Urbanity | .588** | -.505** | -.237** | 1 | - | - |
| 5. Home maintenance | -.281** | .278** | .323** | -.183** | 1 | - |
| 6. Feeling of safety | -.412** | .385** | .293** | -.320** | .264** | 1 |

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$.

nj = numbers of neighborhoods.

2

Model 6 shows the results of the interaction term neighborhood ethnic minority density * non-Western ethnicity, which indicates that higher ethnic minority density is associated with higher birth weight for infants of non-Western ethnic minority women as well as reduced risk for prematurity. The full models of both analyses (model 7) show that the effect of ethnic minority density on the outcome variables, as well as the interaction term of ethnic minority density and non-Western ethnicity, remains stable and highly significant. Figure 2.3 further explores this relationship for birth weight. It is based on values from model 7, where we adjusted for all individual and other neighborhood variables. This figure indicates that the birth weight of infants of Western women decreases as ethnic minority increases, while the birth weight of infants of non-Western women remains stable.

The second models of Table 2.3 and 2.4 show that neighborhood social capital is associated with increased birth weight, but not with a reduced risk for preterm births. However, the effect of neighborhood social capital becomes attenuated for birth weight after controlling for other neighborhood variables. Additional analyses (results not shown) indicate that 'feeling of safety' mediates the relationship between neighborhood social capital and birth weight. By adding the interaction term neighborhood social capital * non-Western ethnicity in model 5, we found that higher neighborhood social capital is associated with higher birth weight of infants among Western women (as compared to non-Western ethnic minority women). We did not find this interaction for preterm births.

Additional analyses

We ran both analyses mentioned above using the aggregated neighborhood social capital scores instead of the estimate derived from the econometrics procedure. The beta coefficients

Table 2.3 Multilevel regression models of neighborhood social capital and ethnic density on birth weight (coefficients, 95% confidence intervals in parentheses)

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
|------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Intercept | 3667.1 (3664.5/ 3669.8)*** | 3664.1 (3661.4/ 3666.8)*** | 3661.5 (3658.8/ 3664.2)*** | 3661.9 (3659.2/ 3664.5)*** | 3661.2 (3658.5/ 3663.9)*** | 3659.9 (3657.3/ 3662.6)*** | 3678.0 (3657.3/ 3662.6)*** |
| <i>Individual level</i> | | | | | | | |
| Maternal age (Ref.=25-29 yrs) | -44.6 (-47.4/ -41.9)*** | -44.2 (-47.0/ -41.4)*** | -44.0 (-46.8/ -41.2)*** | -43.4 (-46.2/ -40.6)*** | -43.3 (-46.1/ -40.5)*** | -43.1 (-45.9/ -40.3)*** | -43.1 (-45.9/ -40.3)*** |
| <25 yrs | | | | | | | |
| 30-34 yrs | 9.8 (7.8/ 11.7)*** | 9.9 (7.9/ 11.9)*** | 9.7 (7.7/ 11.6)*** | 9.5 (7.5/ 11.5)*** | 9.5 (7.6/ 11.5)*** | 9.6 (7.6/ 11.5)*** | 9.6 (7.6/ 11.5)*** |
| 35-39 yrs | -3.9 (-6.3/ -1.4)*** | -3.7 (-6.2/ -1.2)*** | -3.8 (-6.3/ -1.4)*** | -4.2 (-6.7/ -1.7)*** | -4.1 (-6.6/ -1.6)*** | -4.0 (-6.5/ -1.5)*** | -4.0 (-6.4/ -1.5)*** |
| >40 yrs | -35.7 (-40.8/ -30.5)*** | -35.2 (-40.4/ -30.1)*** | -35.5 (-40.6/ -30.3)*** | -35.6 (-40.7/ -30.4)*** | -35.4 (-40.6/ -30.2)*** | -35.2 (-40.3/ -30.0)*** | -35.1 (-40.3/ -30.0)*** |
| Parity (Ref.= multiparous) | -150.3 (-152.0/ -148.6)*** | -150.3 (-152.0/ -148.7)*** | -150.2 (-151.9/ -148.6)*** | -150.4 (-152.1/ -148.7)*** | -150.2 (-151.9/ -148.5)*** | -150.0 (-151.7/ -148.4)*** | -150.0 (-151.7/ -148.3)*** |
| Ethnicity (Ref.= Western) | -87.1 (-89.5/ -84.6)*** | -85.6 (-88.1/ -83.2)*** | -83.4 (-85.9/ -81.0)*** | -83.4 (-85.9/ -80.9)*** | -88.8 (-91.5/ -86.1)*** | -91.7 (-94.4/ -89.0)*** | -92.3 (-95.0/ -89.5)*** |
| Sex infant (Ref.= male) | -133.8 (-135.3/ -132.2)*** | -133.8 (-135.4/ -132.3)*** | -133.9 (-135.4/ -132.3)*** | -133.9 (-135.4/ -132.3)*** | -133.9 (-135.4/ -132.3)*** | -133.9 (-135.4/ -132.3)*** | -133.9 (-135.4/ -132.3)*** |
| Gestational age (Ref.= ≥37 wks) | -1249.3 (-1252.4/ -1246.2)*** | -1249.1 (-1252.3/ -1246.0)*** | -1249.3 (-1252.4/ -1246.2)*** | -83.4 (-85.9/ -80.9)*** | -88.8 (-91.5/ -86.1)*** | -91.7 (-94.4/ -89.0)*** | -92.3 (-95.0/ -89.5)*** |

Table 2.3 Continued

| ni=1,527,565 | nj=3,422 | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
|--|------------------------|---------|---------|----------------------------|---------------------------|--------------------------|----------------------------|----------------------------|
| Neighborhood level | | | | | | | | |
| Ethnic minority density | | | | -22.0 (-24.4/ -19.5)*** | -7.4 (-11.2/ -3.6)*** | -8.6 (-12.4/ -4.8)*** | -15.6 (-19.5/ -11.6)*** | -15.2 (-19.1/ -11.2)*** |
| Neighborhood social capital | 11.6 (9.5/ 13.7)*** | | | 1.2 (-1.5/ 3.8) | 16.5 (13.8/ 19.2)*** | 2.7 (0.1/ 5.4)* | 0.3 (-2.3/ 2.9) | 0.8 (-1.9/ 3.4) |
| Socio-economic status | | | | 16.5 (13.8/ 19.2)*** | 16.5 (13.8/ 19.2)*** | 16.3 (13.6/ 19.0)*** | 16.3 (13.6/ 19.0)*** | 16.3 (13.6/ 19.0)*** |
| Urbanity | | | | 0.6 (-1.7/ 2.9) | 1.2 (-1.2/ 3.5) | 2.2 (-0.2/ 4.5) | 2.1 (-0.2/ 4.5)* | 2.1 (-0.2/ 4.5)* |
| Home maintenance | | | | -2.0 (-3.8/ -0.1)* | -2.0 (-3.8/ -0.1)* | -2.0 (-3.9/ -0.2)* | -2.0 (-3.9/ -0.2)* | -2.0 (-3.9/ -0.2)* |
| Feeling of safety | | | | 3.5 (1.5/ 5.6)*** | 3.5 (1.5/ 5.6)*** | 3.4 (1.4/ 5.5)*** | 3.5 (1.4/ 5.5)*** | 3.5 (1.4/ 5.5)*** |
| Ethnic minority density * non-Western | | | | | | | 16.4 (14.2/ 18.5)*** | 15.0 (12.4/ 17.5)*** |
| Neighb. social capital * non-Western | | | | | -12.3 (-14.8/ -9.9)*** | | | -2.8 (-5.7/ 0.1) |

ni = number of individuals; nj = number of neighborhoods.
*p≤0.05, **p≤0.01, ***p≤0.001.

Table 2.4 Multilevel logistic regression models of neighborhood social capital and ethnic density on premature birth (Odds ratios, 95% confidence intervals in parentheses)

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
|----------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------------------|---------------------|
| ni=1,549,285 nj = 3,422 | | | | | | | |
| Individual level | | | | | | | |
| Intercept | 0.05 (0.05/0.06)*** | 0.05 (0.05/0.06)*** | 0.05 (0.05/0.05)*** | 0.05 (0.05/0.05)*** | 0.05 (0.05/0.05)*** | 0.05 (0.05/0.06)*** | 0.05 (0.05/0.06)*** |
| Maternal age (Ref.=25-29 yrs) | | | | | | | |
| <25 yrs | 0.99 (1.097/1.01) | 0.99 (0.97/1.01)*** | 0.98 (0.96/1.00) | 0.98 (0.96/1.00)* | 0.98 (0.96/0.99)* | 0.98 (0.96/1.00)* | 0.98 (0.96/1.00)* |
| 30-34 yrs | 1.03 (1.06/1.06)*** | 1.03 (1.02/1.05)*** | 1.03 (1.02/1.05)*** | 1.04 (1.02/1.05)*** | 1.04 (1.02/1.05)*** | 1.04 (1.02/1.05)*** | 1.04 (1.02/1.05)*** |
| 35-39 yrs | 1.14 (1.12/1.16)*** | 1.14 (1.12/1.16)*** | 1.14 (1.12/1.16)*** | 1.15 (1.13/1.17)*** | 1.15 (1.13/1.17)*** | 1.15 (1.13/1.17)*** | 1.15 (1.13/1.17)*** |
| >40 yrs | 1.41 (1.36/1.46)*** | 1.41 (1.36/1.47)*** | 1.41 (1.36/1.46)*** | 1.42 (1.36/1.48)*** | 1.42 (1.37/1.48)*** | 1.42 (1.37/1.47)*** | 1.42 (1.37/1.48)*** |
| Parity (Ref.=multiparous) | | | | | | | |
| Primiparous | 1.78 (1.76/1.81)*** | 1.78 (1.76/1.80)*** | 1.78 (1.76/1.81)*** | 1.79 (1.77/1.81)*** | 1.79 (1.77/1.81)*** | 1.79 (1.76/1.81)*** | 1.79 (1.76/1.81)*** |
| Ethnicity (Ref.=Western) | | | | | | | |
| Non-Western | 1.03 (1.01/1.05)*** | 1.04 (1.01/1.05)*** | 1.02 (1.00/1.04) | 1.02 (0.98/1.04) | 1.02 (1.00/1.04)*** | 1.03 (1.01/1.05)** | 1.03 (1.01/1.05)** |
| Neighborhood level | | | | | | | |
| Ethnic minority density | | | 1.03 (1.02/1.04)*** | 1.03 (1.01/1.05)*** | 1.03 (1.02/1.05)*** | 1.04 (1.03/1.06)*** | 1.05 (1.03/1.06)*** |
| Neighborhood social capital | | 0.99 (0.98/01.00) | | 0.99 (0.98/1.00) | 0.99 (0.98/1.00) | 0.99 (0.98/1.01) | 1.00 (0.98/1.01) |
| Socio-economic status | | | | 0.95 (0.94/0.97)*** | 0.95 (0.94/0.97)*** | 0.95 (0.94/0.97)*** | 0.95 (0.94/0.97)*** |
| Urbanity | | | | 0.95 (0.94/0.96)*** | 0.95 (0.94/0.96)*** | 0.95 (0.94/0.96)*** | 0.95 (0.94/0.96)*** |
| Home maintenance | | | | 1.02 (1.00/1.03)** | 1.02 (1.01/1.03)** | 1.02 (1.01/1.032)*** | 1.02 (1.01/1.03)*** |
| Feeling of safety | | | | 0.99 (0.98/1.00) | 0.99 (0.98/1.00) | 0.99 (0.98/1.00) | 0.99 (0.98/1.00) |
| Ethnic minority density * | | | | | | | |
| non-Western | | | | | | 0.98 (0.96/0.99)*** | 0.97 (0.95/0.99)*** |
| Neighb. social capital * | | | | | | | |
| non-Western | | | | 1.01 (0.99/1.03) | | | 0.99 (0.97/1.01) |

ni = number of individuals; nj = number of neighborhoods.

*p≤0.05, **p≤0.01, ***p≤0.001.

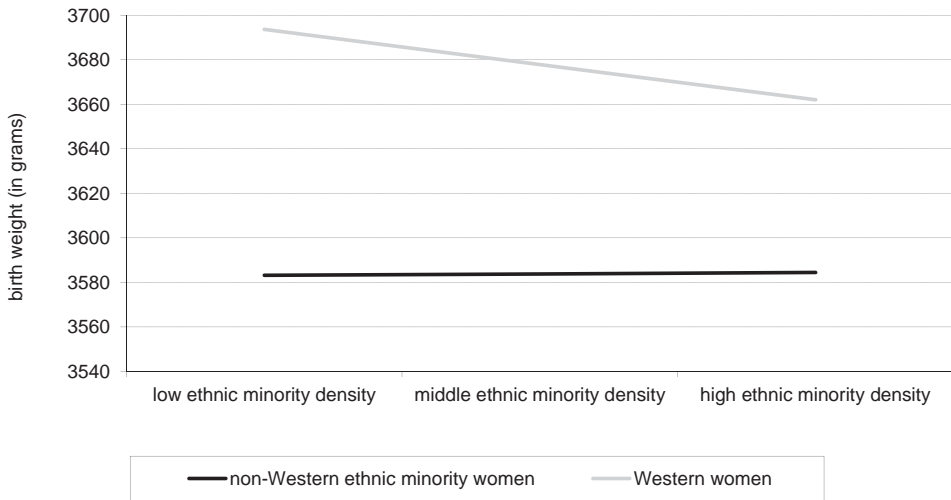


Figure 2.3 Different association between ethnic minority density and ethnicity.

and odds ratios of the aggregated social capital scores were slightly higher than those derived from the econometrics procedure, but the same conclusions can be drawn based on the results. The analysis using ‘small-for-gestational-age’ as the outcome shows that the same conclusions can be drawn from these results as for the birth weight analysis (results for these three additional analyses are not shown).

DISCUSSION

In line with previous studies, we found a modest but significant clustering of birth weight outcomes and prevalence of prematurity across neighborhoods that is not due to compositional effects. This suggests that the context in which a pregnant woman lives matters for perinatal health in the Netherlands. More specifically, higher ethnic minority density was significantly associated with on average lower birth weight and an increased risk for prematurity, even after controlling for individual and other neighborhood characteristics. Similar to other studies done in English-speaking countries, ethnic minority density had an adverse effect on ethnic majority women, but not on ethnic minority women [16,23,24].

The effect size for neighborhood social capital was smaller than that for ethnic density for the birth weight analysis. When controlling for individual and other neighborhood

characteristics, neighborhood social capital was significantly associated with higher birth weight for Western women compared to non-Western ethnic minority women (model 5). Buka et al. (2003) found that neighborhood social capital was associated with an increase in birth weight of infants of white women, but not of black women in the USA [9]. Interestingly, the latter study did not find an association between ethnic minority density and birth weight. Similar to other studies, we found that ‘feeling of safety’ was associated with increased birth weight in the full model and shown to mediate the association between neighborhood social capital and birth weight. This mediation could explain why the effect of neighborhood social capital was attenuated after the inclusion of feeling of safety in the regression models.

In contrast to the birth weight analysis, neighborhood social capital was not significantly associated with premature birth rates. To our knowledge, no other studies have tested this association. More research is necessary to explore the disparate effect of neighborhood social capital on birth weight and prematurity.

In the fully adjusted models, ‘feeling of safety’ in a neighborhood was associated with increased birth weight and lower risk for small-for-gestational age (OR 0.98, CI 0.97-0.99, results of full analysis not shown) but was *not* associated with risk for prematurity. Two studies in the USA show similar results for the association between a related neighborhood construct, namely ‘crime rate’ and birth weight [10,16]. Pregnant women living in areas that are perceived to be unsafe tend to show higher levels of stress, which in return has been associated with an increased risk for premature births but possibly less with restricted fetal growth [16,34]. Therefore, the results of this study are not entirely conclusive. More research needs to be done to investigate how feeling of safety might be associated with birth weight, such as poor dietary patterns or maternal smoking, which are major risk factors for restricted fetal growth.

Studies on neighborhood social capital and ethnic minority density and birth outcomes show comparable effect sizes as our study, with some studies showing slightly larger effect sizes, especially for neighborhood social capital. [9,16,23] This might be because some studies involved comparisons between the extreme ranges of exposure, for example comparing very poor neighborhoods to very wealthy neighborhoods. Moreover, it is interesting that this study found an association between neighborhood socioeconomic status and preterm births, whilst the study conducted in Amsterdam, the Netherlands, did not [8].

Interpretation

Ethnicity as a protective factor

The results of this study help explain why two previous studies in the Netherlands [6,35] found that Western women have higher risks for adverse birth outcomes than non-Western ethnic minority women living in deprived neighborhoods. Our findings show that ethnic minority density is protective for the birth weight of infants and the rate of prematurity of non-Western ethnic minority women. At the same time, neighborhood social capital seems to be slightly protective for the birth weight of infants of Western women. More deprived neighborhoods show higher rates of ethnic minority density and lower levels of neighborhood social capital, hence explaining the relatively disadvantaged position of Western women in these areas.

Most research on the individual determinants of health identifies ‘ethnicity’ (meaning: non-Western ethnic minority status) as only a risk factor for adverse (perinatal) health. This study shows that while ethnic minority status is indeed a risk factor at level 1 (the individual level), it seems to act as a protective factor at level 2 (the neighborhood) in higher ethnic minority density areas. For non-Western ethnic minority women, ethnic minority density seems to mitigate the negative influences of deprived neighborhoods, including lower socioeconomic status, home maintenance, and feeling of safety.

Bonding social capital

As stated above, ethnic minority density seems to be protective for non-Western ethnic minority women but not for Western women, and the reverse was partially found for neighborhood social capital. As such, the protective influence of these factors accrue differentially for Western and non-Western ethnic minority women. It is possible that the variable ethnic minority density taps into the bonding social capital of non-Western groups, whilst neighborhood social capital reflects the bonding social capital of (the majority) Western groups. Bonding social capital has been conceptualized as derived from relationships amongst people that share common characteristics such as similar socioeconomic and sociodemographic status [36]. People who are excluded from bonding social capital are typically also excluded from receiving associated benefits.

Indeed, ethnic minority density has often been defined as a proxy for bonding social capital for ethnic minorities [22,37]. It has been hypothesized that the social capital of a given group increases as it becomes a larger proportion of the total population. At the same time, people

who are part of the minority population (and hence a smaller proportion of population) in a neighborhood may face social exclusion and discrimination [22]. This suggests that non-Western ethnic minority women have more access to social capital than Western women in areas of high ethnic minority density in the Netherlands. It should be noted that as we were not able to consider specific non-Western ethnic minority groups in this study, it remains unclear whether the social capital in high ethnic minority density areas are specific to non-Western residents from distinct backgrounds, for example second generation Turkish immigrants or Christian immigrants from Suriname.

The national survey data from which our neighborhood social capital scores were derived may be primarily driven by the perception of majority Western respondents. The survey that provided the neighborhood social capital data is nationally representative, and as such 82.7% of the respondents were Western. We did apply econometrics when constructing the neighborhood social capital score, which helps to standardize the data, and smooth out variations due to the ethnic (and other) background characteristics of the respondents. However, the resulting score still represents the demographic tendencies of the overall survey sample. If neighborhood social capital measures bonding social capital of Western groups, this could help explain why this index was not associated with better birth outcomes for non-Western women.

Mechanisms

The mechanisms linking ethnic minority density and neighborhood social capital to birth outcomes remain poorly understood in the literature, and have yet to be investigated in the Netherlands. However, literature on social capital and health provides some suggestions for these mechanisms. Plausibly, these mechanisms also hold true for *bonding* social capital. Social capital has been conceptualized to affect health by: a) promoting the exchange of resources between residents, b) stimulating collective action to improve access to local services and amenities c) enforcing healthy norms of behavior, or conversely exerting informal social control over unhealthy behaviors, and d) facilitating more efficient diffusion of health related information [38,39].

Applying the above-mentioned mechanisms to the case of premature births, it is possible that bonding social capital improves prevalence of prematurity *directly* by reducing levels of stress [22,34], for example by reducing exposure to discrimination. Bonding social capital might increase birth weight and reduce prematurity *indirectly* by stimulating healthier

pregnancy-related behavior such as reduced maternal smoking or regular visits to prenatal care. More research is necessary to examine if neighborhoods with higher ethnic minority density tend to improve health-related and health care seeking behavior of non-Western ethnic minority women.

Limitations and strengths

Our study has several limitations. Due to the observational design of our study, we cannot rule out reverse causation, e.g., that poor perinatal health caused lower social capital. Another limitation of the design is that we cannot eliminate bias due to selection into different neighborhoods, meaning that healthy pregnant women move away from low social capital and high ethnic minority density neighborhoods. However, a study showed that selective migration is not a major contributor to health inequalities between neighborhoods in the Netherlands [40]. Another study showed that the vast majority of women who moved during the prenatal phase in the Netherlands remained in neighborhoods of comparable socioeconomic status (and presumably of comparable ethnic minority density and social capital status) [41].

We were not able to control for certain maternal characteristics that have been found to be associated with birth outcomes such as maternal socioeconomic status and smoking during pregnancy [42,43]. However, several of the individual characteristics we did use (age, parity, ethnicity, and prematurity for the birth weight analysis) are partial proxies for socioeconomic and lifestyle determinants of birth outcomes [5]. We also did not have data on the social capital of individuals from the Perinatal Registration Netherlands data set, which prevented us from testing the cross-level interactions between individual and neighborhood social capital with regards to birth outcomes [44,45].

Whilst the dichotomous grouping of Western and non-Western women has some major advantages for our analysis, as discussed in the methods section, it is also potentially problematic. This dichotomy lumps together diverse ethnic groups that may differ with respect to patterns of social capital, health behavior, and birth outcomes. Our study is unable to tease out the specific risks of the various ethnic groups. Moreover, the binary construction might also contribute to the perception of all non-Western ethnic groups as being the ‘same’, and reflecting a uniform ethnic minority ‘problem’. This is clearly an oversimplification, and studies on ethnic disparities need to be cognizant of how classifications of ethnicity chosen by researchers might contribute to (mis)conceptions about ethnic groups [46]. We

do hope, however, that this study demonstrates that the perinatal health of majority and minority groups should be investigated within specific contexts. In fact, the results of this study indicate the protective effects of ethnicity, in contrast to most studies that underline ethnicity as solely as risk factor [46].

Our assessment of neighborhood social capital did not include questions about perceptions of trust between residents. Some researchers have argued that trust is not an integral part of the construct of social capital, but rather that it arises as a consequence of social interactions between members of a group, i.e. trust is a by-product of social capital, not a constituent part of it [47]. However, as outlined in the introduction, others have put forward that trust is an important psychological resource that lubricates the exchange of favors, acts of voluntarism, and collective action within social networks [48]. In other words, without trust, it would be very difficult to access or mobilize the resources that are embedded within social relations. Hence the fact that our survey did not include an assessment of trust is a limitation. Nonetheless, previous studies have also shown a strong correlation between perceptions of trust and other indicators of social capital, such as informal socializing, reciprocity exchanges, and collective efficacy [49]. Thus we believe that the omission of trust in our survey did not introduce a substantial bias in our results.

Despite the above-mentioned limitations, this study also has several strengths. To our knowledge, this is the first study examining neighborhood effects on birth outcomes across an entire country, in this case the Netherlands, as all previous studies are limited to cities or regions. It is also the first study to enquire into the effects of neighborhood social capital and ethnic minority density on birth outcomes in the Netherlands. Moreover, it is one of the few studies to examine the association of a range of both physical (home maintenance, urbanity) and social (ethnic density, neighborhood social capital, feeling of safety, socioeconomic status) neighborhood characteristics on birth outcomes. Another strength of this study is that it is one of the few to use a neighborhood social capital score derived via an econometrics procedure, which improves reliability.

Public health implications

We found modest but significant effects of neighborhood level characteristics on average birth weight and risk for premature births. As such, policies targeting change at the neighborhood level have the potential to affect birth outcomes across entire neighborhoods. We recommend future research into the cost-effectiveness of interventions targeting change

at the neighborhood versus the individual level (or both). Moreover, we suggest future studies that are able to incorporate more specific ethnic categories, for instance by using country of birth of pregnant women, and that of her father/mother, or by using self-ascribed ethnicity.

APPENDIX

For Appendix 2.1, please see the open source version of this article:

<http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0095873>

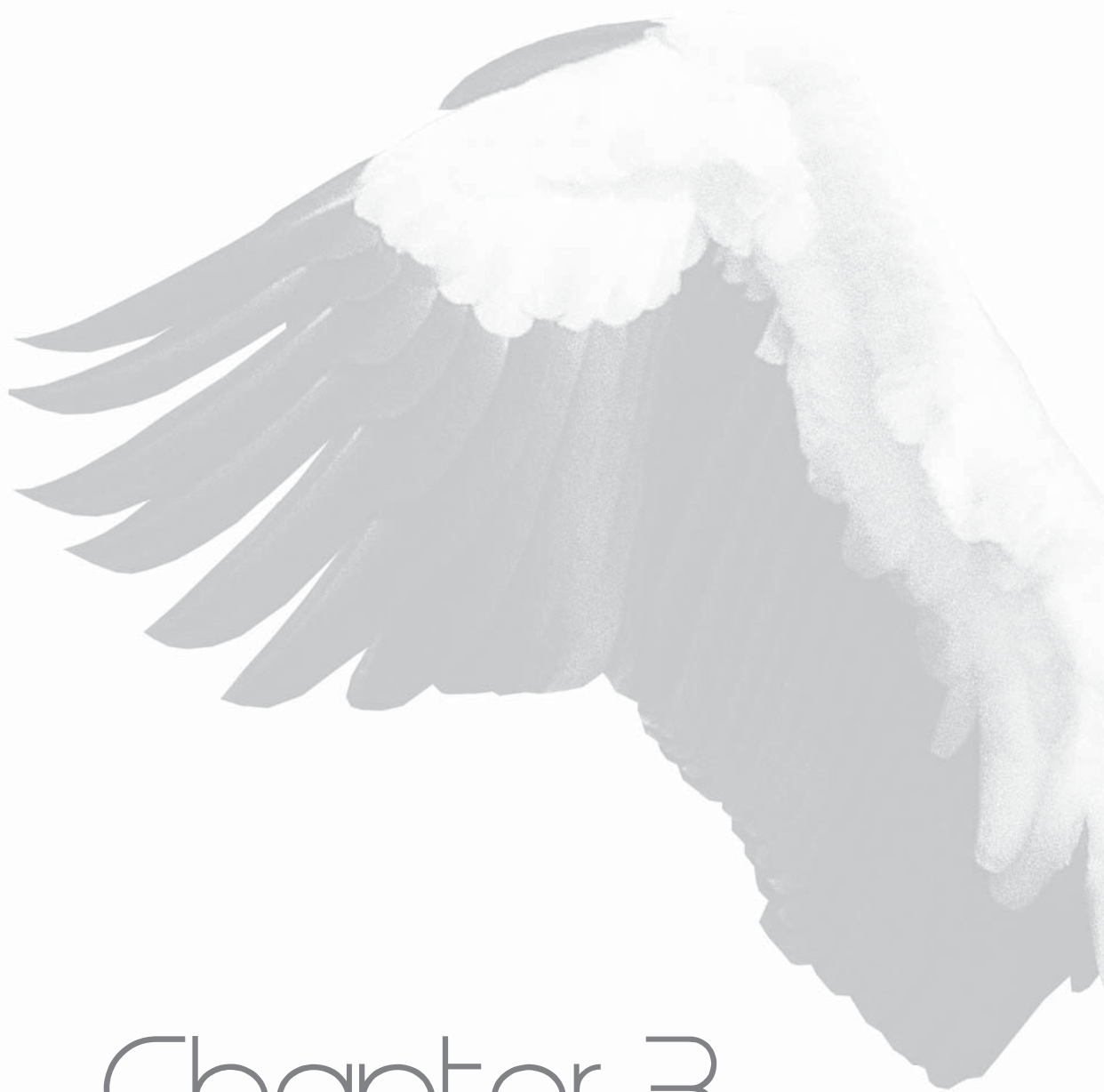
REFERENCES

1. EURO-PERISTAT project with SCPE E (2013) European perinatal health report. The health and care of pregnant women and babies in Europe in 2010.
2. de Graaf JP, Steegers EA, Bonsel GJ (2013) Inequalities in perinatal and maternal health. *Current Opinion in Obstetrics and Gynecology* 25: 98-108.
3. Poeran J, Denktas S, Birnie E, Bonsel GJ, Steegers EAP (2011) Urban perinatal health inequalities. *Journal of Maternal-Fetal and Neonatal Medicine* 24: 643-646.
4. Goedhart G, Van Eijdsden M, Van Der Wal MF, Bonsel GJ (2008) Ethnic differences in preterm birth and its subtypes: the effect of a cumulative risk profile. *BJOG: An International Journal of Obstetrics & Gynaecology* 115: 710-719.
5. de Graaf JP, Ravelli ACJ, de Haan MAM, Steegers EAP, Bonsel GJ (2012) Living in deprived urban districts increases perinatal health inequalities. *Journal of Maternal-Fetal and Neonatal Medicine*: 1-29.
6. Poeran J, Maas AF, Birnie E, Denktas S, Steegers EA, et al. (2013) Social deprivation and adverse perinatal outcomes among Western and non-Western pregnant women in a Dutch urban population. *Social Science & Medicine*.
7. Mook-Kanamori DO, Steegers EA, Eilers PH, Raat H, Hofman A, et al. (2010) Risk factors and outcomes associated with first-trimester fetal growth restriction. *JAMA: The Journal of the American Medical Association* 303: 527-534.
8. Agyemang C, Vrijkotte T, Droomers M, Van der Wal M, Bonsel G, et al. (2009) The effect of neighbourhood income and deprivation on pregnancy outcomes in Amsterdam, The Netherlands. *Journal of epidemiology and community health* 63: 755-760.
9. Buka SL, Brennan RT, Rich-Edwards JW, Raudenbush SW, Earls F (2003) Neighborhood support and the birth weight of urban infants. *American journal of epidemiology* 157: 1-8.
10. Morenoff JD (2003) Neighborhood mechanisms and the spatial dynamics of birth weight1. *American Journal of Sociology* 108: 976-1017.
11. Pearl M, Braveman P, Abrams B (2001) The relationship of neighborhood socioeconomic characteristics to birthweight among 5 ethnic groups in California. *Journal Information* 91.
12. Messer LC, Vinikoor LC, Laraia BA, Kaufman JS, Eyster J, et al. (2008) Socioeconomic domains and associations with preterm birth. *Social Science & Medicine* 67: 1247-1257.
13. O'Campo P, Burke JG, Culhane J, Elo IT, Eyster J, et al. (2008) Neighborhood deprivation and preterm birth among non-Hispanic Black and White women in eight geographic areas in the United States. *American journal of epidemiology* 167: 155-163.
14. Pickett KE, Ahern JE, Selvin S, Abrams B (2002) Neighborhood socioeconomic status, maternal race and preterm delivery: a case-control study. *Annals of epidemiology* 12: 410-418.

15. Collins Jr J, David RJ (1997) Urban violence and African-American pregnancy outcome: an ecologic study. *Ethnicity & disease* 7: 184.
16. Masi CM, Hawkey LC, Harry Piotrowski Z, Pickett KE (2007) Neighborhood economic disadvantage, violent crime, group density, and pregnancy outcomes in a diverse, urban population. *Social Science & Medicine* 65: 2440-2457.
17. Coleman JS, Coleman JS (1994) *Foundations of Social Theory*: Harvard University Press.
18. Putnam RD (1993) The prosperous community. *The american prospect* 4: 35-42.
19. Lochner KA, Kawachi I, Brennan RT, Buka SL (2003) Social capital and neighborhood mortality rates in Chicago. *Social Science and Medicine* 56: 1797-1806.
20. Mohnen SM, Groenewegen PP, Völker B, Flap H (2011) Neighborhood social capital and individual health. *Social Science & Medicine* 72: 660-667.
21. van Hooijdonk C, Droomers M, Deerenberg IM, Mackenbach JP, Kunst AE (2008) The diversity in associations between community social capital and health per health outcome, population group and location studied. *International Journal of Epidemiology* 37: 1384-1392.
22. Pickett KE, Wilkinson RG (2008) People like us: ethnic group density effects on health. *Ethnicity & health* 13: 321-334.
23. Roberts EM (1997) Neighborhood social environments and the distribution of low birthweight in Chicago. *American journal of public health* 87: 597-603.
24. Auger N, Daniel M, Platt RW, Wu Y, Luo ZC, et al. (2008) Association between perceived security of the neighbourhood and small-for-gestational-age birth. *Paediatric and perinatal epidemiology* 22: 467-477.
25. Grady SC (2006) Racial disparities in low birthweight and the contribution of residential segregation: a multilevel analysis. *Social science & medicine* (1982) 63: 3013.
26. Van Huijsduijnen JH, Van Til, R. J., Verhoog, E., Gopal, K., Ferment, B., & Van Galen, J. (2007) *WoON 2006 Onderzoeksdocumentatie e Module Woningmarkt*. [WoOn 2006 documentation of the housing demand survey e Module housing market]. . Delft: The Netherlands Ministry of Housing, Spatial Planning and Environment [Ministerie van VROM].
27. Barker DJP (2006) Adult consequences of fetal growth restriction. *Clinical obstetrics and gynecology* 49: 270-283.
28. Moster D, Lie RT, Markestad T (2008) Long-term medical and social consequences of preterm birth. *New England Journal of Medicine* 359: 262-273.
29. Marlow N, Wolke D, Bracewell MA, Samara M (2005) Neurologic and developmental disability at six years of age after extremely preterm birth. *New England Journal of Medicine* 352: 9-19.
30. Raudenbush SW, Sampson RJ (1999) Ecometrics: toward a science of assessing ecological settings, with application to the systematic social observation of neighborhoods. *Sociological methodology* 29: 1-41.

31. Mujahid MS, Roux AVD, Morenoff JD, Raghunathan T (2007) Assessing the measurement properties of neighborhood scales: from psychometrics to econometrics. *American journal of epidemiology* 165: 858-867.
32. Hox J (2002) *Multilevel analysis: Techniques and applications*: Mahwah, NJ: Lawrence Erlbaum Associates.
33. Snijders T, Bosker R (1999) *Multilevel modeling: An introduction to basic and advanced multilevel modeling*.
34. Dole N, Savitz DA, Hertz-Picciotto I, Siega-Riz AM, McMahon MJ, et al. (2003) Maternal stress and preterm birth. *American journal of epidemiology* 157: 14-24.
35. de Graaf JB, Ravelli AC, Visser GH, Hukkelhoven C, Tong WH, et al. (2010) Increased adverse perinatal outcome of hospital delivery at night. *BJOG* 117: 1098-1107.
36. Szreter S, Woolcock M (2004) Health by association? Social capital, social theory, and the political economy of public health. *International Journal of Epidemiology* 33: 650-667.
37. McKenzie K, Whitley R, Weich S (2002) Social capital and mental health. *The British Journal of Psychiatry* 181: 280-283.
38. Berkman LF, Kawachi I (2000) Social cohesion, social capital, and health. In: Berkman LF, Kawachi I, eds. *Social epidemiology*. New York: Oxford University Press, 2000:174-90.
39. Lin N (2002) *Social capital: A theory of social structure and action*: Cambridge University Press.
40. Van Lenthe F, Mackenbach J (2002) Neighbourhood deprivation and overweight: the GLOBE study. *International journal of obesity and related metabolic disorders: journal of the International Association for the Study of Obesity* 26: 234.
41. Reitsma J, Kardaun J, Gevers E, De Bruin A, Van der Wal J, et al. (2003) [Possibilities for anonymous follow-up studies of patients in Dutch national medical registrations using the Municipal Population Register: a pilot study]. *Nederlands tijdschrift voor geneeskunde* 147: 2286.
42. Jaddoe VW, Troe EJW, Hofman A, Mackenbach JP, Moll HA, et al. (2008) Active and passive maternal smoking during pregnancy and the risks of low birthweight and preterm birth: the Generation R Study. *Paediatric and perinatal epidemiology* 22: 162-171.
43. Kramer MS, Séguin L, Lydon J, Goulet L (2000) Socio-economic disparities in pregnancy outcome: why do the poor fare so poorly? *Paediatric and perinatal epidemiology* 14: 194-210.
44. Moore S, Haines V, Hawe P, Shiell A (2006) Lost in translation: a genealogy of the "social capital" concept in public health. *Journal of epidemiology and community health* 60: 729-734.
45. Poortinga W (2006) Social relations or social capital? Individual and community health effects of bonding social capital. *Social science & medicine* (1982) 63: 255.
46. Proctor A, Krumeich A, Meershoek A (2011) Making a difference: The construction of ethnicity in HIV and STI epidemiological research by the Dutch National Institute for Public Health and the Environment (RIVM). *Social Science & Medicine* 72: 1838-1845.
47. Harpham T, Grant E, Thomas E (2002) Measuring social capital within health surveys: key issues. *Health policy and planning* 17: 106-111.

48. Kawachi I (2010) Social Capital and Health. In: Bird CE, Fremont AM, Zimmermans S, eds. Handbook of medical sociology. Nashville, TN: Vanderbilt University Press, 2010:18-32
49. Sampson RJ, Raudenbush SW, Earls F (1997) Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science* 277: 918-924.



Chapter 3



The association of ethnic minority density with late entry into antenatal care in the Netherlands

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I Kawachi, S Denktaş

ABSTRACT

In the Netherlands, non-Western ethnic minority women – except those with a Turkish or Hindustani-Surinamese background – make their first antenatal visit later than their native Dutch counterparts. Timely entry into antenatal care is important as it provides the opportunity for prenatal screening and the detection of modifiable risk factors for adverse pregnancy outcomes. Studies conducted in the Netherlands have focused on individual-level determinants of time of entry into antenatal care, such as young maternal age. In this study we explored whether women's timely entry into antenatal care is also influenced by the neighborhood in which they live. Moreover, we assessed whether the proportion of ethnic minorities in a neighborhood (ethnic minority density) has a different influence on Western and non-Western ethnic minority women's timely entry into care. As a recent Dutch study on birth outcomes had found that ethnic minority density has a protective effect on non-Western women, but not on Western women, we hypothesized that ethnic minority density has a protective effect against non-Western women's late entry into care.

Data on time of entry into antenatal care and other individual level characteristics were obtained from the Netherlands Perinatal Registry (2000-2008), which includes 97% of all pregnancies in the Netherlands. We derived the neighborhood level data from three other national survey and registration-based sources. In the analyses we included 1,137,741 pregnancies of women who started care under supervision of a community midwife in 3,422 neighborhoods. Multi-level logistic regression was used to assess the associations of individual and neighborhood level determinants with entry into antenatal care before and after 14 weeks of gestation.

We found that neighborhoods characteristics (ethnic minority density, urbanity, socioeconomic status and home maintenance) influence timely entry into care above and beyond individual characteristics. Ethnic minority density was associated with a higher risk of late entry into care. However, our analysis showed that for non-Western women, living in high ethnic minority density areas is less detrimental to their risk of late entry into antenatal care than for Western women. This means that higher proportions of ethnic minority residents has a protective effect on non-Western women, but not on Western women in terms of their chances of timely entry into care.

INTRODUCTION

International studies have shown that pregnant women from ethnic minority backgrounds tend to enter antenatal care at a significantly higher gestational age than ethnic majority women [1, 2]. Research in the Netherlands points in the same direction. Women from all non-Western ethnic minorities except those with a Turkish or Hindustani-Surinamese background make their first antenatal visit later than their Native Dutch counterparts. For example, multiparous Creole-Surinamese women entered antenatal care after 14 weeks of gestation in 49% of cases, against 11% for multiparous Dutch women [3].

Late entry into antenatal care is problematic, as it is associated with a higher risk for adverse birth outcomes. These include abruptio placentae, chorioamnionitis, preterm birth, low birth weight and fetal and neonatal death [4]. Pregnant women in the Netherlands are advised to enter antenatal care between 8 and 10 weeks of gestation. If they enter care too late, i.e. after 14 weeks of gestation, they miss the opportunity to receive prenatal screening for a range of syndromes and congenital anomalies [5].

Commonly cited risk factors in international studies for late entry into care are single status, young maternal age, poor language proficiency, maternal education of less than 5 years, multiparity, unplanned and unwanted pregnancy, difficulty in arranging an appointment for antenatal care, and being uninsured [6]. In the Netherlands, research has shown that a lack of knowledge of the Western healthcare system and poor language proficiency are important reasons for inadequate antenatal care usage among non-Western ethnic minority women [7]. While studies conducted in the Netherlands on time of entry into antenatal care have focused on these individual-level determinants, previous research in the United States and Canada found associations between the area of residence and timing of entry into antenatal care [3, 8-10]. Neighborhood characteristics may affect health outcomes over and beyond the influence of individual determinants. In other words, it is possible that certain neighborhoods are more or less conducive to pregnant women's timing of entry into care.

In this study we explored the association between neighborhood influences and late entry into antenatal care in the Netherlands. Moreover, we assessed whether the proportion of non-Western ethnic minorities in a neighborhood (i.e. ethnic minority density) has a different influence on Western and non-Western ethnic minority women's time of entry into care. We hypothesized that ethnic minority density has a protective effect on non-Western women's timely entry into care. This is based on the findings of a recent Dutch

study by Schölmerich et al. who found that while non-Western ethnic minorities generally have more adverse birth outcomes compared to Western women, this trend is reversed in areas with high ethnic minority density [11]. This means that while non-Western ethnicity is a risk factor at the individual-level, residence in a neighborhood of high ethnic minority density is a *protective* factor for non-Western women's birth outcomes. A similar protective effect of high ethnic minority density has been found in studies on other health outcomes such as mental health and self-rated health and is known as the 'ethnic density effect' [11-13].

Studies have hypothesized that ethnic minorities residing in neighborhoods with high ethnic minority density exhibit better health outcomes than ethnic majority groups because of higher levels of *bonding social capital*. Bonding social capital refers to 'horizontal' ties between members of a network who see themselves as similar (homogenous networks, such as ethnic groups) [14, 15]. Social capital has been conceptualized to influence health in several different ways – plausibly, these patterns also apply to *bonding* social capital: firstly, by promoting the exchange of resources between residents, secondly by residents engaging in collective action to improve access to local services and amenities, thirdly through social control over healthy behavior, and lastly by more efficient diffusion of health related information [16, 17].

While social capital is generally seen as having a positive influence on health (behaviors), studies have found that bonding social capital may promote health but may also act as a source of strain (and hence a detriment to health) in resource-poor settings [18]. Scholars have explained this phenomenon via two pathways. For one, bonding social capital may facilitate good health through the exchange of resources between neighbors, but high reliance on mutual exchange of reciprocity can result in excessive obligations placed upon residents to help each other, which might be detrimental to health. In addition, while bonding social capital can assist in the diffusion of information, the closed nature of social ties in such communities can also restrict the flow of information from the outside (e.g. new information about changes in the Dutch obstetric system) and maintain the circulation of unreliable information [19]. This could lead to less timely and adequate use of antenatal care. This means that neighborhood ethnic minority density could either have a detrimental or beneficial effect on utilization of antenatal care. We hypothesize that in line with the study by Schölmerich et al., ethnic minority density will have a beneficial effect on time of entry into care for non-Western women when compared to Western women [11].

DATA & METHODS

To determine the association between ethnic minority density and the risk of late entry into antenatal care in the Netherlands, we extracted neighborhood-level variables from three national datasets, and linked this with a large dataset on individual pregnancy cases using the four-digit zip code for neighborhoods.

Outcome variable

Timely entry into care was defined as entry at any time before 14 weeks of gestation; late entry into care was defined as starting after 14 weeks of gestation (0=not late, 1=late). The cut-off point of after 14 weeks of gestation was chosen because entry into care after 14 weeks of gestation excludes a woman from prenatal screening on Down, Edwards and Patau syndrome in the Netherlands and early detection and modification of other medical and non-medical risk factors (such as illicit drug use) for adverse pregnancy outcome [5, 20].

Individual level determinants

The data on entry into care were acquired from the Netherlands Perinatal Registry, which contains 97% of Dutch pregnancies since the year 2000 (www.perinatreg.nl). Midwives, gynecologists and neonatologists supply this data. The Perinatal Registration Netherlands committee approved the use of the anonymized data for this study. We selected data on singleton pregnancies in the datasets from 2000 up to and including 2008. The weeks of gestation at entry into care were regrouped dichotomously into 'up to and including 14 weeks of gestation' and 'after 14 weeks of gestation'. Based on previous studies on the association of maternal covariates and time of entry into care, the following maternal covariates were included: maternal age, parity and ethnicity.

In the Netherlands Perinatal Registry, 'ethnicity' is divided into seven categories: Western Dutch, Western Other, Mediterranean, Asian, African, South Asian, or other non-Western. Most non-Western immigrants in the Netherlands are from Turkey, Morocco, Surinam and the Dutch Antilles. The recording of ethnicity in the Netherlands Perinatal Registry is problematic for two reasons: 1) Maternal ethnicity is based on either self-declared ethnicity or country of birth of the mother or her parents causing heterogeneity in registration; 2) the categorization in the registry are not in line with international classifications, making comparisons difficult. Therefore we dichotomized ethnicity into being from 'Western' or 'non-Western' descent for the purpose of this study.

Neighborhood level determinants

Four-digit zip code areas were used to define neighborhoods. Averaging 4,080 residents per neighborhood in 2006, these neighborhoods are comparable to census tracts in the United States or Lower Layer Super Output Areas in the United Kingdom. Because Dutch neighborhoods are sufficiently homogenous in socio-cultural terms, this geographical unit is suitable for contextual studies [21]. Data on the neighborhood characteristics were obtained from Statistics Netherlands, the Housing & Living Survey and the Netherlands Institute for Social Research [22]. This data was collected between 2005 and 2006.

At the neighborhood level, six characteristics were included. Besides ethnic minority density these were: neighborhood social capital, feeling of safety, socio-economic status, urbanity and home maintenance. The latter five variables were included because prior studies in the Netherlands found an association between these neighborhood characteristics and adverse birth outcomes and general health [11, 23, 24]. A more detailed description of the characteristics is given in Table 3.1. All neighborhood characteristics were recoded into z-scores.

The correlations between the neighborhood variables are presented in Appendix 3.1. Most importantly, neighborhoods with higher socio-economic status generally had lower ethnic minority density (corr. -0,56, $p < 0.001$).

The final analysis included 3,422 neighborhoods and 1,137,741 pregnancies. 580 neighborhoods (14% of the total) were excluded because not all six neighborhood characteristics were available (Figure 3.1). Most of the excluded neighborhoods had too few inhabitants to be included in the study because they were rural or industrial areas. 35,326 (2.2%) pregnancies were excluded because they were multiple pregnancies and 31,382 (1.9%) pregnancies because neighborhood or individual characteristics were missing.

This figure shows the number of pregnancies excluded from the multilevel logistic regression analysis.

Only women who started care with a community midwife (the ‘first tier’) were included in the study. The Dutch obstetric care system consists of three ‘tiers’. The first tier consists of autonomously working community midwives who take care of low risk women [25]. When complications (threaten to) occur, women are referred to the second tier of care, consisting of obstetricians in hospitals. The third tier of care consists of academic obstetric care. A quarter of women enter obstetric care immediately in the second or third tier because of

Table 3.1 Detailed description of neighborhood level variables included in the multilevel model

| Variable name | Meaning | Measurement | Source | Ref. |
|------------------------------|--|--|--|--------|
| Ethnic minority density | Concentration of people from ethnic minorities | % of residents from non-Western ethnic backgrounds per 4 digit zip code. Non-Western ethnicity is defined as an individual or at least one of the individual's parents originating from Africa, Latin America, Asia (except Indonesia and Japan) or Turkey. | Statistics Netherlands | [1] |
| Social capital | Access to resources that are generated by relationships between residents in a tightly knit and cohesive community | Five-point Likert scale (1 totally agree – I totally do not agree). 1) Contact with direct neighbors; 2) Contact with other neighbors; 3) Whether people in the neighborhood know each other; 4) whether neighbors are friendly to each other; 5) whether there is a friendly and sociable atmosphere in the neighborhood. Social capital scores were provided by Schöllerich et al. which were created using an 'econometrics' procedure. The reliability of the scale was acceptable, with an estimator of 0.595 (in accordance with Hox). | House and Living Survey (items) Schöllerich et al. (Econometrics score) | [2, 3] |
| Feeling of safety | Perception of safety in the neighborhood | Five-point Likert scale (1 totally agree – I totally do not agree). Statement: "I am scared of being harassed or assaulted in this neighborhood" | House and Living Survey | [2] |
| Socio-economic status | A group's position within a hierarchical social structure | Average income, % of people with low income, % of people with a low education and % of unemployed people in a neighborhood. | Netherlands Institute for Social Research | [4] |
| Urbanity of the neighborhood | Degree of urbanity of the municipality a neighborhood is situated in | Number of addresses per square kilometer (km ²). 1) Rural, up to 499 addresses per km ² ; 2) Semi-rural, 500-999 addresses per km ² ; 3) Intermediate urban-rural, 1,000-1,499 addresses per km ² ; 4) Semi-urban, 1,500-2,499 addresses per km ² ; 5) Urban, more than 2,499 addresses per km ² . | House and Living Survey | [2] |
| Home maintenance | Proxy for the environmental condition in a neighborhood | Five-point Likert scale (1 totally agree – I totally do not agree). Question: "Is your house in bad condition?" | House and Living Survey | [2] |

1. Statistics Netherlands. [cited 2014; Available from: <http://www.cbs.nl/en-gb/menu/home/default.htm>.
2. Van Huijsduijnen JH, VT., R. J., Verhoog, E., Gopal, K., Ferment, B., & Van Galen, J., WoON 2006 Onderzoeksdocumentatie - Module Woningmarkt. [WoON 2006 documentation of the housing demand survey - Module housing market]. 2006.
3. Schöllerich, V.L., et al., The association of neighborhood social capital and ethnic (minority) density with pregnancy outcomes in the Netherlands. PLOS ONE, 2014. 9(5): p. e95873.
4. Netherlands Institute for Social Research. [cited 2014; Available from: http://www.scp.nl/english/Research_and_Data.

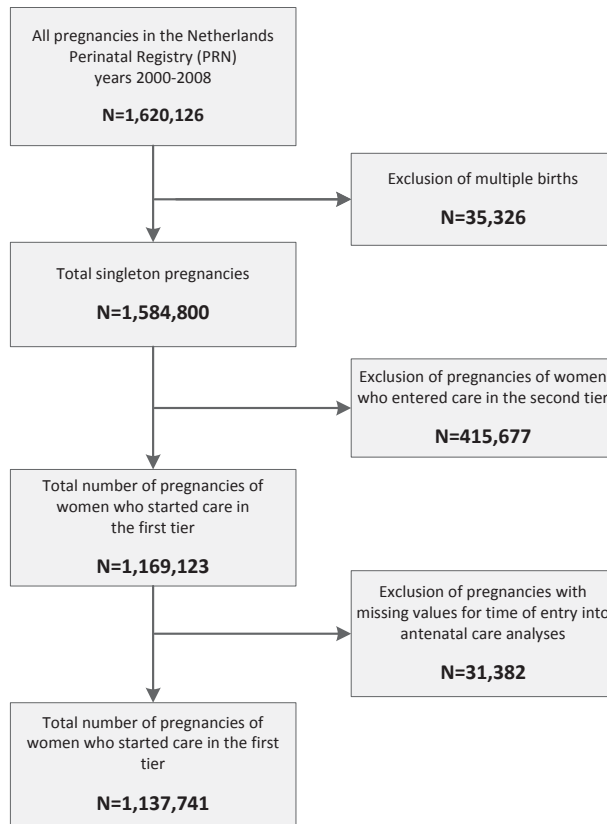


Figure 3.1 Exclusion of pregnancies.

medical risks or complications at the start of their pregnancy [26]. We focused on the first tier population because immediate entry into care in the second and third tier is above all determined by the patients' medical and obstetric history. Typically these women have previously received explicit instructions about their antenatal care and the importance of timely entry. The women included in this study – the first tier population – form the greatest portion of all pregnant women in the Netherlands, namely 74%. These women are not just a low risk population because many of them will be referred to the second tier of care, either during pregnancy, labor or the postpartum period because of new risks or complications [27]. This means that the women included in this study are still heterogeneous in terms of their risk profile, making comparison to other studies justifiable.

Analytical strategy

Because of the hierarchical nature of the data, in which pregnant women (level 1) are nested within neighborhoods (level 2) we performed multilevel logistic regression analyses. First, we estimated a “null-model” which only contained a random intercept to examine the presence of clustering of late entry into care within neighborhoods. To establish the presence of clustering we calculated the intra-class correlation (ICC), using the following formula in which sigma-squared is the intercept variance [28]:

$$ICC = \frac{\sigma^2}{\sigma^2 + 3.29}$$

The ICC can range from 0 to 1. When it deviates from zero, it is appropriate to use multilevel analyses [29]. We found an ICC of 9.5% (results not shown) justifying this modeling approach.

The null-model was then expanded to include the individual level characteristics age, parity and ethnicity as fixed effects to examine the influence of these on late entry into care (model 1). Thereafter, we separately added the neighborhood contextual variables ‘neighborhood social capital’ and ‘ethnic density’ (model 2 and 3) to investigate their specific influence, before adding the other neighborhood variables (model 4). Consecutively an interaction term was included for non-Western ethnicity*neighborhood social capital (model 5) and non-Western ethnicity*ethnic minority density (model 6) to investigate the potential difference in impact of these neighborhood characteristics on Western and non-Western women. Although we were primarily interested in the interaction for non-Western ethnicity*ethnic minority density, we also tested the interaction with neighborhood social capital because Schölmerich et al. found this interaction term to be significant in their analysis of birth outcomes in the Netherlands [11]. In the final model, all individual variables, neighborhood contextual variables and interaction terms were included (model 7). All analyses were performed using SPSS version 20.

RESULTS

Between 2000 and 2008 the prevalence of entry into antenatal care after 14 weeks of gestation was 17.9%. More detailed demographic characteristics on the study population are provided in Table 3.2. Table 3.3 / model 1 shows the odds ratios for the individual level characteristics

Table 3.2 Descriptive statistics of individual variables and time of entry into care

| | Total | | Western | | Non-Western | |
|---|-----------|---------|---------|--------|-------------|--------|
| | N | (%) | N | (%) | N | (%) |
| Total singleton births - first tier of care | 1,137,741 | (100.0) | 959,771 | (84.4) | 177,970 | (15.6) |
| Maternal age | | | | | | |
| <25 yrs | 141,239 | (12.4) | 93,239 | (9.7) | 48,000 | (27.0) |
| 25-29 yrs | 343,101 | (30.2) | 285,336 | (29.7) | 57,765 | (32.5) |
| 30-34 yrs | 451,282 | (39.7) | 403,838 | (42.1) | 47,444 | (26.7) |
| 35-39 yrs | 181,309 | (15.9) | 160,403 | (16.7) | 20,906 | (11.7) |
| >40 yrs | 20,810 | (1.8) | 16,955 | (1.8) | 3,855 | (2.2) |
| Parity | | | | | | |
| Primiparous (first birth) | 541,117 | (47.6) | 465,825 | (48.5) | 75,292 | (42.3) |
| Multiparous (second or higher birth) | 596,624 | (52.4) | 493,946 | (51.5) | 102,678 | (57.7) |
| Time of entry into care | | | | | | |
| < 4 weeks of gestation | 934,453 | (82.1) | 820,752 | (85.5) | 113,701 | (63.9) |
| ≥14 weeks of gestation | 203,288 | (17.9) | 139,019 | (14.5) | 64,269 | (36.1) |

Source: Perinatal Registration Netherlands, 2000-2008.

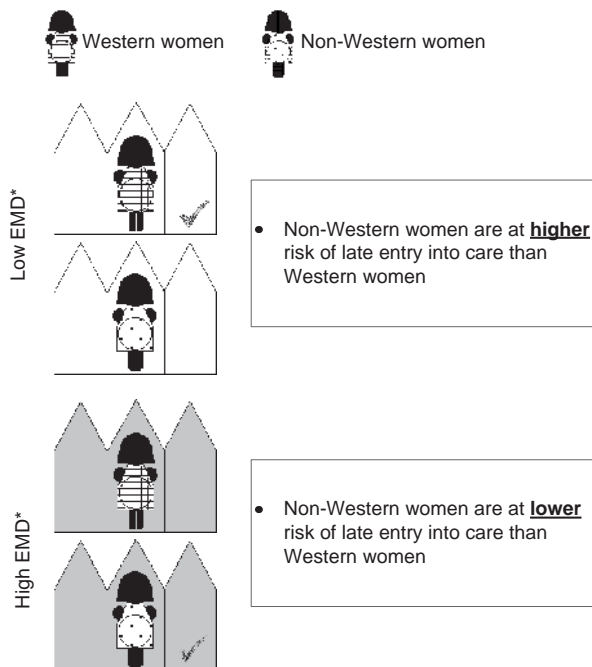


Figure 3.2 The interaction effect between ethnic status (non-Western or Western) and the level of ethnic minority density in a neighborhood for risk of late entry into care.

This figure demonstrates that higher proportions of ethnic minority density has a protective effect on non-Western women, but not on Western women in terms of their risk of late timely entry into care. (*Ethnic Minority Density).

in our logistic regression analysis with 'late entry into care' as the outcome variable. Women in the age category of 30 to 35 years were most likely to enter antenatal care late. Non-Western ethnicity was also strongly associated with higher risk for late entry into care. Contrarily, we found no significant association of parity and time of entry into care. Moreover, the estimates for all of these individual level variables were relatively stable across the models.

In model 2 of our analysis, neighborhood social capital was added (Table 3.3). The association of this variable with late entry into care was not significant and remained so in all other models. In contrast, ethnic minority density (model 3) was significantly associated with late entry into care. This effect remained present after controlling for the other neighborhood contextual variables in model 4. Though feeling of safety had no effect, higher levels of socioeconomic status, home maintenance and urbanity were associated with lower risks of late entry into care. The latter showed the most notable effect of these three. Model 5 and 6 include the interaction terms for neighborhood social capital*non-Western ethnicity and ethnic minority density*non-Western ethnicity, respectively. Though the interaction term for neighborhood social capital*non-Western showed a significant effect in model 5, this effect was no longer present in the full model (model 7). However, the interaction term for ethnic minority density*non-Western ethnicity did remain significant in the full model. From this follows that ethnic minority density is associated with 1.21 times the odds of late entry into care for Western women and 1.13 times the odds for non-Western women (calculated: $\exp(\ln(1.21) + \ln(0.93))$). In the full model, again neighborhood urbanity showed the most notable association (OR 0.87, 95%CI 0.85-0.90, $p \leq 0.01$). Figure 3.2 illustrates the interaction effect between ethnic status (non-Western or Western) and the level of ethnic minority density in a neighborhood for risk of late entry into care.

DISCUSSION

We found that neighborhood contexts influence timing of entry into antenatal care in the Netherlands. In particular, higher rates of neighborhood ethnic minority density are associated with a higher risk of late entry into antenatal care in the Netherlands. However, our analysis also shows that for non-Western women, living in high ethnic minority density areas is less detrimental to their timing of antenatal care than for Western women.

Similar to our study, Heaman et al. reported higher risks of inadequate antenatal care use for women living in neighborhoods with higher numbers of residents with an indigenous minority background [9]. It should be noted that inadequate use of care, the outcome measure

Table 3.3 Multilevel logistic regression models of ethnic minority density and other individual and neighborhood characteristics on late entry into care (after 14 weeks of gestation)

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
|-------------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| ni=1,076,494 n=3,422 | | | | | | | |
| Intercept | 0.15 (0.15/ 0.15)*** | 0.15 (0.15/ 0.15)*** | 0.15 (0.15/ 0.15)*** | 0.15 (0.15/ 0.15)*** | 0.15 (0.15/ 0.15)*** | 0.15 (0.15/ 0.15)*** | 0.15 (0.15/ 0.15)*** |
| Individual level | | | | | | | |
| Maternal age (Ref.=25-29 yrs) | 1.80 (1.77/ 1.83)*** | 1.80 (1.77/ 1.83)*** | 1.80 (1.77/ 1.83)*** | 1.80 (1.77/ 1.83)*** | 1.80 (1.77/ 1.82)*** | 1.79 (1.77/ 1.82)*** | 1.79 (1.77/ 1.82)*** |
| 30-34 yrs | 3.06 (2.96/ 3.15)*** | 3.05 (2.96/ 3.15)*** | 3.05 (2.96/ 3.15)*** | 3.06 (2.97/ 3.16)*** | 3.06 (2.96/ 3.15)*** | 3.05 (2.96/ 3.15)*** | 3.05 (2.96/ 3.15)*** |
| 35-39 yrs | 1.06 (1.05/ 1.07)*** | 1.06 (1.05/ 1.07)*** | 1.06 (1.05/ 1.07)*** | 1.06 (1.05/ 1.07)*** | 1.06 (1.05/ 1.07)*** | 1.06 (1.05/ 1.07)*** | 1.06 (1.05/ 1.07)*** |
| >40 yrs | 1.56 (1.54/ 1.59)*** | 1.56 (1.54/ 1.59)*** | 1.56 (1.54/ 1.59)*** | 1.57 (1.54/ 1.59)*** | 1.56 (1.54/ 1.59)*** | 1.56 (1.54/ 1.59)*** | 1.56 (1.54/ 1.59)*** |
| Parity (Ref.= multiparous) | 1.00 (0.99/ 1.01) | 1.00 (0.99/ 1.01) | 1.00 (0.99/ 1.01) | 1.00 (0.99/ 1.01) | 1.00 (0.99/ 1.01) | 0.99 (0.98/ 1.01) | 0.99 (0.98/ 1.01) |
| Ethnicity (Ref.= Western) | 2.63 (2.60/ 2.67)*** | 2.62 (2.59/ 2.66)*** | 2.62 (2.58/ 2.65)*** | 2.61 (2.58/ 2.65)*** | 2.68 (2.64/ 2.72)*** | 2.72 (2.68/ 2.77)*** | 2.73 (2.69/ 2.77)*** |

Table 3.3 Continued

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
|-------------------------------------|---------|------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Neighborhood level | | | | | | | |
| Ethnic minority density | | | 1.07 (1.04/1.09)*** | 1.16 (1.09/1.17)*** | 1.16 (1.09/1.17)*** | 1.21 (1.16/1.26)*** | 1.21 (1.16/1.26)*** |
| Neighborhood social capital | | 1.00 (0.97/1.02) | 1.09*** | 1.01 (0.98/1.04) | 1.00 (1.00/1.05) | 1.02 (0.99/1.04) | 1.01 (0.99/1.04) |
| Socio-economic status | | | | 0.97 (0.95/1.00)* | 0.97 (0.95/1.00)* | 0.97 (0.95/1.00)* | 0.97 (0.95/1.00)* |
| Urbanity | | | | 0.88 (0.86/0.90)*** | 0.88 (0.86/0.90)*** | 0.87 (0.85/0.90)*** | 0.87 (0.85/0.90)*** |
| Home maintenance | | | | 0.97 (0.95/0.98)*** | 0.97 (0.95/0.99)*** | 0.97 (0.95/0.99)*** | 0.97 (0.95/0.99)** |
| Feeling of safety | | | | 1.00 (0.98/1.02) | 1.00 (0.98/1.02) | 1.00 (0.98/1.02) | 1.00 (0.98/1.02) |
| Neighb. social capital*non-Western | | | | 1.06 (1.05/1.08)*** | 1.06 (1.05/1.08)*** | 1.01 (1.00/1.03) | 1.01 (1.00/1.03) |
| Ethnic minority density*non-Western | | | | | | 0.97 (0.96/0.98)*** | 0.93 (0.91/0.94)*** |

Odds ratios, 95% confidence intervals in parentheses.
 ni=number of individuals; nj=number of neighborhoods; *p≤0.05, **p≤0.01, ***p≤0.001.

of their study, was broader than our outcome measure. Inadequacy of care entails late entry into care and / or an insufficient number of antenatal appointments. There is no international consensus on the appropriate number of antenatal visits. Nevertheless, inadequacy of antenatal care is used in a number of studies because it is believed that it may be associated with adverse pregnancy outcomes [1]. We were unable to analyze the number of antenatal visits each woman had because this is not recorded in the Netherlands Perinatal Registry. However, a systematic review by Feijen et al. showed that both late entry and an insufficient number of antenatal appointments share the same set of risk factors [6]. Therefore we believe that it is valid to compare our results with other studies focusing on inadequate use of antenatal care.

In line with previous studies, being of non-Western ethnic descent was amongst the most important predictors for late entry into care. This supports the commonly held view that ‘ethnicity’ (meaning a non-Western ethnic minority status) is a risk factor for health behavior, including adequate use of care [30, 31]. However, our analysis shows that for non-Western women, living in high ethnic minority density areas is less detrimental to their risk of late entry into antenatal care than for Western women. This means that while ethnic minority status is indeed a risk factor at the individual level, it seems to act as a protective factor at the neighborhood level in areas of higher ethnic minority density for time of entry into care. Our results are in line with a recent study by Schölmerich et al. who found the same pattern for birth outcomes [11]. Similar to our study, Cubbin and colleagues found that place of residence influences ethnic minority and majority groups differently in terms of their risk for late entry into antenatal care [32]. The results were stratified for neighborhood deprivation levels instead of neighborhood ethnic minority density levels. But prior research – as well as our study (see Appendix 3.1) – has shown a relation between higher levels of neighborhood deprivation and higher levels of ethnic minority density [33]. Cubbin and colleagues found that African American women in the least deprived areas (and presumably areas of lower ethnic minority density) were at higher risk of delayed entry into antenatal care than African American women living in moderately deprived areas. Contrastingly, in the most deprived areas (and presumably areas of higher ethnic minority density) the risk of late / no initiation of antenatal care was only elevated among European American women.

Various studies have suggested that ethnic minority density could be seen as a proxy for bonding social capital amongst ethnic minority groups [11, 34, 35]. Applied to our study, this would mean that the non-Western women in our study have higher levels of bonding social capital than their Western counterparts in areas with high ethnic minority density. As outlined in the introduction, higher levels of *bonding* social capital have been associated

with both *higher and lower* risk of adequate health care use. The findings from our study suggest that *bonding* social capital has a positive effect on time of entry into care of non-Western women. For these women, bonding social capital might enhance the chances of timely entry into care: firstly by promoting the exchange of resources between residents (for example money to take public transport to an antenatal care provider); secondly by having residents engage in collective action to improve access to local antenatal services; thirdly through social control over healthy behavior (in this case on timely entry into antenatal care); and lastly by more efficient diffusion of health related information (on the importance of timely entry into care, and access to antenatal care) [16, 17].

In line with previous studies in the Netherlands on other neighborhood effects, we found that home maintenance (as a proxy for the environmental conditions in a neighborhood) and urbanity were associated with slightly better outcomes [11, 23]. Similarly, Larson et al. reported that living in rural areas was strongly associated with late entry into antenatal care in the United States [36]. An explanation mentioned in this study that could also be plausible for our setting is longer travelling distances to care providers in rural areas. Neighborhood social capital showed no effect in our analysis. This was an unexpected finding. In the literature higher levels of neighborhood social capital are associated with more adequate use of care of Western women [37]. Our observations suggest that if Western women have access to bonding social capital, it does not protect them from late entry into care. Lower neighborhood socioeconomic status was associated with a higher risk of late entry into care in all of our models. Two previous studies also reported that lower neighborhood socioeconomic status was associated with inadequate use of antenatal care [9, 10].

Strengths and limitations

This study has several strengths. To our knowledge this is the first study investigating ethnic minority density effects on time of entry into antenatal care on a national level and for Western and non-Western women separately. Most other studies on birth outcomes that included ethnic minority density in their analysis only focused on maternal and neonatal health outcomes. Also, we believe only one prior study has investigated the association between social capital and time of entry into antenatal care, but this study was limited to two cities [38]. As this research was conducted in Brazil, the results cannot be extrapolated to the Dutch setting as the structure of the respective populations and the health care systems differ considerably. Also, the Brazilian study did not take account of ethnic minority density.

There are also a number of limitations in this study. Due to the retrospective nature of the data no inferences could be made on causation, only on associations. The use of a dichotomous variable for ethnicity is both a strength and a weakness. As described in the methods section, it is less misclassified than the multiple categories in the Dutch Perinatal Registry. Yet, collapsing ethnicity into a dichotomous variable leads to grouping women together from heterogeneous backgrounds and with different health behaviors. Therefore the identification of different underlying mechanisms for different ethnic groups is not possible within this study. Moreover, in this study we did not have information on the migrant status of women. Although non-Western ethnicity is often associated with language barriers and lower health literacy levels, time spent in the 'host' country and the degree of acculturation influence health care behavior [39, 40]. Despite the lack of data on ethnic groups and migrant status, we hope to have shown with our study that 'ethnicity' can be beneficial and is not merely a risk factor.

The Netherlands Perinatal Registry database only contains information on individual births. Therefore we were unable to account for clustering of births within mothers. It is conceivable that mothers repeated their health care behavior (that is: time of entering care) across their consecutive pregnancies. Moreover, we were not able to control for certain maternal factors that have been associated with late entry into care in previous studies, such as an unwanted pregnancy, illicit drug use, individual socioeconomic status, level of education and language proficiency [6, 7]. Research in an urban group of Dutch pregnant women showed that 0.5% of them continued using illicit drugs throughout pregnancy [20]. A little less than six percent of pregnancies in the Netherlands are unwanted, of which only a part is carried to term [41]. Based on these figures, unwanted pregnancies and illicit drug use are only present in a small portion of the population and are therefore less likely to have an important impact on our findings.

Future recommendations

This study shows that place of residence and ethnic background matter for antenatal health care use in the Netherlands. Future research could concentrate on teasing apart the beneficial mechanisms within areas of high ethnic minority density leading to early entry into care (i.e. information sharing, financial support or other factors). Moreover, our results suggest that strategies to improve timely entry into care could seek to create change at the neighborhood level (i.e. increase social bonding) in order to target individuals likely of entering care too late.

Also the relative disadvantage of Western women living in areas of high ethnic density needs to be considered, interventions should also focus on Western women living in these areas.

APPENDIX

See this (private) link for Appendix 3.1:

<http://www.verascholmerich.com/appendix/>

REFERENCES

1. Rowe, R.E., et al., *Social and ethnic differences in attendance for antenatal care in England*. Public Health, 2008. **122**(12): p. 1363-72.
2. Trinh, L.T. and G. Rubin, *Late entry to antenatal care in New South Wales, Australia*. Reprod Health, 2006. **3**: p. 8.
3. Chote, A.A., et al., *Ethnic differences in antenatal care use in a large multi-ethnic urban population in the Netherlands*. Midwifery, 2011. **27**(1): p. 36-41.
4. Raatikainen, K., N. Heiskanen, and S. Heinonen, *Under-attending free antenatal care is associated with adverse pregnancy outcomes*. BMC Public Health, 2007. **7**: p. 268.
5. Vassy, C., S. Rosman, and B. Rousseau, *From policy making to service use. Down's syndrome antenatal screening in England, France and the Netherlands*. Soc Sci Med, 2014. **106**: p. 67-74.
6. Feijen-de Jong, E.I., et al., *Determinants of late and/or inadequate use of prenatal healthcare in high-income countries: a systematic review*. Eur J Public Health, 2012. **22**(6): p. 904-13.
7. Boerleider, A.W., et al., *Factors affecting the use of prenatal care by non-western women in industrialized western countries: a systematic review*. BMC Pregnancy Childbirth, 2013. **13**: p. 81.
8. Alderliesten, M.E., et al., *Late start of antenatal care among ethnic minorities in a large cohort of pregnant women*. BJOG, 2007. **114**(10): p. 1232-9.
9. Heaman, M.I., et al., *Social inequalities in use of prenatal care in Manitoba*. J Obstet Gynaecol Can, 2007. **29**(10): p. 806-16.
10. Perloff, J.D. and K.D. Jaffee, *Late entry into prenatal care: the neighborhood context*. Soc Work, 1999. **44**(2): p. 116-28.
11. Schölmerich, V.L., et al., *The association of neighborhood social capital and ethnic (minority) density with pregnancy outcomes in the Netherlands*. PLOS ONE, 2014. **9**(5): p. e95873.
12. Becares, L., D. Cormack, and R. Harris, *Ethnic density and area deprivation: neighbourhood effects on Maori health and racial discrimination in Aotearoa/New Zealand*. Soc Sci Med, 2013. **88**: p. 76-82.
13. Bosqui, T.J., K. Hoy, and C. Shannon, *A systematic review and meta-analysis of the ethnic density effect in psychotic disorders*. Soc Psychiatry Psychiatr Epidemiol, 2014. **49**(4): p. 519-29.
14. Poortinga, W., *Social relations or social capital? Individual and community health effects of bonding social capital*. Soc Sci Med, 2006. **63**(1): p. 255-70.
15. Szreter, S. and M. Woolcock, *Health by association? Social capital, social theory, and the political economy of public health*. Int J Epidemiol, 2004. **33**(4): p. 650-67.
16. Berkman, L.F.a.K., I., , *Social Epidemiology*. 2000: Oxford University Press.
17. Lin, N., *Social Capital: A Theory of Social Structure and Action* 2002: Cambridge University Press.

18. Ferlander, S., *The Importance of Different Forms of Social Capital for Health*. Acta Sociologica, 2007. **50**(2): p. 115-128.
19. St Clair, P.A., et al., *Social network structure and prenatal care utilization*. Med Care, 1989. **27**(8): p. 823-32.
20. Timmermans, S., et al., *Individual accumulation of heterogeneous risks explains perinatal inequalities within deprived neighbourhoods*. Eur J Epidemiol, 2011. **26**(2): p. 165-80.
21. de Graaf, J.P., et al., *Living in deprived urban districts increases perinatal health inequalities*. J Matern Fetal Neonatal Med, 2013. **26**(5): p. 473-81.
22. Van Huijsduijnen JH, V.T., R. J., Verhoog, E., Gopal, K., Ferment, B., & Van Galen, J., *WoON 2006 Onderzoeksdocumentatie - Module Woningmarkt*. [WoOn 2006 documentation of the housing demand survey - Module housing market]. 2006.
23. Mohnen, S.M., et al., *You have to be there to enjoy it? Neighbourhood social capital and health*. Eur J Public Health, 2013. **23**(1): p. 33-9.
24. Poeran, J., et al., *Social deprivation and adverse perinatal outcomes among Western and non-Western pregnant women in a Dutch urban population*. Soc Sci Med, 2013. **83**: p. 42-9.
25. Amelink-Verburg, M.P. and S.E. Buitendijk, *Pregnancy and labour in the Dutch maternity care system: what is normal? The role division between midwives and obstetricians*. J Midwifery Womens Health, 2010. **55**(3): p. 216-25.
26. van Eyck, J., et al., *[Tertiary obstetric care: the aims of the planning decree on perinatal care of 2001 have not yet been achieved] Derdelijns verloskundige zorg: doelstellingen van het 'planningsbesluit bijzondere perinatologische zorg' uit 2001 nog niet gehaald*. Ned Tijdschr Geneesk, 2008. **152**(39): p. 2121-5.
27. Amelink-Verburg, M.P., et al., *Evaluation of 280,000 cases in Dutch midwifery practices: a descriptive study*. BJOG, 2008. **115**(5): p. 570-8.
28. Snijders T., a.B., R., *Multilevel modeling: An introduction to basic and advanced multilevel modeling*. 1999.
29. Merlo, J., et al., *A brief conceptual tutorial of multilevel analysis in social epidemiology: linking the statistical concept of clustering to the idea of contextual phenomenon*. J Epidemiol Community Health, 2005. **59**(6): p. 443-9.
30. Uiters, E., et al., *Use of health care services by ethnic minorities in The Netherlands: do patterns differ?* Eur J Public Health, 2006. **16**(4): p. 388-93.
31. Derose, K.P., J.J. Escarce, and N. Lurie, *Immigrants and health care: sources of vulnerability*. Health Aff (Millwood), 2007. **26**(5): p. 1258-68.
32. Cubbin, C., et al., *Is neighborhood deprivation independently associated with maternal and infant health? Evidence from Florida and Washington*. Matern Child Health J, 2008. **12**(1): p. 61-74.
33. Crowder, K.S., S.J., *Race, Class, and Changing Patterns of Migration between Poor and Nonpoor Neighborhoods*. American Journal of Sociology, 2005. **110**(6): p. 1715-1763.
34. McKenzie, K., R. Whitley, and S. Weich, *Social capital and mental health*. Br J Psychiatry, 2002. **181**: p. 280-3.

35. Pickett, K.E. and R.G. Wilkinson, *People like us: ethnic group density effects on health*. Ethn Health, 2008. **13**(4): p. 321-34.
36. Larson, E.H., L.G. Hart, and R.A. Rosenblatt, *Is non-metropolitan residence a risk factor for poor birth outcome in the U.S.?* Soc Sci Med, 1997. **45**(2): p. 171-88.
37. Derose, K.P. and D.M. Varda, *Social capital and health care access: a systematic review*. Med Care Res Rev, 2009. **66**(3): p. 272-306.
38. Leal Mdo, C., et al., *The relationship between social capital, social support and the adequate use of prenatal care*. Cad Saude Publica, 2011. **27 Suppl 2**: p. S237-53.
39. Arcia, E., et al., *Models of acculturation and health behaviors among Latino immigrants to the US*. Soc Sci Med, 2001. **53**(1): p. 41-53.
40. Landrine, H. and E.A. Klonoff, *Culture change and ethnic-minority health behavior: an operant theory of acculturation*. J Behav Med, 2004. **27**(6): p. 527-55.
41. Bakker, F.d.G., H.; de Haas, S.; Kedde, H.; Kruijer, H.; & Wijsen, C. , *Seksuele Gezondheid in Nederland 2009 [Sexual Health in the Netherlands 2009]*. 2009, Rutgers Nisso Groep: Utrecht.



Chapter 4



**Caught in the middle? How
women deal with conflicting
pregnancy-advice from
health professionals and
their social networks**

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ABSTRACT

The Netherlands is home to one of the highest recorded disparities in birth outcomes in developed countries. Improving pregnancy-related behaviors is therefore a primary policy concern. However, current health promotion interventions show disappointing effectiveness, which has been attributed to a limited understanding of how people's health behaviors are influenced by their social environments.

In this study we aimed to contribute to the current understanding of women's pregnancy-related behavior. We did this by highlighting how theoretical and methodological contributions from the field of sociology could contribute to the mainstream approaches to understanding (pregnancy-related) health behaviors within public health. For this analysis we interviewed 40 women who were pregnant or had recently given birth, had a low socio-economic status, had a Moroccan, Turkish or Dutch background and lived in Rotterdam, the Netherlands. We were particularly interested in exploring how women's pregnancy-related behavior was influenced by the advice they received.

By using a qualitative study design, we were able to sketch how the behavior of women with a Turkish/Moroccan background is not only contingent on their specific relationships with health providers and their social networks, but also on how the norms and advice of these two groups are (mis)aligned. This misalignment created dilemmas for our respondents, who were "caught in the middle". They employed different strategies to deal with these dilemmas, reflective of varying degrees of agency: avoiding, embracing and resolving the dilemma. Lastly, we were also able to show how the influence of the social network of respondents with a Turkish/Moroccan background was not solely a barrier or facilitator to healthy behavior, but actually both. Based on our findings, we suggest not only viewing these women's social networks as a barrier but also as a facilitator to healthy behaviors, and structurally involving members of these networks in health promotion interventions.

INTRODUCTION

International studies have found high rates of inequality between birth outcomes across wealthy and impoverished neighborhoods (Vos, Posthumus, Bonsel, Steegers, & Denktas, 2014). The highest recorded disparities in birth outcomes in any developed country have been found in Rotterdam, the Netherlands (Poeran, Denktas, Birnie, Bonsel, & Steegers, 2011). In the second largest city of the Netherlands, perinatal mortality (deaths from 22 weeks of gestation until 7 days postpartum) ranges from 2 to 34 per 1,000 births across more or less affluent neighborhoods (Poeran et al., 2011).

Reducing these health inequalities is a primary concern for the Dutch government. Besides attempts to improve the antenatal health care system, efforts to influence health behaviors of women before, during and after their pregnancy are central to this concern (“Een goed begin, veilige zorg rond zwangerschap en geboorte [A good start, safe care for pregnancy and birth. Advice of the Committee on Good care during pregnancy and child birth],” 2009). Commonly cited adverse health behaviors include late initiation of antenatal care, inadequate usage of antenatal care, or consumption of alcohol, tobacco and drugs (Boerleider, Wiegers, Mannien, Francke, & Deville, 2013; Chote et al., 2011; Timmermans et al., 2011). Internationally, and also in the Netherlands, interventions attempting to modify health behaviors typically show disappointing results (Huang & Glass, 2008; Moore, de Silva-Sanigorski, & Moore, 2013; van den Berg et al., 2010). Several studies have attributed this lack of effectiveness to a limited understanding of health behaviors within public health research (Glass & McAtee, 2006; Krumeich, Weijts, Reddy, & Meijer-Weitz, 2001).

In this study we aim to contribute to the current understanding of women’s pregnancy-related behavior and to provide suggestions for improving intervention design. To do this, we studied members of a group of women that tend to show particularly adverse birth outcomes in the Netherlands, namely women of low socio-economic status living in the most deprived neighborhoods in Rotterdam, the Netherlands. We were especially interested in exploring how these women dealt with the pregnancy-related advice that they received, and how this influenced their pregnancy-related behavior.

In this paper we use the social-ecological perspective as the starting point of our analysis. This perspective takes explicit account of how individuals are embedded in environments. To further improve our understanding of our respondent’s health behaviors, we integrated sociological perspectives into our analysis. Following Giddens’ (Giddens, 1984) perspective on structure-agency dynamics, we explored how environmental influences can be both

constraining and enabling on health behavior, and to what extent individuals have agency within these constraints. Moreover, by adopting a qualitative study design, we could inductively identify which (interaction of) environmental influences shaped our respondent's health behaviors. In the section below, we outline the mainstream approaches to understanding behavior within public health and the contributions from the sociological perspectives to our study in more detail.

Background

Mainstream public health approaches to understanding health behaviors

Public health research is currently informed by two major theories: the social psychological and the social-ecological models (Burke, Joseph, Pasick, & Barker, 2009). Social psychological theories focus on intrapersonal (i.e. individual-level) characteristics that influence behavior, such as attitudes or health literacy, and only pay limited attention to environmental influences. In contrast, the social-ecological perspective places stronger emphasis on how human behavior is shaped a plethora of environmental influences (e.g. accessibility of local health care, support from social network) (Bronfenbrenner, 1977; McLeroy, Bibeau, Steckler, & Glanz, 1988). More specifically, they depict the various environmental influences as located on various levels. These levels are nested into each other, and form a hierarchy. McLeroy (McLeroy et al., 1988) was one of the first to develop such a model, which includes the following levels: individual, interpersonal, organizational, community and policy.

Social-ecological models have become increasingly popular in the realm of public health (Golden & Earp, 2012). By including the role of context, the social-ecological perspective helps to prevent “blaming the victim” by showing that individuals do not have complete control over their own health-behavior and therefore cannot simply be blamed for not following lifestyle advice (Richard, Gauvin, & Raine, 2011; Willows, Hanley, & Delormier, 2012).

Shortcomings of these mainstream public health approaches

In line with sociological perspectives, socio-ecological models commonly emphasize that human behavior can only be understood by taking a complex interaction of multiple influences into account (Sallis & Owen, 2008; Stokols, 1996). However, applications of these models are commonly limited to studying *dyadic* relationships (i.e. between A and B). The study of Willows and colleagues (Willows et al., 2012), which applies a socio-ecological

framework to understand weight gain in children, is an example of this. Willows et al. sketch various dyadic relationships, such as the relationship between the “school food and physical activity environments” (community level) and “peer and family support for active living and healthy foods” (interpersonal level). Triadic relationships, i.e. relationships including three or more levels, are not considered (also see, for example, Ettner & Grzywacz, 2001; Raneri & Wiemann, 2007).

As a recent review of studies on factors affecting the use of antenatal care shows, the focus on studying dyadic relationships is widespread in public health research (Boerleider, Wieggers, et al., 2013). The studies in this review were inspired by different theoretical tenants, including the social-ecological models and social-psychological theories, whilst other studies lacked a specified theoretical basis. Regardless of theoretical orientation, the studies mostly consider dyadic relationships between, for instance, pregnant women and their health care providers, or pregnant women and their social network. We argue that perspectives on health behaviors that are limited to dyadic relationships risk overseeing other potentially important influential factors, which might be useful for informing intervention design.

Another possible shortcoming in the current mainstream public health approaches can be found in the classification of factors influencing health behavior as either ‘barriers’ or ‘facilitators’ to adequate antenatal care usage (see for example Boerleider, Wieggers, et al., 2013; Foets, Suurmond, & Stronks, 2007). Such a classification is made explicit in social psychological theories (Andersen, 1995; Foets et al., 2007), and not specified in the social-ecological models. In contrast to a dual classification, Giddens (Giddens, 1984) demonstrated that the very same societal structures can both enable and/or constrain human behavior. For example, being a member of a social group might come with several advantages, such as strong social support, which could enable individuals to pursue their goals. At the same time, social groups might also place constraints on their members, for instance by enforcing strict social norms. It should be noted that while Giddens envisioned people as influenced by their environments, he also accredited people as having a certain degree of agency, i.e. the capacity to act in various ways (which might also go against the constraints they face).

Due to the above-mentioned shortcomings, current public health research risks sketching a limited picture of the complex individual-environmental interactions that ultimately shape health behavior, and simplifying environmental influences as either barriers or facilitators of healthy behavior. In the following sections we attempt to empirically demonstrate a more nuanced view on health behavior.

METHODS

Respondents

This study investigated the experiences of women who were pregnant, or had given birth within the last 12 months. The respondents of this study had a low socio-economic background and lived in the most impoverished neighborhoods (Ministerie van VROM/WWI, 2007) in Rotterdam, which is the second largest city of the Netherlands.

During the recruitment of women for this study, we made use of purposive sampling. This means that we attempted to interview women reflecting important segments in these diverse neighborhoods (see Table 4.1 for an overview of their characteristics). We included women of Moroccan and Turkish background as they belong to the largest non-Western minority groups in the Netherlands. Moreover, we attempted to talk to women who varied in terms of the following criteria: a) living situation (living with in-laws or not) b) employment status c) ethnic minority status (1st or 2nd generation) d) number of children and e) age (between 20-45). We have excluded women younger than 20 and older than 45 as well as women undergoing IVF treatment. This is because we expect that such pregnancies represent a different set of experiences and challenges. The criteria outlined above were developed on the basis of discussions with our seven key informants, who were community health workers active in promoting reproductive health in our targeted neighborhoods. They had extensive contacts in these neighborhoods and were active there on a daily basis. As further outlined below, our key informants were involved in the recruitment phase of this project, provided many informal interviews and were also consulted during the data analysis phase.

Recruitment strategy

We employed three main strategies for recruiting respondents. For one, the researchers involved (see below for more information) visited different venues: a) pre-schools and elementary schools (during parent-teacher meetings), b) mosques c) neighborhood community centers and d) Turkish and Moroccan women's associations. Next to this, one of our research assistants was able to recruit several native Dutch women in her indirect network via social media. We then used the 'snowballing' method by asking the already recruited respondents to provide contact details of other possibly interested women (Saunders, Saunders, Lewis, & Thornhill, 2011).

Table 4.1 Overview of the respondent's characteristics

| Respondents | Nr of respondents | Number of respondents living with in laws | Number of employed respondents | Migration history (first/ second generation) | Nr of child- Ren (range) | Age (range) | Time frame |
|----------------------------------|-------------------|---|--------------------------------|---|-----------------------------|-------------|---|
| Women with a Turkish background | 12 | 4 | 4 | 6 women 1 st generation, 6 women 2 nd generation | 0 (pregnant)-5 | 23-39 | March – April 2012 |
| Women with a Moroccan background | 16 | 3 | 5 | 9 women 1 st generation, 7 women 2 nd generation | 0 (pregnant)-4 | 20-40 | March – April 2012 (round 1); March – May 2013 (round 2) |
| Native Dutch women | 12 | 0 | 6 | N/A | 0 (pregnant)-2 | 22-40 | April – June 2013 |

Interviews

We conducted semi-structured interviews with 12 women with a Turkish background, 16 women with a Moroccan background and 12 native Dutch women. The interviews lasted between 40-60 minutes. At the beginning of each interview, we explained to the respondents that we were interested in their experiences surrounding their pregnancy. With the permission of the respondents, all interviews were tape-recorded. These were then subsequently transcribed, and included interviewer's notes on non-verbal communication, moments of silences during the conversation and general impressions of the respondents. Afterwards, the audiotapes were deleted. We also informed the respondents that any identifying information from the interview (such as their names or addresses) would not be transcribed. In this article, all of the names of the respondents have been changed to protect their anonymity. Ethical approval for such a study is not necessary in the Netherlands.

The first author and four research assistants conducted the interviews. One of the research assistants interviewing women with a Moroccan background is Dutch and has a Moroccan background. All of the other research assistants are native Dutch, and the first author is a Dutch-speaking German. All interviews were conducted in Dutch. For a total of five interviews, a friend of the respondent or a key informant acted as translator. The interviewers prepared for the interviews by extensively talking to our key informants and visiting their health promotion sessions in poor neighborhoods in Rotterdam. Moreover, during the recruitment phase the interviewers spent time at local gathering points of the respondents. This allowed them to become more familiar with the respondent's social environment.

The final interview protocol (see Appendix 4.1) focused on the various types of pregnancy-related advice the respondents received and solicited, and their relationships with health care professionals and their social network. As stated in the introduction, one of the goals of this study was to conduct a social-ecological analysis of our respondent's health behavior. To keep this study focused, we only included questions about the relationships with health professionals and the social network. It should be noted that a more complete social-ecological analysis would include a larger range of potential influences, such as neighborhood social cohesion.

Following Glaser & Strauss (Glaser & Strauss, 1967), we adapted our interview protocol slightly as the interviews proceeded. This allowed us to conduct interviews that were increasingly relevant to the emerging theory. A key change in the protocol is that we initially only asked questions strictly pertaining to the pregnancy-phase, but then extended this to

include the caretaking of young infants. This is because our respondents were mentioning many interesting stories that occurred during this phase that could potentially help strengthen our emerging theory. The final version of the interview protocol can be found in Appendix 4.1.

During and after the interview phase, we applied member-checking to increase the quality of our data collection and analysis. We organized three focus groups sessions with a selection of the respondents (4-5 respondents per session). Moreover, we were in constant contact with our seven key informants. These efforts allowed us to report our general interpretations, and check if they aligned with the impressions of our respondents and key informants. Next to member-checking, we also made use of 'peer debriefing'. This means that consultations were held throughout the data collection/analysis phase between the first author and the other authors, which were not involved in this phase of the study. Following Corley and Gioia (Corley & Gioia, 2004), these consultations were used to discuss emerging patterns in the data and evolving propositions, as well as solicit critical questions regarding the steps taken.

Data analysis

We applied an inductive analysis technique, closely following the 'Gioia method' (Gioia, Corley, & Hamilton, 2013). This is a systematic method for moving from raw data to aggregate dimensions (Figure 4.1). In a first step, the interviews were manually coded using open coding. Recognizing patterns between and among the coded sections allowed us to compile a number of first order (informant-centric) terms. This step is also referred to as 'axial coding' (Gioia et al., 2013). Here, we tried to remain very close to the original statements of our respondents. In a next step, we organized the first order terms into second order (theory-centric) themes. Finally, the second order themes were distilled into overarching theoretical dimensions.

One major advantage of creating a data structure is that it facilitates a systematic analysis of the collected data, including theory articulation, and also enables a clear demonstration of how the data was interpreted. In this pursuit, we considered the relationships between the second order concepts and the aggregate dimensions, leading to a conceptual model (see Figure 4.2 in the 'Findings' section). At the same time, we consulted the literature to refine the development of emergent concepts and relationships present in our model.

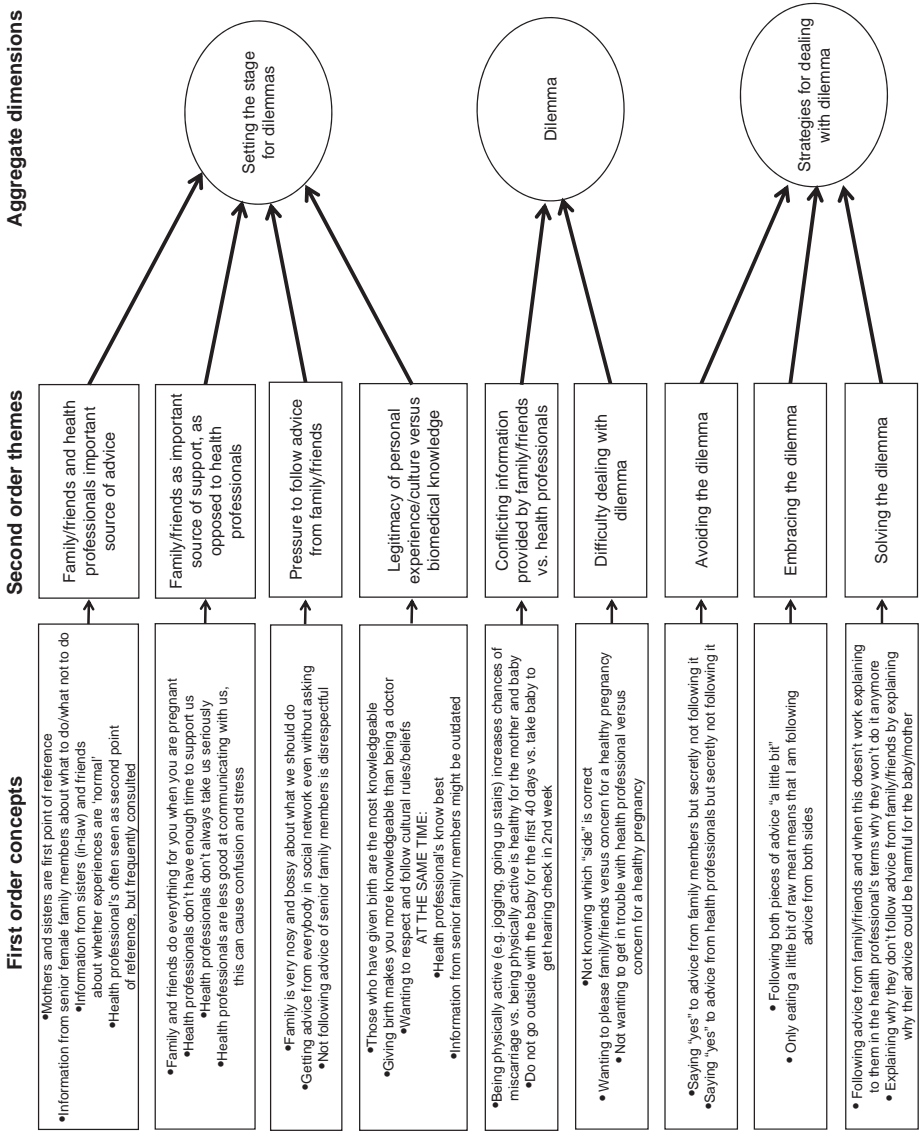


Figure 4.1 Data structure.

FINDINGS

In this section, we first turn to the findings of our interviews with women from a Moroccan or Turkish background. Following the Gioia method, we have presented these findings in a conceptual model (Figure 4.2). As indicated by this model, the respondents were situated in a triangle consisting of their health professionals and social networks of family/friends. These social networks were typically an important source of support *and* advice regarding health behaviors. The respondents expressed often feeling pressured to follow this advice. The women's community midwife/obstetrician or another health professional provided a second source of advice, but was not a source of support. With the two arrows at the top of the model we indicate that the advice provided by family/friends and health professionals were sometimes misaligned. At the same time, both 'sides' enjoy a certain degree of legitimacy:

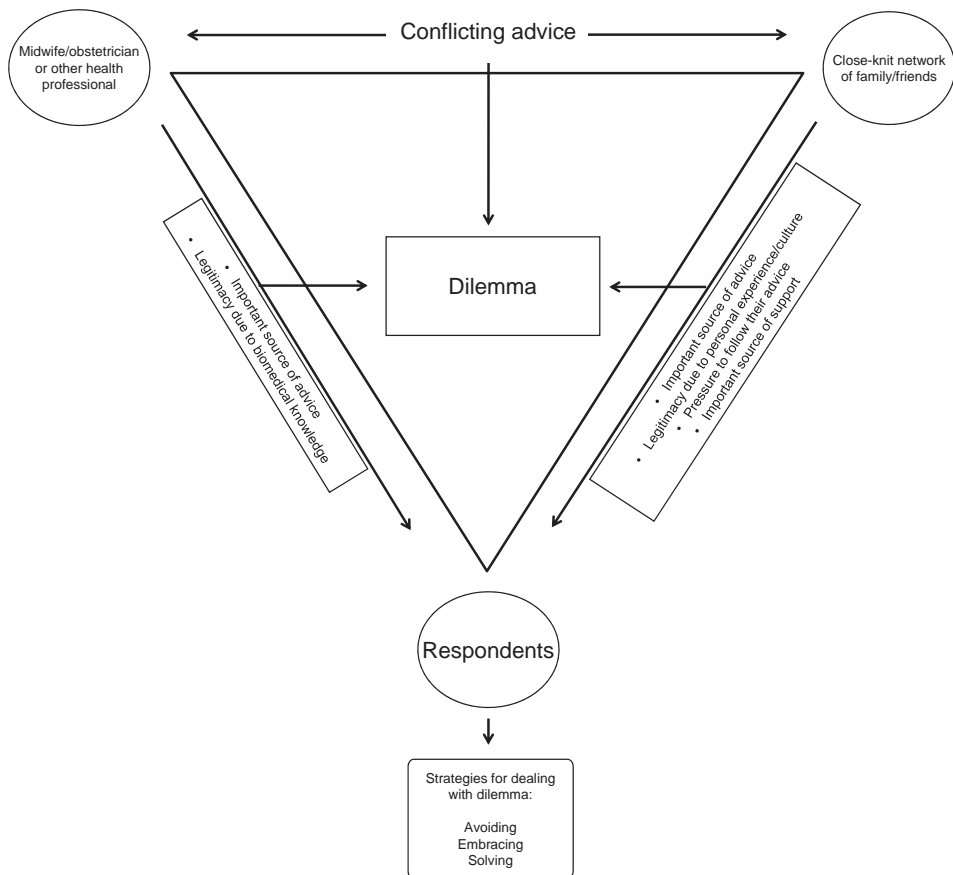


Figure 4.2 Conceptual model.

family and friends have the advantage of having personal experience and referring to “the way things are done in this culture”, while health professionals are valued because they possess biomedical knowledge and received years of training. As a result, the women in our study found themselves in between two ‘sides’ that expressed conflicting norms and ideas about adequate behavior around pregnancy. The respondents were faced with a dilemma as they wanted to please both sides, but were confronted with contradictory pieces of advice. In this study we found that women employed different strategies to deal with this dilemma: a) avoiding the dilemma (secretly not following the advice of one side), b) embracing the dilemma (combining conflicting advice), c) resolving the dilemma (communicating between both sides).

Our interviews with native Dutch women revealed that they were not faced with such dilemmas, even though they were similar to the non-native respondents in many respects. Their social network also seemed to be highly homogeneous, and about half of the native Dutch women were unemployed. Another commonality was that many of these respondents also faced conflicting information coming from health professionals and their social network. For example, Kim explained:

“I mean it has been such a long time ago for them. Everything is a bit expired. You did not have all those rules back then! Sometimes they said: “Child, why are you so hard on yourself?” Back then you could do almost everything. It was even recommended to drink a glass of wine.”

Kim went on to explain that she would just “ignore this advice”, which illustrates the native Dutch women’s typical reactions to conflicting advice coming from their social network. None of the native Dutch respondents reported feeling an inclination or an obligation to (pretend to) respect and adhere to the advice provided by their social networks. This was particularly the case for older members of their network, which were accredited with having ‘out-dated’ and ‘old-fashioned’ information. Members of their social networks that were of the same generation and had experience with pregnancies were regularly consulted, but not seen as giving binding advice, and health professional’s advice was typically trusted more.

In the remainder of this section, we explain the findings represented in Figure 4.2 in more detail. Please note that the findings below only pertain – unless specifically stated – to respondents with a Turkish or Moroccan background.

Setting the stage for dilemmas: the role of women's social network and health professionals

When asked from whom they had received or solicited advice regarding pregnancy-related behavior, the respondents with a Turkish/Moroccan background unanimously stated two groups: a) extended family and a few friends and b) health professionals, typically a community midwife and/or obstetrician, and sometimes also the GP or a postnatal caregiver. Referring to the former group, the respondents explained that the extended family and the handful of friends typically all knew each other. As most of the respondents were unemployed, they did not have contact with any colleagues. Furthermore, respondents indicated that the people in their network were all “similar to each other”. Indeed, they were from the same type of neighborhoods, mostly had a high-school-level education, and were first or second generation Moroccan or Turkish women. These features mean that the respondents were embedded in relatively small, homogeneous and close-knit networks.

Without an exception, the respondents emphasized that their social network was an important source of social support, particularly during the time of pregnancy and after giving birth. Women described family members coming over daily with food, driving women to all of their check-ups with the midwife, or spending many nights at their homes during the first weeks after childbirth. The women we talked to explained this support as “a part of their culture”. The social network of the women seemed to also be an important source of advice. All women indicated that their mothers and sisters were their first reference point for any questions they had surrounding pregnancy and taking care of infants. Mothers were generally contacted for questions about what to do and what not to do. Sisters, and to a lesser extent friends – provided that they had already been pregnant – were asked about whether their experiences were ‘normal’. Often, the respondents indicated that health professionals were seen as a second point of reference, in case their network did not provide satisfying advice. Nadia explains the following:

“Usually I am just like, I always call my older sisters. And if they are like hmmm... And then if I am still really doubting, then I call the midwife.”

The quote above illustrates that health professionals were often a second point of reference. While community midwives and obstetricians were seen as sources of advice, they were not typically seen as sources of support. A commonly heard complaint was that these professionals “don’t always take us seriously [...] they are always so rushed, and don’t take enough time”. Particularly first generation women reported communication problems and

language barriers with midwives and/or obstetricians, which was coupled with confusion and stress on behalf of the respondents.

While the respondents described how they regularly reached out to close female family members and friends for consultations, they also reported regularly receiving unsolicited advice from their extended family. This involvement was often described as “bossy”, as the advice was typically not optional, but formulated in compulsory terms: “you are not allowed to go jogging”. Speaking about her mother, Amina explains that:

“She will totally get involved, you have to do that, don’t do that, this is not good, you have to do it this way. This is what I did, you have to also do it like that.”

The quote above illustrates a key assumption made by our respondents and those in their network: personal experience – “having been there” – is a primary source of legitimacy for knowledge. This means that a woman’s degree of legitimacy was increased according to the number of children one has had. As a consequence, older generations of mothers and mothers-in-law – which typically had more children than younger generations – were accredited with higher levels of knowledge: “My mother had five children, you know, I only have two, who am I then to say that I know better than her?”. While many of our respondents stated feeling overwhelmed by constantly being told what to do, they also noted that it was “disrespectful” not to follow the advice of experienced family members, particularly senior family members.

We found that there was an additional source of legitimacy for providing behavioral advice. Both our respondents and – according to their accounts – the people in their networks explained that certain pieces of advice were legitimate because they were an expression of a “cultural” or “religious belief”, sometimes referring to the Koran, e.g. “babies should be washed right after birth, it says so in the Koran, and that is just the way we do it”. During our research we did not come across instances where pieces of advice legitimized by “culture” or “personal experience” contradicted each other. Rather, references to advice on the basis of “this is just how we do it” were made by people who have not had children yet (and logically could not refer to their own experience), or it was used as an additional argument: “I also did it this way, and this is just the way we do it”.

The respondents did not only attribute legitimacy to the advice coming from their social networks, but also from their health professionals. Health professionals’ legitimacy was related to their professional experience and the education they had received. Most importantly, health professionals’ advice was seen as legitimate because it was “up-to-date”,

while the advice of the older generations might not be. We noticed that many respondents made contradicting statements when comparing the legitimacy of the advice between health professionals and their network. They explained that personal experience was more important than biomedical training, but during other parts of the interview stated that “health professionals know best”.

Dilemmas

During our interviews, our respondents mentioned situations where advice from health professionals and their social network were usually aligned – the most commonly noted form of advice being taking folic acid. However, they also provided countless examples of contradicting advice provided by these two groups. These included:

- Drink Moroccan herbal tea to support getting pregnant vs. these teas may induce miscarriages
- Being physically active (e.g. jogging, going up stairs) increases chances of miscarriage vs. being physically active is healthy for the mother and baby
- Do not go outside with the baby for the first 40 days after birth vs. take baby to get a hearing check in the second week after birth
- It is not necessary to have a postnatal caregiver to come to your house after birth versus it is really important to have them come over for the health of your baby
- Pregnant women should eat whatever they crave for, including raw meat, which is OK for pregnancies versus avoid all raw meats during pregnancy as it endangers the pregnancy
- To avoid the “evil eye”, it is better not to go to the midwife too early (sometimes the second trimester is indicated as a better moment in time) versus it is important to enter into care during the first trimester

Many of the respondents reported having difficulty dealing with the conflicting information provided by their family/friends and health professionals. Women explained that in some instances, they just did not know which “side was correct”. Here, “being correct” was interpreted as being best for their own health and that of their pregnancy/baby. In other instances, women felt that they had a “hunch”, or knew which “side was correct”. Either way, our respondents were faced with a dilemma. Health professionals and family/friends were telling them to do seemingly mutually incompatible things. Choosing for one “side”

seemingly also meant choosing not to follow the advice of the other side, with possible social consequences. As stated above, going against the advice of senior female family members would be disrespectful. Moreover, women also reported feeling “strange” and “scared” about the idea of not following cultural customs. To a lesser extent, women also reported not wanting to “get in trouble” with their midwife/obstetrician. The emotional burden of wanting to do what is best for their pregnancy/baby made the dilemma of wanting to please both sides even more poignant. Referring to these three types of situations, the interviewees reported experiencing feelings such as ‘like they were going crazy’, “confused” and “tired”.

Strategies for dealing with the dilemmas

In this last section, we describe the strategies that women employed in order to deal with their dilemmas. We have characterized these strategies as avoiding, embracing or resolving the dilemma. It should be noted that – based on their accounts during the interviews – most women tended to opt for one type of strategy for most if not all of the dilemmas they faced.

Avoiding the dilemma: secretly not following the advice of one side

We found that some respondents dealt with dilemmas by telling both “sides” that they were following their advice, and then secretly just following one of the sides’ advice. This strategy – if implemented successfully – avoids the potential conflict that could result from openly choosing for one side. Nadia explains:

“Well yeah, they [the parents-in-law] were like, you shouldn’t be jumping around and stuff, because I heard from [the midwife] that you could be pregnant and still go to the fitness center. [...] To be polite to my mother-in-law I would then say thanks, but at the same time I thought... those are just fairy tales... [...] I listen to it but beyond that I don’t do anything with it [the advice].”

While most illustrations of this strategy pertained to women openly accepting but secretly not following the advice of their family/friends, we also found instances of women secretly not following the advice of their health professionals. These situations included not following advice regarding how much formula infants should be given, and getting “enough” exercise.

Embracing the dilemma: combining conflicting advice

Another strategy that we found was that women combined seemingly contradictory pieces of advice. This means that they tried to adhere to both forms of advice, typically by 'doing a little bit of both'. We found particularly many illustrations of this strategy with respect to the realm of the consumption of raw meat. Respondents explained that people in their network emphasized that women who are pregnant should eat whatever they crave for because not doing so would be bad for the baby in the womb. This stands in stark contrast with the advice given by health professionals to avoid raw meat during pregnancy as its consumption poses a risk for the pregnancy. Several respondents mentioned that they consumed "a bit" of raw meat during their pregnancy. It should be noted health professionals would plausibly not consider eating 'just a little bit' of raw meat as compliant behavior. However, this was the way the respondents seemed to view it. As Keya stated: "Yes I do listen to the community midwife, but also to my family, because I just eat a tiny bit, almost nothing actually".

Resolving the dilemma: communicating between both sides

A final strategy that we found was attempts to resolve the dilemma by facilitating communication between both sides. In these instances, women used bio-medical explanations to explain to their family/friends why they chose to act in a certain way, while highlighting that this was good for their health and that of the pregnancy/baby. For example, Saida described how her mother had told her to put olive oil on her son's umbilical cord. However, her postnatal caregiver did not agree with this:

"Then the [postnatal caregiver] said neeeeeeeeever do that again, she says, because olive oil, that makes it softer, and the umbilical cord, that has to actually become hard, because then it will fall off easier. So you shouldn't always use the advice of your family, then I was like OOPS [...] My mother came the next day and then I was like, well, I shouldn't have gone for the olive oil, I got in trouble from postnatal caregiver, because she said you had made it softer! But luckily [reporting this to my mother] was not a problem."

While we did find instances of women engaging in this third strategy, it should be noted that – at least in our sample – these were only women who were second-generation migrants, were not living with their in-laws, and already had at least one child. Interestingly, women who communicated across both sides occasionally stated that while doing so they emphasized their personal experience of pregnancy and childrearing. As outlined earlier, having experience with pregnancy/child birth is seen as a source of legitimacy in the networks of the respondents.

DISCUSSION

In this study we attempted to contribute to the current understanding of women's pregnancy-related behavior and to provide suggestions for improving intervention design. By using an inductive study design, we were able to inductively identify the most important sources of pregnancy-related advice for our respondents with a Dutch/Moroccan background, namely health professionals and family/peers. This study design also allowed us to sketch how their behavior was not only contingent on their specific relationships with health providers and their social networks, but also on how the norms and advice of health professionals and their social networks were (mis)aligned. Likewise, the respondent's pregnancy-related behaviors were also dependent on their own agency to deal with possible misalignments. Lastly, following Giddens (Giddens, 1984), we were also able to show how the influence of family/peers was not solely a barrier or facilitator to healthy behavior, but actually both.

Studying triadic relationships

As outlined in the introduction, most public health research – including the social-ecological approach – on (pregnancy-related) behavior seems to primarily focus on studying dyad relationships, such as the relationship between clients and their health care providers. Indeed, studies in the Netherlands have found that non-Western ethnic minority clients can experience cultural differences and language barriers when in contact with health professionals (Boerleider, Francke, Mannien, Wiegers, & Deville, 2013; Suurmond, Seeleman, & Stronks, 2007). Similarly, many of the respondents of this study with a Moroccan or Dutch background reported having less trust in the formal health care system and complained about communication/language problems with health professionals.

In a study on family planning care, Guendelman et al. (Guendelman, Denny, Mauldon, & Chetkovich, 2000) studied two dyadic relationships, namely between women and their health professionals, as well between women and their social network. When comparing these two relationships, they concluded that minority women tend to trust and rely more often on information from family and peers than on information from health care professionals. This might also be a tentative conclusion of our findings. However, by adopting an inductive, qualitative study design, we came to a more nuanced conclusion. Our study design led us to situate our respondents as part of a triangle consisting of themselves, family/friends and health professionals. Therefore we were able to sketch how women's behavior is not only contingent on their specific relationships with health providers and their social networks,

but also by how the norms and advice of health professionals and their social networks are (mis)aligned – and on their own ways of dealing with possible misalignments.

Environmental influences as both constraining and enabling

Giddens (Giddens, 1984) put forward that social structures can be both enabling and constraining. Indeed, our analysis indicates that the social network and the health professionals could not be classified as either a constrain (= barrier) or an opportunity (facilitator) for ‘healthy’ pregnancy-related behavior. On the one hand, being part of the tight-knit Moroccan/Turkish social networks could be particularly enabling for our respondents during and after pregnancy, particularly because they provided strong social support. On the other hand, these same structures were also constraining as not following advice on pregnancy-related behavior possibly entailed negative social consequences. The same goes for health professionals: they provide opportunities to the women by providing “new” information that is not present in the respondent’s social network, but at the same time place a constraint on these women by providing advice that would necessitate them to violate their social network’s norms.

The idea that social structures can be both enabling and constraining can also be found within research on social capital. Here, social groups with high levels of ‘bonding’ social capital are seen as both enabling and constraining their members. The networks of Turkish/Moroccan women were highly homogeneous and close-knit, and could therefore be classified as constituting ‘bonding’ social capital (Szreter & Woolcock, 2004). Bonding social capital has been shown to be beneficial to members of a social network by facilitating social support and efficient circulation of information. At the same time, such social capital can also place a strain on individuals by enforcing strong social norms and social control. Moreover, new information – such as the advice provided by health professionals – rarely enters the network, meaning that ideas and norms circling within the network are one-sided, and possibly outdated (Kawachi & Berkman, 2000; Szreter & Woolcock, 2004).

Three strategies to deal with dilemmas

In our study we found that the misalignment of advice by health professionals and social networks presented a dilemma for women with a Turkish/Moroccan background. Following one piece of advice seemed to exclude also following the other one, which would possibly entail social consequences. While the native Dutch respondents reported similar misalignments,

they had a strongly articulated preference for the advice of health professionals, and did not fear any social consequences for openly following the latter party's advice.

The variation in the strategies that the women in our study developed to deal with their dilemmas could be understood within the light of Giddens' structure-agency dynamics. The women in our study had varying degrees of agency when dealing with the dilemma created by the misalignments of advice provided by health professionals and their social network. Moreover, Giddens' perspective suggests that the women of this study could potentially have the agency to change this misalignment. The varying forms of agency we encountered during our study can be illustrated with the three different strategies employed by women in our study: avoiding, embracing and solving the dilemma. These strategies can be seen as situated on a scale, with 'avoiding' indicative of lower levels of agency (no pushing against the constraints) and 'solving' at the other end of the continuum, showing higher levels of agency (pushing against the constraints).

We found that the choice of a particular strategy was related to three factors, namely: migration background (being first or second generation, family situation (living with the in laws or not) and personal experience (having had at least one child or not). The women whose strategy was located on the high agency continuum were second-generation ethnic-minorities, did not live with their in-laws and tended to have more children. Research has shown that particularly for second generations, the duality of their insider/outsider position makes them "master of several cultural repertoires that they can selectively deploy in response to the opportunities and challenges they face" (Levitt, 2009). In addition to this potential cultural distance, the physical distance of not living with in-laws also means more space for negotiation. Moreover, the women who had more children were able to legitimize their own position by referring to their high level of personal experience. As outlined in the findings section, references to personal experience were commonly used by women in the respondent's network to add legitimacy to their advice. In other words, certain respondents were using their cultural understanding to their own advantage.

Our study did not collect data on the long-term influences of women's behavior on the misalignment of advice between health professionals and their social network. We do not know, for example, if the behavior of the women with higher levels of agency eventually led to a decrease in this misalignment. Adding Giddens' concept of agency to the social-ecological models would, however, allow to not only envision how contexts influence actors, but also how and in which circumstances actors are able to influence their contexts.

Practical implications

Women of low socio-economic status show particularly adverse birth outcomes in the Netherlands (de Graaf, Steegers, & Bonsel, 2013; Poeran et al., 2013). Amongst other policy concerns, devising strategies to improve their pregnancy-related behaviors are particularly important. We suggest that the analysis performed in this study is an improvement to the commonly performed analyses within the realm of public health, including social-ecological assessments. In this section, we recommend several policy implications for improving pregnancy-related behaviors of women of a low socio-economic status and a Turkish or Moroccan background living in the Netherlands.

We suggest not only focusing on improving the level of trust and communication between ethnic minority clients and their health professionals. While an improved relationship between clients and their health care providers could be helpful, it would not contribute to solving the prevailing misalignment between the advice provided by health professionals and the social networks of our respondents.

Moreover, we discourage viewing women's social networks as a constraint on healthy behavior, as Boerleider and colleagues' (2013) classification suggests. Social networks provide valuable social support to women around the time of pregnancy, and interventions should take care not to alienate them from the target group. As an alternative, we recommend involving women's social network in intervention efforts. In this study we showed that some women were able to find a solution to the dilemmas they faced, namely by creating a bridge between their health professionals and their social network. This suggests a promising route for a health promotion intervention: inviting these women together with members of their social network to attend health promotion sessions. Such sessions could create a safe environment for women to discuss conflicting pieces of advice. The targets of such an intervention could be to increase the negotiation capacity of the target group, but also to increase the health literacy of the members of their social network. This, in turn, would ensure for the circulation of 'new' information within a rather homogeneous, tight-knit network.

APPENDIX

See this (private) link for Appendix 4.1:

<http://www.verascholmerich.com/appendix/>

REFERENCES

- Andersen, R. M. (1995). Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav*, 36(1), 1-10.
- Boerleider, A. W., Francke, A. L., Mannien, J., Wiegers, T. A., & Deville, W. L. (2013). "A mixture of positive and negative feelings": a qualitative study of primary care midwives' experiences with non-western clients living in the Netherlands. *Int J Nurs Stud*, 50(12), 1658-1666. doi: 10.1016/j.ijnurstu.2013.04.009
- Boerleider, A. W., Wiegers, T. A., Mannien, J., Francke, A. L., & Deville, W. L. (2013). Factors affecting the use of prenatal care by non-western women in industrialized western countries: a systematic review. *BMC Pregnancy Childbirth*, 13, 81. doi: 10.1186/1471-2393-13-81
- Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American psychologist*, 32(7), 513.
- Burke, N. J., Joseph, G., Pasick, R. J., & Barker, J. C. (2009). Theorizing social context: Rethinking behavioral theory. *Health Educ Behav*, 36(5 suppl), 55S-70S.
- Chote, A. A., de Groot, C. J., Bruijnzeels, M. A., Redekop, K., Jaddoe, V. W., Hofman, A., . . . Foets, M. (2011). Ethnic differences in antenatal care use in a large multi-ethnic urban population in the Netherlands. *Midwifery*, 27(1), 36-41. doi: 10.1016/j.midw.2009.07.008
- Corley, K. G., & Gioia, D. A. (2004). Identity ambiguity and change in the wake of a corporate spin-off. *Administrative Sci Quart*, 49(2), 173-208.
- de Graaf, J. P., Steegers, E. A., & Bonsel, G. J. (2013). Inequalities in perinatal and maternal health. *Current Opinion in Obstetrics and Gynecology*, 25(2), 98-108.
- Een goed begin, veilige zorg rond zwangerschap en geboorte [A good start, safe care for pregnancy and birth. Advice of the Committee on Good care during pregnancy and child birth] (S. Z. e. geboorte, Trans.). (2009). Utrecht.
- Ettner, S. L., & Grzywacz, J. G. (2001). Workers' perceptions of how jobs affect health: a social ecological perspective. *J Occup Health Psychol*, 6(2), 101-113.
- Foets, M., Suurmond, J., & Stronks, K. (2007). De relatie tussen etnische herkomst en gezondheid(szorg). Een conceptualisering. In M. Foets, J. Schuster & K. Stronks (Eds.), *Gezondheids(zorg) onderzoek onder allochtone bevolkingsgroepen. Een praktische introductie* (pp. 29-50). Amsterdam: Aksant.
- Giddens, A. (1984). *The constitution of society*. Cambridge: Polity Press.
- Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking qualitative rigor in inductive research notes on the gioia methodology. *Organ Res Methods*, 16(1), 15-31.
- Glaser, B., & Strauss, A. (1967). *The discovery of grounded theory*. London: Weidenfeld & Nicolson.
- Glass, T. A., & McAtee, M. J. (2006). Behavioral science at the crossroads in public health: extending horizons, envisioning the future. *Soc Sci Med*, 62(7), 1650-1671. doi: 10.1016/j.socscimed.2005.08.044
- Golden, S. D., & Earp, J. A. L. (2012). Social ecological approaches to individuals and their contexts: twenty years of health education & behavior health promotion interventions. *Health Educ Behav*, 39(3), 364-372.

- Guendelman, S., Denny, C., Mauldon, J., & Chetkovich, C. (2000). Perceptions of hormonal contraceptive safety and side effects among low-income Latina and non-Latina women. *Matern Child Health J*, 4(4), 233-239.
- Huang, T. T., & Glass, T. A. (2008). Transforming research strategies for understanding and preventing obesity. *Jama*, 300(15), 1811-1813. doi: 10.1001/jama.300.15.1811
- Kawachi, I., & Berkman, L. (2000). Social cohesion, social capital, and health. In L. Berkman & I. Kawachi (Eds.), *Social epidemiology* (pp. 174-190). New York: Oxford University Press.
- Krumeich, A., Weijts, W., Reddy, P., & Meijer-Weitz, A. (2001). The benefits of anthropological approaches for health promotion research and practice. *Health Educ Res*, 16(2), 121-130.
- Levitt, P. (2009). Roots and Routes: Understanding the Lives of the Second Generation Transnationally. *JEMS*, 35(7), 1225-1242.
- McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health Educ Q*, 15(4), 351-377.
- Ministerie van VROM/WWI (2007). Integratienota 2007-2011. Zorg dat je erbij hoort. The Hague: VROM.
- Moore, L., de Silva-Sanigorski, A., & Moore, S. N. (2013). A socio-ecological perspective on behavioural interventions to influence food choice in schools: alternative, complementary or synergistic? *Public Health Nutr*, 16(6), 1000-1005. doi: 10.1017/s1368980012005605
- Poeran, J., Denktas, S., Birnie, E., Bonsel, G. J., & Steegers, E. A. (2011). Urban perinatal health inequalities. *J Matern Fetal Neonatal Med*, 24(4), 643-646. doi: 10.3109/14767058.2010.511341
- Poeran, J., Maas, A. F., Birnie, E., Denktas, S., Steegers, E. A., & Bonsel, G. J. (2013). Social deprivation and adverse perinatal outcomes among Western and non-Western pregnant women in a Dutch urban population. *Soc Sci Med*, 83, 42-49. doi: 10.1016/j.socscimed.2013.02.008
- Raneri, L. G., & Wiemann, C. M. (2007). Social ecological predictors of repeat adolescent pregnancy. *Perspect Sex Reprod Health*, 39(1), 39-47. doi: 10.1363/3903907
- Richard, L., Gauvin, L., & Raine, K. (2011). Ecological models revisited: their uses and evolution in health promotion over two decades. *Annu Rev Public Health*, 32, 307-326. doi: 10.1146/annurev-publhealth-031210-101141
- Sallis, J. F., & Owen, N. (2008). Ecological models of health behavior. In K. Glanz, B. K. Rimer & F. M. Lewis (Eds.), *Health behavior and health education* (3rd ed., pp. 462-484). San Francisco: Jossey-Boss.
- Saunders, M. N., Saunders, M., Lewis, P., & Thornhill, A. (2011). *Research methods for business students* (5th ed.): Pearson Education India.
- Stokols, D. (1996). Translating social ecological theory into guidelines for community health promotion. *Am J Health Promot*, 10(4), 282-298.
- Suurmond, J., Seeleman, C., & Stronks, K. (2007). Multiculturaliteit in zorg en verpleging. *Onderwijs en Gezondheidszorg*, 31(4), 127-131.
- Szreter, S., & Woolcock, M. (2004). Health by association? Social capital, social theory, and the political economy of public health. *Int J Epidemiol*, 33(4), 650-667. doi: 10.1093/ije/dyh013

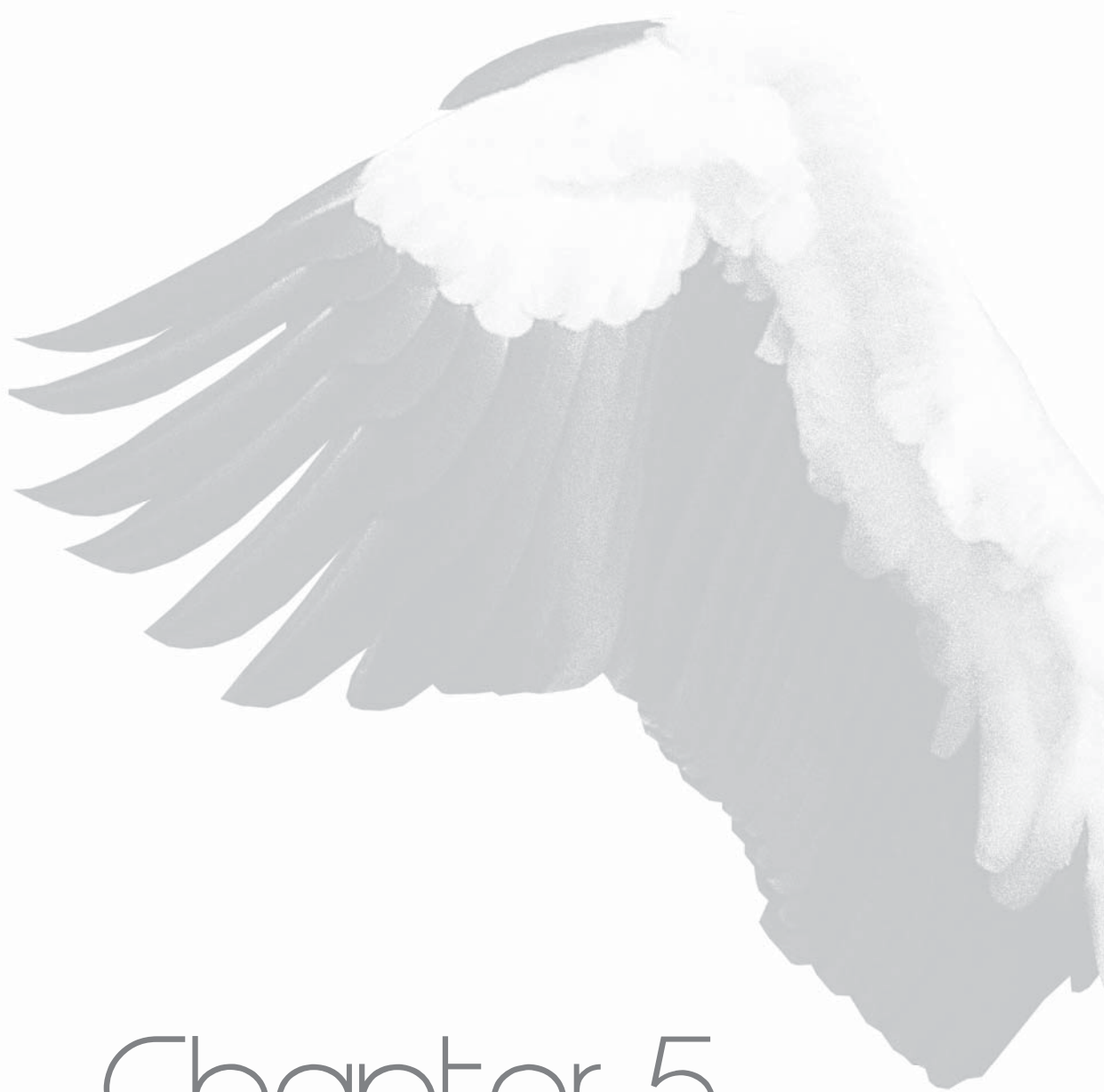
- Timmermans, S., Bonsel, G. J., Steegers-Theunissen, R. P., Mackenbach, J. P., Steyerberg, E. W., Raat, H., . . . Steegers, E. A. (2011). Individual accumulation of heterogeneous risks explains perinatal inequalities within deprived neighbourhoods. *Eur J Epidemiol*, 26(2), 165-180. doi: 10.1007/s10654-010-9542-5
- van den Berg, M., Bovendeur, I., Meijer, S. A., Savelkoul, M., Hamberg-van Reenen, H. H., Zwakhals, S. L. N., & Kommer, G. J. (2010). Effecten van preventieve interventies voor lokaal gezondheidsbeleid. Een overzicht op basis van de leeflijnen uit de handleidingen voor roken, alcohol, overgewicht en depressie: RIVM.
- Vos, A. A., Posthumus, A. G., Bonsel, G. J., Steegers, E. A., & Denktas, S. (2014). Deprived neighborhoods and adverse perinatal outcome: a systematic review and meta-analysis. *Acta Obstet Gynecol Scand*. doi: 10.1111/aogs.12430
- Willows, N. D., Hanley, A. J., & Delormier, T. (2012). A socioecological framework to understand weight-related issues in Aboriginal children in Canada. *Appl Physiol Nutr Metab*, 37(1), 1-13.





Part II

Vertical integration of
reproductive health interventions;
integrating the influence of
social environments to improve
reproductive health behaviors



Chapter 5



Reproductive health education for a multicultural target group

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ABSTRACT

Purpose Dutch perinatal mortality rates are relatively high compared to other European countries. Non-Western ethnic minorities show particularly adverse outcomes. They seem to have low health literacy and less access to health care. We studied the characteristics of the participants and the success of the recruitment methods and increase in knowledge of participants in Reproductive Health Peer Education (RHPE).

Design We targeted specifically these groups, and developed reproductive health education covering the full spectrum of obstetric care, led by specifically trained female peer educators coming from the targeted communities.

Findings 'Active' recruitment methods were the most successful methods. 1,896 women and 275 men were recruited and participated in the intervention. 65% of the total female participants had a first generation immigrant background. Significant knowledge improvements were found on all five measurements of reproductive behaviour and antenatal and postnatal health care system knowledge (24% average knowledge increase in already knowledgeable participant group and 46% in the not knowledgeable group).

Conclusion Active interpersonal recruitment methods were most successful in reaching the target groups. Peer education resulted in knowledge increase in these groups. Practice implications: invest in training of educators for peer education reproductive health. Organize recruitment by verbal advertising by community organizations and social networks of peer educators.

Originality To our knowledge, no studies have been conducted combining investigation of the results of specific recruitment methods, the characteristics of reached participants in a multi-ethnic population and their increase in knowledge about reproductive health and care.

INTRODUCTION

Perinatal mortality rates are relatively high in the Netherlands when compared to all other European countries (Peristat II, 2004). This is in particular the case for large cities where perinatal mortality rates are 20 to 50% higher than in rural areas (De Graaf et al., 2013A; Poeran et al., 2010). Within large cities, substantial inequalities can be found. For instance, in Rotterdam, neighborhood perinatal mortality rates range from 2 to 34‰ (Poeran et al., 2010). Inequalities can also be found when considering the perinatal health of different ethnic groups. Among non-western ethnic minority women, the perinatal mortality rates are higher than those of western minorities and the native Dutch (Poeran et al., 2010). Non-western ethnic minorities represent 11.4% of the population of the Netherlands and 32% of the inhabitants of the four largest cities in the Netherlands (BOS, 2012). Many studies have shown that ethnicity and socio-economic deprivation are strongly related to adverse perinatal outcomes such as preterm birth and too small for gestational age (Agyemang et al., 2009; Goedhart et al., 2008; De Graaf et al., 2013B). These trends are not unique to perinatal outcomes, but can also be seen when considering the general health of non-western ethnic minorities in a socio-economic disadvantaged position (Mackenbach et al., 2013).

When compared to Dutch natives and western minorities, non-western ethnic minorities groups not only show poorer general health, but are also underserved by health care (RIVM, 2007). This means that they have insufficient access to health care, as evidenced by not timely use of health services which can affect their health outcomes (Andrulis, 1998). Ample studies have indicated a relationship between access to health care and general health (Stronks et al., 2001; Lindström et al., 2001). Some studies even claim that limited access to health care resources is the most important contributing factor for ethnic disparities in health (Burnes et al., 2004; Alderliesten et al., 2007). In the area of reproductive health, one third of Moroccan and Antillean women book their first antenatal visit with an obstetric caregiver after 14 weeks of pregnancy, which is often too late to allow for routine first trimester prenatal screening and provision of other prenatal healthcare (Alderliesten et al., 2007; Choté et al., 2011). Health literacy is also problematic as these groups have e.g. low awareness of folic acid supplementation and of the negative effect of smoking during pregnancy (Timmermans et al., 2008; Temel et al., 2013). Limited knowledge of health services in general and reproductive health services specifically can be a major barrier to use health care services (Stronks et al., 2001; Fransen et al., 2009).

In 2009 an urban perinatal health programme called 'Ready for a Baby' was initiated in Rotterdam, the second largest city of the Netherlands (Denktaş et al., 2011). Rotterdam has a population of more than 600,000 citizens (CBS, 2011). 52% of the inhabitants have a native Dutch background, 11% have a western minority background and 37% have a non-western minority background (Hoppensteijn, 2009 and 2011). The largest minority groups are from Suriname (9%), Turkey (8%), Morocco (7%), the Dutch Antilles (4%) and Cape Verde (3%) (Hoppensteijn, 2011).

The aim of the city wide Ready for a Baby programme is to tackle perinatal health inequalities and to improve perinatal health outcomes. Timely reaching of women with a high risk profile is an important aim of this programme. Therefore, we developed – as a part of this program – an intervention aimed at improving the low reproductive health (care) literacy of non-western ethnic minority groups in socially disadvantaged neighbourhoods.

We hypothesized that 1) active recruitment methods based on interpersonal interaction are more effective methods in reaching the target groups for reproductive health education than passive methods, and 2) for the target groups customized peer education is an effective method to increase knowledge about reproductive health and the healthcare system.

METHODS

Reproductive health peer education: theoretical framework

Health related peer education is an approach whereby community members are supported to promote health-enhancing change among their peers. A more conventional method would be to train (non-peer) health professionals to address the needs of specific target groups. Proponents of peer education argue that specifically trained lay people are in a better position to encourage healthy behavior amongst their peers. Turner and Shepherd listed 10 commonly cited and review based arguments for the use of peer education (Turner and Shepard, 1999).

1. Peer education can be used to educate those who are hard to reach through conventional methods
2. It utilises an already established means of sharing information and advice
3. Education presented by peers may be acceptable when other education is not
4. Peer education is beneficial for those involved
5. Peer educators act as good role models

6. It is more cost effective than other methods
7. Peers are more successful than professionals in passing on information because people identify with their peers
8. Peer education is empowering for those involved
9. Peers are a credible source of information
10. Peers can reinforce learning through ongoing contact

Phase I: training peer educators

The first phase of the intervention started in September 2010. 16 bilingual women with a non-western ethnic minority background, and a high school diploma were trained during a full-time six month course (intermediate vocational educational level 4) to become peer educators. The course covered a wide range of topics, including communication and health education skills, basic knowledge about diseases and the Dutch health care system. The focus of the course was on reproductive health. The students were trained to lead four educational meetings: preconception, antenatal, intrapartum and postpartum health and care. During the course, the students were also trained to translate the (biomedical) messages of caregivers into the language and cultural framework of an ethnically diverse target group. In 2011, 12 students graduated as peer educators perinatal health. The educators had different backgrounds: Moroccan (Dutch/Arabic/Berber language proficiency (LP), Turkish (Dutch/Turkish LP), Antillean (Dutch/Papiamentu/Spanish LP), Surinamese-Creole (Dutch/Scranantango LP), Brazilian (Dutch/Portuguese LP), and Cape Verdean (Dutch/Portuguese LP). Peer education modules and topics are as follows:

- *Preconception health and care*: Folic acid, alcohol, drugs, cigarette use, healthy nutrition intake, sexual transmitted diseases, medication, lifestyle of male partner, preconception health care system.
- *Antenatal health and care*: Healthy lifestyle, the three trimesters of pregnancy, pregnancy symptoms, necessity of pregnancy checks and preparation for childbirth, organization of antenatal care,
- *Intrapartum health and care*: Starting of the delivery, contractions, rupture of membranes, childbearing process, placenta, complications, painkillers.
- *Postpartum health and care*: The delivery, risk signals, a healthy start for mother and child, motherhood, infant and youth centres, postpartum health care system.

Phase II: recruiting participants and execution of the peer educational meetings

Phase II started in July 2011 and ended in April 2012. Primarily women were targeted, but men who were interested to participate were not excluded. Inspired by previous studies (Lee et al., 1997), the participants were recruited by two active and two passive methods (see Figure 5.1). See Appendix 5.1 for a schematic overview of the study design and intervention.

Peer educational meetings

After recruitment of the participants the meetings were organized. The meetings always had the same structure:

- *Start*: acquaintance and fill in pre-test questionnaires by participants;
- *Peer Education*: customized knowledge transfer using presentations, role-play, discussions, images (e.g. in case of very low educated groups), educational video clips and games (e.g. in case of an adolescent group);
- *End*: verbal evaluation and fill in post-test questionnaires by participants.

In order to create a safe and open atmosphere women's and men's groups were separated.

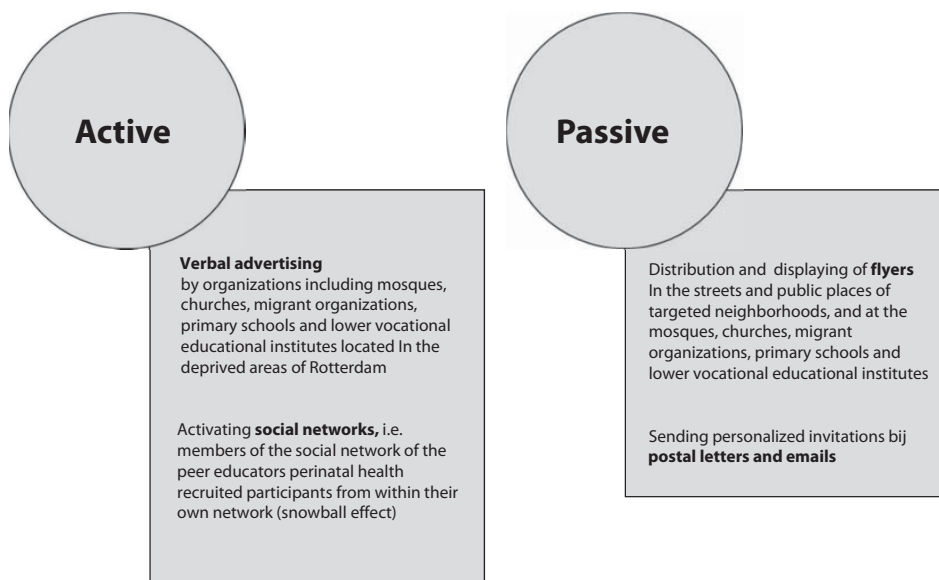


Figure 5.1 Active and passive recruitment methods.

Measurements

To collect data on the characteristics of the individuals reached by this pilot, participants were asked to fill in questionnaires. Twenty-five percent of the 2,171 individuals who filled in the questionnaire received assistance from the peer educators because of their low language proficiency level. The questionnaires were specifically adjusted for the four aforementioned peer education meetings (see Box 5.2).

The questionnaires obtained information about the participants' socio-demographic characteristics: age [year of birth], ethnic background [participant's country of birth and that of his or her parents], generation [first generation immigrants are born outside the Netherlands, second generation immigrants are born in the Netherlands and have at least one parent born abroad] (CBS, 2000), marital status [yes/no], children [yes/no], educational attainment level [from low: not completed education, primary school to high: higher vocational education, university, other: residual category], place of residence [four digit zip code]. Information about residence made it possible to infer their neighborhood social-economic classification by using the 'Social Index'. This index is calculated annually for the Rotterdam municipal authorities by the Centre for Research and Statistics Rotterdam. The Social Index is a composite multidimensional variable indicating neighborhood social quality on a 1-10 scale (Poeran et al., 2013; Municipality of Rotterdam, 2012). Self-reported information about the Dutch language proficiency of the participants was also obtained ["When you have a conversation in the Dutch language do you have difficulty with it?" [low: often/always difficulty, intermediate: frequently but not always difficulty, high: never difficulties].

Information was also obtained about the way participants were recruited by the open-ended question "How were you recruited for this meeting?" Answers were categorized into 'verbal advertising by organizations', 'flyers', 'mailing' and 'social network'. Furthermore, participant's preferences for healthcare providers or other caregivers when seeking advice about preconception, antenatal, intrapartum and postpartum health and care were asked. Finally, information was obtained about knowledge of reproductive health and the health care system before and after the meeting. For example, before the meetings on preconception we asked whether the participant knew what preconception care is and after the meetings we asked whether she/he had learned new information about preconception care.

Analysis

First we described the participants by socio-demographic and socio-economic status, according to ethnic background. Chi-square testing was performed to detect significant differences. To evaluate whether reproductive health (care) knowledge had increased, the non-parametric statistical McNemar test was used. All analyses were performed using IBM SPSS Statistics 20.

RESULTS

Response

In less than ten months, 1,896 women and 275 men were recruited and participated in the intervention (Table 5.1). Eighty four participants were excluded from the analyses because of missing or incomplete questionnaires, e.g. missing gender variable. 88% of the male participants were adolescents (<19 years). 90% of the female and 66% of the male participants had an ethnic minority background. 71% of the female participants lived in a neighbourhood classified as 'problematic' or 'vulnerable' by the Social Index. Relatively more men (65%) lived in a neighbourhood classified as social 'sufficient'. Only 17% of the female participants had 'insufficient' language proficiency.

Preferences of participants for health care professionals

Figure 5.2 shows the preferences of female participants for health care professionals or other caregivers with respect to the various reproductive stages. The results indicate the predominant preference for the midwife and the general practitioner during the periconceptional and antenatal period. In the post-partum period midwives and maternity nurses are reported as the preferred care providers followed by the family. Most men preferred the general practitioner during the preconception period, and the GP and the gynaecologist during the antenatal period. Because of the small size of the male participants results are not shown in the figure.

Results recruitment methods

Figure 5.3 shows the results of the four recruitment methods for each of the reproductive health meetings. The coloured lines with percentages show the contribution of a method for

Table 5.1 Background characteristics of participants in Reproductive Health Peer Education N=2,171

| Variable | Women | | Men | |
|------------------------------|-------|----|-----|----|
| | N | % | N | % |
| Total | 1,896 | 87 | 275 | 13 |
| Age (years) | 1,658 | | 267 | |
| <19 | 449 | 27 | 236 | 88 |
| 20-29 | 252 | 15 | 10 | 4 |
| 30-39 | 412 | 25 | 7 | 3 |
| 40-59 | 412 | 25 | 11 | 4 |
| ≥60 | 133 | 8 | 3 | 1 |
| Ethnic origin | 1,807 | | 263 | |
| Native Dutch | 181 | 10 | 90 | 34 |
| Surinamese | 180 | 10 | 41 | 16 |
| Antillean | 74 | 4 | 30 | 11 |
| Cape Verdean | 55 | 3 | 5 | 2 |
| Turkish | 452 | 25 | 36 | 14 |
| Moroccan | 669 | 37 | 31 | 12 |
| Other | 192 | 11 | 30 | 11 |
| Generation | 1,803 | | 264 | |
| First generation immigrant | 1,172 | 65 | 50 | 19 |
| Second generation immigrant | 444 | 25 | 124 | 47 |
| Native Dutch | 187 | 10 | 90 | 34 |
| Married | 1,767 | | 220 | |
| Yes | 1,096 | 62 | 20 | 9 |
| Children | 1,719 | | 224 | |
| Yes | 1,230 | 72 | 29 | 13 |
| Educational attainment level | 1,692 | | 442 | |
| Low | 795 | 47 | 151 | 62 |
| Intermediate | 718 | 38 | 88 | 36 |
| High | 67 | 4 | 1 | 1 |
| Other | 112 | 7 | 2 | 1 |
| Social Index Score | 1,906 | | 166 | |
| Problematic 3.9-4.9 | 204 | 13 | 10 | 6 |
| Vulnerable 5.0-5.9 | 932 | 58 | 33 | 20 |
| Sufficient 6.0-7.0 | 449 | 28 | 107 | 65 |
| Strong ≥7.1 | 24 | 1 | 16 | 10 |
| Language proficiency | 1,519 | | 221 | |
| Insufficient | 250 | 17 | 21 | 10 |
| Sufficient | 593 | 39 | 28 | 12 |
| Good | 676 | 44 | 172 | 78 |

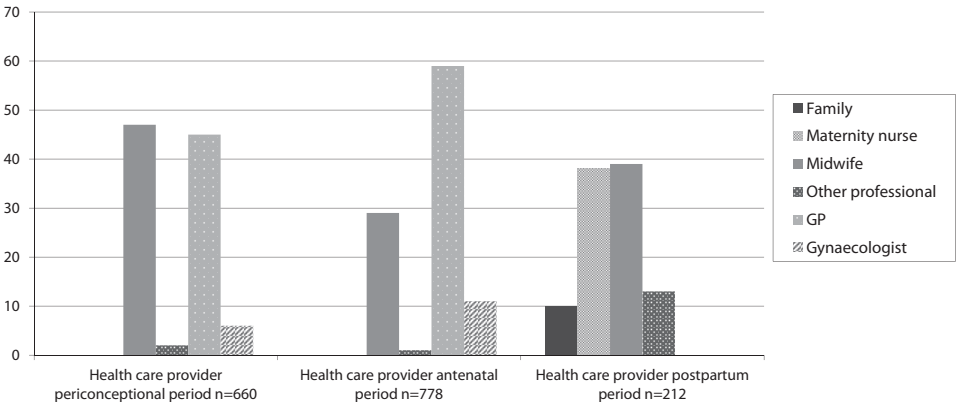


Figure 5.2 Preferences of female participants for perinatal healthcare professional.

^{1,2}Answer options: GP, Midwife, Gynaecologist and Other professional.

³Answer options: GP, Midwife, Maternity nurse and Family.

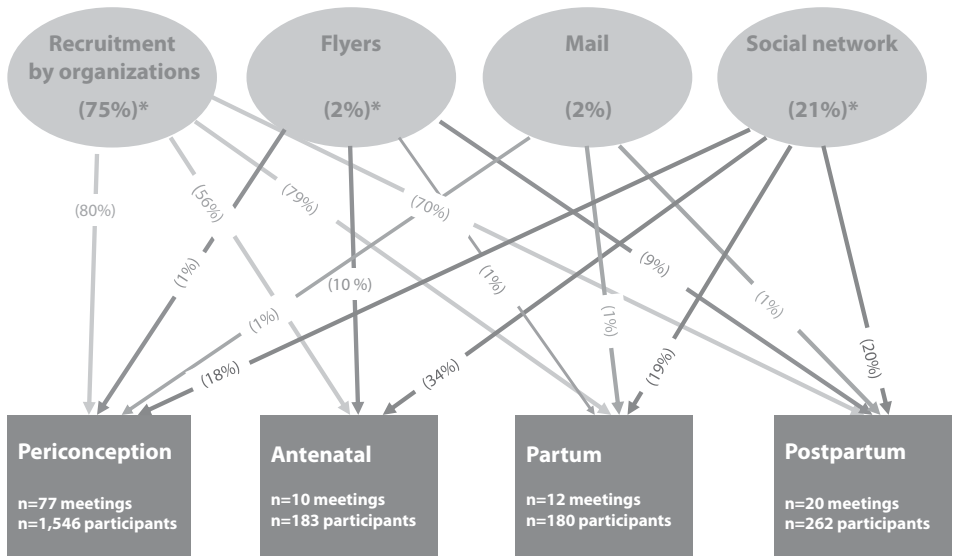


Figure 5.3 Recruitment of participants for Peer Education by four methods.

*P-value <0.001.

recruitment of participants for each of the four educational meetings. The peer educators organized 105 network meetings together with community organizations to achieve cooperation of these organizations in the recruitment. 75% of these network meetings directly resulted in inclusion of participants in the reproductive health meetings. 800 flyers were distributed and 350 postal- and e-mails were send which accounted for 2% of the participants

in the meetings. The interpersonal methods ‘verbal advertising by organizations’ and ‘social network’ were the most successful. Almost all participating men (91%) had been reached by ‘Verbal advertising by organizations’ (not shown in figure).

In addition to Figure 5.2, Table 5.2a and b show ethnic and generational differences in recruitment. Native Dutch and ethnic minority women both were most effectively recruited by ‘verbal advertising by organizations’. The ‘social network’ method was particularly successful in recruiting ethnic minority women. No major generational differences were found in recruitment except that the flyer method was more successful in reaching the second than first generation participants.

Table 5.2a Recruitment results of female native Dutch and first and second generation minority group participants for Reproductive Health Peer Education n=1,388 (in absolute numbers and percentages)

| | Dutch N=172 | Surinamese N=122 | Antillean N=57 | Cape Verdean N=38 | Turkish N=337 | Moroccan N=510 | Other ¹ N=152 |
|-------------------------------------|--------------------------|----------------------|----------------------|-------------------------|-----------------------|------------------------|-----------------------------|
| Verbal advertising by organizations | 153 (89) ^{abcd} | 95 (77) ^a | 47 (82) ^e | 31 (82) | 236 (70) ^b | 363 (70) ^{ce} | 107 (70) ^d |
| Flyers | 2 (1) | 1 (1) | 0 (0) | 4 (10) | 9 (3) | 18 (3) | 6 (4) |
| Mailing | 0 (0) | 2 (2) | 0 (0) | 0 (0) | 1 (0) | 10 (2) | 1 (1) |
| Social network | 17 (10) ^{abcd} | 24 (20) ^a | 10 (18) | 3 (8) | 91 (27) ^b | 119 (23) ^c | 38 (25) ^d |

^aSignificant (<0.05) difference between native Dutch and Surinamese group.

^bSignificant (<0.001) difference between native Dutch and Turkish group.

^cSignificant (<0.001) difference between native Dutch and Moroccan group.

^dSignificant (<0.001) difference between native Dutch and Other group.¹

^eSignificant (<0.05) difference between Antillean and Moroccan group.

¹Non-Western Asian and African immigrants.

Table 5.2b Recruitment results of female immigrant generations for Perinatal Health Peer Education n=1,235 (in absolute numbers and percentages)

| | First generation n=880 | Second generation n=355 |
|-------------------------------------|---------------------------|----------------------------|
| Verbal advertising by organizations | 626 (71) | 253 (71) |
| Flyers | 17 (2)* | 23 (6)* |
| Mailing | 12 (1) | 2 (1) |
| Social network | 225 (26) | 77 (22) |

*Significant (<0.001) difference between first and second immigrant generation.

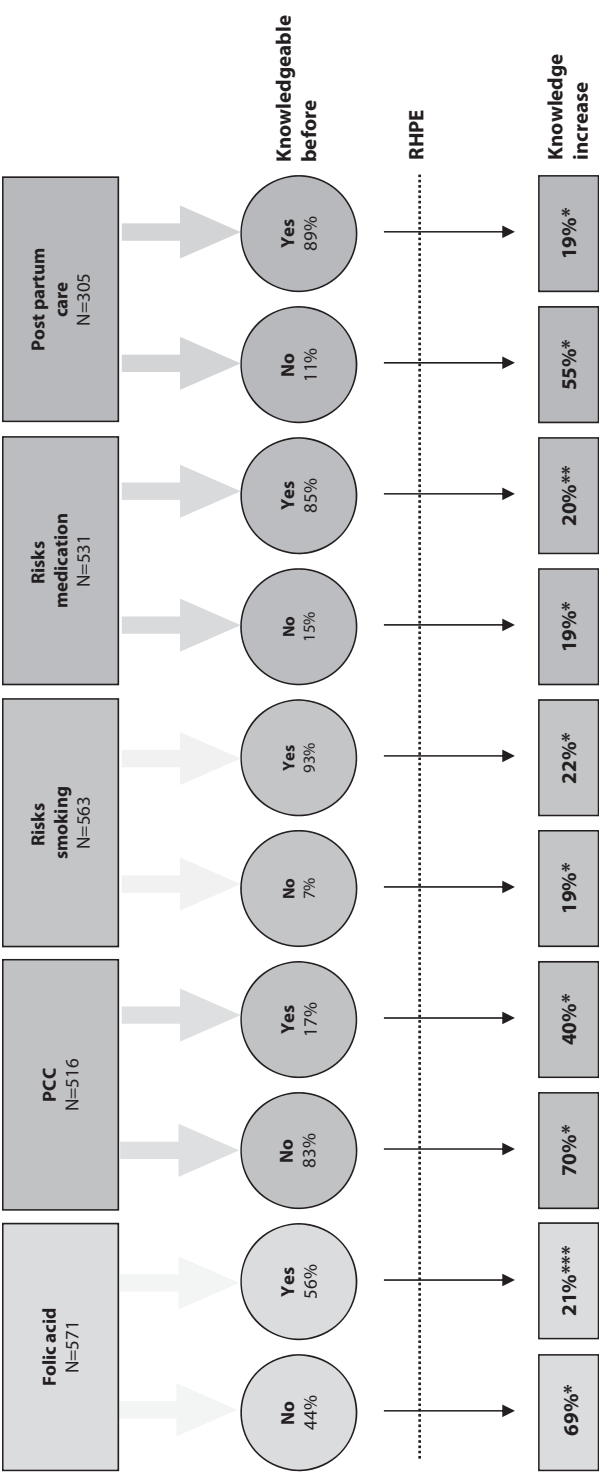


Figure 5.4 Knowledge before and after Reproductive Health Peer Education (RHPE).

*P-value <0.001, **P-value <0.05, ***P-value >0.05.

PCC = Preconception Care; Risks smoking = health risks of smoking before and during pregnancy; Risks medication = health risks of medication use before and during pregnancy.

Knowledge improvements of participants in RHPE

Finally, Figure 5.4 shows significant improvements that were found on all five measurements of knowledge of adequate reproductive behaviour and the antenatal and postnatal health care system. For example, participants who did not know what folic acid and preconception care were before the reproductive health meeting had a significantly self-reported knowledge increase on these subjects of respectively 69% and 70%.

DISCUSSION AND CONCLUSION

Discussion

Non Western immigrant women are commonly difficult to reach, especially the first generation. In our study 65% of the total female participants had a first generation immigrant background. The recruitment results confirmed our *first hypothesis* that active recruitment methods based on interpersonal interaction are more effective methods in reaching the target groups for reproductive health education than passive methods. Of all recruitment methods used, the active recruitment method ‘verbal advertising by organizations’ and ‘social network’ were most successful.

A comparison of demographic data of our participants with those from the general population confirmed that we reached our target group, i.e. participants with a non-western minority background living in socially deprived areas with potentially limited access to receive adequate antenatal and postnatal health care. A large majority (90%) of the participants were from a female immigrant background and lived in a neighbourhood receiving a ‘problematic’ or ‘vulnerable’ Social Index score. These neighbourhoods are at increased risk for adverse perinatal outcomes (perinatal mortality and perinatal morbidity) (Municipality of Rotterdam, 2012). According to data from the Centre of Research and Statistics Rotterdam (COS), these types of neighbourhoods show low scores for experienced health and high scores for registered use of primary care (but not for reproductive health care) (Choté et al., 2011; COS, 2012). These low health scores are associated with low income, a low language proficiency level, unemployment, weak social network and social cohesion and poor housing (COS, 2012). These findings and our study results indicate that the target group needs support for healthy motherhood. The project successfully reached non-western ethnic minority females from deprived neighbourhoods. A majority of the participants lived in a neighbourhood (n=33) with a low Social Index score, 85% reported a

low or intermediate educational level, and 17% of the females reported insufficient language proficiency. In these neighborhoods, a mean percentage of 2.4 [range 0.4 to 9.3%] among the target population [non Western female immigrants, aged between 18 and 42] was reached (COS, 2011). Compared to the native Dutch population more children are born in the non-Western immigrant groups (COS, 2011). The Dutch National Institute for Public Health and the Environment has indicated that preventive lifestyle interventions are not able to reach low SES groups, let alone non-western immigrant groups (RIVM, 2013). Most Dutch publications about lifestyle interventions show a lack of absolute numbers of participation of specific target groups caused by the absence of registration of background characteristics like SES and ethnicity variables in these intervention programmes (ZonMw, 2011).

The change of knowledge results confirm our *second hypothesis* that for the target groups customized peer education is an effective method to increase knowledge about reproductive health (care). After participating in the educational meetings a knowledge increase regarding adequate folic acid use, preconception care, smoking and medication intake was observed.

Health peer education has become very popular in the broad field of HIV prevention and it is also used to reduce tobacco, drug or alcohol abuse among young people. While not commonly used within the field of reproductive health, several international examples can be found of prenatal and postnatal peer led educational programmes focused on preconception health, HIV prevention for pregnant woman, nutrition, mental health, breastfeeding and smoking (Owens et al., 2006; Rempel and Moore, 2012). Most of the pregnancy-related peer education programmes were developed and evaluated for single health issues such as nutritional intake (Boyd and Windsor, 2003) in contrast to slightly broader education programmes in the United States of America, Nepal and India (Massey et al., 2006, Tripathy et al., 2010). To our knowledge, this is the first time that a peer-led reproductive health education project spans the entire chain of obstetric care, ranging from the preconception to the postnatal health period.

Participants

The majority of participants were female which can be explained by (1) the pilot design (inclusion criteria: directed primary at women and secondary at men) and (2) the content of the meetings. Reproductive health is commonly perceived by both men and women as primarily “women’s” issues (Murphy Tighe, 2010; Iliyasu et al., 2010). Nevertheless relatively

high number of male adolescent participants can be explained by the fact that some of the meetings were organized in a school for intermediate vocational education. Three out of nine peer educators had a Moroccan background, which probably explains the higher proportion of Moroccan participants.

The higher number of first generation female participants is probably due to (1) the first generation immigrant status of most of the peer educators who might have more first generation females in their social network (Martijn et al., 2004; De Graaf et al., 2013A) the low employment rates of first generation immigrants which could provide more time for participating in the sessions (CBS, 2004; Temel et al., 2013; Poeran et al., 2010) the higher educational level of second generation immigrants, who tend to feel that they are already knowledgeable enough (CBS, 2004) and (4) the involvement of several immigrant organizations in the recruitment.

Recruitment

In our study the 'active' recruitment methods were by far the most successful method, which is in line with other studies (Velott et al., 2008; Murphy Tighe, 2010; El-Khorazaty et al., 2007). As expected, the passive methods (flyer and invitation by mail) were less successful, especially for first generation immigrants, probably due to insufficient language skills of these groups, which makes it difficult to read and understand text in Dutch (Denktaş et al., 2009; Ng and Newbold, 2011; Thomas et al., 2010).

Preferences for health care provider

Midwives, gynaecologists and general practitioners (GPs) are the designated professionals to offer preconception care in the Netherlands (van der Zee et al., 2011). About 45% of the participants had a preference for seeing a midwife, whilst about the same percentage of the participants preferred a GP. A cross-sectional study found that 70% of the population of one of the districts of Rotterdam preferred a GP (Ready for a Baby, 2011). Our study showed that GPs were also the mostly preferred choice for the first booking visit during pregnancy. Possible reasons for this are that (1) GPs are located in closer proximity than designated obstetric professionals (2) citizens are more familiar with GPs (3) ethnic minorities are less aware of the existence of midwifery care (in a non-hospital setting) (Alderliesten et al., 2007).

Knowledge

Non-western ethnic minorities in the Netherlands tend to have low awareness of folic acid supplementation and of the negative effect of smoking during pregnancy (Alderliesten et al., 2007; Choté et al., 2011). About half of our participants indicated that their knowledge of folic acid usage had increased after the educational meetings. This might suggest that the public campaigns and advice offered by governmental organizations and healthcare providers about folic acid use in the Netherlands did not fully reach our target group. The limited effectiveness of these methods might be caused by (1) the passive and impersonal nature of campaigns and (2) the lack of adaptation to people with low/intermediate educational levels (de Walle et al., 1999). In the educational meetings, participants learned about the negative effects of smoking before and during pregnancy. Despite of mass-media campaigns about the detrimental health effects of smoking for the general health, the meetings delivered new information (STIVORO, 2010). As expected, the majority of the participants indicated that they heard new information about preconception care. Other studies have shown that preconception care is not a very well-known type of care (Coonrod et al., 2009; Frey and Files, 2006).

Points of improvement

Registration forms were only available in the Dutch language. This might have caused a barrier for participants with poor Dutch language proficiency. Four percent of the questionnaires were incomplete (missing of gender variable and missing of more than five respondent characteristics) that were excluded from the analysis. We cannot fully oversee the consequences that these omitted questionnaires have for results of this study. However, given the small number of exclusions (4%) we do not expect a bias. For future research we recommend translating the forms in the relevant languages or deployment of research assistants who can primarily focus on assisting participants in filling in the forms.

Conclusion

The peer led educational format used in this study was successful in reaching and educating non-Western ethnic minorities – a typically underserved population – for reproductive health education. Cornerstones of the success were 1) the active recruitment strategies ‘verbal advertising by organizations’ and ‘social network’, 2) the involvement of bicultural peer educators as recruiters, and 3) a customized knowledge transfer using an eclectic peer educational method.

Practice implications

In line with the results of this pilot study, we recommend educational programmes to invest in: a) training of educators for peer education about peer education reproductive health; training of educators with a Central African and Eastern European background are highly needed in the Netherlands as well as native Dutch peer educator; b) recruitment for peer education by verbal advertising by organizations and social networks of peer educators.

Future research

This pilot study showed that it is possible to reach first and second generation non-Western ethnic minority groups via reproductive health peer education. The success of this pilot is the starting point for a scaling-up of this method to other cities in the nationwide perinatal health program called 'Healthy Pregnancy 4 ALL' which started in 2011.

We recommend the following future research: (1) a network study of how recruiters / educators use their social network to recruit participants and (2) a study on how community organizations such as churches, mosques, schools and community centres are able to recruit participants.

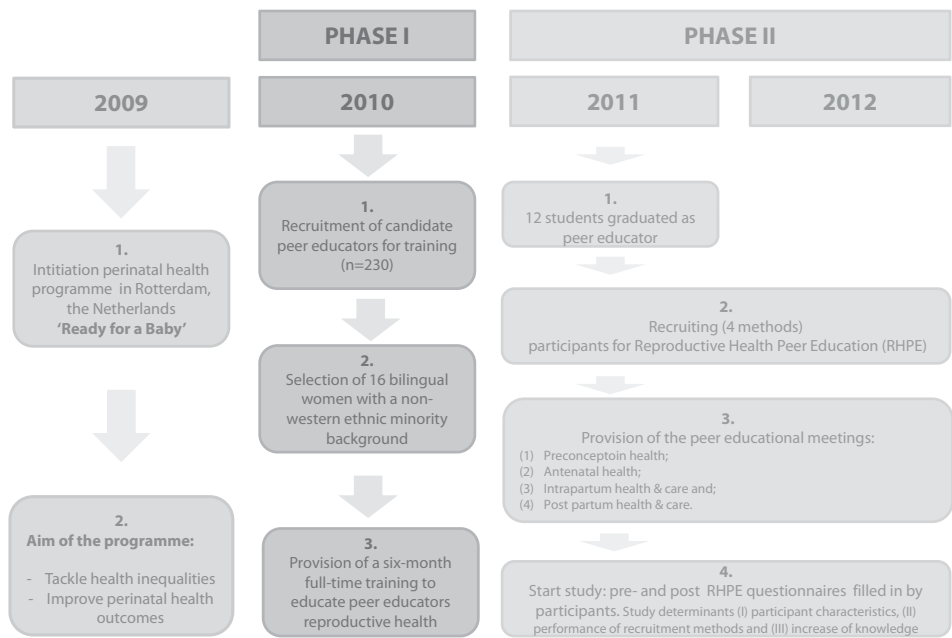
REFERENCES

- Agyemang C, Vrijkotte TG, Droomers M, van der Wal MF, Bonsel GJ, Stronks K. (2009) The effect of neighbourhood income and deprivation on pregnancy outcomes in Amsterdam, The Netherlands. *J Epidemiol Community Health*; 63(9):755-60.
- Alderliesten ME, Vrijkotte TG, van der Wal MF, Bonsel GJ (2007) Late start of antenatal care among ethnic minorities in a large cohort of pregnant women. *BJOG*; 114(10):1232-9.
- Andrulis DP (1998) Access of Care Is the Centerpiece in the Elimination of Socioeconomic Disparities in Health. *Ann Intern Med*; 412-6.
- BOS Office Research and Statistics Amsterdam (2012) [Dutch: Population by ethnic group] Available at: <http://www.os.amsterdam.nl/feiten-en-cijfers/>. (Accessed June 2012).
- Boyd NR, Windsor RA (2003) A formative evaluation in maternal and child health practice: the Partners for Life Nutrition Education Program for pregnant women. *Matern Child Health J*; 7(2):137-43.
- Burnes Bolton L, Giger JN, Georges CA (2004) Structural and racial barriers to health care. *Annual Review of Nursing Research*; 22(1):39-58.
- CBS Statistics Netherlands (2000) [Dutch: Standard definition immigrant] Available at: <http://www.cbs.nl/NR/rdonlyres/26785779-AAFE-4B39-AD07-59F34DCD44C8/0/index1119.pdf>. (Accessed June 2012).
- CBS Statistics Netherlands (2004) [Dutch: Second generation immigrants more successful than first generation] Statistics Netherlands. Available at: <http://www.cbs.nl/nl-NL/menu/themas/arbeid-sociale-zekerheid/publicaties/artikelen/archief/2004/2004-1611-wm.htm>. (Accessed February 2014).
- Choté AA, Koopmans GT, Redekop WK, de Groot CJ, Hoefman RJ, Jaddoe VW, Hofman A, Steegers EA, Mackenbach JP, Trappenburg M, Foets M (2011) Explaining Ethnic Differences in Late Antenatal Care Entry by Predisposing, Enabling and Need Factors in the Netherlands. The Generation R Study. *Matern Child Health J*; 15:689-99.
- Coonrod DV, Bruce NC, Malcolm TD, Drachman D, Frey KA (2009) Knowledge and attitudes regarding preconception care in a predominantly low-income Mexican American population. *Am J Obstet Gynecol*; 200(6):686.e1-7.
- COS Rotterdam Centre for Research and Statistics (2011) Customized data request: Rotterdam neighborhood birth rates of non-Western women aged between 18 and 42. Rotterdam Centre for Research and Statistics. Rotterdam; 2011.
- COS Rotterdam Centre for Research and Statistics (2012) Rotterdam Social Measured [Dutch] Available at: <http://www.rotterdam.nl/DG%20Centrum/Sociale%20Index%202012.pdf>. (Accessed July 2012).
- Denktaş S, Koopmans G, Birnie E, Foets M, Bonsel G (2009) Ethnic background and differences in health care use: a national cross-sectional study of native Dutch and immigrant elderly in the Netherlands. *Int J Equity Health*; 1-9.

- Denktaş S, Bonsel GJ, van der Weg EJ, Voorham AJJ, Torij HW, De Graaf JP, Wildschut HJJ, Peters IA, Birnie E, Steegers EAP (2011) An urban perinatal health programme of strategies to improve perinatal health. *Matern Child Health J*; 16(8):1553-8.
- El-Khorazaty MN, Johnson AA, Kiely M, El-Mohandes AA, Subramanian S, Laryea HA, Murray KB, Thornberry JS, Joseph JG (2007) Recruitment and retention of low-income minority women in a behavioral intervention to reduce smoking, depression, and intimate partner violence during pregnancy. *BMC Public Health*; 6(7):233.
- Fransen MP, Wildschut H, Vogel I, Mackenbach J, Steegers E, Essink-Bot ML (2009) Information about prenatal screening for Down syndrome: ethnic differences in knowledge. *Patient Educ Couns*; 77(2):279-88.
- Frey KA, Files JA (2006) Preconception healthcare: what women know and believe. *Matern Child Health J*; 10:S73-S77.
- Goedhart G, van Eijsden M, van der Wal MF, Bonsel GJ (2008) Ethnic differences in preterm birth and its subtypes: the effect of a cumulative risk profile. *BJOG*; 115(6):710-9.
- De Graaf JP, Ravelli AC, De Haan MA, Steegers EA, Bonsel GJ (2013A) Living in deprived urban districts increases perinatal health inequalities. *J Matern Fetal Neonatal Medicine*; 26:473-81.
- De Graaf JP, Steegers EA, Bonsel GJ (2013B) Inequalities in perinatal and maternal health. *Curr Opin Obstet Gynecol*; 25:98-108.
- Hoppensteyn M (2009) [Dutch: Rotterdam population prognoses 2010-2025]. COS Rotterdam Centre for Research and Statistics. Available at: <http://www.rotterdam.nl/COS/publicaties/Vanaf%202005/08-2926.Bevolkingsprognose%20Rotterdam%202010-2025.pdf>. (Accessed May 2011).
- Hoppensteyn M (2011) [Dutch: Factsheet, population monitor, April 2011] COS Center for Research and Statistics Rotterdam; Rotterdam, Netherlands.
- Iliyasu Z, Abubakar IS, Galadanci HS, Aliyu MH (2010) Birth preparedness, complication readiness and fathers' participation in maternity care in a northern Nigerian community. *Afr J Reprod Health*; 14(1):21-32.
- Lee RE, McGinnis KA, Sallis JF, Castro CM, Chen AH, Hickman SA (1997) Active vs. passive methods of recruiting ethnic minority to a health promotion program. *Ann Behav Med*; 19:378-84.
- Lindström M, Sundquist J, Östergren P-O (2001) Ethnic differences in self-reported health in Malmo in southern Sweden. *J Epidemiol Community Health*; 55:97-103.
- Mackenbach JP, Karanikolos M, McKee M (2013) Health in Europe 1. The unequal health of Europeans: successes and failures of policies. *Lancet*; 381(9872):1125-34.
- Martijn C, de Vries NK, Voorham T, Brandsma J, Meis M, Hospers HJ (2004) The effects of AIDS prevention programs by lay health advisors for migrants in The Netherlands. *Patient Educ Couns*; 53:157-65.
- Massey Z, Rising SS, Ickovics J (2006) Centering Pregnancy group prenatal care: Promoting relationship-centered care. *JOGNN*; 35(2):286-94.
- Municipality of Rotterdam, Social Index Score, (2012), Available at: http://www.rotterdam.nl/tekst_sociale_index_centrum. (Accessed July 2012).

- Murphy Tighe S (2010) An exploration of the attitudes of attenders and non-attenders towards antenatal education. *Midwifery*; 26(3):294-303.
- Ng C, Newbold KB (2011) Health care providers' perspectives on the provision of prenatal care to immigrants. *Cult Health Sex*; 13(5):561-74.
- Owens MD, Kieffer EC, Chowdhury FH (2006) Preconception Care and Women with or at Risk for Diabetes: Implications for Community Intervention. *Matern Child Health J*; 10:S137-S141.
- Peristat II (2004): EURO-PERISTAT project in collaboration with SCPE, EUROCAT and EURONEONET. European perinatal health report. Better statistics for better health for pregnant women and their babies in 2004. Available at: <http://www.europeristat.com/reports/european-perinatal-health-report2004.html>. (accessed May 2012).
- Poeran J, Denktas S, Birnie E, Bonsel J, Steegers EAP (2010) Urban perinatal health inequalities. *J Mater Fetal Neonatal Medicine*; 24(4):643-6.
- Poeran J, Maas AF, Birnie E, Denktas S, Steegers EA, Bonsel GJ (2013) Social deprivation and adverse outcomes among Western and non-Western pregnant women in a Dutch urban population. *Soc Sci Med*; 83:42-9.
- Programme Ready for a Baby (2011) [Dutch: Report, baseline measurement preconception care district Feijenoord, Rotterdam]. *Program Ready for a Baby Rotterdam*; 22.
- Rempel LA, Moore KC (2012) Peer-led prenatal breast-feeding education: a viable alternative to nurse-led education. *Midwifery*; 28(1):73-9.
- RIVM (2013) [Dutch: What is the effect of prevention in the Netherlands?] *National Compass Public Health*. Available at: <http://www.nationaalkompas.nl/preventie/bereik/> and <http://www.nationaalkompas.nl/algemeen/menu-rechts/english/>. (Accessed January 2013).
- STIVORO (2010) ITC Netherlands Survey: Report on Smokers' Awareness of the Health Risks of Smoking and Exposure to Second-Hand Smoke, Netherlands.
- Stronks K, Ravelli AC, Reijneveld SA (2001) Immigrants in the Netherlands: Equal access for equal needs? *J Epidemiol Community Health*; 55:691-2.
- Temel S, Birnie E, Voorham AJJ, Bonsel GJ, Steegers EAP, Denktas S (2013) Determinants of the intention of preconception care use: lessons from a multi-ethnic urban population in the Netherlands. *Int J Public Health*; 58:295-304.
- Thomas PE, Beckmann M, Gibbons K (2010) The effect of cultural and linguistic diversity on pregnancy outcomes. *Aust N Z J Obstet Gynaecol*; 50:419-22.
- Timmermans S, Jaddoe VW, Mackenbach JP, Hofman A, Steegers-Theunissen RP, Steegers EA (2008) Determinants of folic acid use in early pregnancy in a multi-ethnic urban population in The Netherlands: the Generation R study. *Prev Med*; 47:427-32.

- Tripathy P, Nair N, Barnett S, Mahapatra R, Borghi J, Rath S, Gope R, Mahto D, Sinha R, Lakshminarayana R, Patel V, Pagel C, Prost A, Costello A (2010) Effect of a participatory intervention with women's groups on birth outcomes and maternal depression in Jharkhand and Orissa, India: a cluster-randomised controlled trial. *Lancet*; 375(9721):1182-92.
- Turner G, Shepard J (1999) A method in search of theory: peer education and health promotion' *Health Educ Res*; 14(2):235-47.
- Velott DL, Baker SA, Hillemeier MM, Weisman CS (2008) Participant recruitment to a randomized trial of a community-based behavioral intervention for pre- and interconceptional women findings from the Central Pennsylvania Women's Health Study. *Womens Health Issues*; 18:217-24.
- Waelput AJM, Achterberg PW (2007) Ethnic origin and care during pregnancy and birth: an exploration of Dutch research [Dutch]. RIVM National Institute for Public Health and the Environment, Bilthoven, Netherlands.
- de Walle HEK, van der Pal KM, de Jong-van den Berg LTW, Jeeninga W, Schouten JSAG, de Rover CM, Buitendijk SE, Cornel MC (1999) Effect of mass media campaign to reduce socioeconomic differences in women's awareness and behaviour concerning use of folic acid: cross sectional study. *BMJ*; 319(7205):291-2.
- van der Zee B, de Beaufort I, Temel S, de Wert G, Denktas S, Steegers E (2011) Preconception care: an essential preventive strategy to improve children's and women's health. *J Public Health Policy*; 32(3):367-79.
- ZonMw (2011) [Dutch: The future of an intercultural preventive for mental health care]. Available at: http://www.zonmw.nl/uploads/tx_vipublicaties/Rapport_ggz_ZonMw.pdf. (Accessed November 2012).



Appendix 5.1 Intervention and study design.



Chapter 6



**Translating the social-
ecological perspective into
multilevel interventions:
theory and practice**

VLN Schölmerich, I Kawachi

ABSTRACT

Recommendations are frequently made to develop preventive public health interventions that are ‘multilevel’. Such interventions take explicit account of the role of environments by incorporating socio-ecological frameworks into their design and implementation. However, research on how public health interventions have translated these concepts into practice remains scarce.

This article seeks to review the current definitions and operationalization of multilevel interventions. First, the divergent definitions of multilevel interventions are highlighted, and we show the persistent ambiguity around this term. We argue that interventions involving activities at several levels but lacking targets (i.e. objectives) to create change on more than one level have not incorporated a socio-ecological framework and should therefore not be considered as ‘multilevel’.

In a second step, this study focuses on family planning interventions to illustrate the extent to which public health interventions have successfully incorporated a socio-ecological framework. To this end, the 62 studies featured in Mwaikambo et al.’s 2011 systematic review on family planning interventions were re-examined. This assessment indicates that the socio-ecological perspective has seldom been translated into interventions. Specifically, the majority of interventions involved some form of activity at the community and/or organizational level, yet targeted intrapersonal change as opposed to explicitly targeting environmental modification.

Lastly, we argue that the theoretical framework for guiding the design of multilevel interventions remains underdeveloped. We seek to contribute to this framework by highlighting two theoretical perspectives that hold promise by being incorporated into multilevel interventions, viz. the complementarity principle and risk compensation theory.

INTRODUCTION

Health behaviors – such as smoking or physical inactivity – account for a substantial proportion of the global burden of disease [3]. Accordingly, developing effective interventions to prevent these behaviors has become a cornerstone of public health. Typical areas of study include nutrition, physical activity, alcohol/tobacco/drug consumption and sexual risk behavior. Studies on sexual risk behavior tend to focus on AIDS and Sexually Transmitted Diseases, while family planning has received less attention [4-6]. By definition, family planning is the capacity of individuals and couples to anticipate and attain their desired number of children and the spacing and timing of their births. It is achieved through the use of contraceptive methods (<http://www.who.int/>). Global rates of unintended pregnancies remain high [5, 7], and have far reaching health as well as social and economic consequences for women, children, their families and society at large [5, 8, 9].

Efforts to understand health behaviors have traditionally focused on mapping the intrapersonal characteristics that influence behavior, such as knowledge, attitudes and perceptions [3]. During the last two decades, growing attention has been devoted to how physical and socio-economic environments shape behavior [10]. Studies have shown that variation in family planning behavior, for instance, cannot be completely understood by considering intrapersonal correlates alone. Rather, behavior is also influenced by environmental correlates such as local access to health care, community gender norms, or the level of the partner's support [11-13]. Within family planning, but also across the entire public health sector, scholars and practitioners alike have argued that interventions must be informed by a contextualized understanding of health behaviors [3, 12, 14]. More specifically, recommendations have been made to develop public health interventions that take explicit account of the role of environments by incorporating 'multilevel' or 'socio-ecological' frameworks into their design and implementation [3, 15-17].

While the term "multilevel" has become a buzzword in public health [18, 19], research remains scarce on how public health interventions have translated this concept into practice. The general impression from the literature is that the frequency of multilevel interventions remains low [14, 18-21]. In goals of this review is to shed light on the current definitions and operationalization of multilevel interventions. To do this, the prevailing definitions of multilevel interventions are considered. Subsequently, this article examines to what extent family planning interventions have incorporated a multilevel perspective by re-assessing the interventions featured in the Mwaikambo et al. 2011 systematic review. One publication

featured in the review was excluded as we were unable to obtain the publication (FOCUS/Care 2000), resulting in a total of 62 assessed interventions [6]. We chose to focus on family planning because calls for multilevel interventions are frequently made in this area [12, 22, 23] but it is unclear to what extent such interventions are actually implemented. At the same time, efforts to boost family planning have been largely disappointing, [6, 24] indicating that a critical review of intervention strategies would be helpful. Following the assessment of family planning interventions, we argue that the theoretical framework for guiding the design of multilevel interventions remains underdeveloped. We seek to contribute to this framework by highlighting two theoretical perspectives that hold promise by being incorporated into multilevel interventions, viz. the complementarity principle and risk compensation theory.

Background

Public health efforts to modify health behaviors have drawn from diverse theoretical perspectives [25]. Traditionally, they were based heavily on the social psychological approach, including the health belief model, cognitive social learning theory and the theory of reasoned action [26]. These theories pay little attention to the role of environments, and share the assumption that individuals are conscious of the choices they make and ultimately control their behavior [25]. As a result, interventions based on these theories tend to emphasize changing intrapersonal cognitive characteristics such as health literacy or attitudes [3, 27, 28]. An example of such an approach was the Just Say No campaign in the USA in the early 1980s which was part of the “War on Drugs” [29]. The effectiveness of such initiatives has been largely disappointing and their failure has been attributed to their neglect of context [10, 28, 30-32].

As formulated by Bandura [33], the Social Cognitive Theory emphasizes that individual’s sense of self-efficacy is highly influential on their behavior. At the same time, it was the first mainstream theory within public health to devote substantial attention to the role of the social environment, and the interaction between individuals and their environment. Nonetheless, Burke et al. [25] note that most attempts to operationalize Bandura’s model tend to overlook the interaction between the individual and the environment. Instead, these interventions have heavily focused on arming individuals with information and self-efficacy – assuming that this would allow individuals to construct their lives as to avoid negative health outcomes.

Developed around the same time as the Social Cognitive Theory, the social-ecological perspective (also referred to as ‘Ecological Systems Theory’, the ‘Ecological’ or the ‘Multilevel’

perspective [19], places particular emphasis on how human behavior is not only influenced by intrapersonal attributes but also embedded in environments [34, 35]. Similar to the Social Cognitive Theory, this perspective considers the interaction between individuals and their environments, but adds that individual-environment interactions can be observed at various ‘levels’ and that there are feedback loops across these different levels [3, 25, 36]. Various models have been developed that describe these levels. McLeroy’s model [35] is widely cited and comprises the following levels: intrapersonal (or individual), interpersonal, organizational (or institutional), community and policy [18, 20]. These levels are explained in more detail in Table 6.1. According to the social-ecological perspective, the different levels are seen as nested within each other, forming a hierarchy.

Defining multilevel interventions

The social-ecological perspective has been used to develop ‘multilevel interventions’ in order to modify health-related behavior (also referred to as ‘ecological’ or ‘social-ecological’ interventions). In line with the social-ecological perspective, multilevel interventions can

Table 6.1 Overview of social-ecological levels

| Level | Working definitions of these levels | Examples of correlates influencing family planning behavior at these levels |
|----------------------|--|---|
| Policy level | “Larger systems possessing the means to control several aspects of the lives and development of their constituent subsystems (provinces, states, countries)” [14] | Contraception laws [37], investments in national family-planning programmes [4] |
| Community level | “Collectives of people identified by common values and mutual concern for the development and well-being of their group or geographic area (villages, neighborhoods)” [14] | Gender norms [13], community socio-economic status [38], information available about family planning [11] |
| Organizational level | “Systems with a formal multiection decision process operating in pursuit of specific targets (schools, companies, professional associations)” [14] | Access and quality of health care [11], public transport [12] |
| Interpersonal level | “Persons and small groups with whom the at-risk people associate” (family, friends) [14] | Partner’s approval of contraception [12], partner’s involvement in family planning [39] |
| Intrapersonal level | “Characteristics of the individual such as knowledge, attitudes, behavior, self-concept, skills, etc.” [35] | Knowledge [12], religious affiliation [40], perceptions [41] |

intervene at various levels and have different targets (i.e. objectives) at each of these levels. Moreover, proponents of multilevel interventions assume that such interventions must target change at an environmental level. Beyond this, there are at least two divergent definitions of what multilevel interventions are. These differ in their view of *which* levels need to be targeted.

A broad definition of multilevel interventions – to which we adhere to in this article – is that they have targets to create change at more than one level. The two (or more) levels targeted can include the intrapersonal and an environmental level, or only environmental levels [15, 21, 42]. For example, a multilevel intervention might target an increase in the quality of health care (organizational level) and improvement of either local gender norms (community level) or individual health literacy (intrapersonal level). In contrast, a more narrow definition is that multilevel interventions must not only target more than one level, but must specifically combine environmental with intrapersonal change [35, 36, 43]. Confusingly, Kahn & Gallant [44] refer to such interventions as ‘multicomponent’ rather than ‘multilevel’ interventions.

There is some ambiguity about the definition of multilevel interventions. For one, scholars use different models that purport to rely on the social-ecological approach. Scholars such as Shoveller et al. [45] base their understanding of multilevel interventions on the model of Bronfenbrenner. This models groups the intrapersonal and the interpersonal levels into one level, namely the micro level. Scholars using Bronfenbrenner’s model might therefore not consider interventions with intrapersonal and interpersonal targets as being multilevel, while other researchers (including our view) would suggest that they are.

A second and major source of confusion stems from scholars incorrectly labeling *activities* that take place at the environmental level (e.g. community commercials) as *targets* for environmental change. This could lead to interventions being seen as multilevel because they involve activities at the contextual level, but not because they aim for environmental change. As outlined above, our definition of multilevel interventions includes the notion that they – next to possible targets at the intrapersonal level – aim for environmental modification. Interestingly, even scholars who share our definition occasionally classify interventions as multilevel based on an assessment of the activities as opposed to the targets. For example, in their review of intervention strategies for STIs, DiClemente et al. [42] consider ‘mass-media campaigns’ as an environmental-level target. This is actually an example of an activity at the community level with a target for intrapersonal change, as opposed to environmental modification. Another illustration of this confusion can be found in Engbers et al.’s (2005, p. 64) review of multilevel interventions. While some of the intervention strategies listed

under ‘environmental modification’ are indeed targets to create contextual change (such as the inclusion of healthy food at the canteen), some of the strategies are actually merely activities located at the environmental level with the target to create intrapersonal change (such as “posters to publicize healthy eating habits”). (For more examples see Coates et al. 2008, p. 673, Quinn et al. 2005, p. 675).

The crucial element of multilevel interventions, therefore, is not whether the activities are multilevel – but whether the *targets* are explicitly focused on more than one level [35]. While it is conceivable that most multilevel interventions also employ multilevel activities, Kok et al. [14] point out that this is not necessarily the case. An example would be lobbying lawmakers (activity at the policy level) to influence the passage of regulations that affect individuals, organizations, as well as society at large (multilevel targets). Indeed, the passage of laws to restrict smoking in workplaces in the USA influenced not only individual behavior change directly, but also organizations as well as society at large (via changes in social norms regarding smoking in public places) [46, 47].

It should be noted that initiatives adhering to the “structural approach” are related to the social-ecological approach, but are not necessarily multilevel initiatives following our preceding definition. Lieberman et al. [48] define these interventions as modifying the “[...] physical, social, political, and economic environment in which people make health-related decisions.” (Also see [20, 49]) Such initiatives incorporate social-ecological thinking in the sense that they explicitly attempt to change the environment; but they do not necessarily target *several* levels simultaneously. Interventions based on behavioral economics are increasingly popular and often adhere to a structural approach [36]. These efforts operate under the assumption that situational factors can ‘nudge’ a person’s capacity to behave in their own self-interest. An example of a nudge would be changing the order in which food is presented in the school cafeteria, i.e. arranging healthy foods ahead of unhealthy options so that the food tray is filled first with desirable options. Thaler and Sunstein refer to this type of intervention as “choice architecture” [50].

METHODS

Mwaikambo et al.’s 2011 systematic review of 62 family planning interventions was used to assess the extent to which these interventions incorporated a multilevel framework [6]. The review included interventions published between 1995 and 2008 that used an experimental or quasi-experimental design to ascribe intervention effects to changes in fertility and

other family planning outcomes. The interventions took place in Africa [24], Asia [21], the Americas [14], Eurasia [2] and the Middle-East [2]. This article uses McLeroy's model [35] of the social-ecological levels – as outlined in the section 'background' – to assess at which levels the activities, targets and results of the interventions were located.

The coding of the studies was carried out by the first author (VLNS) and a research assistant. They reviewed each original article to code the level (i.e. the setting) at which the intervention activities took place. For example, an intervention with recreational activities in the community and educational sessions in school would be coded as having activities at the community and organizational level. Next, the researchers reviewed each original article to code the levels targeted by the intervention. For instance, interventions with the aim to increase knowledge and the quality of health care were coded as having intrapersonal and organizational targets. The distinction between activities and targets is critical in the light of the definition of multilevel interventions described above. Moreover, this approach allowed for comparability with the analysis performed by Golden & Earp [18] on health promotion programs. In contrast to Golden & Earp, this study also identified at which level the results were assessed in order to gauge the extent to which the interventions were able to measure social-ecological impact.

Not surprisingly, many of the interventions had the ultimate target of achieving individual-level behavior change (such as increased use of contraception) and/or population-level change (e.g. a decline in fertility). This information was included in the coding scheme. We were, however, particularly interested in assessing the mechanisms through which the interventions attempted to influence individual behavior or achieve population-level change. For example, an intervention might seek to achieve increased contraception usage by increasing individual knowledge and the quality of health care (intrapersonal and organizational targets, respectively). Interventions that only mentioned a target to achieve a change in individual-level behavior or population-level metrics were considered to not have any targets at the social-ecological level. For background information, Mwaikambo's summary of the setting, sample size and the sample characteristics of the interventions is included (see the following link for Mwaikambo et al.'s full summary of the interventions: <http://tinyurl.com/o4ldjx3>).

Before coding all of the interventions, the researchers independently coded the activities, targets and results of five original articles to test-pilot the coding scheme. After the pilot phase, the two researchers independently coded the other studies. The information about the

activities and targets were abstracted from the original studies. For the coding of the results of each study, the researchers made use of Mwaikambo et al.'s already prepared summary of the results of each intervention. The researchers also checked the original articles for accuracy of this summary. Once this was completed, the two researchers compared their results and resolved any inconsistencies by discussion. The two coders agreed on their coding of the targets, activities and results 87%, 90% and 97% of the time, respectively.

RESULTS

The assessment of the 62 family planning interventions revealed that the majority of the interventions employed some kind of activity at the community and/or organizational level, yet they targeted change and/or measured results at the intrapersonal level. To illustrate the diversity of the reviewed interventions, Table 6.2 includes an excerpt of the assessed initiatives. The full list of coded interventions can be found in Appendix 6.1.

On the basis of the coding of all of the interventions (see Appendix 6.1 for the complete list), we can conclude the following:

Multilevel activities:

- In terms of activities, the majority of interventions operated on the organizational and/or community level. This does not mean that these activities were necessarily targeted toward creating *change* at these levels. Many interventions included activities such as mass-media campaigns geared at changing intrapersonal knowledge/attitudes/perceptions.
- 43 of the 62 interventions employed activities at one level, 17 interventions employed activities at two levels
- None of the interventions took action at the policy level.
- 11 of the 62 interventions implemented activities at both the intrapersonal and environmental levels
- 11 of the 62 interventions performed activities that sought to modify the environment – even though this was explicitly stated as a target for only about half of these interventions. For example, the study reported by Magnani et al. [1] invested in improving reproductive health services (an organizational activity that could plausibly lead to organizational change), combined with sexual education for school children, but did not state organizational change as an intervention target.

Table 6.2 Excerpt of the assessed initiatives

| Intervention reference | Setting, sample size, sample characteristics ¹ | Activity at each level | Target at each level | Results measured at each level ² (No significant difference 0; significant desirable difference +; significant undesirable difference -) | Notes |
|--------------------------|---|--|--|---|--|
| Meekers et al. 1997 | <ul style="list-style-type: none"> Lobatse, Botswana (treatment); Francistown, Botswana Males and females ages 13-18 n=1,002 baseline; n=2,396 follow-up | <p>Community-level:</p> <ul style="list-style-type: none"> Multi-media campaign Multi-media addressed to households <p>Organizational-level:</p> <ul style="list-style-type: none"> Outlets with reproductive health info and products Social marketing of condoms Peer sales of contraceptives (also at schools) | <p>Intrapersonal level:</p> <ul style="list-style-type: none"> Improve knowledge/attitudes/perceptions <p>Individual behavior change:</p> <ul style="list-style-type: none"> Contraception use Decline in sexual activity and promiscuity | <p>Intrapersonal level:</p> <ul style="list-style-type: none"> Believe that condoms reduce AIDS and pregnancy risk: Males: 0 Females: + Believe AIDS is not curable: Males: 0 Females: + Believe sex leads to marriage: Males: 0 Females: + Believe sex increases one's status: Males: - Females: 0 Believe sex is an AIDS' risk: 0 Believe abstinence is protective: Males: 0 Females: + Attitude toward female's initiating condom use: 0 | Activities at two levels, but target and results measured at intrapersonal level |
| Agha and Van Rossem 2004 | <ul style="list-style-type: none"> Zambia (urban secondary, boarding schools) n=416 respondents ages 14-23 (at baseline) were interviewed in all three survey rounds (86% follow-up rate) | <p>Organization-level:</p> <ul style="list-style-type: none"> Sexual health education in schools | <p>Intrapersonal-level:</p> <ul style="list-style-type: none"> Improve knowledge/perceptions/attitudes <p>Individual behavior change:</p> <ul style="list-style-type: none"> Increase in abstinence Condom use | <p>Intrapersonal-level:</p> <ul style="list-style-type: none"> Normative beliefs about abstinence: + (sustained until 6 months) Approval of condom use and intention to use: + (not sustained at 6 months) Normative beliefs about condom use: + (only at 6 months follow-up) <p>Individual behavior change:</p> <ul style="list-style-type: none"> Condom use: 0 Multiple regular partners: + (only at 6 months follow-up) | Example of an intervention that only has a single-level activity/target/results |

| | | | | | |
|---------------------|--|--|---|---|--|
| Erulkar et al. 2004 | <ul style="list-style-type: none"> • Nyeri Municipality, Kenya (treatment); Nyahururu Municipality, Kenya (control) • At baseline, unmarried young people ages 10-24; n=1,544; at endline, young adults ages 10-26; n=1,865 (only respondents ages 10-24 in this analysis) | <p>Community-level:</p> <ul style="list-style-type: none"> • Youth educational and recreational sessions led by young parents <p>Organizational level:</p> <ul style="list-style-type: none"> • Coordination with family planning association to train reproductive care providers (and related providers) to provide youth friendly services and subsidize care | <p>Organization-level:</p> <ul style="list-style-type: none"> • Reproductive health information and service environment responsive to needs of youth <p>Intrapersonal-level</p> <ul style="list-style-type: none"> • Improve knowledge/perceptions/attitudes • Communication with parents or other adults <p>Individual behavior change:</p> <ul style="list-style-type: none"> • Condom use • Decline in number of partners • Delay the onset of sexual activity | <p>Intrapersonal-level:</p> <ul style="list-style-type: none"> • Communication with parents: Males: - Females: + • Communication with other adults: Males & Females: + <p>Individual behavior change:</p> <ul style="list-style-type: none"> • Sexual debut: Males: + (marginally significant .8) Females: 0 • Secondary abstinence: Males: 0 Females: + • Condom use: Males: + Females: 0 • Number of sex partners: Males: 0 Females: + | One of the twelve interventions with targets at more than one level. However, the results are only measured at the intrapersonal level |
| Drop et al. 2004 | <ul style="list-style-type: none"> • Senegal (urban): Louga and Saint-Louis (treatment); Diourbel (control) • Baseline adolescents=2,893 and parents=1,683; Endline adolescents=2,738 and parents=1,409 (also included cost analysis) | <p>Community-level:</p> <ul style="list-style-type: none"> • Media campaign • Recreational activities • Peer education at community events • Meetings to sensitize parents <p>Organizational level:</p> <ul style="list-style-type: none"> • Health care infrastructure modification • Training of providers • Training of teachers | <p>Organization-level:</p> <ul style="list-style-type: none"> • Improve youth-friendliness of reproductive health services <p>Intrapersonal-level:</p> <ul style="list-style-type: none"> • Improve communication between parents and their children <p>Intrapersonal-level:</p> <ul style="list-style-type: none"> • Improve knowledge/attitudes/perceptions <p>Individual behavior change:</p> <ul style="list-style-type: none"> • Contraceptive use • Increase use of services | <p>Interpersonal level:</p> <ul style="list-style-type: none"> • Parents' approval of adolescents receiving reproductive health services: + • Communication between parents and adolescents: + <p>Intrapersonal level:</p> <ul style="list-style-type: none"> • Use of services: + (excluding all girls in Louga and older boys in Saint-Louis) • Knowledge of risks of early sexuality, pregnancy, and abortion: + • Knowledge of contraceptive methods: Males + Females + (for Louga and only 15-19 Saint-Louis) • Attitudes regarding contraceptive use: 0 <p>Individual behavior change:</p> <ul style="list-style-type: none"> • Sexual debut: + (positive delays/increases in age for younger boys and older girls) | One out of the eight interventions that measure results at more than one level |

This table is an excerpt of the assessed interventions. For the full list of assessed interventions, please see Appendix 6.1.

¹The information in this column was obtained an appendix of Mwaikambo et al.'s 2011 systematic review: <http://tinyurl.com/o4ldjx3>.

²The results presented in this column (but not the coding of social-ecological levels) were obtained from the appendix of Mwaikambo et al.'s 2011 systematic review: <http://tinyurl.com/o4ldjx3>. Reprinted with the permission of the Population Council.

Box 6.1 An exemplary multilevel intervention

The study described in Diop et al. [2] is one of the exemplary 'multilevel' interventions featured in Mwaikambo's review. Educational and quality of health care activities were performed across the communities and the project targeted both change at the intrapersonal level (knowledge/attitudes/perceptions), at the interpersonal-level, viz. parental approval of adolescents receiving reproductive health services as well as at the organizational level (improved youth-friendliness of reproductive health services). Moreover, this intervention measured results at both levels by collecting data from both adolescents and their parents.

Multilevel targets:

- 8 interventions did not have a target at a social-ecological level (i.e. solely had targets for individual-behavior change and/or population-level change)
- 13 interventions (about 20% of all interventions) had targets to create change at more than one level, mostly at the intrapersonal level combined with the organizational or the interpersonal level
- None of the interventions had targets at the policy level
- 38 interventions had targets to create change at solely the intrapersonal level, typically improving knowledge, attitudes and perceptions

Multilevel results:

- 8 interventions did not have any targets at a social-ecological level
- 8 (about 13% of all interventions) interventions measured results at more than one level, typically at the intrapersonal-level combined with either the interpersonal- or the organizational-level
- 43 interventions solely measured results at the intrapersonal level.

DISCUSSION

The assessment of the family planning interventions featured in Mwaikambo et al.'s [6] systematic review showed that while many of the interventions featured activities occurring at more than one level, the vast majority had intrapersonal-level targets. As defined at the outset, this study considered multilevel interventions to be those that targeted at least two levels of change. Accordingly, this review suggests that very few family planning efforts have actually implemented the social-ecological approach into practice. 13 of the 62 interventions

had targets on more than one level. Likewise, 8 out interventions measured results at more than one level. Interventions with targets or results measured at more than one level typically combined the intrapersonal-level with either the interpersonal- or the organizational-level.

The findings of this study add to the sparsely available evidence that show that public health interventions mostly have single-level targets and are predominantly focused on intrapersonal change [14, 18-21]. This is perhaps not so surprising. For one, multilevel interventions require conceivably larger resources than single-level efforts [36]. Multilevel interventions include more than one target, need to be adapted to the local context and possibly also require longer time intervals before an effect can be detected at the population level. These requirements pose considerable operational and methodological challenges [19, 29].

A second major hurdle to designing multilevel interventions is that it is not yet clear what the added value of multilevel interventions is vis-à-vis single-level initiatives. A prominent argument for multilevel interventions is that they will have a larger impact on health outcomes than single-level initiatives [29]. However, such claims remain untested in the light of limited empirical investigation [48]. A few studies have investigated the question of whether initiatives combining environmental modification and intrapersonal-level strategies were more effective than those only employing intrapersonal-level targets. These studies have yielded inconsistent conclusions [44, 51-53].

In addition to the limited empirical evidence of the effectiveness of multilevel interventions, there is only rudimentary theoretical understanding of why they might be more effective than single-level interventions. Kahn & Gallant [44] argue that multilevel interventions are probabilistically more likely to succeed than single-level interventions as the latter typically only have one target that could potentially succeed. This thinking is in line with Stokols [43] and Richards et al.'s [21] view that an intervention is more 'multilevel' based on the numbers of levels targeted. While it is conceivable that targeting more than one level in an intervention might increase impact, this argument in itself does not justify the design of (typically expensive) multilevel interventions. It should be noted that there are exceptions to the expected probabilistic higher impact of multilevel interventions. Fluoridated water as the public water supply is a case in point – this is a single-level intervention which is presumably much more effective than complex multilevel interventions.

Instead of operating on the assumption that multiplying the number of targets will probabilistically increase an intervention's impact, a more promising approach is to consider

the theories that provide insight into *why* multilevel interventions might be advantageous in certain situations. More specifically, theories are needed that show how knowledge about the *linkages* between the levels could be leveraged to increase impact [18, 54]. As outlined in the introduction, an important contribution of the social-ecological perspective was the emphasis placed on these linkages. While some scholars have suggested that social-ecological models help inform multilevel intervention design [14], it seems that simply acknowledging the embeddedness of human behavior in nested contexts does little to guide intervention design. A current limitation of this perspective is, hence, that it only draws attention to the potential existence of these linkages and does not provide an understanding of how these linkages might take shape in specific situations. This means that the social-ecological approach is not sufficient to provide a theoretical basis for identifying the situations in which combining different targets would be advantageous.

To contribute toward the development of a theoretical framework to guide multilevel intervention design, we consider two theories that help illustrate how paying attention to the linkages between levels could substantially enhance an intervention's impact. Moreover, we examine the potential applications of these theories to public health challenges.

1. Complementarity principle. The complementarity principle posits that intervening at one level to reduce the risks to health increases the marginal utility of individuals to invest in other aspects of their health [55]. This means that an environmental modification can increase an intrapersonal correlate, namely the individual's motivation to invest in her health. The principle was originally formulated when researchers noticed that a community vaccination campaign seemed to increase the rates of pregnant women exercising and in increase in nutrition provided to infants in sub-Saharan Africa (both unrelated health behaviors). Here, improving the chances of infant survival via vaccination increased the marginal utility of investing in these unrelated health behaviors [56].

Although Sorensen and colleagues [57] did not specifically cite this principle, their WellWorks-2 Cluster Randomized Trial of smoking cessation within blue-collar workplaces provides a useful illustration of this principle. They found that health education efforts geared solely at the individual workers failed to motivate them to stop smoking. As a reason for their reluctance to change their behavior, the workers pointed out that they were already exposed to the same chemicals present in tobacco smoke (e.g. benzene) in their workplaces and were hence not motivated to quit. In other words, the motivation to quit (an intrapersonal correlate) strongly depended on the level of workplace toxins (an environmental correlate). In

response, the intervention team combined the individual education efforts with a worksite-level occupational health and safety intervention to reduce chemical hazards in the workplace. The evaluation showed that workers who received this environmental modification were twice as likely to quit smoking as their counterparts assigned to the work sites only receiving individual health education [57, 58]. In observational data, it has similarly been found that adolescents growing up in unsafe neighborhoods in the United States are also more likely to smoke [59]. Put differently, when the prospect of longevity is threatened by violence, it is assumed to reduce the marginal utility of investing in one's future health (by not smoking).

In cases where this principle applies, environmental change might not only amplify the beneficial effect of intrapersonal correlates (such as motivation) but is perhaps even a prerequisite for behavioral change. Moreover, the complementarity principle also draws attention to the potential linkages that might exist between intrapersonal and environmental correlates that do not – at first glance – appear to be related to each other. Depending on the given context, this principle could apply to family planning in a number of ways. For instance, as child mortality rates drop due to improved quality of health care (a community level correlate), women might be more able – and therefore more motivated – to anticipate the number of children they plan to have (intrapersonal level correlate). In other words, reducing child mortality might increase the marginal utility of individuals to invest in family planning.

2. Risk compensation theory. The risk compensation theory highlights the opposite of the compensation principle, i.e. an unintended negative consequence of an intervention. The principle posits that a decrease in environmental risk may lead to an increase in the risks individuals are willing to take. Applied to public health, this means that a benefit for health behavior accrued on an environmental level may be compensated by individuals on another level. An experiment by Roberto and colleagues [60] illustrates this principle. They found that individuals eating in a restaurant providing information about the calories of meals (organizational level) tended to consume less calories in the restaurant, but later on compensated for this by eating even more calories at home (interpersonal level). This study suggests that a multilevel intervention combining a) providing information about the calories of meals and b) increasing availability and accessibility of healthy food at home might be more effective. This example shows how attention to the linkages between correlates situated at different levels can help to overcome the unintended consequences of an intervention. More broadly, this theory suggests that benefits created at one level can be attenuated by compensatory behavior if change is not simultaneously created at another level.

Limitations & contribution

This review has several limitations. For one, the assessment of interventions featured in Mwaikambo et al.'s systematic review do not cover all of the interventions published in scientific journals and in the grey literature during this time period. Furthermore, it is possible that some of the reviewed interventions appear to be single-level but were actually part of a larger multilevel program. Despite these limitations, this review makes several contributions. First, we highlighted the persistent ambiguity around the definition of multilevel interventions and argued that community-based interventions are not necessarily multilevel. Second, on the basis of this assessment of family planning interventions, we suggest that the social-ecological perspective has not been substantially translated into multilevel interventions. We also showed that the reviewed interventions were even less likely to have measured results on more than one level. Lastly two theories were highlighted that demonstrate the added value of multilevel interventions in certain situations, namely the complementarity principle and the risk-compensation theory. For future research, we recommend further exploring theories that help to understand linkages across levels and thereby highlight leverage points for interventions.

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APPENDIX

See this (private) link for Appendix 6.1:

<http://www.verascholmerich.com/appendix/>

REFERENCES

1. Magnani RJ, Gaffikin L, de Aquino EML, Seiber EE, Almeida MdC, Lipovsek V. Impact of an integrated adolescent reproductive health program in Brazil. *Studies in family planning*. 2001;32(3):230-43.
2. Diop NJ, Bathidja H, Diop Touré I, Thierno D, Babacar M, RamaRao S, et al. Improving the Reproductive Health of Adolescents in Senegal: *Frontiers in Reproductive Health*, Population Council; 2004.
3. Glass TA, McAtee MJ. Behavioral science at the crossroads in public health: extending horizons, envisioning the future. *Soc Sci Med*. 2006;62(7):1650-71.
4. Cleland J, Bernstein S, Ezeh A, Faundes A, Glasier A, Innis J. Family planning: the unfinished agenda. *Lancet*. 2006;368(9549):1810-27.
5. Cleland K, Peipert JE, Westhoff C, Spear S, Trussell J. Family Planning as a Cost-Saving Preventive Health Service. *Choice*. 2011;8:1.
6. Mwaiambo L, Speizer IS, Schurmann A, Morgan G, Fikree F. What works in family planning interventions: a systematic review. *Studies in family planning*. 2011;42(2):67-82.
7. Dehlendorf C, Rodriguez MI, Levy K, Borrero S, Steinauer J. Disparities in family planning. *American journal of obstetrics and gynecology*. 2010;202(3):214-20.
8. Brown SS, Eisenberg L. The best intentions: Unintended pregnancy and the well-being of children and families: National Academies Press; 1995.
9. Karlsen S, Say L, Souza J-P, Hogue CJ, Calles DL, Gülmezoglu AM, et al. The relationship between maternal education and mortality among women giving birth in health care institutions: Analysis of the cross sectional WHO Global Survey on Maternal and Perinatal Health. *BMC Public Health*. 2011;11(1):606.
10. Huang TT, Drewnowski A, Kumanyika SK, Glass TA. A systems-oriented multilevel framework for addressing obesity in the 21st century. *Prev Chronic Dis*. 2009;6(3).
11. Gupta N, Katende C, Bessinger R. Associations of mass media exposure with family planning attitudes and practices in Uganda. *Studies in family planning*. 2003;34(1):19-31.
12. Stephenson R, Baschieri A, Clements S, Hennink M, Madise N. Contextual influences on modern contraceptive use in sub-Saharan Africa. *American journal of public health*. 2007;97(7):1233-40.
13. Stephenson R, Beke A, Tshibangu D. Contextual influences on contraceptive use in the Eastern Cape, South Africa. *Health Place*. 2008;14(4):841-52.
14. Kok G, Gottlieb NH, Commers M, Smerecnik C. The ecological approach in health promotion programs: a decade later. *American journal of health promotion : AJHP*. 2008;22(6):437-42.
15. Coates TJ, Richter L, Caceres C. Behavioural strategies to reduce HIV transmission: how to make them work better. *Lancet*. 2008;372(9639):669-84.

16. CSDH. Closing the gap in a generation: health equity through action on the social determinants of health. Final Report of the Commission on Social Determinants of Health Geneva: World Health Organization; 2008 [cited 2013 5 October]. Available from: http://whqlibdoc.who.int/publications/2008/9789241563703_eng.pdf.
17. Smedley BD, Syme SL. Promoting Health: Intervention Strategies from Social and Behavioral Research. Smedley BD, Syme SL, editors: The National Academies Press; 2000.
18. Golden SD, Earp JAL. Social Ecological Approaches to Individuals and Their Contexts: Twenty Years of Health Education & Behavior Health Promotion Interventions. *Health education & behavior : the official publication of the Society for Public Health Education*. 2012;39(3):364-72.
19. Richard L, Gauvin L, Raine K. Ecological models revisited: their uses and evolution in health promotion over two decades. *Annu Rev Public Health*. 2011;32:307-26.
20. Quinn LA, Thompson SJ, Ott MK. Application of the social ecological model in folic acid public health initiatives. *J Obstet Gynecol Neonatal Nurs*. 2005;34(6):672-81.
21. Richard L, Potvin L, Kishchuk N, Prlic H, Green LW. Assessment of the integration of the ecological approach in health promotion programs. *American journal of health promotion : AJHP*. 1996;10(4):318-28.
22. Mi Kim Y, Kols A, Nyakauru R, Marangwanda C, Chibatamoto P. Promoting Sexual Responsibility among Young People in Zimbabwe. *Int Fam Plan Perspect*. 2001;27(1):11-9.
23. Meuwissen LE, Gorter AC, Knottnerus AJ. Impact of accessible sexual and reproductive health care on poor and underserved adolescents in Managua, Nicaragua: a quasi-experimental intervention study. *J Adolesc Health*. 2006;38(1):56.
24. Paek H-J, Lee B, Salmon CT, Witte K. The contextual effects of gender norms, communication, and social capital on family planning behaviors in Uganda: a multilevel approach. *Health education & behavior : the official publication of the Society for Public Health Education*. 2008;35(4):461-77.
25. Burke NJ, Joseph G, Pasick RJ, Barker JC. Theorizing social context: rethinking behavioral theory. *Health education & behavior : the official publication of the Society for Public Health Education*. 2009;36(5 Suppl):55s-70s.
26. Speizer IS, Magnani RJ, Colvin CE. The effectiveness of adolescent reproductive health interventions in developing countries: a review of the evidence. *J Adolesc Health*. 2003;33(5):324-48.
27. McMichael AJ. Prisoners of the proximate: loosening the constraints on epidemiology in an age of change. *Am J Epidemiol*. 1999;149(10):887-97.
28. Moore L, de Silva-Sanigorski A, Moore SN. A socio-ecological perspective on behavioural interventions to influence food choice in schools: alternative, complementary or synergistic? *Public Health Nutr*. 2013;1-6.
29. Aguirre-Molina M, Gorman DM. Community-based approaches for the prevention of alcohol, tobacco, and other drug use. *Annu Rev Public Health*. 1996;17:337-58.
30. Krumeich A, Weijts W, Reddy P, Meijer-Weitz A. The benefits of anthropological approaches for health promotion research and practice. *Health Educ Res*. 2001;16(2):121-30.

31. McLeroy KR, Steckler AB, Simons-Morton B, Goodman RM. Social science theory in health education: Time for a new model? *Health Educ Res.* 1993;8:305-.
32. Gortmaker SL, Swinburn BA, Levy D, Carter R, Mabry PL, Finegood DT, et al. Changing the future of obesity: science, policy, and action. *Lancet.* 2011;378(9793):838-47.
33. Bandura A. *Social foundations of thought and action: a social cognitive theory*: Prentice-Hall; 1986.
34. Bronfenbrenner U. Toward an experimental ecology of human development. *The American psychologist.* 1977;32(7):513-31.
35. McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programs. *Health education quarterly.* 1988;15(4):351-77.
36. Stokols D. Translating social ecological theory into guidelines for community health promotion. *American journal of health promotion : AJHP.* 1996;10(4):282-98.
37. Goldin C, Katz LF. The power of the pill: Oral contraceptives and women's career and marriage decisions. *J Polit Econ.* 2002;4:730-70.
38. Grady WR, Klepinger DH, Billy JOG. The influence of community characteristics on the practice of effective contraception. *Family planning perspectives.* 1993;25(1):4-11.
39. Giusti C, Vignoli D. Determinants of Contraceptive Use in Egypt: A Multilevel Approach. *Stat Methods Appt.* 2006;15(1):89-106.
40. Goodson P. Protestants and Family Planning. *J Relig Health.* 1997;36(4):353-66.
41. Giles M, Liddell C, Bydawell M. Condom use in African adolescents: the role of individual and group factors. *AIDS care.* 2005;17(6):729-39.
42. DiClemente RJ, Salazar LF, Crosby RA, Rosenthal SL. Prevention and control of sexually transmitted infections among adolescents: the importance of a socio-ecological perspective--a commentary. *Public health.* 2005;119(9):825-36.
43. Stokols D. Establishing and maintaining healthy environments. Toward a social ecology of health promotion. *The American psychologist.* 1992;47(1):6-22.
44. Kahn JL, Gallant MP. Making healthy behaviors the easy choice for employees: a review of the literature on environmental and policy changes in worksite health promotion. *Health education & behavior : the official publication of the Society for Public Health Education.* 2012;39(6):752-76.
45. Shoveller JA, Johnson JL, Savoy DM, Wia Pietersma WA. Preventing sexually transmitted infections among adolescents: an assessment of ecological approaches and study methods. *Sex Educ.* 2006;6(2):163-83.
46. Gottlieb NH, Eriksen MP, Lovato CY, Weinstein RP, Green LW. Impact of a restrictive work site smoking policy on smoking behavior, attitudes, and norms. *Journal of occupational medicine : official publication of the Industrial Medical Association.* 1990;32(1):16-23.
47. Fichtenberg CM, Glantz SA. Effect of smoke-free workplaces on smoking behaviour: systematic review. *BMJ (Clinical research ed).* 2002;325(7357):188.

48. Lieberman L, Golden SD, Earp JA. Structural approaches to health promotion: what do we need to know about policy and environmental change? *Health education & behavior : the official publication of the Society for Public Health Education*. 2013;40(5):520-5.
49. Frieden TR. A framework for public health action: the health impact pyramid. *American journal of public health*. 2010;100(4):590-5.
50. Thaler RH, Sunstein CR. *Nudge: Improving Decisions about Health, Wealth, and Happiness*: Yale University Press; 2008.
51. Kahn EB, Ramsey LT, Brownson RC, Heath GW, Howze EH, Powell KE, et al. The effectiveness of interventions to increase physical activity. A systematic review. *American journal of preventive medicine*. 2002;22(4 Suppl):73-107.
52. O'Connor TM, Jago R, Baranowski T. Engaging parents to increase youth physical activity a systematic review. *American journal of preventive medicine*. 2009;37(2):141-9.
53. Stice E, Shaw H, Marti CN. A meta-analytic review of obesity prevention programs for children and adolescents: the skinny on interventions that work. *Psychological bulletin*. 2006;132(5):667-91.
54. Meadows D, Wright D. *Thinking in Systems: A Primer*: Chelsea Green Publishing; 2008.
55. Dow WH, Philipson TJ, Sala-i-Martin X. Longevity Complementarities under Competing Risks. *Am Econ Rev*. 1999;89(5):1358-71.
56. Bloom E, Bitran R, Dow W, Orozco M, Straffon B. *The Demand for Health Care in Mexico: An Econometric Analysis*, National Population Council. Mexico 1995.
57. Sorensen G, Stoddard A, Hunt MK, Hebert JR, Ockene JK, Avrunin JS, et al. The effects of a health promotion-health protection intervention on behavior change: the WellWorks Study. *American journal of public health*. 1998;88(11):1685-90.
58. Hunt MK, Lederman R, Stoddard AM, LaMontagne AD, McLellan D, Combe C, et al. Process evaluation of an integrated health promotion/occupational health model in WellWorks-2. *Health education & behavior: the official publication of the Society for Public Health Education*. 2005;32(1):10-26.
59. Ganz ML. The relationship between external threats and smoking in central Harlem. *American journal of public health*. 2000;90(3):367-71.
60. Roberto CA, Larsen PD, Agnew H, Baik J, Brownell KD. Evaluating the impact of menu labeling on food choices and intake. *American journal of public health*. 2010;100(2):312-8.





Part III

Horizontal integration of
midwifery and obstetrics:
improving coordination between
community midwives and obstetric
professionals



Chapter 7



Improving interprofessional coordination in Dutch midwifery and obstetrics: a qualitative study

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ABSTRACT

Background Coordination between the autonomous professional groups in midwifery and obstetrics is a key debate in the Netherlands. At the same time, it remains unclear what the current coordination challenges are.

Methods To examine coordination challenges that might present a barrier to delivering optimal care, we conducted a qualitative field study focusing on midwifery and obstetric professional's perception of coordination and on their routines. We undertook 40 interviews with 13 community midwives, 8 hospital-based midwives and 19 obstetricians (including two resident obstetricians), and conducted non-participatory observations at the worksite of these professional groups.

Results We identified challenges in terms of fragmented organizational structures, different perspectives on antenatal health and inadequate interprofessional communication. These challenges limited professionals' coordinating capacity and thereby decreased their ability to provide optimal care. We also found that pregnant women needed to compensate for suboptimal coordination between community midwives and secondary caregivers by taking on an active role in facilitating communication between these professionals.

Conclusions The communicative role that pregnant women play within coordination processes underlines the urgency to improve coordination. We recommend increasing multidisciplinary meetings and training, revising the financial reimbursement system, implementing a shared maternity notes system and decreasing the expertise gap between providers and clients. In the literature, communication by clients in support of coordination has been largely ignored. We suggest that studies include client communication as part of the coordination process.

BACKGROUND

Dutch midwifery and obstetrics distinguishes three levels of care: primary, secondary and tertiary care. Community midwives situated in neighborhood practices provide primary care, while obstetric caregivers in hospitals provide secondary and tertiary care. Community midwives and obstetricians in secondary and tertiary care are autonomous professionals. Nevertheless, they need to coordinate activities to support women during their pregnancy and labor/birth such as sharing information related to pregnant women. This is especially necessary when pregnant women transfer from one level of care to the other. As professionals in the three levels of care are autonomous and yet interdependent on each other in order to deliver optimal care, the Dutch midwifery and obstetric system is imbued with inherent coordination challenges. In this study, we use Faraj & Xiao's definition of coordination: "(...) coordination is about the integration of organizational work under conditions of task interdependence and uncertainty" [1].

The current public debate in the Netherlands, along with two key public reports, emphasizes the need for improved coordination in midwifery and obstetrics, especially between primary and secondary care [2, 3]. However, coordination has not yet been systematically studied in this sector. We aim to fill this gap by conducting a field study on coordination challenges within primary and secondary care in the region of Rotterdam, the second largest city of the Netherlands. By interviewing and observing caregivers, we investigated which factors are frequently mentioned as barriers to successful coordination. This study focuses on the antenatal phase of care as care of women during labor/birth and the postnatal phases could manifest different coordination challenges. In line with our above mentioned definition of coordination, we adopted a practice-based method in order to explore coordination "as it occurs in practice" during everyday working routines [1].

The challenge of coordination is not unique to Dutch midwifery and obstetrics and is also present in other health care sectors in the Netherlands and abroad, where professionals are highly specialized. Specialization allows professions to develop their own expertise, but also makes it more difficult to then integrate their various contributions in order to deliver optimal care [4]. Although recently changes have been made to medical education, many professionals were still educated to believe that the quality of their provided care depends on their individual knowledge and hard work and not on coordination with others [5]. As such, it is not surprising that health care is viewed as particularly burdened by the coordination challenge [6].

There are two major perspectives on how coordination can be achieved. The organizational design-perspective is the traditional perspective, which argues that it is possible to achieve optimal coordination with the right *organizational structures* in place, such as rules and protocols [7]. More recent studies point out that this assumes a static and predictable environment of an organization [1]. Emphasizing that many organizations work in dynamic environments and are faced with time constraints and uncertainty, Faraj and Xiao argue for a coordination-practice perspective [1]. These studies point to the importance of *interprofessional communication* (in addition to organizational structures) to deal with an unpredictable environment [8]. In line with this perspective, Gittell has developed the 'Relational Coordination Theory', highlighting that coordination is a fundamentally *relational* process [9].

The Dutch midwifery and obstetric care system

Community midwives care for women estimated to be at 'low-risk' for obstetric and medical complications from the early antenatal until the postpartum period. If women remain low risk throughout pregnancy, women have the option of birthing at home, at a birthing centre (community midwife-led centre in proximity of hospital) or in a hospital, in all cases under the supervision of their community midwife. In 2012, 84.7% of pregnant women started antenatal care with a visit to a community midwife. At the onset of labor, 51.6% of women were still under the care of their community midwife [10]. As such, community midwives play a key role in the provision of maternal health care in the Netherlands.

Should complications (threaten to) occur, community midwives refer women to secondary care in a hospital setting [11]. If necessary, obstetricians refer women with very high maternal or fetal risk to tertiary perinatal care, which is located in eight academic hospitals and two additional non-academic hospitals with obstetric high care and neonatal intensive care units. In 2012, 15.3% of women entered antenatal care in secondary or tertiary care due to their high-risk medical and/or obstetric history [10]. Secondary and tertiary care is provided by obstetricians, resident obstetricians and in most hospitals also by hospital-based midwives (midwives specifically trained to work in a clinical setting) [12].

Coordination and performance outcomes

Several studies in health care have found a relationship between coordination and performance outcomes in the area of efficiency (e.g. length of hospitalized stay, costs) and

effectiveness (e.g. patient satisfaction, clinical outcomes) [9, 13]. It would be particularly relevant to improve coordination in the Dutch midwifery and obstetrics as perinatal mortality rates are still relatively high compared to other European countries, and also unequally distributed across neighborhoods [14, 15]. In 2010, the extended perinatal mortality rate (deaths from 22 weeks of gestation up to 28 days postpartum) was 9.0 per 1,000 births [16]. In socio-economically deprived neighborhoods of the four largest cities, perinatal mortality can be over 30 per 1,000 births [15].

METHODS

Gathering data

We conducted a field study consisting of interviews and observations in order to investigate coordination within midwifery and obstetrics in the region of Rotterdam. The data collection took place in the summer of 2012.

The decision to opt for a qualitative design was based on two arguments. First, the qualitative approach allows to inductively explore the current factors that make it challenging to achieve coordination in Dutch midwifery and obstetrics. Second, asking “how” questions rather than “how many” allowed us to gain a richer and deeper understanding of our field site. Whilst the results of this study cannot be generalized to a larger or different population, they do indicate how coordination can be improved in Rotterdam.

Selection

The selection of informants was done by purposive sampling. This means that we chose respondents based on specific characteristics to ensure the inclusion of a wide range of perspectives. We included community midwives, hospital-based midwives, obstetricians and resident obstetricians. All obstetric departments of all hospitals and all midwifery practices in the region of Rotterdam were contacted and invited to participate. We spoke to at least one hospital-based midwife and two obstetricians from each of the seven hospitals in the region of Rotterdam (excluding one hospital which does not employ hospital-based midwives). We interviewed community midwives from 13 out of the 33 midwifery practices in the region of Rotterdam. When scheduling interviews with community midwives, we attempted to interview caregivers located in diverse neighborhoods, ranging from urban to more rural, and high-income to deprived neighborhoods.

Interviews

We conducted 40 interviews with 13 community midwives, 8 hospital-based midwives and 19 obstetricians (including two resident obstetricians). We interviewed caregivers from a tertiary hospital, which also acts as a secondary care hospital and as such works together with community midwives (to protect anonymity this hospital is referred to as belonging to secondary care from this point onwards). The first and second author (a social scientist and a non-practicing medical doctor, respectively) conducted most of the interviews, with additional support from two social scientists. The interviews were semi-structured and consisted of broad and open questions (see additional file 1 in the Appendix). We asked questions regarding coordination experiences, the perceived consequences of misaligned coordination, and how caregivers dealt with coordination challenges.

Observations

To complement the interviews and further enhance the quality of the data, the first author conducted non-participatory observations. Each of the four types of professionals was shadowed during a typical workday, which included interaction with pregnant women. In the hospital settings, this included the outpatient clinic and consults between (resident) obstetricians and community midwives. A community midwife was shadowed during regular consulting hours. These observations took place at three different hospitals and one midwifery practice. The observed care providers were all individuals whom we had interviewed beforehand. During and at the end of the day, they were willing to answer questions that arose during the observations. Next to this, three multidisciplinary meetings to discuss the organization of care as well as a perinatal audit meeting discussing substandard care led by midwifery and obstetric professionals were observed. The four studied types of caregivers were present at all of these meetings.

Role of researchers and consent

The first and second authors are affiliated to a tertiary medical center. As such, the researchers worked in the same department as a few of the respondents. The researchers did not know the large majority of the other respondents outside of the department. All of the interviews were audio recorded and the contents as well as the field-notes were fully transcribed without any identifying characteristics of the respondents. Consent was obtained from all observed and interviewed caregivers. We do not reveal any confidential or potentially identifying data of care providers and pregnant women. During the observations, it was the responsibility

of the shadowed care providers to clarify the presence of the researcher and ask pregnant women for consent. In this study we do not include any data from pregnant women who did not provide consent. This study was exempt from an ethical approval in the Netherlands as it did not require respondents to take any specific actions (such as taking blood tests). For more information, please see the Dutch CCMO (Dutch Central Committee on Research Involving Human Subjects) website: <http://www.ccmo.nl/nl/uw-onderzoek-wmo-plichtig-of-niet.nl>.^A

Analysis

The analysis of the interview transcripts and observation field-notes was conducted to identify coordination challenges. We used directed content analysis in order to create codes for the analysis. This means that key concepts derived from existing literature are used to form preset codes. Directed content analysis was chosen as it is suitable when trying to support existing theoretical frameworks, or when applied to a novel context [17]. We used key concepts of the organizational-design perspective to identify codes for organizational structures. Examples of these preset codes are ‘obstetric protocols’ and ‘midwifery guidelines’ [8]. Sketching the organizational structures can help to understand the context within which coordination practices occur. Drawing on research from the coordination-practice perspective, we used Gittel’s relational coordination theory to derive codes for interprofessional communication, such as ‘mutual respect’ or ‘frequency of contact’ [8, 9].

During the coding process of the first eight interviews, we also used emergent codes in order to facilitate a possible extension of the existing literature. The customized coding list (containing preset and emergent codes) was used to analyze the remaining interviews and field-notes. All analyses were done using ATLAS.ti 7. To increase the trustworthiness of our interpretation of the data, we reviewed the preset and emerging concepts with midwifery and obstetrics providers during both the fieldwork and the analysis phase. The fourth author, a non-practicing community midwife and a colleague of the first author, a gynecologist, also provided valuable feedback as experts from the field regarding whether the codes adequately represented the empirical data. All of the quotes used were translated into English by an English native speaker, and then translated back into Dutch by a Dutch native speaker to check for consistency. The analysis performed on the data collected allowed us to identify patterns of coordination in midwifery and obstetrics in the Netherlands. We paid attention to both the respondents’ perception of coordination, and the actual coordination routines as we saw them unfold.

RESULTS

We found that all caregivers interviewed mentioned a variety of factors they currently employ to facilitate coordination. Most frequently cited were multidisciplinary meetings in ‘collaborations in midwifery and obstetrics’ (*verloskundige samenwerkingsverbanden*), which allow for deliberation between community midwives and obstetrical caregivers regarding the organization of care and the care for specific pregnant women. In order to indicate areas for improvement, we focus on commonly cited and observed unmet coordination challenges. Figure 7.1 (see ‘discussion’) provides an overview of the most commonly identified problems. For an overview of the number of respondents who mentioned these specific problems, see additional file 2 in the Appendix.

The results indicate that the current system of midwifery and obstetric care makes it challenging for community midwives and secondary obstetric caregivers to achieve coordination. As an obstetrician explained: “These two systems [of care], they don’t understand each other”. Coordination problems mostly emerged during referral from one level of care to another level. According to national data, these referrals occur frequently in the Netherlands: in 2012, approximately 32.9% of women who started care at the primary level switched to the secondary or tertiary level of care before the onset of labor.

The current *organizational structures* seem to separate community midwives and secondary caregivers and often do not encourage joint deliberation. For one, the current obstetric guidelines classify women into one level of care. They do not arrange for shared care, where a pregnant woman could be, for instance, seen by both a community midwife and an obstetrician. The obstetric guidelines do leave room for deliberation between the levels of care, but this is primarily employed to decide which level of care a pregnant woman belongs to.

Next to these guidelines, there is also a clear physical separation between community midwives and secondary caregivers, as community midwifery practices are mostly located in neighborhoods, away from hospitals. As such, formal and informal contact between primary and secondary caregivers typically does not take place on a daily basis during the antenatal phase of care. Moreover, community midwifery practices and hospitals use different and non-compatible maternity notes (also referred to as antenatal notes or patient files) systems. The process that most hospitals and community midwifery practices use for exchanging information relating to pregnant women involves several steps. Community midwives print out a summary of their maternity notes and ask the pregnant woman to hand this to the

secondary caregiver. This document is then scanned and added to the hospital maternity notes. Should a pregnant woman move back to the community midwife, secondary care-providers update the responsible community midwife via telephone, fax, email or post, by providing a summary of their maternity notes.

Moreover, community midwifery practices and most secondary hospitals are financially autonomous, which means that their income partially depends on the number of women in their care, and the type of care provided. Caregivers explained that this could lead to an incentive not to refer women to other caregivers. Without exception, all caregivers stated that this created an unwanted situation of competition and discouraged collaboration.

Different *perspectives* on antenatal health also seem to separate community midwives and secondary caregivers. An insightful illustration of this is that community midwives refer to pregnant women as ‘clients’ and secondary caregivers use the term ‘patients’. Community midwives emphasized that pregnancies are a fundamentally physiological process. As an obstetrician observed, this made some community midwives reluctant to collaborate with secondary care:

“I think that [community midwives] are definitely in support of working with secondary care, but for now the perceived threat that pregnant women will be medicalized is way too big, this clashes with their ideas of a physiological birth.”

Some secondary caregivers also reported that they felt that they did not speak the same ‘language’ as community midwives and therefore did not always understand each other. On the basis of our interviews and observations, we found that obstetric caregivers tend to use more ‘medical’ terms to convey the same meaning. Several obstetricians explained that frequent contact with community midwives in multidisciplinary meetings (‘obstetric collaborations’) helped to overcome the feelings of frustration resulting from different perspectives on antenatal health.

The current state of *interprofessional communication* also hinders the achievement of coordination in Dutch midwifery and obstetrics. For one, we found that *shared knowledge* between primary and secondary care-providers was partially missing. All community midwives reported being somewhat familiar with what secondary obstetric caregivers do. Hospital-based midwives who used to be community midwives were highly knowledgeable about both ‘worlds’. However, many (resident) obstetricians stated that they were largely unaware of what community midwives actually do, including how they screen for risks. This also became apparent during our observations. In addition, almost all caregivers stated

that there was *inaccurate communication* during referrals and consults, where essential information related to pregnant women was not referred correctly and/or completely, or not transferred at all.

All caregivers mentioned *mutual respect and trust* between community midwives and obstetricians. The issue of respect was particularly emphasized by community midwives, and commonly associated with a perceived hierarchy. Frequently mentioned issues were: obstetricians not taking the medical opinion of midwives seriously, a lack of trust between community midwives and obstetricians and a feeling of being in competition with each other. We also found that the abovementioned elements – fragmented organizational structures, different perspectives on antenatal health and problematic interprofessional communication – are intertwined. This is illustrated by the following situation, where not seeing how other professions work due to infrequent face-to-face contact was intertwined with a lack of shared knowledge of each other's policies and consequently not trusting the other professional. A community midwife reported that when she transferred a client to a specific hospital, the secondary caregivers always re-ordered the laboratory blood measurements, even when she had sent them the results of blood tests she had recently ordered herself. She felt that this was a sign of lack of trust in community midwives, and that she did not want to work with the hospital anymore. However, interviews with obstetricians from this very hospital revealed that it was hospital policy to always re-order blood measurements from any external care unit. The community midwife was not aware of this hospital policy.

Pregnant women as communicators

We found that pregnant women at times needed to compensate for suboptimal coordination between community midwives and secondary caregivers. As already indicated above, one major area of suboptimal coordination is the transmission of information related to pregnant women between midwives and secondary care professionals. Pregnant women who were referred between primary and secondary care sometimes forgot to take a hardcopy of their maternity notes with them. When this happened, professionals did not have immediate access to these notes due to the lack of a shared digital maternity notes system in Dutch obstetrics and midwifery. Even when the maternity notes were transferred correctly between primary and secondary care, the contained information was not always accurate. During our observations and based on the interviews, we found that professionals frequently dealt with these coordination problems by asking pregnant women to provide information about

the care received at the other care level, and sometimes the results of relevant tests. These questions went beyond the standard intake questions that are routinely asked after referral. During our observations, and based on the perception of the interviewed professionals, some women had difficulty answering these questions – especially regarding the specific results of tests that had been done.

Based on our interviews, women not only transmitted information, but also needed to correct or add information in the process of referral from one level of care to the other. For example, a woman had had a previous child with a metabolic disease. This information was known to the community midwife, but not conveyed to the obstetrician who later on became responsible for the care of the woman. The obstetrician only discovered the history of metabolic disease because the pregnant woman had mentioned it.

DISCUSSION

Our research indicates that community midwives and secondary obstetric professionals at times work in fragmented worlds. This fragmentation can be understood from an organizational-design perspective, as we identified problematic organizational structures, such a lack of a shared maternity notes system and misaligned financial incentives. Additionally, in line with the more recent studies taking a coordination-practice angle, the results show that there were also a number of coordination practices that made coordination difficult. Important were different perspectives on antenatal health and suboptimal interprofessional communication. Thus organizational structures and coordination practices hindered caregivers in achieving optimal coordination. These challenges also exist outside of Dutch midwifery and obstetrics, and have been shown to have adverse effects on organizational efficiency and effectiveness [1, 8, 18].

An unexpected finding of this study is the communicative role of pregnant women in support of interprofessional coordination. Pregnant women played a role in transferring and correcting information between community midwives and secondary caregivers. This is an outcome that none of the caregivers in our study aimed for, but seems to be the result of a number of currently suboptimal coordination practices, as outlined in this article.

As pregnant women support coordination between community midwives and secondary caregivers, they may be experiencing tensions similar to ‘boundary spanners’ [19]. Pregnant women who are able to effectively communicate might help facilitate coordination between

separate organizations. However, we expect that women who are less educated and/or not fluent in Dutch have more difficulties fulfilling this communicative function. Therefore, these women might be particularly disadvantaged. This may contribute to the existing perinatal health disparities associated with socio-economic status in the Netherlands (see introduction).

Having pregnant women take on a communicative role in situations where they might not fully be able to do so is not only problematic in the setting of Dutch midwifery and obstetrics, but in the entire health care sector. Health care professionals are highly specialized, and clients are typically without expert knowledge. In the case of Dutch midwifery and obstetrics, this imbalance in expertise makes it very challenging for pregnant women to understand and accurately engage with the information received from caregivers and navigate through oftentimes complex and fragmented systems of care.

The communicative role of clients/patients is a central theme in the field of ‘patient participation’, which is expected (but thus far rarely proven to) increase quality of care, care outcomes and ultimately, patient empowerment [20-22]. However, it does not seem that the findings of our study are examples of patient participation. At the lower end of the patient empowerment scale, participation is seen as informing pregnant women so that they are able to join in discussions about their condition. At the higher end of this scale, participation is conceptualized as enabling clients/patients to join in the decision-making process [21]. The findings in our study did not include joint decision-making. Pregnant women did not *receive* information for the purpose of greater participation, but actually they were *transmitting* information in situations where there was presumably an expertise gap between them and the professional.

Next to studies on patient participation, studies on coordination focus on the *effect* of coordination on clients, such as on patient satisfaction or clinical outcomes [9, 13]. For instance, Gittel’s model of relational coordination is increasingly used to assess coordination practices, but it does not include a possible communicative role of the client [9]. As such, the coordination literature currently treats clients as merely recipients, rather than as supporters or even as co-producers of coordination. This study indicates that research on coordination should incorporate the experiences of clients. The term ‘stake-holder coordination’ would be more apt in incorporating the role of clients in coordination processes than the currently used term ‘interprofessional coordination’.

Practical implications

We found that pregnant women are at times required to take on a communicative role to facilitate coordination. This might be an additional indication for the need – already felt by the professionals – to improve coordination in Dutch midwifery and obstetrics. Fortunately, a large number of initiatives are currently in place to improve coordination in Dutch midwifery and obstetrics. Based on the results of this study, we recommend a number of measures that could help improve interprofessional coordination and thereby minimize the necessity for pregnant women to take on a communicative role in support of coordination, as outlined in Figure 7.1.

We recommend more frequently scheduled face-to-face meetings with both midwives and hospital-based caregivers in order to discuss and improve coordination practices as well as the care pathways for women that would benefit from shared care, i.e. the involvement of more than one level of care [23]. Such meetings are already in place in some areas and could increase interprofessional communication, such as mutual trust and shared knowledge [18]. This could concurrently be achieved by implementing training in interprofessional teamwork and education [24, 25]. In terms of education, we recommend that the training of resident obstetricians include time spent at community midwifery practices. Moreover, we support the current movements in the Netherlands towards a shared maternity notes system for all levels of care, as is in use in part of the UK [3, 26].

A concurrent strategy would be to improve the communicative capacity of pregnant women so they are better equipped to support interprofessional coordination, if they need to. This could be done by exploring ways of making provider-information more accessible to pregnant women, facilitating more dialogue between pregnant women and providers, and increasing health literacy. Although effectiveness studies remain scarce [20], some potentially interesting interventions exist, such as www.mijnzorgnet.nl^B a website that allows clients, their social network and providers to share and discuss health-related information. However, it should be noted that increasing the communicative capacity must only be seen as a potential complimentary strategy. Pregnant women cannot be expected to master the technical knowledge in order to fully navigate the midwifery and obstetrics system and the prevailing medical expertise.

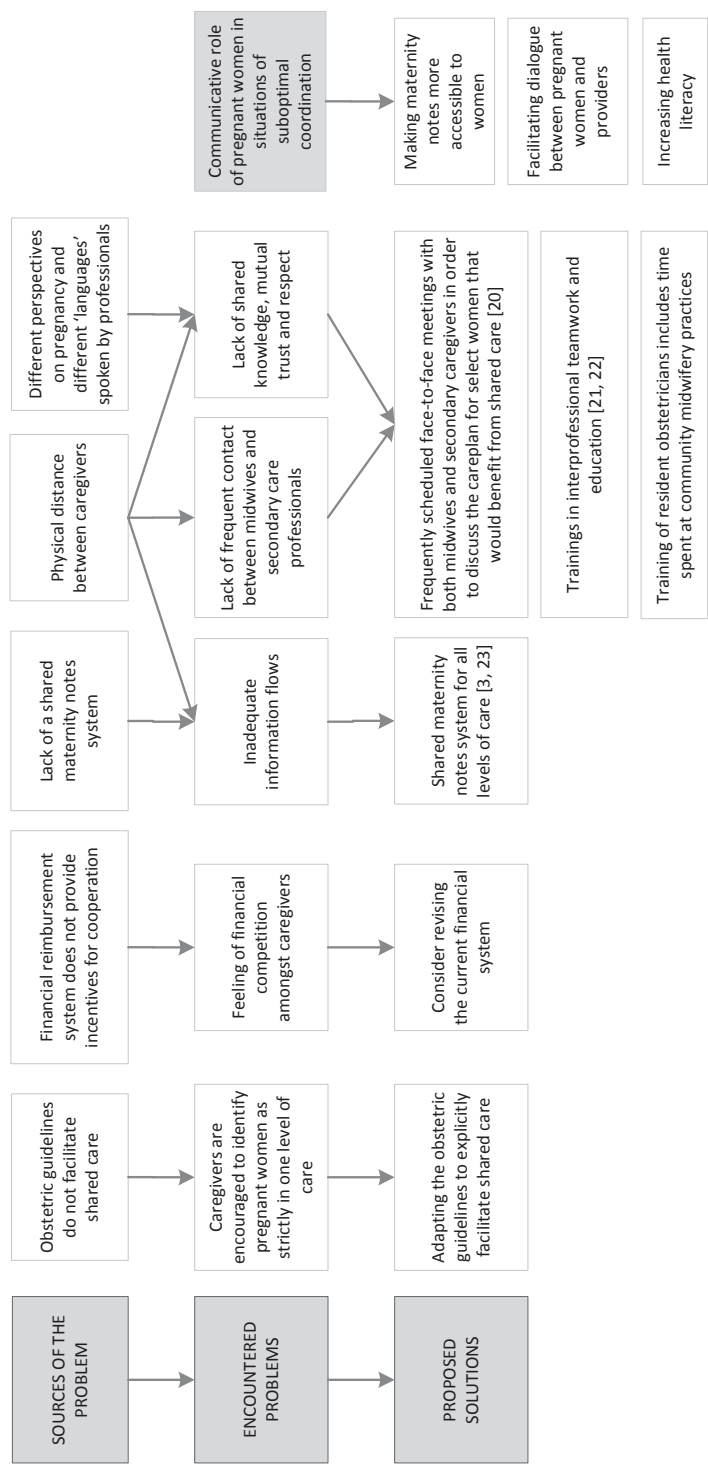


Figure 7.1 Sources of the coordination problems, encountered problems and possible solutions. This figure summarizes the identified sources of a given problem and the encountered problems, based on the findings of this study. Moreover, it indicates possible solutions suggested by the authors. It should be noted that the currently encountered problems (middle row in the figure) are seen as contributing to the problem of communicative role of pregnant women in situations of suboptimal coordination' (far right in the figure). The arrows indicating this have not been added in order to reduce figure complexity.

Limitations & future research

While we conducted a relatively large number of interviews, we only spent several days doing observations of obstetric practices, which is brief compared to traditional standards. The scope of this study was the region of Rotterdam. This was done in order to provide a detailed picture of local coordination challenges. Whilst the results cannot be generalized, we believe that they do indicate possible areas in need for improvement in midwifery and obstetrics in the entire Rotterdam region and in other regions in the Netherlands. This is because almost all of these regions have autonomous yet interdependent primary and secondary care systems; and the organizational structures that complicate coordination in Rotterdam such as lack of a shared maternity notes and physical distance can also be found elsewhere in the country [3].

We recommend extending the scope of coordination studies to include a broader range of coordinating stakeholders. This could be done by studying the coordinating roles of other professionals, such as nurses, general practitioners and managers. Moreover, it would be interesting to conduct interviews and more observation moments with pregnant women themselves in order to better understand the role they play within coordination processes. Lastly, it would be interesting to conduct studies on the role of clients in the coordination process in other health care sectors.

CONCLUSION

This study indicated coordination challenges within Dutch midwifery and obstetrics in the realm of organizational structures, perspectives on antenatal health, and interprofessional communication. An unexpected finding of this study is that some pregnant women played an active role in communicating in situations of suboptimal interprofessional coordination. We argue that these findings underline the urgency to improve coordination. We recommend increasing multidisciplinary meetings and training, revising the financial reimbursement system, implementing a shared maternity notes system and decreasing the expertise gap between providers and clients. Moreover, monitoring the manner in which clients actively communicate due to imbalances in the coordination of care should garner more attention in future research.

ENDNOTES

A. <http://www.ccmo.nl/nl/uw-onderzoek-wmo-plichtig-of-niet>

B. <https://www.mijnzorgnet.nl/welkom/>; accessed on 2/05/2013

APPENDIX

See the open access version of this article to access Additional file 1 and 2:

<http://www.biomedcentral.com/1471-2393/14/145>

REFERENCES

1. Faraj S, Xiao Y: **Coordination in fast-response organizations.** *Management Science* 2006, **52**(8):1155-1169.
2. Bonsel G, Birnie E, Denktas S, Poeran J, Steegers E: **Priorities in research to reduce perinatal mortality, signalement-study pregnancy and birth 2010.** In Dutch: **Lijnen in de Perinatale Sterfte, Signalementstudie Zwangerschap en Geboorte 2010.** Rotterdam: Erasmus MC; 2010.
3. Stuurgroep Zwangerschap en geboorte: **A good start, safe care for pregnancy and birth. Advice of the Committee on Good care during pregnancy and child birth.** In Dutch: **Een goed begin, veilige zorg rond zwangerschap en geboorte.** Advies Stuurgroep Zwangerschap en Geboorte. Utrecht; 2009.
4. Heath C, Staudenmayer N: **Coordination neglect: How lay theories of organizing complicate coordination in organizations.** *Research in Organizational Behavior* 2000, **22**:153-192.
5. Oandasan IF: **The way we do things around here.** *Canadian Family Physician* 2009, **55**(12):1173-1174.
6. Gittell JH, Weinberg DB, Bennett AL, Miller JA: **Is the doctor in? A relational approach to job design and the coordination of work.** *Human Resource Management* 2008, **47**(4):729-755.
7. Van De Ven AH, Delbecq AL, Koenig R: **Determinants of Coordination Modes within Organizations.** *American Sociological Review* 1976, **41**(2):322-338.
8. Okhuysen GA, Bechky BA: **10 Coordination in Organizations: An Integrative Perspective.** *The Academy of Management Annals* 2009, **3**(1):463-502.
9. Gittell JH: **Coordinating mechanisms in care provider groups: Relational coordination as a mediator and input uncertainty as a moderator of performance effects.** *Management Science* 2002:1408-1426.
10. Stichting Perinatale Registratie Nederland: **Perinatal care in the Netherlands 2012.** In Dutch: **Perinatale Zorg in Nederland 2012.** Utrecht; 2013.
11. Amelink-Verburg MP, Buitendijk SE: **Pregnancy and labour in the Dutch maternity care system: what is normal? The role division between midwives and obstetricians.** *Journal of Midwifery & Women's Health* 2010, **55**(3):216-225.
12. Wiegers TA, Hukkelhoven CWPM: **The role of hospital midwives in the Netherlands.** *BMC Pregnancy and Childbirth* 2010, **10**(1):80.
13. Gittell JH, Fairfield KM, Bierbaum B, Head W, Jackson R, Kelly M, Laskin R, Lipson S, Siliski J, Thornhill T: **Impact of relational coordination on quality of care, postoperative pain and functioning, and length of stay: a nine-hospital study of surgical patients.** *Medical Care* 2000, **38**(8):807-819.
14. EURO-PERISTAT project with SCPE E: **European perinatal health report. The health and care of pregnant women and babies in Europe in 2010.** 2013.
15. Poeran J, Denktas S, Birnie E, Bonsel GJ, Steegers EAP: **Urban perinatal health inequalities.** *Journal of Maternal-Fetal and Neonatal Medicine* 2011, **24**(4):643-646.
16. Stichting Perinatale Registratie Nederland: **Perinatal care in the Netherlands 2010.** In Dutch: **Perinatale Zorg in Nederland 2010.** Utrecht 2010.

17. Humble Á: **Technique triangulation for validation in directed content analysis.** 2009.
18. Gittel JH: **High performance healthcare: Using the power of relationships to achieve quality, efficiency and resilience:** McGraw-Hill New York; 2009.
19. Carlile PR: **Transferring, translating, and transforming: An integrative framework for managing knowledge across boundaries.** *Organization Science* 2004, **15**(5):555-568.
20. Crawford MJ, Rutter D, Manley C, Weaver T, Bhui K, Fulop N, Tyrer P: **Systematic review of involving patients in the planning and development of health care.** *BMJ* 2002, **325**(7375):1263.
21. Thompson A: **The meaning of patient involvement and participation in health care consultations: a taxonomy.** *Social Science & Medicine (1982)* 2007, **64**(6):1297.
22. WHO: **A declaration on the promotion of patients' rights in Europe.** *Copenhagen WHO Regional Office for Europe* 1994.
23. Posthumus A, Schölmerich V, Waelput A, Vos A, De Jong-Potjer L, Bakker R, Bonsel G, Groenewegen P, Steegers E, Denktas S: **Bridging Between Professionals in Perinatal Care: Towards Shared Care in The Netherlands.** *Maternal and Child Health Journal* 2013, **17**(10):1981-1989.
24. Reeves S, Zwarenstein M, Goldman J, Barr H, Freeth D, Hammick M, Koppel I: **Interprofessional education: effects on professional practice and health care outcomes.** *Cochrane Database Syst Rev* 2008(1):CD002213.
25. Kisely S, Chisholm P: **Shared mental health care for a marginalized community in inner-city Canada.** *Australas Psychiatry* 2009, **17**(2):130-133.
26. Dorr DA, Jones SS, Wilcox A: **A framework for information system usage in collaborative care.** *J Biomed Inform* 2007, **40**(3):282-287.



Chapter 8



Bridging between professionals in perinatal care: towards shared care in the Netherlands

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ABSTRACT

Purpose Relatively high perinatal mortality rates in the Netherlands have required a critical assessment of the national obstetric system. Policy evaluations emphasized the need for organizational improvement, in particular closer collaboration between community midwives and obstetric caregivers in hospitals.

The leveled care system that is currently in place, in which professionals in midwifery and obstetrics work autonomously, does not fully meet the needs of pregnant women, especially women with an accumulation of non-medical risk factors.

This article provides an overview of the advantages of greater interdisciplinary collaboration and the current policy developments in obstetric care in the Netherlands. In line with these developments we present a model for shared care embedded in local 'obstetric collaborations'. These collaborations are formed by obstetric caregivers of a single hospital and all surrounding community midwives.

Description Through a broad literature search, practical elements from shared care approaches in other fields of medicine that would suit the Dutch obstetric system were selected. These elements, focusing on continuity of care, patient centeredness and interprofessional teamwork form a comprehensive model for a shared care approach.

Conclusion By means of this overview paper and the presented model, we add direction to the current policy debate on the development of obstetrics in the Netherlands. This model will be used as a starting point for the pilot-implementation of a shared care approach in the obstetric collaborations', using feedback from the field to further improve it.

BACKGROUND

The midwife plays a key role as provider of obstetric care in the Netherlands. About 84% of pregnant women start with a first antenatal visit to the community midwife. At the start of the delivery about 50% of pregnant women are under responsibility of a midwife [1].

The midwife and the obstetrician work autonomously and generally play a complementary role. Yet complementarity requires an intensive mutual relationship with a common point of departure in the management of pregnant women. The nature and quality of this collaboration has come under scrutiny as perinatal mortality rates in the Netherlands are higher than in the surrounding countries and are showing a slower rate of decline [2]. The latest confirmed statistics describe a fetal mortality rate (deaths from 22 weeks of gestation) of 6.4 and neonatal deaths (up to 7 days postpartum) of 2.7 per 1,000 births [1].

Explanations for these adverse outcomes have been put forward at the level of the mother, the unborn child, the organization of care, including the Dutch 3-tier system, and the area of living [3]. At the organization level, a nationwide study suggested a key role for low hospital performance at off business hours [4]. Neighborhood inequalities seem to play an additional role, with higher risks for adverse outcomes for women living in deprived areas, in particular in the four largest cities in the Netherlands. In some of these neighborhoods, perinatal mortality is beyond 30 per 1,000 births [5, 6].

As a response to public concern, the Ministry of Health installed an Advisory Committee on 'Good care during pregnancy and child birth' in 2009. Based on stakeholders' opinions this committee presented a set of recommendations on the direction in which the Dutch obstetric field should evolve [7]. This report was followed shortly by a scientific report with a comprehensive analysis of national perinatal data, an overview of knowledge gaps and a proposition for a research agenda in the perinatal health field [3].

Both reports underscored the need for organizational improvement, in particular closer collaboration between community midwives and obstetricians. This was also emphasized by the recent recommendations of the Foundation for Perinatal Audit in the Netherlands, after audit analyses of perinatal mortality at term [8]. Furthermore, both professional organizations for obstetricians and midwives endorse the necessity of an integrated obstetric care system.

THE CURRENT SITUATION

The Dutch obstetric system is unique in the world. It consists of three levels of care which function mainly autonomously. The primary level of care is provided by independently practicing community midwives who care for estimated low-risk pregnant women from the early prenatal until the postpartum period. Pregnancy, birth and the puerperium are traditionally perceived as fundamentally physiologic processes [9]. If pregnancy and childbirth occur without complications, women can choose to either deliver at home or in a hospital, both under the supervision of their community midwife. If complications (threaten to) occur, midwives refer women under their care to an obstetrician at the secondary care level. Tertiary care takes place in centers for perinatology with a neonatal intensive care unit and an obstetric ‘high care’ department. The latter is reserved for severely ill women, severe fetal pathology and (threatening) prematurity (<34 weeks of gestation) [10]. Approximately 15%-18% of women have their first antenatal visit directly at a secondary or tertiary care hospital because of their high-risk medical or obstetric history [3, 11]. Referral is based on the ‘List of Obstetric Indications’ which is a risk selection list [12]. This list consists of medical conditions divided into risk categories. These different categories are shown in Figure 8.1. Depending on the severity, either a community midwife (category A) or an obstetrician (category C) is eligible to deliver care. Category B covers consultation and category D for a hospital based midwife-led delivery.

| Risk categories Medical conditions | Level of care and caregiver |
|---------------------------------------|---|
| A | = First level of care. (Care delivered by community midwife or GP) |
| B | = Consultation between levels of care. (Care giver depends on outcome of deliberation) |
| C | = Second level of care. (Care delivered by an obstetrician) |
| D | = Birth has to take place in hospital. (Care delivered by community midwife or GP) |

Figure 8.1 The obstetric indication list.

The current classification system does not facilitate shared responsibility by both professionals. Moreover, it implies that thorough risk selection of pregnant women is always possible, resulting in a high-risk versus low-risk dichotomy with a ‘demarcation-of-responsibilities’ between community midwives and obstetricians [13]. However, several studies have shown that the occurrence of adverse perinatal outcomes often depends on the presence of a number of smaller risk factors rather than a single greater one that may be easier to detect. This is known as risk accumulation [6, 14, 15]. The presence of this risk accumulation and the under-detection of conditions such as intrauterine growth restriction make it harder to state that a woman exclusively belongs in one level of care or the other [14]. This may indicate that the current system needs adjustment.

Some of the problems experienced in the relationship between community midwives and obstetricians might reflect broader system issues such as negative financial incentives caused by the insurance policy, e.g. referring a patient to another professional for consultation may result in loss of income for the initial caregiver. More specific factors that seem to play a role but are not explicitly described in the literature include a lack of communication between midwives and obstetricians which can be an important problem when transferring patients during labor. The authors believe providers from different disciplines feel a lack of mutual respect and support for the contributions that they make in providing obstetric health care. This is supported by preliminary results from interviews we have conducted with obstetric caregivers. The resulting fragmentation of care between the different professionals makes the system vulnerable to the occurrence of substandard care.

Local obstetric collaborations (OCs) have been important starting points for new developments in obstetrics in the Netherlands. Starting in 1987, OCs were founded across the country, consisting of obstetricians of a single hospital and all surrounding community midwives referring to this hospital. OCs are meant to evoke better collaboration between primary and secondary obstetric care.

A recent investigation by the Dutch Health Care Inspectorate found that OCs were in place in 91% of the 92 hospitals providing obstetric care. In these OCs, midwives and obstetricians regularly have meetings to deliberate about the care in their geographical area. Next to the OCs, all hospitals providing obstetric care have implemented local multidisciplinary perinatal mortality audits [16]. Collaboration during these audits and on guideline development stimulates the cooperation between obstetric caregivers on a policy level [8, 17].

The Advisory Committee has expressed the aim of increasing collaboration between the obstetric levels for patient care. This aim has only been incorporated into the targets of a quarter of the OCs. Multidisciplinary collaboration for individual patients has so far only taken place on a small scale. Other recommendations by the Committee including local execution of multidisciplinary protocols developed on a national level and prevention of caregiver delay, are embraced by almost all OCs. The Committee also emphasized the importance of timely identification and assessment of medical but also of nonmedical risk factors, by all professionals involved in perinatal care [7].

A precondition for this is a risk selection instrument focusing on both types of risks, including psychological, social, lifestyle, obstetric and non-obstetric care related risks. The Rotterdam Reproductive Risk Reduction (R4U) checklist could fulfill these criteria and is based on the concept of risk accumulation []. During the first antenatal visit (at the community midwife or obstetrician) risks can be assessed with the R4U and subsequently a (weighed) score can be calculated for the (combination of) risk factor(s) identified. If the total score of a pregnant woman is higher than a given cut-off point, she can be prioritized for a 'shared care' approach within the OC. Shared care can be defined as interdisciplinary collaboration with a joint sense of responsibility for the individual patient and the ability to learn from each other's skills and knowledge [[19]. Such an approach to care can help to improve the current system.

AIM OF THIS PAPER

Even though a number of recommendations have been made, a clear-cut model that ensures tailored shared care for the individual pregnant woman in the Dutch obstetric health system is not available.

We fill this gap by presenting an overview paper that: 1) highlights the advantages of greater collaboration between community midwives and obstetricians in the Netherlands, 2) describes a model of shared care in which the expertise of caregivers is endorsed and a range of practitioner behaviors, practices, and policies which can contribute to collaborative obstetric health care are provided, and 3) describes the pilot implementation of shared obstetric care in clinical practice.

TOWARDS A SHARED CARE MODEL: FIRST A THEORETICAL FRAMEWORK

We propose a reappraisal of the care provided by community midwives and obstetricians. Based on the arguments outlined above, starting points are improved tailored care for the individual woman and the involvement of the expertise of both community midwives and obstetricians.

We searched for descriptions of different forms of collaboration between obstetric professionals in other countries, such as Canada, Australia, New Zealand and the United Kingdom [20-25]. There were a number of different approaches: shared care provided by midwives and obstetricians for low and/or high risk cases, a form of case management or community antenatal care combined with intrapartum care delivered by hospital-based professionals. However, as the Dutch obstetric system is different from the systems abroad, there is no precedent for a model of shared care that can be fully implemented in the Dutch context [11, 26].

We then performed a broad literature search on shared care and its synonyms in all fields of medicine. These synonyms are numerous. Examples are 'integrated care', 'joint care', 'combined care' and 'collaborative care'. These terms indicate differences in the intensity of collaboration between health care professionals.

By reviewing studies that explicitly describe models of care, elements of these models were identified that satisfied the following requirements: 1) compatible with the recommendations of the Advisory Committee, 2) contribute to the development and sustainability of shared care and 3) can be applied to the Dutch health care system.

For purposes of clarity we organized these elements into three categories: continuity of care, patient centeredness and interprofessional collaboration. The categories of the proposed shared care model are summarized in Table 8.1 and a visualization of the model is given in Figure 8.2.

CONTINUITY OF CARE

The first element of our shared care model is 'continuity of care'. This concept is defined by Haggerty et al as: "the degree to which a series of discrete healthcare events is experienced as coherent and connected and consistent with the patient's medical needs and personal

Table 8.1 Overview with the specific categories and elements of the new model for shared care

| Category | Elements |
|--------------------------------------|--|
| Continuity of care [27] | Case manager oversees the care from booking visit to postnatal period [7, 28]. Templates for standardised care pathways [29]. Interdisciplinary electronic patient notes [7, 30]. Short waiting times for referral to other health care professionals [31]. Scheduled frequent meetings to discuss care plan [7, 31]. |
| Patient centeredness [32] | Frequent and thorough communication with the pregnant woman [28]. Self-management of the woman is fostered [30]. Cultural (and socio-economic) background of the woman is taken into account [31]. Care provider is close to the community of the pregnant woman [31]. Efforts are made to combine appointments to different care providers. Home visit by one of the care providers to each pregnant woman [7]. Interdisciplinary individual care plan for the pregnant woman [7, 33]. |
| Interprofessional collaboration [34] | Shared sense of responsibility for the individual pregnant woman [7, 35]. Clear definition of roles of different health care professionals [30]. Joint set of aims and ambitions for collaboration [30]. Stimulation of trust among the care providers [7, 30]. Strong leadership in the implementation of shared care [36]. Trainings on team work and sessions for interprofessional education [7, 37]. Continuous evaluation and feedback on the shared care approach [30]. Opportunity for experimentation and pilot-projects [30]. |

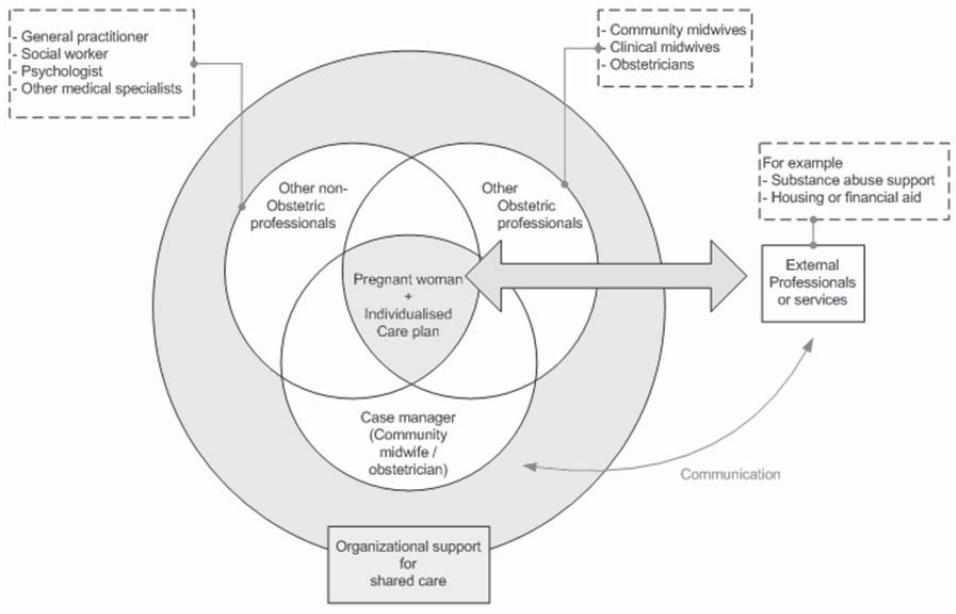


Figure 8.2 Visualization of the shared care model.

context.” Three types of continuity can be distinguished: relational continuity (e.g. a limited number of different care providers directly involved with the patient), informational continuity (e.g. patient information known to an individual care provider) and management continuity (e.g. care protocols) [27]. Our model foresees that case management can help to improve the latter two forms of continuity [38].

The case manager – either a community midwife or an obstetrician, depending on the risk profile – should guide a woman through pregnancy from the first antenatal visit to the postpartum period coordinating the necessary care [7, 28, 31, 39]. He or she is the primary caregiver and the primary point of contact for the pregnant woman and for all other involved caregivers.

To further enable continuity of information, a number of facilitating factors should be addressed, such as uniformity in shared information and electronic patient notes that are accessible to all involved health care professionals [30, 40-42]. On a small scale experiments with shared electronic notes already take place in the Netherlands. Ideally, the notes alert caregivers to scheduled tasks for an individual patient or the availability of new results. Furthermore web based applications allow for the sharing of non-patient information such as shared protocols, schedules and care plan templates [35].

If a pregnant woman scores above the cut-off point of a given risk-assessment tool, such as the abovementioned R4U, a customized care plan based on the care plan template is made by the case manager and discussed within the OC [33]. The care plan includes predesigned care pathways [12, 30]. A care pathway focuses on a specific need or risk of the pregnant woman. Often the pathways address non-medical issues that form an (indirect) risk for the pregnant woman, such as domestic violence or being uninsured. Moreover, the pathways consist of steps that need to be taken by the caregiver (including relevant referral procedures). The predesigned pathways should therefore be adapted to the local settings. Examples of a non-medical and medical care pathway are given in Figure 8.3 and 8.4. We hypothesize that women with an accumulation of different risk factors will benefit from the care pathway approach.

PATIENT CENTEREDNESS

The Institute of Medicine defines patient centered care as “providing care that is respectful of and responsive to individual patient preferences, needs, and values, and ensuring that

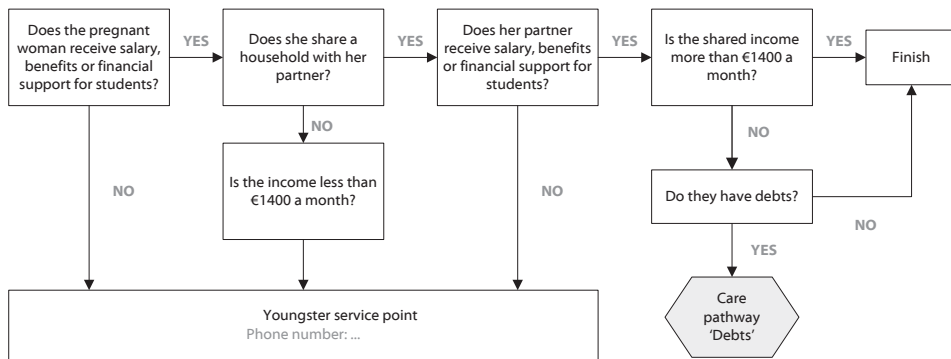


Figure 8.3 Care pathway 'income and pregnant women (age 18-23 years)'.

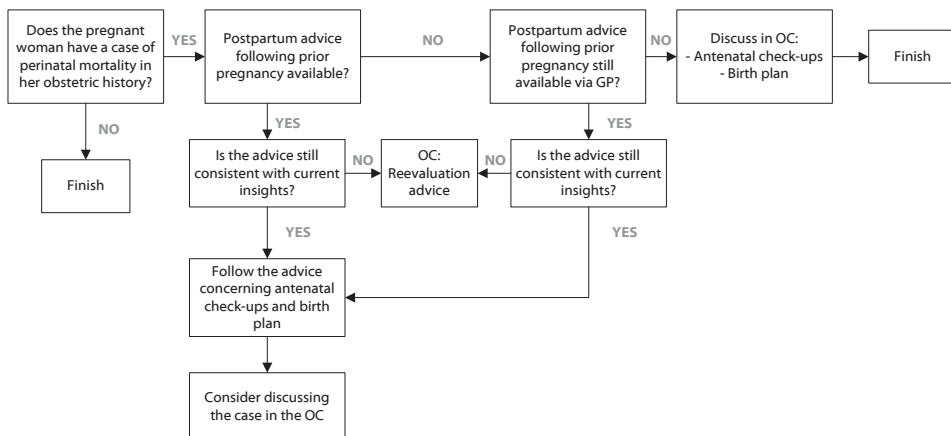


Figure 8.4 Care pathway 'perinatal mortality in obstetric history'.

patient values guide all clinical decisions” [32]. This definition shows strong parallels to one of the aims of the Advisory Committee, namely a comprehensive approach to patient care. Currently, obstetric caregivers are mostly trained for and focused on the clinical aspects of pregnancy. When they identify complicated non-medical factors such as financial and psychological issues, they do not have the right tools and training to support the women, or referral options might be unknown or unavailable. In a shared care approach caregivers such as general practitioners, social workers and psychologists can help to meet those needs and reduce the related risks.

In order to acquire a more complete picture of the (non-medical) background of the pregnant woman, a home visit before 34 weeks of gestation is made by one of the obstetric caregivers

[7]. If present, psychosocial issues can be assessed and prenatal information can be given (this assessment is carried out again after the woman has given birth). Furthermore, the inventory of the domestic situation is used to determine whether home birth is a safe option for the pregnant woman, unborn child and the caregiver.

In this shared care model, the self-management and empowerment of the pregnant woman should be encouraged, enabling her to make informed choices and to know what to expect during pregnancy and delivery and when to contact her caregivers. Efforts should be made to limit barriers (e.g. language) for this. A program in Rotterdam illustrates how this can be done. Here, perinatal health peer educators have been trained to support women from different socio-economic and cultural backgrounds. As stated before, obstetric care can only meet the needs of the individual woman when socio-economic, cultural and religious backgrounds are taken into account [31].

INTERPROFESSIONAL COLLABORATION

Interprofessional collaboration is understood to be the process in which different professional groups work together to make a positive impact on the provision of health care [34]. The proposed model aims to create a shared sense of responsibility amongst caregivers for individual pregnant women prioritized for a shared care approach [35]. This can be stimulated by a number of different measures which will also help to increase mutual respect and trust between caregivers: First, a joint set of aims and ambitions [30]. Second, clearly defined roles and activities of different caregivers [30]. These should be complementary and should allow caregivers to be responsive to the changing needs of patients, their families, and other caregivers, as well as to resource availability [30, 39, 40]. A third measure is the deliberation amongst professionals on an individual patient level. A community midwife and an obstetrician are always involved in the design and evaluation of the care plan of pregnant women selected for the shared care approach, even though only one of these caregivers holds final responsibility. Depending on the specifics of the case, other healthcare professionals can be consulted, such as a general practitioner or a social worker. Other options include one-to-one meetings to reflect on difficult cases or shared rounds.

If a caregiver observes patient issues that may be of relevance to other providers involved, this is communicated in the meetings and, if necessary, at an earlier stage to the case manager [35]. For example, a general practitioner might notice in her consultations that the pregnant woman shows signs of depression and signal this to the involved obstetric caregivers. Collaboration

Box 8.1 A case

Mrs. T is a 29 year old G2P1. In her first pregnancy intrauterine growth restriction occurred. Her son was born at 38+3 weeks of gestation with a birth weight of 2,350 grams (< 2.3 percentile). She was told that therefore in her next pregnancy her antenatal care should be given by an obstetrician in the hospital. Her midwife and obstetrician are members of the same OC. In the OC they have started an experiment for women with an intrauterine growth restriction in the prior pregnancy. They receive their care primarily from their midwife but are seen four times by an obstetrician for extra ultrasound fetal biometry measurements to check on fetal growth. If all is well Mrs. T can give birth under supervision of her midwife. She feels content with this option.

could also be facilitated by locating all caregivers in close proximity of each other [31, 36]. In order to improve necessary teamwork skills, teamwork trainings can be introduced [37]. A fourth measure to improve collaboration could be interprofessional education [37, 39, 43]. The abovementioned shared rounds and case deliberation can also contribute to improved interprofessional education. A fifth measure could be frequently scheduled face-to-face meetings by members of the OC. Here, care for new and ongoing cases can be discussed and evaluated [28, 31, 39, 44]. A structured approach for these meetings is necessary, using a daily board consisting of a chairman (either one individual for a longer period of time or a rotating chairman) and a secretary to schedule the interdisciplinary meetings and to ensure that agreed tasks are carried out [30, 35]. In addition, the board can direct the ongoing monitoring, evaluation and adjustment of the shared care approach as a whole. The sixth measure we propose is creating opportunities for innovation and experimentation [30]. For example, pregnant women who in the current system are only treated by an obstetrician, would – according to this model – primarily be seen by a community midwife with some specific additional antenatal appointments with an obstetrician. An example is given in Box 8.1. Through such innovations the traditional barriers between the levels in the Dutch obstetric system can be overcome in order to become a truly shared care system.

DISCUSSION

Adverse perinatal outcomes in the Netherlands have necessitated an orientation towards a shared care approach to adjust the current obstetric system. Based on our overview of the literature, it seems that shared care should lead to improved pregnancy outcomes and better use of the time and skills of community midwives, obstetricians and other caregivers.

We collected elements from shared care models outside the field to create a model that may suit the Dutch obstetric system. Because the model is based on an exploration of the literature

there may still be elements that we have overlooked that could be a valuable addition. The elements we have included were categorized as pertaining to patient centeredness, continuity of care and interprofessional collaboration. Further investigation of these concepts could also lead to an inclusion of additional elements to the model in the future.

Excluding a number of the elements we encountered in the literature was inevitable as a choice needed to be made on which elements were suitable to the Dutch obstetric system. Most were not applicable because of being very specific for other fields of medicine. An example is the fluctuation of care intensity over time in long-time follow up for oncology patients [45].

Lastly, we are aware of the potential discrepancies between this theoretical model and clinical practice. However, the model we present is a starting point and feedback from the field will help to improve it.

GETTING STARTED

The pilot-implementation of the model commences at the end of this year, taking place in OCs in the city of Rotterdam. In this city some important steps towards shared care have already been taken in the framework of the perinatal health program ‘Ready for a Baby’. In this program, health researchers joined hands with municipal policy makers in order to develop a comprehensive program to improve perinatal health in the city [18]. One of the tools that we propose to use for the shared care model, the risk screening instrument R4U, is adopted from the ‘Ready for a Baby’ program.

Semi-structured interviews with obstetric caregivers in the Rotterdam region have been completed and will be used to obtain a clearer picture of the current challenges in collaboration and caregivers’ opinions about shared care. Perceived success and failure factors of the shared care approach, changes in effectiveness of interprofessional collaboration, number of interdisciplinary referrals and patient satisfaction will be evaluated after the pilot-implementation of the model. This information will be used to further improve the model and the intervention.

The study in the Rotterdam region will focus on the implementation process and organizational perspectives of the development of shared care. The national program ‘Healthy Pregnancy 4 All’, which encompasses the same intervention, will focus on perinatal outcomes [46].

Shared care in obstetrics does exist in other forms abroad, but to our knowledge there is no literature available on the development and implementation of a model that meets the needs of the obstetric health system in the Netherlands. We believe that this study and the outcomes of the implementation in the field are therefore also of interest to (obstetric) health care systems abroad that show parallels to ours. In addition, it is relevant to other countries considering the implementation of a perinatal approach similar to the current Dutch system.

POSSIBLE BARRIERS

There are a number of barriers to be expected when implementing this model. These barriers will be explored in the pilot implementation. How extensive the change is that needs to be made to adopt the shared care model greatly depends on the current situation within the various OCs.

The shared care model will necessitate a different mindset for all involved health care professionals. The current system clearly divides the roles between primary and secondary obstetric care. Both professional groups are used to working fairly autonomously, yet many health caregivers realize that a change is necessary. This is shown by the fact that all hospitals and most of the community midwifery practices in Rotterdam have agreed to implement the R4U as a tool for a shared care approach.

Lack of time may be another challenge. If a woman has a number of different risk factors more time will be needed for the caregivers to arrange all necessary care pathways for her. Furthermore the OCs currently tend to meet on a (bi)monthly basis. To collaborate on an individual patient level, meeting more frequently is necessary. The physical separation of midwifery practices and hospitals may therefore form another barrier in the long run because caregivers will need to travel to attend face-to-face meetings. If the caseload is not too high, sending a single representative per midwifery practice and medical specialty may be a solution.

We also realize that a number of the required changes will necessitate additional financial means which may not be available in all participating OCs. The reimbursement in new models of collaborative care is currently an important topic of discussion in the Netherlands. Recently the Dutch Healthcare authority published a report on the funding of integrated obstetric care, concluding that interprofessional collaboration needs to be established first before funding for integrated care will be provided [47]. If this model proves to be

successful, the outcomes could be used in deliberations with insurance companies to obtain an alternative reimbursement model. For now we will need to find provisional solutions through dialogues with the OCs, the hospital boards, health insurance companies and regional support structures.

REFERENCES

1. Stichting Perinatale Registratie Nederland. Perinatal care in the Netherlands 2008. In Dutch: Perinatale Zorg in Nederland 2008. Utrecht 2011.
2. EURO-PERISTAT project in collaboration with SCPE EaE. European perinatal health report. Better statistics for better health for pregnant women and their babies in 2004. 2008.
3. Bonsel G, Birnie E, Denktas S, Poeran J, Steegers E. Priorities in research to reduce perinatal mortality, signalement-study pregnancy and birth 2010. In Dutch: Lijnen in de Perinatale Sterfte, Signalementstudie Zwangerschap en Geboorte 2010. Rotterdam: Erasmus MC, 2010.
4. de Graaf JP, Ravelli AC, Visser GH, Hukkelhoven C, Tong WH, Bonsel GJ, et al. Increased adverse perinatal outcome of hospital delivery at night. *BJOG*. 2010;117(9):1098-107. Epub 2010/05/26.
5. Poeran J, Denktas S, Birnie E, Bonsel GJ, Steegers EA. Urban perinatal health inequalities. *J Matern Fetal Neonatal Med*. 2011;24(4):643-6. Epub 2010/09/15.
6. de Graaf JP, Ravelli AC, Wildschut HI, Denktas S, Voorham AJ, Bonsel GJ, et al. [Perinatal outcomes in the four largest cities and in deprived neighbourhoods in The Netherlands] Perinatale uitkomsten in de vier grote steden en de prachtwijken in Nederland. *Ned Tijdschr Geneesk*. 2008;152(50):2734-40. Epub 2009/02/06.
7. Stuurgroep Zwangerschap en geboorte. A good start, safe care for pregnancy and birth. Advice of the Committee on Good care during pregnancy and child birth. In Dutch: Een goed begin, veilige zorg rond zwangerschap en geboorte. Advies Stuurgroep Zwangerschap en Geboorte. Utrecht: 2009.
8. Stichting Perinatale Audit Nederland. Term mortality 2010. Perinatal audit: the first explorations. In Dutch: A terme sterfte 2010. Perinatale audit: eerste verkenningen. Utrecht: 2011.
9. Merkus JM. [Obstetric care in The Netherlands under assessment again] De verloskundige zorg in Nederland opnieuw de maat genomen. *Ned Tijdschr Geneesk*. 2008;152(50):2707-8. Epub 2009/02/06.
10. van Eyck J, Bloemenkamp KW, Bolte AC, Duvekot JJ, Heringa MP, Lotgering FK, et al. [Tertiary obstetric care: the aims of the planning decree on perinatal care of 2001 have not yet been achieved] Derdelijns verloskundige zorg: doelstellingen van het 'planningsbesluit bijzondere perinatologische zorg' uit 2001 nog niet gehaald. *Ned Tijdschr Geneesk*. 2008;152(39):2121-5. Epub 2008/10/17.
11. Amelink-Verburg MP, Verloove-Vanhorick SP, Hakkenberg RM, Veldhuijzen IM, Bennebroek Gravenhorst J, Buitendijk SE. Evaluation of 280,000 cases in Dutch midwifery practices: a descriptive study. *BJOG*. 2008;115(5):570-8. Epub 2007/12/29.
12. Obstetric Vademecum 2003. In Dutch: Verloskundig Vademecum 2003. Eindrapport van de Commissie Verloskunde van het College voor zorgverzekeringen. Diemen: 2003.
13. Amelink-Verburg M. The role of primary care midwives in the Netherlands. Evaluation of midwifery care in the Dutch maternity care system: a descriptive study 2011.

14. van der Kooy J, Poeran J, de Graaf JP, Birnie E, Denktass S, Steegers EA, et al. Planned home compared with planned hospital births in the Netherlands: intrapartum and early neonatal death in low-risk pregnancies. *Obstet Gynecol.* 2011;118(5):1037-46. Epub 2011/10/22.
15. Timmermans S, Bonsel GJ, Steegers-Theunissen RP, Mackenbach JP, Steyerberg EW, Raat H, et al. Individual accumulation of heterogeneous risks explains perinatal inequalities within deprived neighbourhoods. *Eur J Epidemiol.* 2011;26(2):165-80. Epub 2011/01/05.
16. Inspectorate DHC. [Observations and conclusions of the survey on the state of affairs concerning the implementation of the Advices of the Committee on Good care during pregnancy and child birth on the 1st of november 2011.] *Bevindingen en conclusies van de inventarisatie naar de stand van zaken rond de implementatie van het Advies van de Stuurgroep Zwangerschap en Geboorte in ziekenhuizen in Nederland op 1 november 2011.* In: Ministry of Health WaS, editor. 2012.
17. van Diem MT, Bergman KA, Bouman K, van Egmond N, Stant DA, Timmer A, et al. [Perinatal audit in the North of the Netherlands: the first 2 years] *Perinatale audit Noord-Nederland: de eerste 2 jaar.* *Ned Tijdschr Geneesk.* 2011;155(18):A2892. Epub 2011/05/12.
18. Denктаş S, Bonsel GJ, Van der Weg EJ, Voorham AJ, Torij HW, De Graaf JP, et al. An Urban Perinatal Health Programme of Strategies to Improve Perinatal Health. *Matern Child Health J.* 2011. Epub 2011/08/27.
19. Moorhead R. Sharing care between allied health professionals and general practitioners. *Aust Fam Physician.* 1995;24(11):1985. Epub 1995/11/01.
20. Skinner JP, Foureur M. Consultation, referral, and collaboration between midwives and obstetricians: lessons from New Zealand. *J Midwifery Womens Health.* 2010;55(1):28-37. Epub 2010/02/05.
21. Halliday J, Ellis I, Stone C. "Who usually delivers whom and where". Report on models of antenatal care. Melbourne: Perinatal Data Collection Unit, Victorian Government Department of Human Services, 1999.
22. Canadian institute for Health information. Giving birth in Canada. Providers of maternity and infant care. 2004.
23. Towards better births. A review of maternity services in England. Commission for Healthcare Audit and Inspection, 2008.
24. Improving Maternity Services in Australia: A Discussion Paper from the Australian Government. Commonwealth of Australia 2008.
25. Report on Maternity. Maternal and Newborn Information 2004. New Zealand Health information service, 2007.
26. Benoit C, Wrede S, Bourgeault I, Sandall J, De Vries R, van Teijlingen ER. Understanding the social organisation of maternity care systems: midwifery as a touchstone. *Sociol Health Illn.* 2005;27(6):722-37. Epub 2005/11/15.
27. Haggerty JL, Reid RJ, Freeman GK, Starfield BH, Adair CE, McKendry R. Continuity of care: a multidisciplinary review. *BMJ.* 2003;327(7425):1219-21. Epub 2003/11/25.

28. Kodner DL, Spreeuwenberg C. Integrated care: meaning, logic, applications, and implications--a discussion paper. *Int J Integr Care*. 2002;2:e12. Epub 2006/08/10.
29. National Institute for Health and Clinical Excellence. Diabetes in pregnancy Pathway. London: NICE. 2011; Available from: <http://www.nice.org.uk>.
30. Minkman M, Ahaus K, Fabbrocetti I, Nabitz U, Huijsman R. A quality management model for integrated care: results of a Delphi and Concept Mapping study. *Int J Qual Health Care*. 2009;21(1):66-75. Epub 2008/10/24.
31. Maar MA, Erskine B, McGregor L, Larose TL, Sutherland ME, Graham D, et al. Innovations on a shoestring: a study of a collaborative community-based Aboriginal mental health service model in rural Canada. *Int J Ment Health Syst*. 2009;3:27. Epub 2009/12/19.
32. Institute of Medicine. Crossing the quality chasm. A New Health System for the 21st Century. Washington, DC: 2001.
33. Lombardo M, Golding G. Shared antenatal care. A regional perspective. *Aust Fam Physician*. 2003;32(3):133-9. Epub 2003/04/02.
34. Zwarenstein M, Goldman J, Reeves S. Interprofessional collaboration: effects of practice-based interventions on professional practice and healthcare outcomes. *Cochrane Database Syst Rev*. 2009(3):CD000072. Epub 2009/07/10.
35. Chomik T. A report on Shared Care - Part of the Primary Health Care Shared Care Network Development Initiative. Province of British Columbia Provincial Health Services Authority, 2005.
36. Bainbridge D, Brazil K, Krueger P, Ploeg J, Taniguchi A. A proposed systems approach to the evaluation of integrated palliative care. *BMC Palliat Care*. 2010;9:8. Epub 2010/05/13.
37. Kisely S, Chisholm P. Shared mental health care for a marginalized community in inner-city Canada. *Australas Psychiatry*. 2009;17(2):130-3. Epub 2008/10/16.
38. Reid RJ. Defusing the confusion: concepts and measures of continuity of healthcare. . Canadian Health Services Research Foundation, 2002.
39. Marshall D, Howell D, Brazil K, Howard M, Taniguchi A. Enhancing family physician capacity to deliver quality palliative home care: an end-of-life, shared-care model. *Can Fam Physician*. 2008;54(12):1703- e7. Epub 2008/12/17.
40. Goldman J, Meuser J, Rogers J, Lawrie L, Reeves S. Interprofessional collaboration in family health teams: An Ontario-based study. *Can Fam Physician*. 2010;56(10):e368-74. Epub 2010/10/15.
41. Dorr DA, Jones SS, Wilcox A. A framework for information system usage in collaborative care. *J Biomed Inform*. 2007;40(3):282-7. Epub 2006/11/14.
42. de Jong FJ, van Steenberg-Weijenburg KM, Huijbregts KM, Vlasveld MC, Van Marwijk HW, Beekman AT, et al. The Depression Initiative. Description of a collaborative care model for depression and of the factors influencing its implementation in the primary care setting in the Netherlands. *Int J Integr Care*. 2009;9:e81. Epub 2009/07/11.

43. Reeves S, Zwarenstein M, Goldman J, Barr H, Freeth D, Hammick M, et al. Interprofessional education: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev.* 2008(1):CD002213. Epub 2008/02/07.
44. Rollman BL, Herbeck Belnap B. The Bypassing the Blues trial: collaborative care for post-CABG depression and implications for future research. *Cleve Clin J Med.* 2011;78 Suppl 1:S4-12. Epub 2011/10/14.
45. Cohen HJ. A model for the shared care of elderly patients with cancer. *J Am Geriatr Soc.* 2009;57 Suppl 2:S300-2. Epub 2010/02/04.
46. Denktas S. [Preconception care and risk selection during pregnancy] Preconceptiezorg en risicoselectie tijdens de zwangerschap. . TSG 2012(Accepted, in press).
47. Dutch Healthcare Authority. [Advice: Funding (integrated) care for pregnancy and child birth. Encouraging collaboration.] Advies: Bekostiging (integrale) zorg rondom zwangerschap en geboorte. Het stimuleren van samenwerking. 2012.



Chapter 9



General discussion

AIM OF THIS THESIS

The aim of this thesis is to increase our understanding of reproductive health inequalities (with an emphasis on inequalities of birth outcomes) and to propose ways for reducing them. This thesis addresses this aim in three parts.

Part I and **Part II** seek to contribute to the key policy recommendation presented to the Dutch government of improving pregnancy-related health behaviors. **Part I** investigates the influence of social environments on pregnancy-related behavior and birth outcomes. This part also examines how possible interactions between social environments and individual characteristics influence pregnancy-related behavior and birth outcomes. The studies in **Part II** explore how knowledge of the influence of social environments on health behaviors can be used to ameliorate interventions aiming to improve reproductive health-related behavior.

Part III seeks to contribute to the key policy recommendation of improving coordination between community midwives and obstetric caregivers. We do this by assessing how coordination between midwives and obstetric professionals could be strengthened and by proposing a new organizational model for Dutch midwifery and obstetrics.

PRINCIPAL FINDINGS

Part I – Understanding pregnancy-related behavior and birth outcomes: the influence of social environments

The studies of **Part I** investigate how aspects of the social environment (e.g. neighborhood social capital or social support from social networks) influence pregnancy-related behavior as well as birth outcomes. These studies also explore how possible interactions between environmental and individual characteristics influence pregnancy-related behavior as well as birth outcomes. The investigated concepts and relationships for each chapter are illustrated in Figure 9.1. As this figure illustrates, the various influences on behavior can be conceptualized as located on different levels (e.g. the social network is located on the ‘interpersonal’ level). Please note that for the sake of clarity, the figure below does not indicate interactions between environmental and individual characteristics.

In **Chapter 2**, we demonstrate that the neighborhood a woman lives in influences her chances of healthy birth outcomes in the Netherlands. Moreover, when controlling for other relevant neighborhood characteristics, we found that higher proportions of ethnic

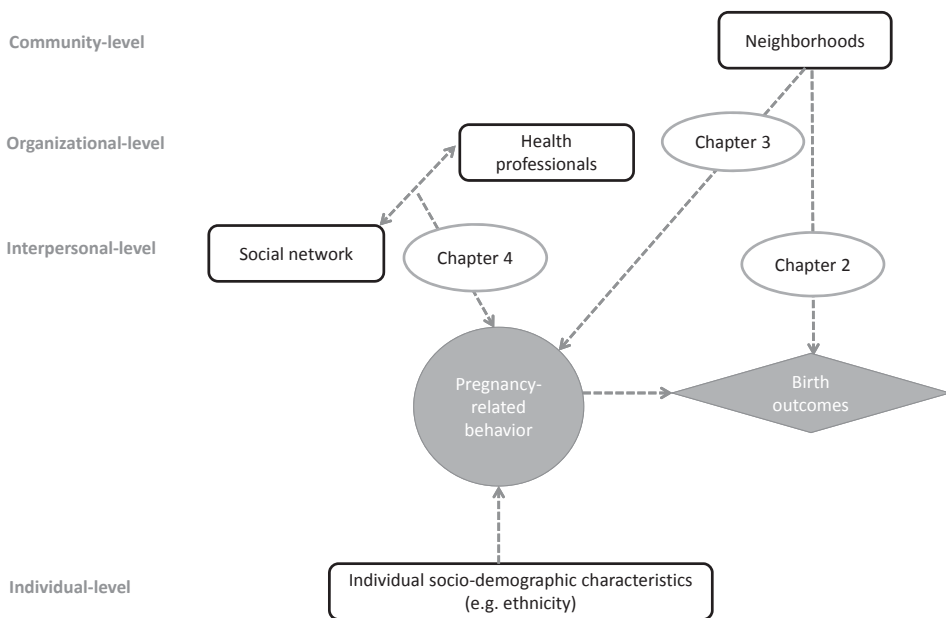


Figure 9.1 Investigated concepts and relationships for each chapter.

minority residents in a neighborhood (i.e. ethnic minority density) were associated with lower birth weight and higher rates of premature births. A third finding of this study, however, was that living in a neighborhood with higher proportions of ethnic minority residents had a different effect on Western and non-Western women. Higher proportions of ethnic minority residents in a neighborhood were associated with higher birth weight for infants of non-Western ethnic minority women *compared to* Western women (15 grams; 95% CI 12.4-17.5) as well as a reduced risk for prematurity (OR 0.97; 95% CI 0.95-0.99). This means that a higher proportion of ethnic minority residents seems to be a protective factor for non-Western ethnic minority women, but not for Western women. In turn, this helps explain the increased risk of Western women in deprived neighborhoods for adverse birth outcomes found in previous studies [1, 2].

Most research on the individual determinants of health identifies ‘ethnicity’ (meaning: non-Western ethnic minority status) as only a risk factor for adverse (perinatal) health. In contrast, this study shows that while ethnic minority status is indeed a risk factor at the individual level, it seems to act as a protective factor at the neighborhood level in areas with a higher proportion of ethnic minority residents. Our analysis shows that neighborhoods

with a higher proportion of ethnic minority residents show higher levels of poverty – which has a negative effect on birth outcomes. For non-Western ethnic minority women, however, living in a neighborhood with a higher proportion of ethnic minority residents seems to mitigate the negative influences of poverty.

In **Chapter 2** we suggest that the proportion of ethnic minority residents is a proxy for the level of bonding social capital of non-Western groups. Bonding social capital has been conceptualized as derived from relationships amongst people who are similar to each other, especially in terms of socioeconomic and socio-demographic background [3]. Studies have hypothesized that the social capital of a given group increases as it becomes a larger proportion of the total population. At the same time, people who are part of the minority population (and hence a smaller proportion of population) in a neighborhood may face social exclusion and discrimination [4]. For our study, this would mean that compared to Western women, non-Western women have higher levels of bonding social capital in neighborhoods with high proportions of ethnic minority residents.

There are several possible mechanisms by which bonding social capital may influence the birth outcomes of those who have access to this resource – in our case, non-Western ethnic minority women. Women who have access to bonding social capital might be more protected from discrimination and feel safer in their neighborhoods, which could reduce their stress levels – a key predictor of premature births [4, 5]. Bonding social capital might also have a positive influence on birth outcomes by stimulating healthier pregnancy-related behavior. High bonding social capital might enforce healthy norms of behavior (such as not smoking during pregnancy), and facilitate more efficient diffusion of health related information (such as the importance of early entry into antenatal care) [6, 7].

While in **Chapter 2** we could only speculate how the proportion of ethnic minority residents (and therefore the level of bonding social capital for ethnic minority residents) might influence pregnancy-related behavior, in **Chapter 3** we were able to assess this. More specifically, we studied to what extent higher proportions of ethnic minority residents were associated with pregnant women's risk of late entry into care. Timely entry into care (i.e. before 14 weeks of gestation) is important, as it allows for prenatal screening for a range of syndromes and congenital anomalies and for early detection and modification of other medical and non-medical risk factors (such as illicit drug use) for adverse birth outcomes [8-10]. Indeed, late entry into care is associated with adverse birth outcomes, including premature birth and lower birth weight [11].

The results presented in **Chapter 3** indicate that higher proportions of ethnic minority residents act as a protective factor for non-Western women, but not for Western women. We found that non-Western women demonstrated a lower risk of late entry into antenatal care when compared to Western women (OR 0.86; CI 0.84-0.88; $p < 0.001$). We interpret this as showing that higher levels of bonding social capital amongst ethnic minority residents acts a buffer for ethnic minority women against delay in time of entry into antenatal care.

Chapter 3 considers how neighborhoods might influence women's time of entry into care. In **Chapter 4**, we studied how other dimensions of the social environment influence women's health behaviors. Conducting a qualitative study in poor neighborhoods in Rotterdam with a high proportion of ethnic minorities, we explored how women's health professionals and their social network influenced their pregnancy-related behaviors. With regards to their social network, we found that women of a Moroccan or Turkish background were located in a tight-knit and homogeneous network of family and peers, and reported high levels of social support. This social network helped women in various ways. For example, (distant) family members would babysit their children so that they could visit the community midwife, or help out in the household. The Native Dutch women's networks were equally homogenous, but less tight-knit, and these women experienced lower levels of support.

The ethnic minority women in our study in **Chapter 4** report higher levels of social support from their social network, which is indicative that they have higher levels of *individual-level* social capital when compared to the Native Dutch respondents. The findings of **Chapter 2** suggest that ethnic minority women living in neighborhoods with a higher proportion of ethnic minority residents also have access to higher levels of social capital at the *neighborhood level*. Native Dutch women living in these neighborhoods, on the other hand, appear to experience lower levels of neighborhood and individual-level bonding social capital, which might help explain their particularly adverse birth outcomes in these areas.

It should be noted that individual-level social capital (also referred to as 'micro-level' social capital) and neighborhood-level social capital are two different constructs. Individual-level social capital is an individual good, and is composed of a person's relationships to specific persons – their social network. Neighborhood-level social capital, in contrast, is a collective good from which all members of a social group can benefit [12, 13].

While women with a Turkish or Moroccan background living in poor neighborhoods have access to higher levels of individual-level social capital, this is not necessarily only beneficial (**Chapter 4**). The women in our study commonly reported receiving high levels

of social support, but also faced conflicting advice provided by their network of family/peers and involved health professionals. For example, health professionals advised these women to refrain from eating raw meat, while their social network commonly encouraged this. The women we interviewed were confronted with a dilemma, as following one piece of advice seemed to exclude also following the other one, which would possibly entail social consequences. We categorized the strategies that women developed to deal with these dilemmas as follows: a) avoiding the dilemma (secretly not following the advice of one side), b) embracing the dilemma (combining conflicting advice), c) resolving the dilemma (communicating between both sides). The Native Dutch women we spoke to were not faced with a similar dilemma, as they did not fear any social consequences for not following through with advice of their social network.

In **Chapter 4**, we also highlighted how theoretical and methodological contributions from sociology could contribute to the mainstream approaches to understanding (pregnancy-related) health behaviors within public health. We argue that these mainstream approaches have at least three pitfalls: a) they are limited to studying dyadic relationships, such as the relationship between clients and their health care providers, b) they leave little room for people's agency over their own lives and c) they see social structures (e.g. social networks) as either enabling or constraining for healthy behavior.

By employing an inductive design in **Chapter 4**, we were able to sketch how the behavior of women with a Turkish/Moroccan background is not only contingent on their specific relationships with health providers and their social networks, but also on how the norms and advice of health professionals and their social networks are (mis)aligned. Likewise, the pregnancy-related behaviors of these women were dependent on their own agency to deal with possible misalignments. Lastly, following Giddens [14], we were also able to show how the influence of the family and peers of our respondents with a Turkish or Moroccan background was not solely a barrier or facilitator to healthy behavior, but actually both. We argue that such an analysis not only provides a more nuanced understanding of health behavior, but also leads to more nuanced policy implications (see section 'Policy recommendations' below).

Part II – Vertical integration of reproductive health interventions: Integrating the influence of social environments to improve reproductive health behaviors

The studies in **Part I** explored how women's pregnancy-related behavior and birth outcomes are shaped by multilevel influences (environmental and individual-level), and also by interactions between individual attributes and environmental influences. The studies of **Part II** turn to how such a multilevel perspective can be applied to the design and implementation of public health interventions aiming to improve reproductive health. I argue that public health interventions need to achieve a *vertical integration*. This means that interventions need to understand how human behavior is shaped by both individual-level and environmental factors (and possible interactions), and integrate this knowledge into their design and implementation.

As depicted in Figure 9.2, such a vertical integration could be achieved by involving social networks and community organizations in the recruitment of participants for health promotion sessions (**Chapter 5**). Moreover, **Chapter 6** suggests targeting change at multiple levels, spanning the individual and the environmental levels.

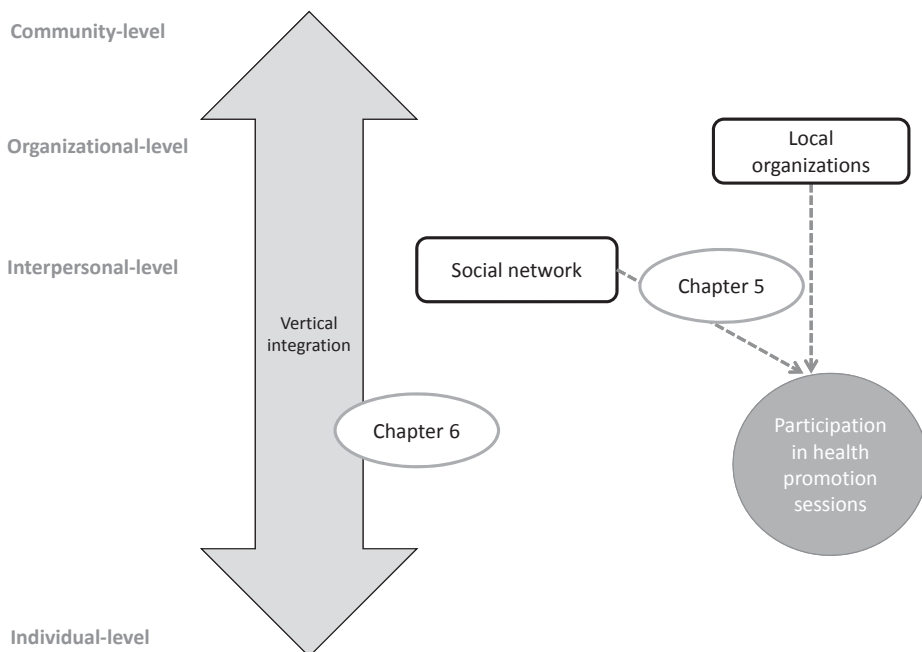


Figure 9.2 Investigated concepts and relationships for each chapter.

The study in **Chapter 4** indicates that non-Western ethnic minority women living in poor neighborhoods might have more difficulty accessing midwifery and obstetric care due to the described tension between the advice provided by their health professionals and social networks. Indeed, non-Western women show lower levels of access to midwifery and obstetric care than their native Dutch counterparts [15] (for international examples see [8, 16]). This is problematic due to the established linkage between low access to care and health outcomes [17, 18]. In **Chapter 5**, we present a study that aimed to increase ethnic minority women's access to midwifery and obstetric care.

In the Netherlands and abroad, a key challenge of health promotion efforts for low socio-economic status target groups is the recruitment of participants. The groups that are expected to benefit the most from these efforts are the least likely to actually participate [19-22]. The intervention described in **Chapter 5** made use of the knowledge of how women are embedded in social environments in order to recruit ethnic minority women living in poor areas – a target group described as “difficult to reach”. More specifically, the intervention employed advertising by local organizations (such as mosques and schools) and reached out to potential participants via the social network of the educators. These ‘active’ recruitments methods were more successful than the passive strategies of handing out flyers and sending invitations via email and mail to potential participants. By paying attention to the social actors that play an important role in the lives of the potential participants, this intervention was able to recruit a total of 1,896 female participants, 90% of which belonged to a non-Western ethnic minority and lived in deprived neighborhoods (and therefore belong to the group that is the most “difficult to reach”). In other words, this intervention made use of vertical integration in its recruitment strategy.

The intervention outlined in **Chapter 5** performs a vertical integration by implementing activities at an environmental level – more specifically, involving the social network (i.e. interpersonal level). While such a vertical integration of the activities of an intervention is laudable, in **Chapter 4 and 6** we argue that health promotion efforts should take a step further by adopting a ‘multilevel’ strategy. In Chapter 6, we define interventions as ‘multilevel’ if they have *targets* to create change on at least two levels. For example, a multilevel intervention might seek to create change at the individual-level by increasing people's health literacy, but also on the organizational level by increasing the quality of health care. Even though multilevel intervention has become a buzzword in public health [23, 24], it was unclear to what extent public health interventions had translated this concept into practice. By assessing a recent review of family planning interventions [25], we found that the multilevel perspective

has seldom been translated into interventions. Specifically, the majority of interventions involved some form of *activity* at the community and/or organizational level, yet only had *targets* for individual-level change as opposed to explicitly targeting environmental modification.

In **Chapter 5**, we argue that the small amount of interventions that are multilevel might partially be due to the underdevelopment of the theoretical framework guiding the design of multilevel interventions. While **Chapter 4** focuses on how a social science theory could substantiate this theoretical framework, in **Chapter 6** we suggest two theories from the field of economics, viz. the complementarity principle and risk compensation theory.

Part III – Horizontal integration of midwifery and obstetrics: Improving coordination between community midwives and obstetric professionals

In **Part II**, we advocate that reproductive health interventions should perform a vertical integration of their activities, and in particular, of their targets. The studies of **Part III** suggest a complementary strategy, namely horizontal integration of the midwifery and obstetrical health care system. Such integration can be achieved by strengthening coordination between two autonomous professional groups in the Netherlands: community midwives (who work in primary care) and obstetricians (who work in secondary or tertiary care). The recommended horizontal integration is depicted in Figure 9.3.

In order to propose ways to improve coordination within midwifery and obstetrics, the study in **Chapter 7** first outlines the current coordination challenges in this sector. While two key policy reports suggested improving coordination [26, 27], this matter had not yet been systematically studied before. In this qualitative study we identified challenges in terms of

- fragmented organizational structures (e.g. lack of shared patient-files)
- different perspectives on antenatal health (e.g. pregnancy as physiological versus pathological)
- inadequate interprofessional communication (e.g. problematic mutual respect)

These challenges limited professionals' coordinating capacity and thereby decreased their ability to provide optimal care. We also found that pregnant women needed to compensate for suboptimal coordination between community midwives and obstetricians by taking on an active role in facilitating communication between these professionals. The communicative

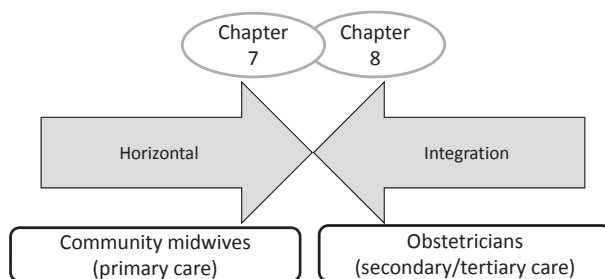


Figure 9.3 Investigated concepts and relationships for each chapter.

role that pregnant women play within coordination processes underlines the urgency to improve coordination.

Chapter 7 argues that limited horizontal integration of midwifery and obstetrics places an additional burden on pregnant women who have to take on a communicative role. In **Chapter 8** we consider another consequence of the limited horizontal integration between midwifery and obstetrics. We argue that this limited integration does not fully meet the needs of pregnant women with an accumulation of non-medical risk factors (such as poverty and lack of social support). In the current classification system, women are either seen as ‘low-risk’ and assigned to a community midwife, or as ‘high-risk’ and assigned to an obstetrician in a hospital setting [28]. However, particularly women with several non-medical risk factors fall in between these categories [29, 30] and could be seen as ‘medium-risk’. We argue that these women would benefit from shared care from *both* community midwives, who have more expertise in dealing with non-medical risk factors, and obstetricians, who are more specifically trained in dealing with pathology.

In **Chapter 8** we present such a model of ‘shared care’, which would facilitate shared responsibility of community midwives and obstetricians over women classified as being at ‘medium-risk’. Such a model envisions increased horizontal integration of midwifery and obstetrics by a) adapting the risk classification system (‘obstetric indication list’) to explicitly facilitate shared care of certain pregnant women, and b) the national roll-out of ‘obstetric collaborations’. These collaborations are formed by obstetric caregivers of a single hospital and all surrounding community midwives. They can assure continuity of care, patient centeredness and foster interprofessional teamwork. These elements are further elaborated upon in the section ‘Policy Recommendations and Future Research’ below.

METHODOLOGICAL ISSUES

The studies presented in **Chapter 2 and 3** were both retrospective cross-sectional studies, and made use of the same national data sets. Data on birth outcomes were derived from the Netherlands Perinatal Registry, and data for neighborhood characteristics were obtained from a) the Housing & Living Survey, b) the Netherlands Institute for Social Research, and c) Statistics Netherlands. Due to the specific study design and employed data sets, both studies share a number of methodological limitations, as discussed in the following paragraphs.

Due to the cross-sectional nature of both studies, we cannot rule out reverse causation, e.g., that poor perinatal health or late entry into care caused lower social capital/higher ethnic density. Another limitation of the designs is that we cannot eliminate bias due to selection into different neighborhoods, meaning that pregnant women who are healthy and make adequate use of health care move away from low social capital and high ethnic minority density neighborhoods. However, a study showed that selective migration is not a major contributor to health inequalities between neighborhoods in the Netherlands [31]. Another study showed that the vast majority of women who moved during the prenatal phase in the Netherlands remained in neighborhoods of comparable socioeconomic status (and presumably of comparable ethnic minority density and social capital status) [32].

A second limitation of both studies **Chapter 2 and 3** is that we were unable to control for certain maternal characteristics that have been found to be associated with our outcome measures. Most importantly, we missed data on individual-level socioeconomic status and lifestyle (for birth outcomes see [33, 34], for entry into care see [9, 35]. For the analysis on birth outcomes, however, several of the individual characteristics we did use (age, parity, ethnicity, and prematurity for the birth weight analysis) are partial proxies for socioeconomic and lifestyle determinants of birth outcomes [36]. As for the analysis of time of entry into care, it should be noted that two commonly used individual risk factors for late entry into care, unwanted pregnancy and illicit drug use, are only present in a small portion of the population and are therefore less likely to have an important impact on our findings. Research in an urban group of Dutch pregnant women showed that 0.5% of them continued using illicit drugs throughout pregnancy [29]. Only about six percent of pregnancies in the Netherlands are unwanted, of which only a part is carried to term [37].

Lastly, both studies made use of The Netherlands Perinatal Registry for data on individual characteristics, including birth outcomes and time of entry into care. This national data set contains 97% of all pregnancies from 2000-2008 and has been collected by 94% of midwives,

99% of obstetricians, and 68% of pediatricians – including 100% of Neonatal Intensive Care Unit pediatricians (www.perinatreg.nl). The registry also provides information on the ethnic origin on the women, which we used as independent variables in both of our studies.

The classification of ethnicity is made by the healthcare professional. Such a method is problematic in several ways. From a methodological standpoint, it is likely to produce classification error. As we were primarily interested in examining why Western women are at higher risk for adverse perinatal outcomes in poor neighborhoods, we opted for a crude binary classification of Western versus non-Western ethnic minority women. To do this, we defined the first two classes of the original classification as “Western” women and the other five classes were together defined as “non-Western ethnic minority” women. By collapsing into these simplified two categories, we sought to circumvent the misclassification introduced by the method of ethnicity ascertainment on the registry records. Another advantage of this dichotomy is that it makes the results of both studies in **Chapter 2 and 3** comparable to each other, and also to previous studies [2, 36].

Whilst the dichotomous grouping of Western and non-Western women has some major advantages for our analysis, it is also problematic. This dichotomy lumps together diverse ethnic groups that differ with respect to patterns of social capital, health behavior, and birth outcomes. Our study is unable to tease out the specific risks of the various ethnic groups. Moreover, the binary construction might also contribute to the perception of all non-Western ethnic groups as being the ‘same’, and reflecting a uniform ethnic minority ‘problem’. This is clearly an oversimplification, and studies on ethnic disparities need to be cognizant of how classifications of ethnicity chosen by researchers might contribute to (mis)conceptions about ethnic groups [38]. We do hope, however, that this study demonstrates that the perinatal health of majority and minority groups should be investigated within specific contexts. In fact, the results of this study indicate the protective effects of ethnicity, in contrast to most studies that underline ethnicity as solely as risk factor [38].

Despite the above-mentioned limitations, both studies share a number of strengths. To our knowledge, these are the first studies examining neighborhood effects on birth outcomes/timely entry into care across an entire country, in this case the Netherlands, as all previous studies are limited to cities or regions. They are also the first studies to enquire into the effects of neighborhood social capital and ethnic minority density on birth outcomes and timely entry into care in the Netherlands. Moreover, they are one of the few studies to examine the association of a range of both physical (home maintenance, urbanity) and social (ethnic

density, neighborhood social capital, feeling of safety, socioeconomic status) neighborhood characteristics on birth outcomes/timely entry into care. Lastly, a major strength of both studies is that they are one of the few attempts to use a neighborhood social capital score derived via an econometrics procedure, which improves reliability.

Chapters 4 and 7 present two qualitative studies on the experiences of midwives and obstetric professionals, and women around the time of pregnancy, respectively. Both studies were situated in the region of Rotterdam. However, we believe that the policy implications of both studies are relevant for other settings. The results of **Chapter 7** are applicable to other Dutch settings, as almost all of regions have autonomous yet interdependent community midwives and obstetric professionals; and the organizational structures that complicate coordination in Rotterdam such as lack of a shared maternity notes and physical distance can also be found elsewhere in the country [27]. Plausibly, the dilemma's experienced by the interviewed women – as outlined in **Chapter 4** – are also not intrinsic to Rotterdam, but could also be found in other large cities, which experience similarly high levels of ethnic minority density, neighborhood deprivation and adverse birth outcomes [2].

Both of the studies in **Chapter 4 and 7** conducted 40 interviews. We did not conduct observations for our study on women around the time of pregnancy, and only spent several days doing observations of obstetric practices, which is brief compared to traditional ethnographic standards. Observations are helpful for identifying differences between what people say and what they actually do. For both studies, it would have been interesting to conduct extensive observations on clients themselves, as well as client-provider interactions. For the study presented in **Chapter 4**, it would have also been helpful to include observations on women interacting with their social network. It should be noted, however, that in both studies we asked respondents to recall countless experiences, from which we were able to gain an insight into their actions.

Despite of a number of limitations, both studies presented in **Chapter 4 and 7** applied rigorous methods to increase the trustworthiness of our interpretation of the data. During and after the interview phase, we applied member-checking (i.e. verifying the interpretation with the respondents) to improve the quality of our data collection and analysis. Next to member-checking, we also made use of 'peer debriefing' for both studies. This means that consultations were held throughout the data collection/analysis phase between the first author and the other authors, which were not involved in this phase of the study. Following Corley and Gioia [39], these consultations were used to discuss emerging patterns in the

data and evolving propositions, as well as solicit critical questions regarding the steps taken.

The review presented in **Chapter 6** has several limitations. For one, the assessment of interventions featured in Mwaikambo et al.'s systematic review do not cover all of the interventions published in scientific journals and in the grey literature during this time period. Furthermore, it is possible that some of the reviewed interventions appear to be single-level but were actually part of a larger multilevel program.

Lastly, **Chapter 5** presents a pilot study of peer education in the field of reproductive health. This study has several limitations. As it was a pilot study, we did not perform a controlled trial. Therefore, we were not able to attribute any causal effects to the intervention. The results should therefore be seen as indicators of a potentially promising intervention strategy, which need to be assessed more rigorously in the future. For future assessments, the registration forms/questionnaires used to measure increase in knowledge of participants should also be translated into the native languages of the participants. During the pilot phase, these forms were only available in the Dutch language. This might have caused a barrier for participants with poor Dutch language proficiency. Four percent of the questionnaires were incomplete (missing of gender variable and missing of more than five respondent characteristics) that were excluded from the analysis. We cannot fully oversee the consequences that these omitted questionnaires have for results of this study. However, given the small number of exclusions, we do not expect a substantial bias.

POLICY RECOMMENDATIONS AND FUTURE RESEARCH

Based on the sections above, we now turn to a number of policy recommendations and provide several suggestions for future research. As the titles of the **Part II** and **Part III** of this thesis suggest, we primarily recommend a further expansion of the vertical integration of health promotion interventions, and an expansion of the horizontal integration of midwifery and obstetrics.

In order to strengthen a vertical integration of health promotion interventions, we suggest the following:

- We recommend employing recruitment methods for increasing the reach of underserved (“difficult to reach”) target groups that take into account how the target groups are influenced by their social environments. In the case of our pilot study, we leveraged the influence of peers and local organizations

on the women we were trying to reach. We did this by having peer educators reach out to their own network, and asking local organizations close to the target group to approach potential participants (**Chapter 5**).

- Health promotion interventions adhering to social-ecological models should not only employ *activities* situated on multiple levels (e.g. one-on-one education combined with mass-media campaign) but also specify multilevel *targets*, and attempt to also measure results on these levels (**Chapter 6**).
- We discourage viewing women's social networks as a constraint on healthy behavior. Social networks provide valuable social support to women around the time of pregnancy, and interventions should take care not to alienate them from the target group. As an alternative, we recommend involving women's social network in intervention efforts (**Chapter 4**).
- Our analysis in **Chapter 4** suggests a promising route for a health promotion intervention for women facing conflicting advice from their health professionals and their social network: inviting these women together with members of their social network to attend health promotion sessions. Such sessions could create a safe environment for women to discuss conflicting pieces of advice. The targets of such an intervention could be to increase the negotiation capacity of the target group, but also to increase the health literacy of the members of their social network. This, in turn, would ensure for the circulation of 'new' information within a rather homogeneous, tight-knit network.
- Based on the recommendations outlined for **Chapters 4 and 6** above, we formulate a recommendation for the future roll-out of the pilot study with peer education outlined in **Chapter 5**. We suggest that this intervention not only employ multilevel activities (i.e. employing social networks and local environments to recruit participants), but also target to create change at the target group's interpersonal level. This could be done by structurally including members of the social network of the primary target group as participants for the educational sessions, and steering towards increasing their health literacy.
- We have shown that neighborhoods influence pregnancy-related behavior and birth outcomes. This finding indicates a new route for improving

birth outcomes: targeting improvements at the neighborhood level (e.g. increase neighborhood social capital) instead of only targeting change at the individual level (e.g. individual health education). Even though the effect size of the influence of neighborhoods on time of entry into care and birth outcomes was modest, changes at the neighborhood level have can have a large outreach by affecting a large number of people's health behaviors and birth outcomes within neighborhoods (**Chapter 2 and 3**).

- We recommend future research into the cost-effectiveness of interventions targeting change at the environmental versus at the individual level. Is it more cost-effective, for example, to perform individual health education on the risk of smoking, or to invest in changing social norms of a community about smoking? Likewise, little is known about the interaction between changes at the environmental and the individual level. For example, if interventions target both individual health education and changing social norms about smoking, are the effects of these interventions accumulative, or reinforcing, or potentially even conflicting?
- The study presented in **Chapter 7** indicates that clients play a communicative role in the coordination process between community midwives and obstetricians. However, it is plausible that not all women are capable of playing this role, and are not sufficiently supported in doing so. Next to improving interprofessional coordination (see below), this situation could be addressed by implementing policies supporting women who have to play a communicative role in coordination processes. As we outline in **Chapter 7**, this could be done by exploring ways of making provider-information more accessible to pregnant women, facilitating more dialogue between pregnant women and providers, and increasing health literacy (**Chapter 7 and 8**). Our analysis presented in **Chapter 4** suggests also including the women's social network in this dialogue.
- The current literature on coordination treats clients as merely recipients, rather than as supporters or even as co-producers of coordination (see, for example, [40, 41]). We suggest that the term 'stakeholder coordination' would be more apt in incorporating the role of clients in coordination processes than the currently used term 'interprofessional coordination'. For future

research, we recommend extending the scope of coordination studies to include a broader range of coordinating stakeholders. This could be done by conducting studies on the role of clients in the coordination process in other health care sectors. Moreover, it would be interesting to conduct interviews and more observation moments with pregnant women themselves in order to better understand the role they play within coordination processes.

In order to achieve a horizontal integration of the midwifery and obstetric care system, we recommend a number of measures:

- We recommend more frequently scheduled face-to face meetings with community midwives and obstetric professionals in order to discuss and improve coordination practices. These meetings could also be used to communicate about the care pathways for women that would benefit from shared care, i.e. receiving care from both community midwives and obstetricians. Such meetings are already in place in some areas and could increase interprofessional communication, such as mutual trust and shared knowledge [42] (**Chapter 7 and 8**).
- To increase continuity of care, we suggest assigning case managers to oversee the care plan of women receiving care from both community midwives and obstetricians, starting at the first antenatal visit and lasting until the postnatal period [27, 43] (**Chapter 8**).
- Improved communication between community midwives and obstetric professionals could concurrently be achieved by implementing training in interprofessional teamwork and education [44, 45] (**Chapter 7 and 8**). In terms of education, we recommend that the training of resident obstetricians include time spent at community midwifery practices (**Chapter 7**).
- Moreover, we support the current movements in the Netherlands towards a shared maternity notes system for all levels of care, as is in use in part of the UK [27, 46] (**Chapter 7 and 8**).

REFERENCES

1. de Graaf, J.P., et al., *Increased adverse perinatal outcome of hospital delivery at night*. BJOG, 2010. **117**(9): p. 1098-1107.
2. Poeran, J., et al., *Social deprivation and adverse perinatal outcomes among Western and non-Western pregnant women in a Dutch urban population*. Soc Sci Med, 2013. **83**: p. 42-9.
3. Szreter, S. and M. Woolcock, *Health by association? Social capital, social theory, and the political economy of public health*. International Journal of Epidemiology, 2004. **33**(4): p. 650-667.
4. Pickett, K.E. and R.G. Wilkinson, *People like us: ethnic group density effects on health*. Ethnicity & health, 2008. **13**(4): p. 321-334.
5. Dole, N., et al., *Maternal stress and preterm birth*. American journal of epidemiology, 2003. **157**(1): p. 14-24.
6. Berkman, L.F. and I. Kawachi, *Social cohesion, social capital, and health*. In: Berkman LF, Kawachi I, eds. *Social epidemiology*. New York: Oxford University Press, 2000:174-90. 2000.
7. Lin, N., *Social capital: A theory of social structure and action*. Vol. 19. 2002: Cambridge University Press.
8. Rowe, R.E., et al., *Social and ethnic differences in attendance for antenatal care in England*. Public Health, 2008. **122**(12): p. 1363-72.
9. Feijen-de Jong, E.I., et al., *Determinants of late and/or inadequate use of prenatal healthcare in high-income countries: a systematic review*. Eur J Public Health, 2012. **22**(6): p. 904-13.
10. Cubbin, C., et al., *Is neighborhood deprivation independently associated with maternal and infant health? Evidence from Florida and Washington*. Maternal and child health journal, 2008. **12**(1): p. 61-74.
11. Raatikainen, K., N. Heiskanen, and S. Heinonen, *Under-attending free antenatal care is associated with adverse pregnancy outcomes*. BMC Public Health, 2007. **7**: p. 268.
12. Lin, N., et al., *Social support, stressful life events, and illness: a model and an empirical test*. J Health Soc Behav, 1979. **20**(2): p. 108-19.
13. Berkman, L.F. and T. Glass, *Social integration, social networks, social support, and health*, in *Social epidemiology*, L.F. Berkman and I. Kawachi, Editors. 2000, Oxford University Press: New York, NY. p. 137-173.
14. Giddens, A., *The constitution of society*. 1984, Cambridge: Polity Press.
15. Chote, A.A., et al., *Ethnic differences in antenatal care use in a large multi-ethnic urban population in the Netherlands*. Midwifery, 2011. **27**(1): p. 36-41.
16. Trinh, L. and G. Rubin, *Late entry to antenatal care in New South Wales, Australia*. Reproductive Health, 2006. **3**(8): p. 1-8.
17. Stronks, K., A.C. Ravelli, and S.A. Reijneveld, *Immigrants in the Netherlands: equal access for equal needs?* J Epidemiol Community Health, 2001. **55**(10): p. 701-7.

18. Philibert, M., C. Deneux-Tharaux, and M.H. Bouvier-Colle, *Can excess maternal mortality among women of foreign nationality be explained by suboptimal obstetric care?* BJOG 2008. **115**(11): p. 1411–1418.
19. RIVM. *What is the effect of prevention in the Netherlands? (in Dutch)*. 2013 January 2013]; Available from: <http://www.nationaalkompas.nl/preventie/bereik/> and <http://www.nationaalkompas.nl/algemeen/menu-rechts/english/>.
20. Poeran, J., et al., *Urban perinatal health inequalities*. J Matern Fetal Neonatal Med, 2011. **24**(4): p. 643-6.
21. Fabian, H., et al., *Women with non-Swedish speaking background and their children: a longitudinal study of uptake of care and maternal and child health*. Acta Paediatr, 2008. **97**(12): p. 1721-8.
22. Petrou, S., et al., *Clinical, provider and sociodemographic determinants of the number of antenatal visits in England and Wales*. Soc Sci Med, 2001. **52**(7): p. 1123-34.
23. Golden, S.D. and J.A.L. Earp, *Social ecological approaches to individuals and their contexts: twenty years of health education & behavior health promotion interventions*. Health Educ Behav 2012. **39**(3): p. 364-372.
24. Richard, L., L. Gauvin, and K. Raine, *Ecological models revisited: their uses and evolution in health promotion over two decades*. Annu Rev Public Health, 2011. **32**: p. 307-26.
25. Mwaikambo, L., et al., *What works in family planning interventions: a systematic review*. Stud Fam Plan, 2011. **42**(2): p. 67-82.
26. Bonsel, G., et al., *Lijnen in de Perinatale Sterfte, Signalementstudie Zwangerschap en Geboorte 2010 [Priorities in research to reduce perinatal mortality, signalement-study pregnancy and birth 2010]*. . 2010, Erasmus MC: Rotterdam.
27. *Een goed begin, veilige zorg rond zwangerschap en geboorte [A good start, safe care for pregnancy and birth. Advice of the Committee on Good care during pregnancy and child birth]*. 2009: Utrecht.
28. Amelink-Verburg, M., *The role of primary care midwives in the Netherlands. Evaluation of midwifery care in the Dutch maternity care system: A descriptive study*, in AMC. 2011, UvA: Amsterdam. p. 279.
29. Timmermans, S., et al., *Individual accumulation of heterogeneous risks explains perinatal inequalities within deprived neighbourhoods*. Eur J Epidemiol, 2011. **26**(2): p. 165-80.
30. DHC, I., *Bevindingen en conclusies van de inventarisatie naar de stand van zaken rond de implementatie van het Advies van de Stuurgroep Zwangerschap en Geboorte in ziekenhuizen in Nederland op 1 november 2011 [Observations and conclusions of the survey on the state of affairs concerning the implementation of the Advices of the Committee on Good care during pregnancy and child birth on the 1st of November 2011.]*, M.o.H. WaS, Editor. 2012.
31. van Lenthe, F.J. and J.P. Mackenbach, *Neighbourhood deprivation and overweight: the GLOBE study*. Int J Obes Relat Metab Disord, 2002. **26**(2): p. 234-40.
32. Reitsma, J.B., et al., *[Possibilities for anonymous follow-up studies of patients in Dutch national medical registrations using the Municipal Population Register: a pilot study]*. Ned Tijdschr Geneesk, 2003. **147**(46): p. 2286-90.

33. Jaddoe, V.W., et al., *Active and passive maternal smoking during pregnancy and the risks of low birthweight and preterm birth: the Generation R Study*. Paediatr Perinat Epidemiol, 2008. **22**(2): p. 162-71.
34. Kramer, M.S., et al., *Socio-economic disparities in pregnancy outcome: why do the poor fare so poorly?* Paediatr Perinat Epidemiol, 2000. **14**(3): p. 194-210.
35. Boerleider, A.W., et al., *Factors affecting the use of prenatal care by non-western women in industrialized western countries: a systematic review*. BMC Pregnancy Childbirth, 2013. **13**: p. 81.
36. de Graaf, J.P., et al., *Living in deprived urban districts increases perinatal health inequalities*. J Matern Fetal Neonatal Med, 2012: p. 1-29.
37. Bakker, E.d.G.H., et al., *Seksuele gezondheid in Nederland 2009 [Sexual health in the Netherlands 2009]*. 2009, Rutgers Nisso Groep: Utrecht.
38. Proctor, A., A. Krumeich, and A. Meershoek, *Making a difference: the construction of ethnicity in HIV and STI epidemiological research by the Dutch National Institute for Public Health and the Environment*. Soc Sci Med, 2011. **72**(11): p. 1838-45.
39. Corley, K.G. and D.A. Gioia, *Identity ambiguity and change in the wake of a corporate spin-off*. Administrative Sci Quart, 2004. **49**(2): p. 173-208.
40. Gittell, J.H., *Coordinating mechanisms in care provider groups: relational coordination as a mediator and input uncertainty as a moderator of performance effects*. Manage Sci, 2002. **48**(11): p. 1408-1426.
41. Gittell, J.H., et al., *Impact of relational coordination on quality of care, postoperative pain and functioning, and length of stay: a nine-hospital study of surgical patients*. Med Care, 2000. **38**(8): p. 807-19.
42. Gittell, J.H., *High performance healthcare: Using the power of relationships to achieve quality, efficiency and resilience*. 2009, New York: McGraw-Hill.
43. Kodner, D.L. and C. Spreeuwenberg, *Integrated care: meaning, logic, applications, and implications--a discussion paper*. Int J Integr Care, 2002. **2**: p. e12.
44. Kisely, S. and P. Chisholm, *Shared mental health care for a marginalized community in inner-city Canada*. Australas Psychiatry, 2009. **17**(2): p. 130-3.
45. Reeves, S., et al., *Interprofessional education: effects on professional practice and health care outcomes*. Cochrane Database Syst Rev, 2008(1): p. Cd002213.
46. Dorr, D.A., S.S. Jones, and A. Wilcox, *A framework for information system usage in collaborative care*. J Biomed Inform, 2007. **40**(3): p. 282-7.



Chapter 10



English summary
Nederlandse samenvatting

ENGLISH SUMMARY

There are high rates of inequality between birth outcomes across wealthy and impoverished neighborhoods in the Netherlands. The most pronounced inequalities can be found in Rotterdam, where the rate of perinatal mortality is 10 times higher in the poorest neighborhoods than in the richest neighborhoods. With such high rates of inequality, the Netherlands is home to one of the highest recorded disparities in birth outcomes across neighborhoods in any developed country. Substantial inequalities are not only found across neighborhoods, but also across different social groups. Women of low socio-economic status and/or with a non-Western ethnic minority background show the worst birth outcomes.

Reducing inequalities in birth outcomes has become a primary concern for the Dutch government. In line with this concern, this thesis aims to increase our understanding of reproductive health inequalities (and birth outcomes, in particular) and to propose ways for addressing them. More specifically, this thesis focuses on two themes that have been identified by two recent scientific reports as key to reducing reproductive health inequalities: a) improving pregnancy-related health behaviors and b) strengthening coordination between midwives and obstetric caregivers.

This thesis mostly focusses on pregnancy-related behaviors and interprofessional coordination within the Dutch context. These themes are, however, also relevant in other settings. The capacity to modify (pregnancy-related) health behavior has become a primary goal of public health efforts across the globe. This is partially because diseases related to health behavior are on the rise, and now constitute more than half of the global burden of disease, coupled with the current ineffectiveness of health promotion interventions. Moreover, interprofessional coordination is a rising problem across all sectors of health care. As health professionals become more and more specialized, the need for coordination (i.e. integration) of the tasks performed by different professionals also increases.

In order to address such complex and diverse topics, the manuscripts contained in this thesis make use of diverse data sets, are of an empirical and/or theoretical nature, employ qualitative and quantitative designs and span the disciplines of obstetrics, midwifery, medical sociology, social epidemiology, organization science, and public health.

This thesis is divided into three parts. **Part I** and **Part II** seek to contribute to the key policy recommendation presented to the Dutch government of improving pregnancy-related health behaviors. **Part I** investigates the influence of social environments on pregnancy-related

behavior and birth outcomes. This part also examines how possible interactions between social environments and individual characteristics influence pregnancy-related behavior and birth outcomes. The studies in **Part II** explore how knowledge of the influence of social environments on health behaviors can be used to ameliorate interventions aiming to improve reproductive health-related behavior.

Part III seeks to contribute to the key policy recommendation of improving coordination between community midwives and obstetric caregivers. We do this by assessing how coordination between midwives and obstetric professionals could be strengthened and by proposing a new organizational model for Dutch midwifery and obstetrics.

Part I – Understanding pregnancy-related behavior and birth outcomes: the influence of social environments

In **Part I, Chapter 2**, we demonstrate that the neighborhood a woman lives in influences her chances of healthy birth outcomes in the Netherlands. Moreover, when controlling for other relevant neighborhood characteristics, we found that higher proportions of ethnic minority residents in a neighborhood (i.e. ethnic minority density) were associated with lower birth weight and higher rates of premature births.

A third finding of **Chapter 2** was that living in a neighborhood with higher proportions of ethnic minority residents had a different effect on Western and non-Western women. A higher proportion of ethnic minority residents in a neighborhood was associated with higher birth weight and a reduced risk for prematurity for infants of non-Western ethnic minority women *compared to* Western women. This means that a higher proportion of ethnic minority residents seems to be a protective factor for non-Western ethnic minority women, but not for Western women. This helps explain the increased risk of Western women in deprived neighborhoods for adverse birth outcomes found in previous studies.

In **Chapter 2**, we speculate that the proportion of ethnic minority residents might influence pregnancy-related health behaviors, which in turn influence birth outcomes. In **Chapter 3**, we were able to assess whether the proportion of ethnic minority residents influences the time at which pregnant women enter into antenatal care. Our results indicate that a *higher* proportion of ethnic minority residents were associated with *later* entry into care. Similar to our study presented in **Chapter 2**, higher proportions of ethnic minority residents act as a protective factor for non-Western women, but not for Western women. Non-Western women demonstrated a lower risk of late entry into antenatal care when compared to Western women.

Most research on the individual determinants of health identifies ‘ethnicity’ (meaning: non-Western ethnic minority status) as only a risk factor for adverse (perinatal) health. In contrast, **Chapter 2 and 3** show that while ethnic minority status is indeed a risk factor at the individual level, it seems to act as a protective factor at the neighborhood level in areas with a higher proportion of ethnic minority residents. Our analyses show that neighborhoods with a higher proportion of ethnic minority residents show higher levels of poverty – which in turn has a negative effect on time of entry into care and birth outcomes. For non-Western ethnic minority women, however, living in a neighborhood with a higher proportion of ethnic minority residents seems to mitigate the negative influences of poverty.

In **Chapter 2 and 3** we suggest that the proportion of ethnic minority residents is a proxy for the level of bonding social capital of non-Western groups. There are several possible mechanisms by which bonding social capital may influence the behavior and the birth outcomes of those who have access to this resource – in our case, non-Western ethnic minority women. Women who have access to bonding social capital might be more protected from discrimination and feel safer in their neighborhoods, which could reduce their stress levels – a key predictor of premature births. Bonding social capital might also stimulate healthier pregnancy-related behavior (and therefore improve birth outcomes). More specifically, bonding social capital might enforce healthy norms of behavior (such as not smoking during pregnancy), and facilitate more efficient diffusion of health related information (such as the importance of early entry into antenatal care).

Chapter 3 considers how neighborhoods might influence women’s time of entry into care. In **Chapter 4**, we studied how other dimensions of the social environment influence women’s health behaviors. Conducting a qualitative study in poor neighborhoods in Rotterdam with a high proportion of ethnic minorities, we explored how women’s health professionals and their social network influenced their pregnancy-related behaviors. With regards to their social network, we found that women of a Moroccan or Turkish background were located in a tight-knit and homogeneous network of family and peers, and reported high levels of social support. This social network helped women in various ways. For example, (distant) family members would babysit their children so that they could visit the community midwife, or help out in the household. The Native Dutch women’s networks were equally homogeneous, but less tight-knit, and these women experienced lower levels of support.

The ethnic minority women in our study in **Chapter 4** report higher levels of social support from their social network, which is indicative that they have higher levels of *individual-level*

social capital when compared to the Native Dutch respondents. The findings of **Chapter 2** suggest that ethnic minority women living in neighborhoods with a higher proportion of ethnic minority residents also have access to higher levels of social capital at the *neighborhood level*. Native Dutch women living in these neighborhoods, on the other hand, appear to experience lower levels of neighborhood and individual-level bonding social capital, which might help explain their particularly adverse birth outcomes in these areas.

Part II – Vertical integration of reproductive health interventions: integrating the influence of social environments to improve reproductive health behaviors

The studies in **Part I** explored how women's pregnancy-related behavior and birth outcomes are shaped by multilevel influences (environmental and individual-level), and also by interactions between individual and environmental influences. The studies of **Part II** turn to how such a multilevel perspective can be applied to the design and implementation of public health interventions aiming to improve reproductive health. We argue that public health interventions need to achieve a *vertical integration*. This means that interventions need to understand how human behavior is shaped by both individual-level and environmental factors (and possible interactions), and integrate this knowledge into their design and implementation.

As **Chapter 5** shows, such a vertical integration could be achieved by involving social networks and community organizations in the recruitment of participants for health promotion sessions. The intervention described in this study successfully made use of the knowledge of how women are embedded in social environments in order to recruit ethnic minority women living in poor areas – a target group described as “difficult to reach”. More specifically, the intervention employed advertising by local organizations (such as mosques and schools) and reached out to potential participants via the social network of the educators. These ‘active’ recruitment methods were more successful than the passive strategies of handing out flyers and sending invitations via email and mail to the potential participants.

While a vertical integration of the recruitment strategy – as outlined in **Chapter 5** – is laudable, in **Chapter 4 and 6** we argue that health promotion efforts should take one step further by adopting a ‘multilevel’ strategy. In **Chapter 6**, we define interventions as ‘multilevel’ if they have *targets* to create change on at least two levels. For example, a multilevel intervention might seek to create change at the individual-level by increasing people's health

literacy, but also on the organizational level by increasing the quality of health care. Even though multilevel intervention has become a buzzword in public health, it was unclear to what extent public health interventions had translated this concept into practice. By assessing a recent review of family planning interventions, we found that the multilevel perspective has seldom been translated into interventions. Specifically, the majority of interventions involved some form of *activity* at the community and/or organizational level, yet only had *targets* for individual-level change as opposed to explicitly targeting environmental modification.

Part III – Horizontal integration of midwifery and obstetrics: improving coordination between community midwives and obstetric professionals

In **Part II**, we advocate that public health interventions should perform a vertical integration of their recruitments strategies and targets. The studies of **Part III (Chapters 7 and 8)** suggest a complementary strategy, namely horizontal integration of the midwifery and obstetrical health care system. Such integration can be achieved by strengthening coordination between two autonomous professional groups in the Netherlands: community midwives (who work in the primary care) and obstetric professionals (who work in secondary/tertiary care).

In order to propose ways to improve coordination within midwifery and obstetrics we first identified the main coordination challenges in this sector: fragmented organizational structures (e.g. lack of shared patient-files), different perspectives on antenatal health (e.g. pregnancy as physiological versus a pathological) and inadequate interprofessional communication (e.g. problematic mutual respect) (**Chapter 7**). These challenges limited professionals' ability to provide optimal care. We also found that pregnant women needed to compensate for suboptimal coordination between community midwives and obstetric caregivers by taking on an active role in facilitating communication between these professionals.

Chapter 7 argues that limited horizontal integration of midwifery and obstetrics places an additional burden on pregnant women who have to take on a communicative role. In **Chapter 8** we consider another consequence of the limited horizontal integration between midwifery and obstetrics. We argue that this limited integration does not fully meet the needs of pregnant women with an accumulation of non-medical risk factors (such as poverty and lack of social support). In the current classification system, women are either seen as 'low-risk' and assigned to a community midwife, or as 'high-risk' and assigned to an obstetrician in a hospital setting. However, particularly women with several non-medical

risk factors fall in between these categories and could be seen as ‘medium-risk’. We argue that these women would benefit from shared care from *both* community midwives, who have more expertise in dealing with non-medical risk factors, and obstetricians, who are more specifically trained in dealing with pathology.

In **Chapter 8** we present such a model of ‘shared care’, which would facilitate shared responsibility of community midwives and obstetricians over women classified as being at ‘medium-risk’. Such a model envisions increased horizontal integration of midwifery and obstetrics by adapting the risk classification system (‘obstetric indication list’) to explicitly facilitate shared care of certain pregnant women. The model builds upon the national roll-out of ‘obstetric collaborations’, which will help implement increased collaboration. The obstetric collaborations are formed by obstetric caregivers of a single hospital and all surrounding community midwives. By allowing obstetric caregivers and community midwives to meet on a regular basis and discuss patient-related issues, they are key to facilitating the envisioned model of shared care.

Conclusion

The stated aim of this thesis was to increase our understanding of reproductive health inequalities (and birth outcomes, in particular) and to propose ways for addressing them. This thesis recommends achieving an increased vertical integration of reproductive health interventions by taking explicit account of how individuals interact with their environments. Moreover, improved horizontal integration could be achieved by fostering stronger coordination between community midwives and obstetric professionals.

NEDERLANDSE SAMENVATTING

Er zijn grote verschillen in geboorte-uitkomsten tussen rijke en arme wijken in Nederland. Dit houdt met name in dat in arme wijken vaker kinderen te vroeg of te licht geboren worden. In Rotterdam vindt men de grootste verschillen: de kans dat een kind rond de geboorte overlijdt, is in de armste wijken tien keer zo groot als in de rijkste wijken. Deze verschillen zijn zelfs zo groot dat Nederland een van de landen is met de grootste verschillen tussen arm en rijk qua geboorte-uitkomsten van alle ontwikkelde landen.

Ongelijkheden in geboorte-uitkomsten zijn er niet alleen tussen verschillende wijken, maar ook tussen sociale groepen. Vrouwen met een lage sociaaleconomische status en/of van een niet-westerse etnische minderheid hebben de slechtste geboorte-uitkomsten.

De Nederlandse overheid heeft het dan ook een prioriteit gemaakt om de ongelijkheid in geboorte-uitkomsten te verkleinen. Dit proefschrift draagt hieraan bij door ons begrip van het probleem te vergroten en mogelijke oplossingen aan te dragen. Deze worden met name gezocht in a) het verbeteren van zwangerschapsgerelateerd gezondheidsgedrag (zoals te laat in verloskundige zorg komen) en b) het versterken van de samenwerking tussen verloskundigen en gynaecologen.

Hoewel dit proefschrift zich richt op de Nederlandse situatie, zijn de gestelde vragen ook in andere landen en/of andere vakgebieden relevant. Het beïnvloeden van gezondheidsgedrag – zoals roken tijdens de zwangerschap, of ongezond eten, is een belangrijk doel binnen de public health over de hele wereld. Dit komt mede doordat ziektes die veroorzaakt worden door gedrag (zoals obesitas) steeds vaker voorkomen – en inmiddels meer dan de helft van alle ziektes vormen. Bovendien blijken veel van de huidige interventies om gedrag te veranderen niet effectief te zijn. Daarnaast is samenwerking tussen professionals een groeiend probleem binnen alle delen van de gezondheidszorg. Met toenemende specialisatie van zorgverleners groeit ook de behoefte aan samenwerking – dat wil zeggen de behoefte aan integratie van de activiteiten die door de verschillende beroepsgroepen uitgevoerd worden.

Om zwangerschapsgerelateerd gedrag en samenwerking tussen zorgverleners te onderzoeken maakt dit proefschrift gebruik van meerdere onderzoeksmethoden, zowel kwalitatief als kwantitatief. De studies in dit proefschrift zijn empirisch en theoretisch van aard, en bekijken zwangerschapsgerelateerd gedrag en samenwerking vanuit verschillende disciplines, onder andere vanuit de verloskunde, medische sociologie, sociale epidemiologie, organisatiewetenschappen en public health.

Het proefschrift bestaat uit drie delen. **Deel I** gaat in op de invloed van de sociale omgeving op zwangerschapsgerelateerd gezondheidsgedrag en geboorte-uitkomsten. **Deel II** bespreekt de noodzaak om de kennis over de invloed van de sociale omgeving mee te nemen bij het ontwerpen van interventies in de gezondheidszorg (*verticale integratie*). Tenslotte pleit **Deel III** voor een versterking van de samenwerking tussen verloskundigen en gynaecologen (*horizontale integratie*).

Deel I – De invloed van de sociale omgeving op zwangerschapsgerelateerd gezondheidsgedrag en geboorte-uitkomsten

De **Hoofdstukken 2 en 3** laten zien op welke manier de wijk waarin een vrouw woont invloed heeft op haar zwangerschap. Uit **Hoofdstuk 2** blijkt dat de wijk waarin een vrouw woont het geboortegewicht van haar kind en de kansen op een vroeggeboorte beïnvloedt. In **Hoofdstuk 3** laten we zien dat de wijk waarin een vrouw woont haar kansen op het te laat in verloskundige zorg komen beïnvloedt. Met name armoede en een hoge dichtheid van niet-westerse allochtonen in een wijk leiden tot slechtere geboorte-uitkomsten en het later in verloskundige zorg komen.

Een verrassende uitkomst is dat het wonen in een wijk met een hoge dichtheid van niet-westerse allochtonen, verschillende invloeden heeft op allochtone en autochtone vrouwen. In het algemeen geldt dat niet-westerse allochtone vrouwen slechtere geboorte-uitkomsten hebben en later in zorg komen dan autochtone vrouwen. Maar in wijken met een hoge dichtheid van niet-westerse allochtonen is deze trend omgekeerd. Ten opzichte van autochtone vrouwen hebben niet-westerse allochtone vrouwen in deze wijken een kleinere kans op een vroeggeboorte. Hun kinderen hebben bovendien een hoger geboortegewicht en deze vrouwen hebben een kleinere kans op laat in zorg komen.

In het algemeen wordt een niet-westerse etniciteit als risicofactor gezien. Onze studies laten echter zien dat het behoren tot een niet-westerse etnische minderheid een risicofactor is op het *individuele niveau*, maar een beschermende factor is op het *wijkniveau* in wijken met een hoge dichtheid van niet-westerse allochtonen. De verklaring hiervoor is dat allochtone vrouwen in deze wijken toegang hebben tot een groter sociaal kapitaal. Toegang tot sociaal kapitaal beïnvloedt de kans op een succesvolle zwangerschap via een aantal verschillende mechanismen. Een voorbeeld daarvan is dat er minder stress optreedt door de zwangere vrouw een verhoogd gevoel van veiligheid en vertrouwdheid te geven (en stress is een zeer negatieve factor voor de zwangerschap).

Hoofdstukken 2 en 3 laten zien dat allochtone vrouwen die in wijken wonen met een hoge dichtheid van allochtonen profiteren van groter sociaal kapitaal op het *wijkniveau*. In **Hoofdstuk 4** laten we zien dat vrouwen met een Marokkaanse of Turkse achtergrond in deze wijken ook profiteren van groter sociaal kapitaal op het *individuele niveau* ten opzichte van autochtone vrouwen. Deze allochtone vrouwen bevinden zich in een hecht en relatief homogeen sociaal netwerk van familie en vrienden, en zij rapporteerden een hoge mate van steun vanuit dit netwerk. Deze ondersteuning houdt bijvoorbeeld in dat familieleden op de kinderen van deze vrouwen kwamen passen zodat deze vrouwen naar hun afspraak met hun verloskundige konden gaan, of dat familieleden een groot deel van de huishoudelijke taken overnamen. De autochtone vrouwen in onze studie rapporteerden veel minder steun vanuit hun netwerk. De bevindingen dat allochtone vrouwen in wijken met een hoge dichtheid van allochtone inwoners een hogere mate van sociaal kapitaal op wijk- en individueel niveau vertonen is een mogelijke verklaring voor de slechtere geboorte-uitkomsten voor autochtone vrouwen in deze wijken.

Deel II – Verticale integratie van reproductieve gezondheidsinterventies: meenemen van de sociale omgeving om het reproductieve gezondheidsge-drag te verbeteren

De studies in **Deel I** bestuderen hoe het gedrag en de geboorte-uitkomsten van vrouwen beïnvloed worden vanuit een ‘multilevel’ perspectief: dit betekent dat we de rol van de sociale omgeving *en* van individuele kenmerken onderzoeken. **Deel II** bestudeert hoe dit multilevel perspectief gebruikt kan worden bij het ontwerpen van interventies die gedrag proberen te verbeteren. Hierbij wordt gepleit voor *verticale integratie* van public health interventies, waarbij de invloed van individuele en omgevingsfactoren expliciet meegenomen wordt in het ontwerpen van interventies.

In **Hoofdstuk 5** wordt een succesvol voorbeeld besproken van verticale integratie van een interventie: een voorlichtingsinterventie waarbij de sociale netwerken van de voorlichters en lokale organisaties worden betrokken bij het werven van vrouwen die als “moeilijk bereikbaar” worden gezien. Deze interventie heeft dus gebruik gemaakt van de kennis van hoe vrouwen door hun sociale omgeving beïnvloed worden om de werving van deze vrouwen te verbeteren. De evaluatie van deze interventie laat zien dat deze wervingsmethode succesvoller was dan de traditionele methode die bestaat uit het uitnodigen van mogelijke deelnemers per post en e-mail en het uitdelen van flyers.

Hoewel de interventie in **Hoofdstuk 5** een goed voorbeeld is van verticale integratie, beargumenteren wij in **Hoofdstuk 4 en 6** dat een extra stap nodig is voor het ontwikkelen van echte *multilevel* interventies. In **Hoofdstuk 6** definiëren we multilevel interventies als interventies die beogen om veranderingen te bereiken op ten minste twee 'levels'. Een interventie zou, bijvoorbeeld, de kennis van deelnemers kunnen verbeteren, en tegelijkertijd ook de omgeving kunnen veranderen door de kwaliteit van zorg te verbeteren. Er wordt wel veel over 'multilevel' interventies gesproken, maar uit onze review over family-planning interventies blijkt dat dit zelden in de praktijk wordt gebracht. Het merendeel van deze interventies bestaat uit *activiteiten* op meerdere niveaus – zoals onze interventie in **Hoofdstuk 5** – maar heeft geen *doelen* om ook op meerdere niveaus veranderingen te weeg te brengen.

Deel III – Horizontale integratie van de verloskunde: het verbeteren van de samenwerking tussen verloskundigen en gynaecologen

Deel II betoogt dat public health interventies een verticale integratie van hun wervingsstrategieën en doelen zouden moeten nastreven. In **Deel III** presenteren we een tweede complementaire strategie, namelijk een *horizontale integratie* van het verloskundig systeem. In het onderzoek liepen we namelijk tegen uitdagingen aan die niet op verschillende niveaus plaatsvonden, maar tussen verschillende professionals die op hetzelfde niveau werken. We beargumenteren dat een betere horizontale integratie van de verloskunde bereikt zou kunnen worden door de samenwerking tussen verloskundigen en gynaecologen – twee autonome beroepsgroepen in Nederland – te versterken.

In een eerste stap hebben we de huidige samenwerkingsproblemen tussen verloskundigen en gynaecologen in kaart gebracht in **Hoofdstuk 7**. De volgende factoren maken het moeilijk voor deze twee beroepsgroepen om samen te werken: a) gefragmenteerde organisatiestructuren (bijvoorbeeld een gebrek aan gedeelde patiëntendossiers), b) verschillende perspectieven op prenatale gezondheid (bijvoorbeeld het zien van zwangerschap als een natuurlijk versus een medisch proces) en c) inadequate communicatie tussen professionals (bijvoorbeeld een gebrek aan wederzijds respect). Een verrassende uitkomst van dit onderzoek was dat zwangere vrouwen soms moesten compenseren voor de suboptimale samenwerking tussen gynaecologen en verloskundigen door de samenwerking zelf te faciliteren.

In **Hoofdstuk 7** beargumenteren wij dat het gebrek aan horizontale integratie van de verloskundige zorg nadelig is voor zwangere vrouwen, omdat zij dan een samenwerkingsrol moeten overnemen. In **Hoofdstuk 8** onderzoeken we een ander gevolg van een gebrek aan

horizontale integratie van de verloskunde. We bepleiten dat de huidige risicoselectie in de verloskunde niet adequaat is voor vrouwen met een opeenstapeling van niet-medische risicofactoren op individueel en omgevingsniveau, zoals armoede of een gebrek aan steun uit hun sociale netwerk. Vrouwen worden namelijk ingedeeld in een 'hoog' of 'laag' risicogroep en op basis daarvan krijgen ze zorg van een gynaecoloog of een verloskundige. De vrouwen in kwestie zouden echter gezien kunnen worden als een 'medium' risicogroep en zouden om die reden baat hebben bij zowel de expertise op fysiologisch en sociaal gebied van de verloskundigen als die op pathologisch gebied van de gynaecoloog.

In **Hoofdstuk 8** presenteren we een 'shared care model', dat gedeelde zorg door verloskundigen en gynaecologen voor 'medium'-risicovrouwen kan faciliteren. Dit model beoogt een geïntensiveerde integratie tussen verloskundigen en gynaecologen door het risicosignaleringssysteem aan te passen om gedeelde zorg voor medium-risicovrouwen te faciliteren. Het model sluit aan op de huidige nationale uitbreiding van 'verloskundige samenwerkingsverbanden'. Deze samenwerkingsverbanden bestaan uit de gynaecologieafdeling van één ziekenhuis en alle verloskundigen uit de omringende wijken en zijn noodzakelijk om de beoogde gedeelde zorg te kunnen faciliteren.



Chapter 11



Authors and affiliations

Manuscripts

Curriculum Vitae

PhD portfolio

About the author

Acknowledgements

AUTHORS AND AFFILIATIONS

Erasmus University Medical Centre, Department of Obstetrics and Gynecology, Division of Obstetrics and Prenatal Medicine, Rotterdam, the Netherlands:

Rachel Bakker, Gouke Bonsel, Semiha Denктаş, Lieke de Jong-Potjer, Ingrid Peters, Anke Posthumus, Eric Steegers, Danielle van Veen, Amber Vos, Adja Waelput

VU University Amsterdam, Department of Organizational Sciences, Amsterdam, the Netherlands:

Peter Groenewegen

VU University Amsterdam, Department of Sociology, Amsterdam, the Netherlands:

Halleh Ghorashi

From Harvard School of Public Health, Department of Social and Behavioral Sciences, Boston, Massachusetts, United States of America:

Ichiro Kawachi

Municipality of Rotterdam, Research and Business Intelligence, Rotterdam, the Netherlands:

Özcan Erdem

Erasmus University Medical Center, Department of Public Health, Rotterdam, the Netherlands:

Özcan Erdem, Gerard Borsboom

MANUSCRIPTS

Manuscripts included in this thesis

Chapter 2

Schölmerich VLN, Erdem Ö, Borsboom G, Ghorashi H, Groenewegen P, Steegers EAP, Kawachi I, Denktas S (2014). The Association of Neighborhood Social Capital and Ethnic (Minority) Density with Pregnancy Outcomes in the Netherlands. PLoS ONE 9(5): e95873. (open access version)

Chapter 3

Posthumus AP, Schölmerich VLN, Steegers EAP, Kawachi I, Denktas S. The association of neighborhood social capital and ethnic minority with late entry into antenatal care in the Netherlands. Manuscript submitted for publication.

Chapter 4

Schölmerich VLN, Ghorashi H, Denktas S, Groenewegen P. Caught in the middle? How women deal with conflicting pregnancy-advice from health professionals and their social networks. Manuscript submitted for publication.

Chapter 5

Peters IA, Schölmerich VLN, Veen van DW, Steegers EAP, Denktas S (2014). Recruitment of non-Western ethnic minority participants for reproductive health peer education. Journal for Multicultural Education 8(3): 162-178.

Chapter 6

Schölmerich VLN, Kawachi I. Translating the Social-Ecological perspective into multilevel interventions: theory and practice. Manuscript submitted for publication.

Chapter 7

Schölmerich VLN, Posthumus AG, Ghorashi H, Waelpu AJM, Groenewegen P, Denktas S (2014). Improving interprofessional coordination in Dutch midwifery and obstetrics: a qualitative study. BMC Pregnancy and Childbirth 2014, 14:145. (open access version)

Chapter 8

Posthumus AG, Schölmerich VLN, Waelput AJ, Vos AA, De Jong-Potjer LC, Bakker R, Bonsel GJ, Groenewegen P, Steegers EAP, Denktas S (2013). Bridging Between Professionals in Perinatal Care: Towards Shared Care in The Netherlands. *Maternal and Child Health Journal* 17(10). (abstract and link to open access version)

Report not included in this thesis

Denktas S, Jong-Potjer LC, Waelput AJM, Temel S, Voorst van SF, Vos AA, Schölmerich VLN, Bonsel GJ, Kooy van der J, Quispel C, Poeran VJJ, Peters IA, Vujkovic M, Bakker R, Steegers EAP (2012). Preconception Care: A Review of the Evidence, University Medical Centre Rotterdam, Erasmus Medical Centre, Rotterdam, The Netherlands. (pdf)

CURRICULUM VITAE – VERA LUISA NOELANI SCHÖLMERICH

Languages

German, English (both native), **Dutch, French** (both fluent), **Thai** (Proficient speaking & reading/writing skills)

Work experience

May 2014 –
Present

Erasmus University Rotterdam (EUR)

Erasmus University College, the international honour's college of EUR

- Responsible for co-developing the research program, designing methods courses and grant-seeking at this newly opened college
- Research program focuses on contextual influences on (health) behaviour, and designing/evaluating behavioural change interventions
- Teaching: coordinating and teaching courses on research design & quantitative/qualitative methods

Assistant Professor

The Netherlands

March 2012 –
April 2014

Erasmus Medical Center (EMC) & VU University Amsterdam

Joint PhD at Department of Obstetrics and Gynaecology (EMC) & Organization Sciences (VU)

- **Research focus:** coordination between maternal health care professionals & the influence of social capital on prenatal health-related behavior and pregnancy outcomes. Focus on women from resource-poor settings
- **Main project:** Large randomized controlled trial on the effect of a new risk-assessment tool on quality of coordination between midwives and obstetricians. Including 10 municipalities and over 40 hospitals and midwifery practices in the Netherlands. Responsible for study design, data collection and analysis
- **Methods:** Quantitative (cross-sectional and randomized control trial) and qualitative (semi-structured interviews, observations)
- **Teaching:** MSc thesis supervision (7 students), co-teacher MSc course 'Urban Perinatal Health and Health Care. Ethnic origin, social disadvantage and poverty' (Erasmus Medical Center)
- **Visiting scientist at Harvard School of Public Health**, Department of Social and Behavioral Sciences. Supervised by Prof. Ichiro Kawachi (3 months in 2013). Wrote 1 article together during this time, continued research collaboration for 2 projects after stay

PhD Candidate

The Netherlands/
The United States of
America

September 2011 –
February 2012
(6 months)

VU University Amsterdam

- Teaching: BA course 'Introduction to Research Methodology'
- Grant-seeking: secured €50 K from Erasmus Medical Center to co-fund PhD trajectory (jointly funded with VU University)

Teacher and Researcher

The Netherlands

| | | |
|---|---|---|
| July 2010 – July 2011 (12 months) | Consulting projects Full-time work as a freelance researcher for 3 projects: <ol style="list-style-type: none"> 1. Monitoring & Evaluation of a project aiming to increase participation of youth in the policies of a refugee center, for NGO 'De Vrolijkheid'. 6 months 2. Improvement of content and user interface of a database on health & migration: www.mighealth.nl, at the European Research Center on Migration and Ethnic Relations, Utrecht University. 3 months 3. Study on the social impact for a large EU life sciences and materials company, member of consultant team at Erasmus Center for Strategic Philanthropy, Erasmus University. 3 months | Consultant The Netherlands |
| 2009 – 2010 (12 months) | Rank a Brand Internet start-up NGO that assesses CSR policies of brands by using crowd-sourcing e-tools <ul style="list-style-type: none"> • Joined during the start-up phase of this NGO • Responsible for external communication and fund-raising | CCO The Netherlands |
| 2008 (12 months) | Trompenaars Hampden-Turner A cross-cultural management consultancy <ul style="list-style-type: none"> • Drafting proposals and budgets, re-organizing database of clients, conceptual development of consultancy tools | Project Manager The Netherlands |
| 2006 (3 months) | Delegation of the European Commission <ul style="list-style-type: none"> • Research on undocumented indigenous groups of Northern Thailand (desktop research and semi-structured interviews) • Contributed to policy of the Commission | Intern Researcher Thailand |
| 2004 (8 months) | American Field Service (AFS) <ul style="list-style-type: none"> • Lived with a local host family in extremely remote village in Northern Thailand for 8 months • Taught English and French in a primary school and worked on a rice field | Volunteer Thailand |
| 2003 (4 months) | Council of Europe, Department of Internal Audit <ul style="list-style-type: none"> • Administration support to staff, translation of documents (English, German, French) | Intern France |
| Education | | |
| March 2012 – Present | PhD <ul style="list-style-type: none"> • Advanced quantitative methods, focus on multilevel modelling (University of Essex, Utrecht University, NIHES) • Women, Gender and Health (Harvard University) • Research design for quantitative analysis and small-N comparisons (VU University) | The Netherlands, The United Kingdom, The United States of America |
| 2008 – 2009 (12 months) | University of Cambridge: MPhil Development Studies <ul style="list-style-type: none"> • Interdisciplinary program • Focus on development economics, inequality and poverty alleviation | High Merit United Kingdom |

| | | |
|----------------------------|---|--|
| 2007 – 2008 (12 months) | VU University Amsterdam MSc Culture, Organization and Management <ul style="list-style-type: none"> • Focus on diversity management and identity in organizations • Thesis: 6-month ethnography on cross-cultural management in the consultancy sector. Cum Laude | Cum Laude The Netherlands |
| 2004 – 2007 (3 years) | International Honours College of Utrecht University: College Utrecht BA, Liberal Arts & Sciences Program <ul style="list-style-type: none"> • Major in Sociology & Anthropology • Thesis: 4-month ethnography on the ethnic identity of the Lisu, an indigenous people of Northern Thailand. Cum Laude • Exchange Semester: Mahidol University International College, South-East Asian studies. GPA 4.0/4.0 | Magna Cum Laude The Netherlands/ Thailand |
| 2003 | German Abitur and French Baccalauréat Bilingual secondary school in Germany | Abitur: 1,7 (Cum Laude) Baccalauréat: Perfect score |

Scholarships

| | | |
|-------------|---|------------------------|
| 2014 | Early completion of PhD, VU University, €1k | The Netherlands |
| 2008 – 2009 | Cambridge University European Trust, Scholarship for MPhil, €10 K | United Kingdom |
| 2007 – 2008 | HSP Huygens Full-Scholarship (Nuffic) for MSc program at VU University. €50 K | The Netherlands |
| 2003 | Full Scholarship for Summer program, European College of Liberal Arts. €5 K | Germany |

Research skills

- SPSS (with syntax), R (learning), ATLAS.ti

PHD PORTFOLIO: PHD TRAINING AND TEACHING

| | |
|----------------------------|---|
| Name PhD candidate: | Vera Luisa Noelani Schölmerich |
| Affiliation: | Erasmus MC Department Obstetrics and Gynaecology, Division of Obstetrics and Prenatal Medicine & VU University Amsterdam, Faculty of Social Sciences, Department of Organization Sciences |
| PhD period: | March 2012 - April 2014 (PhD sent to the PhD committee in July 2014) |
| Supervisors: | Prof. dr. Eric A.P. Steegers Prof. dr. Peter Groenewegen, Prof. dr. Halleh Ghorashi |
| Co-supervisor: | Dr. Semiha Denktaş |

Training

| Course | Institution | Year | Workload (ECs) |
|--|---|------|----------------|
| Writing a Research Proposal | VU University Amsterdam, Graduate School of Social Sciences | 2012 | 12 |
| Biostatistics for Clinicians | NIHES Rotterdam | 2012 | 1 |
| Regression Analysis for Clinicians | NIHES Rotterdam | 2012 | 1.9 |
| Multivariate Analysis | Utrecht University | 2013 | 3 |
| Multilevel Analysis with Applications | Essex University | 2013 | 15 |
| Women & Health | Harvard School of Public Health, Harvard University | 2013 | N/A (Audit) |
| Didactics (course within the BKO training) | VU University Amsterdam | 2013 | N/A |
| TOTAL: | | | 32.9 |

Teaching

| Course | Institution | Year |
|---|-------------------------|-----------|
| Research design and methods, BA-level | VU University Amsterdam | 2012 |
| Supervision of 5 Master theses (Organization Sciences): Katia van Bommel, Toos van der Pauw, Jessie Smeets, Nathalie van den Berg, Najla Aâzzouzi | VU University Amsterdam | 2012–2014 |
| Urban Perinatal Health and Health Care. Ethnic origin, social disadvantage and poverty (co-teacher) | NIHES Rotterdam | 2012 |

Presentations (selection)

| Title of presentation | Institution/event | Year |
|---|---|------|
| Samenwerking in de verloskunde (<i>in Dutch</i>) | Faculty research symposium, Erasmus Medical Center | 2012 |
| Understanding cultural diversity in organizations: how theory meets practice | Guest lecture MA course Communication, Organization and Management | 2012 |
| Translating the Social-Ecological perspective into multilevel interventions: theory and practice | Society of Reproductive and Infant Psychology, annual conference | 2012 |
| Improving interprofessional coordination in midwifery and obstetrics in the Netherlands | VU University Graduate School of Social Sciences, annual conference | 2012 |
| Risikoassessment in der Schwangerschaft: Ein neuer Ansatz in den Niederlanden bei zugewanderten und einheimischen Frauen (<i>in German</i>) | Geburtshilfe in der Einwanderungsgesellschaft (Symposium for German practitioners and policy makers) Charité – Universitätsmedizin Berlin | 2013 |
| Improving interprofessional coordination in midwifery and obstetrics in the Netherlands | European Conference of Public Health Pre-conference: Health Services | 2013 |
| Interprofessional or inter-stakeholder coordination: the role of clients in coordination | European Conference of Public Health, annual conference | 2013 |
| Perinatal health and inequalities in the Netherlands | The effects of early experiences on child development - International Symposium University of Osnabrück 9 | 2013 |
| Neighborhood effects on birth outcomes in the Netherlands | Department research meeting, Social and Behavioral Sciences, Harvard School of Public Health | 2013 |

ABOUT THE AUTHOR



Vera Luisa Noelani Schölmerich was born in Mainz, Germany (1983). Before settling down in the Netherlands, Vera lived in the USA, France and Thailand. In the Netherlands, Vera had the good fortune of doing her **BA** at **Utrecht University College**. Here, she majored in social sciences and made friends for life. Vera then moved to the most beautiful city in the world (Amsterdam) and started working at a cross-cultural consultancy while doing her **MSc** in **Culture, Organization and Management** at the **VU University Amsterdam**. Wanting to know why some countries are so poor, she went on to enroll in an **MPhil** in **Development Studies** at **Cambridge University**.

Curious to experience life outside of academia after completing her Master degrees, Vera did various consulting projects for NGOs in Amsterdam for 2 years. Tired of making big claims that weren't based on sound research, she decided to go back to academia in 2012, which felt like home. She completed her **joint-PhD** at the Department of Obstetrics and Gynaecology (**Erasmus Medical Center**) & the Department of Organization Sciences (**VU University Amsterdam**). Highlights of her PhD included a semester-long research visit to the **Harvard School of Public Health**, and being able to do such diverse research projects.

Since May 2014, Vera is an **assistant professor** at **Erasmus University College**, Rotterdam. She teaches research design, statistics, and qualitative methods, and conducts research on the interplay between social environments and health behaviors.

ACKNOWLEDGEMENTS

On the first day of my PhD I had no idea what to do. So I started reading through PhD theses – especially the acknowledgements, of course. The author of the first thesis described going through “a valley of hell” during her PhD; others used less dramatic words to say that they had a really, really hard time. This won’t happen to me, I thought.

And it didn’t. I have loved doing my PhD. One of the best parts has been the closeness to the field of midwifery and obstetrics. During my first months as a PhD candidate, I spent some time shadowing community midwives and obstetricians during their consulting hours and, once, during their assistance to a woman giving birth. On my first day with an obstetrician, a Latin-American woman came in for a check-up. She was 8-months pregnant and this was the second time she had come to see a health professional – far under the advised amounts of check-ups. The young woman had previously seen a community midwife, and did not have her patient file with her. Unable to figure out what kind of care the woman had received with the community midwife, the obstetrician ran several tests, and asked her some questions about her medical history: “Did the midwife measure the belly? Was the baby growing well?”. The pregnant woman shrugged and said – in broken Dutch – “I guess so”. The obstetrician suspected that the baby might not be growing properly. I later found out that this woman lost her baby a few weeks later.

Who is to blame for such losses? The main problem in Public Health, as I have tried to demonstrate in my thesis, is not that individuals fail, but that systems fail. Health care systems and social environments fail to adequately help those that are most disadvantaged. Therefore, we should stop pointing the blame at select professionals, or at pregnant women for not following a healthy lifestyle, but start understanding how we can improve the health care system and create healthier environments.

This has become the *idée fixe*.

There are a number of people I would like to thank for making my exploration of this *idée fixe* so worthwhile. First and foremost, I have four supervisors – from four different academic backgrounds – to thank.

Eric Steegers, the obstetrician. Eric, thank you for agreeing to the wild experiment of adding a social scientist on board. Your main research interests lie in subjects I can barely pronounce, yet you gave me the space to study coordination, and other non-cellular phenomena.

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During my PhD I had the good fortune of spending a semester at the department of Social and Behavioral Sciences at Harvard School of Public Health, under the mentorship of Ichiro Kawachi. Ichiro, you do amazing research, seem to be endlessly curious about the world, and have remained so humble and approachable. Chapeau.

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To the community midwives and obstetricians for making the time for long interviews and for letting me follow them around; to the many pregnant women we interviewed for letting us peak into their lives.

To Lonia Jakubowska for being a role model by being so authoritative and kind and for casually mentioning – while I was still a Bachelor student – “you will probably do a PhD at some point, and I think you should”. To Jocelyn Ballantyne for being an amazing tutor at EUC and for her continuing support.

I finished my PhD at www.artisagreece.org, where Celeste Neelen and Louise Thoonen offer paradise-like writing retreats at the coast of Greece. Halleh, thank you for making this possible – I am addicted.

Lastly, I would like to thank my friends and family for adding so much magic to my life. To my girlies in Amsterdam – Milou Klasen, Lara Herpers, Steffie Schwillens and Kellie Liket. Thank you for being warm and critical and for choosing to make your lives awesome. Kellie Liket for your unpredictable thoughts, and for being so wonderfully outrageous. Thomas Bunnik, for your ongoing love affair with life, and for never being Mr. Nice Guy.

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to talk to about research. To Dad, for making me curious about the world, being a walking Wikipedia, and for being so warm. Daniel, for always being so frustratingly relaxed and content; David for being so very much himself and so disarming; Lea for being so joyous, silly and determined.

To my magicians: I love you and I like you.



Vera Luisa Noelani Schölmerich completed her joint-PhD at the Department of Obstetrics and Gynaecology (Erasmus Medical Center) & the Department of Organization Sciences (VU University Amsterdam).

During her PhD she explored her *idée fixe*, as outlined in this book: to reduce inequalities in reproductive health, we need to stop blaming women for failing to lead healthy lives, or blaming health professionals for providing inadequate care. Rather, we should improve coordination between health professionals so that they can provide adequate care, and create social environments that support women in leading healthy lives.

Vera is currently an assistant professor at Erasmus University College, Rotterdam. She teaches research design, statistics, and qualitative methods, and conducts research on the interplay between social environments and health behaviors.