



Preconception Care and Interconception Care

Evaluating and advancing implementation

Meertien K. Sijpkens

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The research presented in this thesis was performed at the department of Obstetrics and Gynaecology, division of Obstetrics and Prenatal Medicine, Erasmus University Medical Centre, Rotterdam, the Netherlands.

Part of the research in this dissertation was supported by a grant from the Ministry of Health, Welfare and Sport (VWS), the Netherlands (grant number 318804 and 323911).

Financial support for the printing of this thesis was kindly provided by the department of Obstetrics and Gynaecology, Erasmus MC, Rotterdam.

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Cover illustration: Rowan Sterenberg

Lay-out and printing: Optima Grafische Communicatie

ISBN: 978-94-6361-367-5

Preconception Care and Interconception Care

Evaluating and advancing implementation

Preconceptiezorg en interconceptiezorg

Evalueren en bevorderen van implementatie

Proefschrift

ter verkrijging van de graad van doctor aan de
Erasmus Universiteit Rotterdam
op gezag van de rector magnificus
Prof.dr. R.C.M.E. Engels
en volgens het besluit van het College voor Promoties.

De openbare verdediging zal plaatsvinden op
woensdag 29 januari 2020 om 15:30 uur
door

Meertien Klazien Sijpkens
geboren te Groningen

PROMOTIECOMMISSIE

Promotor	Prof. dr. E.A.P. Steegers
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1

Introduction

“Well begun is half done” - Aristotle & Mary Poppins

PRECONCEPTION CARE AND INTERCONCEPTION CARE

Preventive healthcare deserves more attention as the burden of healthcare costs, non-communicable (chronic) diseases and health inequalities increases.^{1,2} The earliest form of primary prevention is preconception care (PCC), which can make a lifetime difference. PCC aims to prevent biomedical, behavioral, and psychosocial risks already before conception to promote health of the future child.^{3,4} PCC after one pregnancy and before a potential next pregnancy is referred to as interconception care (ICC).⁵ PCC and ICC can be considered part of a life course approach, improving the health of men and women of reproductive age and the health of future generations.⁶ PCC and ICC also offer an opportunity to extend to obstetric care and to be integrated into routine healthcare visits for women and their children. It should lead to increased awareness on the association between maternal health, pregnancy outcomes and health in later life of both the woman and the child.

RATIONALE

In the periconception period, defined as the fourteen weeks before and ten weeks after conception, crucial developments of the gametes, embryo and placenta take place.⁷ This development is of importance for the course of pregnancy and health outcomes. Embryonic development is associated with perinatal health outcomes as well as health later in life, such as birthweight and cardio-vascular health status in young children.^{8,9} It is also known that this early periconceptional phase is already affected by risk factors. For instance, lifestyle behaviors such as smoking, alcohol consumption, and inadequate folic acid intake, are negatively associated with embryonic growth.¹⁰⁻¹² Therefore, prevention of risk factors should be aimed for as early as possible. Regular antenatal care starts too late to avoid risk factors affecting early pregnancy.¹³ PCC is needed to promote health in the periconception period. Based on associations of many risk factors with adverse perinatal outcomes, the content of PCC encompasses medical and non-medical domains. Thirteen domains for PCC activities have been described: health promotion, immunization, infectious diseases, medical conditions, psychiatric conditions, parental exposures, genetics and genomics, nutrition, environmental exposures, psychosocial stressors, medications, reproductive history.¹⁴

RELEVANCE

In the Netherlands, perinatal mortality has been high compared to other European countries.¹⁵ In addition, in the Netherlands as well as many other countries, substantial inequalities in perinatal health exist.^{16,17} These inequalities, in line with general health inequalities, negatively

affect people with a lower socio-economic status in particular.^{16 18 19} The inequalities in perinatal outcomes are in a large part explainable by inequalities in both medical and non-medical risk factors, such as smoking, obstetric history and a low educational background.^{20 21} In general, risk factors are widely prevalent in the preconception and early pregnancy period, providing opportunities for modification and prevention.^{20 22-25} Lifestyle behavioral factors are known to be difficult to change and need a timely approach for it to be effective before pregnancy. Altogether, this emphasizes the need for PCC interventions to timely promote parental health and offer an opportunity for informed decision-making.

IMPLEMENTATION QUEST: POINT OF DEPARTURE FOR THIS THESIS

The need and potential benefits of PCC interventions are clear, yet implementation of PCC is lacking behind.²⁶ In the Netherlands, the Inspectorate of Public Health advised on periconceptional folic acid supplements for the prevention of neural tube defects in 1993 and this was translated in a mass media campaign two years later.^{27 28} In 2007, an advisory report by the Dutch Health Council recommended integration of PCC into the Dutch obstetric care system.²⁹ Also around that time, guidelines and tools for professionals and the target group were developed.^{30 31} However, actual implementation of individual PCC for the general public was not pursued due to political changes, and hence delivery of PCC remained uncommon.^{32 33} Before politically advancing the implementation of PCC, more evidence was required on reaching high-risk women and on the effectiveness of PCC with regards to health outcomes.

Since reaching women before pregnancy is difficult, it is challenging to deliver PCC at a population level and different complementary approaches are likely to be necessary.^{34 35} Important barriers to delivery of PCC include low awareness and perceived necessity about PCC of both healthcare providers as well as the target group.³⁶⁻³⁹ The target group itself, recommends active outreach to address every couple with a desire to have a child as well as integration in routine care.^{38 40} The latter is particularly relevant to ICC, since most women who have been pregnant are known to maternal and child healthcare providers. A valuable opportunity to embed ICC is within Preventive Child Healthcare (PCHC) centers, since almost all parents visit these clinics regularly with their young children for routinely scheduled appointments.⁴¹ Such routine encounters provide a meaningful gateway to PCC and ICC, but are generally not optimally utilized.^{5 33 41 42} Due to the scarce delivery of PCC and ICC the limited evidence of effective interventions to reduce risks before conception, the actual effectiveness of PCC and ICC remains debated.^{4 14 43-46}

The described knowledge gaps and opportunities have resulted in experimenting with the implementation of PCC and ICC in the context of two nationwide programs. From 2011 until 2017,

the Dutch Ministry of Health, Welfare and Sport financed the successive programs HP4All-1 and HP4All-2 to improve perinatal and child health in disadvantaged neighborhoods.^{17 47} Together, these programs aimed at broadening risk assessment and increasing health promotion from the preconception period through to pregnancy and the postpartum period, up to and including the interconception period. Within the programs, PCC and ICC interventions were developed, implemented and evaluated. These interventions involved stakeholders of municipal public healthcare and primary care, such as general practitioners, midwives and PCHC professionals. The PCC and ICC interventions of the HP4ALL programs formed the point of departure for this thesis.

AIMS OF THE THESIS

The overall aim of this thesis is to evaluate and advance the implementation of PCC and ICC in primary care settings. This has resulted in the following objectives:

1. To evaluate the effects of recruitment strategies on uptake of PCC and ICC in primary care settings.
2. To study the effects of individual PCC and ICC consultations in primary care.
3. To assess the level of adoption and implementation of PCC and ICC by different stakeholders.
4. To explore considerations of women and healthcare professionals about involvement in PCC or ICC.
5. To examine and develop specific conditions related to the implementation of ICC;
 - 5.1. To describe the rationale for ICC in the context of geographical differences in the prevalence of adverse pregnancy outcomes and child poverty outcomes.
 - 5.2. To search for consensus on the concept of ICC.
 - 5.3. To investigate implementation outcomes of ICC in preventive child healthcare.

THESIS OUTLINE

This thesis is based on research performed within or parallel to the Healthy Pregnancy 4 All (HP4All) programs. The first program (HP4All-1) made no distinction between PCC and ICC; the second program (HP4All-2) focused specifically on ICC. This difference is reflected in the outline of this thesis, which consists of two parts.

Part I concerns different evaluations of the PCC intervention within HP4All-1, in search for opportunities to advance future implementation. In **chapter 2**, we evaluate outreach and PCC uptake following a four-pronged outreach strategy for PCC, which includes describing the

formation of a study cohort of women who visited the PCC services. Building upon this cohort, in **chapter 3** we report the effects of having a PCC consultation by determining the change in lifestyle behaviors and other indicators. **Chapter 4** provides a quantitative and qualitative process evaluation of the implementation of the HP4All-1 intervention at different levels (i.e. involvement of local stakeholders, the recruitment strategy and the PCC service delivery). In **chapter 5**, using semi-structured interviews, we report on exploring the perceptions about preparing for pregnancy, of women with a low to middle educational attainment including a subgroup from our PCC cohort, in search for possibilities to better adapt PCC to this vulnerable group.

Part II addresses conditions supporting the implementation of ICC within the HP4All2 program. In **chapter 6**, we illustrate the rationale for perinatal and postpartum preventive measures such as ICC by describing the Dutch prevalence of two adverse pregnancy outcomes and two child poverty outcomes, as well as geographical differences in the prevalence of these outcomes. In **Chapters 7**, we reflect on the concept of ICC (i.e. the term, definition, content, target group and outreach methods), based on a literature review and expert discussions. In **chapter 8**, we search for potential determinants of integrating ICC in PCHC using focus group discussions. The results of the implementation of ICC in PCHC are described in **chapter 9**, measured primarily as the proportion of eligible women who were informed about an ICC consultation ('coverage'). Secondary study outcomes include implementation outcomes assessed by surveying women who consider to get pregnant and PCHC professionals.

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PART I

**Evaluating and advancing
preconception care**

2

The effect of a preconception care outreach strategy: The Healthy Pregnancy 4 All study

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ABSTRACT

Background: Preconception care has been acknowledged as an intervention to reduce perinatal mortality and morbidity. However, utilization of preconception care is low because of low awareness of availability and benefits of the service. An outreach strategy was employed to promote uptake of preconception care consultations. Its effect on the uptake of preconception care consultations was evaluated within the Healthy Pregnancy 4 All study.

Methods: We conducted a community-based intervention study. The outreach strategy for preconception care consultations included four approaches: (1) letters from municipal health services; (2) letters from general practitioners; (3) information leaflets by preventive child healthcare services and (4) encouragement by peer health educators. The target population was set as women aged 18 to 41 years in 14 Dutch municipalities with relatively high perinatal morbidity and mortality rates. We evaluated the effect of the outreach strategy by analyzing uptake of preconception care consultations between February 2013 and December 2014. Registration data of applications for preconception care as well as participant questionnaires were obtained for analysis.

Results: The outreach strategy led to 587 applications for preconception care consultations. The majority of applications (n=424; 72%) were prompted by the invitation letters (132,129) from the municipalities and general practitioners. The effect of the municipal letter seemed to fade out after three months.

Conclusions: Outreach strategies amongst the general population promote uptake of preconception care consultations, although on a small scale and with a temporary effect.

INTRODUCTION

Early pregnancy has been acknowledged as critical for the outcome of pregnancy and health later in life.^{1,2} It is therefore important to minimize risk factors for adverse embryonic growth and development even before conception. Preconception care (PCC) has been advocated to identify and modify relevant risks (e.g. biomedical, behavioral, and social risks) to a woman's health and pregnancy outcome before conception.^{1,3}

PCC's potential has increasingly gained attention in the Netherlands. Recognition that Dutch perinatal mortality rates are higher than rates in other comparable European countries has placed PCC both on the political and professional agenda.^{4,5} This has resulted in governmental advisory reports, guidelines and tools for professionals.^{6,7} However, despite the evidence in favor of implementing PCC, it is still an uncommon form of care in the Netherlands as well as in many other countries.^{8,9} It is challenging to deliver PCC at a population level and different complementary approaches are likely to be necessary.^{10,11} An important challenging factor seems to be low awareness about preconception health and PCC among women.^{12,13} Since the prevalence of preconception risk factors is high,^{14,15} this requires educating women or couples about preconception health and PCC. Integration into routine care could be one strategy, but this would not be sufficient to reach the target population, because there is no system for routine preventive care as seen in some other countries. We hypothesized that by reaching out to women of reproductive age to educate them about PCC, we could increase the uptake of PCC among women considering getting pregnant. As such, we could reach the majority of the target population, since most pregnancies in the Netherlands are planned.

In the multi-municipal Healthy Pregnancy 4 All (HP4All) PCC study, general practitioners (GPs) and midwives were incentivized to deliver PCC, whilst a community based four-pronged outreach strategy was employed to promote uptake of PCC by women who are planning to become pregnant.^{16,17} The rationale of the HP4All PCC study has been described more extensively elsewhere.¹⁷ The main objective of this study was to evaluate the effect of the HP4All PCC outreach strategy in terms of uptake of PCC consultations.

METHODS

Setting

The study was conducted within the HP4All program. This program started in 2011 and was financed by the Dutch Ministry of Health, Welfare and Sports. It included preventive interventions in the preconception period (PCC) and antenatal period (new approach to antenatal risk-assessment) with the ultimate aim to improve pregnancy outcomes and reduce perinatal health

inequalities in the Netherlands.¹⁶ To attain maximum effect, the interventions were delivered in high-risk neighborhoods (zip code areas) in 14 selected municipalities with perinatal mortality and morbidity rates above the national average. The selection process of the municipalities has been described elsewhere.¹⁶ Five municipalities were clustered as they were relatively small and belonged to the same province. As a result, we refer to a total of ten municipalities in this study. In these municipalities, the target population of the study is defined as women of reproductive age (i.e. 18-41 years). Therefore, the target population was 165,615 women. The annual number of pregnancies of about 11,058 women reflects the potential number of candidates for PCC.

Study design

The HP4All PCC study was designed as a community-based PCC intervention study and included the identification of a prospective cohort of participating women who utilized the PCC services (see figure 1). To draft this study we used Andersen's model of healthcare utilization as our theoretical framework (see additional file 1).¹⁷ The model explains how the outreach strategy would likely interact with the target population via predisposing, enabling and need characteristics, which ultimately may lead to the uptake of PCC consultations.

Intervention; the PCC outreach strategy

The outreach strategy for PCC had four main components targeting women aged between 18 and 41 years: 1) Participating municipalities were requested to send a mailing with information about the possibility for PCC consultations to all women in the target age range residing in the selected neighborhoods; 2) Participating GPs were requested to send a similar invitation letter to all of their female patients aged 18 to 41 years; 3) Preventive child healthcare services, responsible for monitoring and promoting optimal growth and development of children aged 0-4 years, were asked to inform parents with invitation leaflets at the regular six months well-baby visit; 4) Lastly, a training was offered to instruct peer health educators to organize preconception health education sessions for the target group of women aged 18-41 years considering getting pregnant. Peer health educators would then encourage this group to visit a PCC service. All four approaches were based on promising results of earlier Dutch studies using comparable approaches.¹⁸⁻²¹ The four approaches were seen as complementary parts of one outreach strategy. They all included information on what PCC entails (personal advice, answers on fertility and health questions, good preparation for pregnancy), as well as information on when to apply for PCC (when considering pregnancy) and how to make an appointment at a PCC service (see online additional file). The HP4All PCC services consisted of two consultations offered by GP and midwifery practices in the designated neighborhoods. These professionals received training to provide PCC in accordance with the study protocol and the national guideline.^{7,17}

Cohort study of women who utilized the PCC services

All women aged from 18 up to and including 41 years who made an appointment for a PCC consultation at a study practice were eligible to participate in the cohort study. Eligibility was independent of the outreach approach that preceded PCC application. When women gave permission to be approached for the study, a member of the research team contacted them by telephone to counsel about participation in the cohort study. The study had the following exclusions criteria: not attending the PCC appointment, not wishing to get pregnant, and not speaking Dutch, English, Turkish, Polish or Arabic.

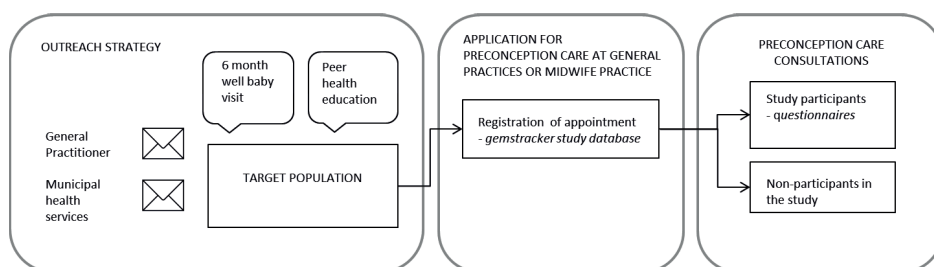


Figure 1. Flowchart healthy pregnancy 4 all preconception care strategy and study

Data collection

Intervention; the PCC outreach strategy

Outreach strategies were implemented when GPs and midwives were ready to deliver PCC within the HP4All study. Directly after the first outreach approach of a strategy was implemented, the GPs and midwives registered all applications for PCC in an online database used for the study (Gemstracker; Generic Medical Survey Tracking System). They registered the date of the appointment and which outreach approaches women indicated as the trigger to make the appointment. We obtained information on the total number of women aged from 18 up to and including 41 years that resided in the selected neighborhoods from municipal registries. The total number of births of women in the respective zip codes was obtained from Perined (www.perined.nl). Perined is a national perinatal registry and collects information on more than 97% of all deliveries in the Netherlands from midwives, gynecologists and pediatricians.

Cohort study of women who utilized the PCC services

If women who applied for PCC agreed to participate in the cohort study, they were asked to fill in a questionnaire (on paper or via an internet link) before the consultation. The questionnaire contained questions regarding determinants from our model for PCC utilization (see additional file 1 and online additional file). These determinants included socio-demographic characteristics, as well as details on the medical and obstetric history, lifestyle behavior, attitude and knowledge with regards to preconception health and PCC. The first municipality started data

collection in February 2013 and the last municipality started in February 2014. Participants were enrolled until December 31st 2014.

Outcomes and data-analysis

Intervention; the PCC outreach strategy

We determined the effect of the outreach strategy for PCC by analyzing the uptake of PCC consultations in total and per component of the outreach strategy. This was expressed in absolute numbers of women who applied for PCC and, if possible, as percentages of the number of women approached and of the average annual number of deliveries in the targeted areas. We also illustrated the duration of the 'outreach effect' of the municipal letters specifically by plotting a timeline showing the PCC appointments as a result of letters sent by each municipality.

Cohort study of women who utilized the PCC services

We reflected upon the outreach of the strategy by analyzing the data collected from the questionnaires filled in by the participants of the cohort study, who had utilized the PCC services. In line with the framework used for PCC utilization (see Additional file 1), we analyzed data on different characteristics: 1) socio-demographic characteristics; 2) barriers, beliefs and knowledge with regards to preconception health and PCC; and 3) the need and motivation for PCC, which included pregnancy and preconception health characteristics (i.e. medical and obstetric history and lifestyle behavior). These characteristics were described either continuously (mean or median with standard deviation (SD) or interquartile range (IQR)), or descriptively (percentages), as appropriate.

RESULTS

The PCC outreach strategy

PCC outreach strategy implementation

An overview of the implementation of the outreach strategy components is provided in table 1. The adoption of the components differed by municipality (2nd column). The potential outreach in all municipalities together was set as the total number of women aged 18-41 years residing in these areas, which consisted of 165,615 women. The outreach strategy reached the majority of these women with at least one approach (3th column). The last column of table 1 provides the uptake per outreach approach, given as the actual number of women who made an appointment and reported these specific outreach approaches.

Table 1. Overview of the outreach approaches and uptake of PCC

Intervention		Outreach	Uptake
Outreach approach	Number of municipalities that adopted the approach	Number reached by the approach	Number of PCC applications indicating this approach ^a
Municipal letters	7/10	110,199 letters	338
GP letters	10/10	21,930 letters	95
Youth healthcare leaflets	8/10	unknown no. of leaflets	6
Peer health education	7/10	147 sessions; 1,796 participants	1

Uptake was registered between February 2013 and the end of December 2014, following the implementation of a outreach approach per municipality. ^a Does not count up to the total number of 587 PCC applications due to missing data, overlap and other reported approaches.

The effect of the outreach strategy

The total registered uptake following the outreach strategy consisted of 587 applications for a PCC consultation. This number differs from the sum of the uptake numbers reported in table 1 for the following reasons: The outreach approach was not reported in 54 (9.2%) of the cases; nine women (1.5%) were reached by more than one of the four predefined outreach approaches; 102 women (17.4%) reported that another motivating factor than the four components of the outreach strategy had brought them to make the appointment. These women reported that they had made an appointment after being informed about PCC consultations by their midwife or their GP (other than by means of the letter), by friends or by different media (e.g. newspaper articles or websites).

When the uptake numbers are related to the outreach of all approaches, the effect is small. The relatively small-scale outreach activity of the child healthcare services and peer health educators resulted in hardly any applications ($n = 7$) for PCC. The mailings of letters informing women of PCC were the most effective measures since they resulted combined in 424 (72%) of the total applications for PCC. When we relate the uptake of the municipal letters (338) to the average annual number of pregnancies in the targeted areas of these municipalities (6875), the equivalent of 4.9% of these pregnant women would have been reached by PCC as a result of the letters.

Additional file 2 shows the timing of the municipal letter mailings in relation to the subsequent PCC appointments that were a result of these letters during the following year. Visualization shows that the main effect was seen in the first three months after the letter was sent and then seems to fade out.

Characteristics of the population that utilized the PCC services

The enrollment and data collection process of the HP4All cohort study is presented in figure 2.

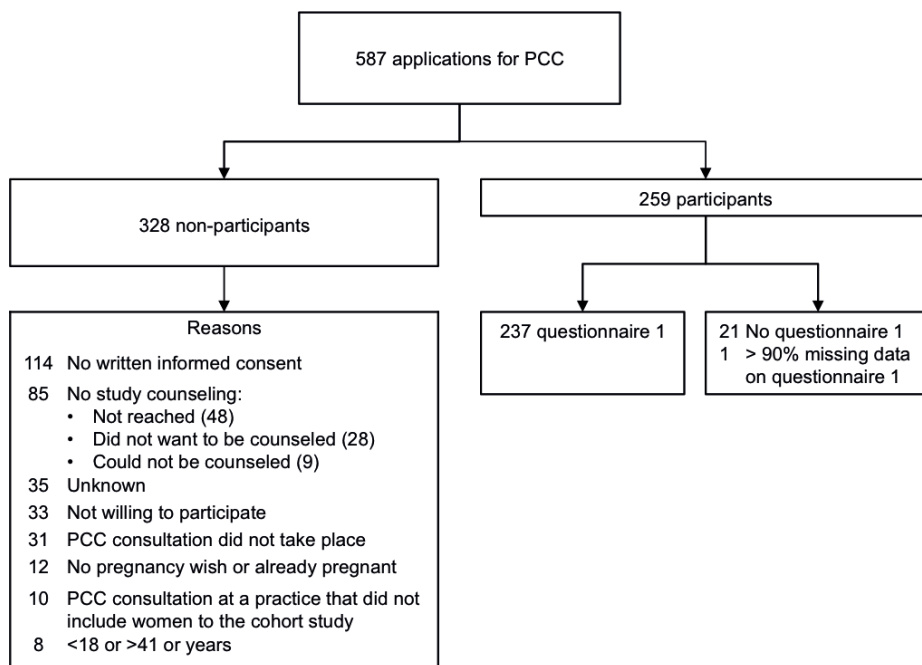


Figure 2. Participant enrolment in the cohort study

Of the total of 587 women who applied for a PCC consultation, 259 women (44%) could be included in the cohort study. Reasons for exclusion or non-participation are described in figure 2. An important factor for exclusion was lack of written informed consent ($n = 114$). Of the 259 participants, 237 (92%) filled in questionnaire 1. Their characteristics are presented in table 2 (and more detailed regarding their attitude and knowledge in additional file 3).

Socio-demographic characteristics

Those who made use of PCC included women from nearly the total age range of the predefined target population. More than a third of women considered themselves from ethnic minorities, the largest proportion being from Surinamese background. Not only women in a relationship, but also single women made use of PCC. With regard to socio-economic status (SES) based on education, income and occupational status, the majority of the group consisted of women of higher SES, but women with lower SES characteristics also made use of a PCC consultation.

Barriers, beliefs and knowledge with regards to preconception health and PCC

With regards to attitudes towards a PCC consultation, the women in the cohort generally scored low on potential barriers to using PCC. However, two-thirds of the participants indicated that

they would search for information about having a healthy pregnancy in alternative ways to the PCC consultation and one-third indicated they had enough knowledge already. The majority of women had positive beliefs and attitudes towards PCC. More than 84% of the women knew the right answer (true or false) to the knowledge statements on folic acid supplementation, medication and illicit drug use in relation to (early) pregnancy. By contrast, only half of the women knew the negative effects of smoking and being underweight on the success of conception.

Table 2. “Predisposing, enabling and need” characteristics of participants of the cohort

Socio-demographic characteristics (N =237) ^a		N	(%)
Age	Median age in years (min- max)	30	(19 – 41)
	(IQR)		(27 – 34)
Ethnicity ^b	Dutch	145	(63.3)
Civil status	Married or living together	178	(77.1)
	In a relationship, not living together	32	(13.8)
	Not in a relationship	21	(9.1)
Educational attainment ^c	Low	18	(7.8)
	Intermediate	84	(36.5)
	High	121	(52.6)
	Other – foreign education	7	(3.1)
Occupational status	No paid job	53	(22.8)
Monthly household income (N=212)	Low (<1500€)	46	(21.7)
	Middle (1500 - 2500€)	65	(30.7)
	High (>2500€)	101	(47.6)
Attitude and knowledge about PCC			
Barriers summary ^d (max 25)	Median score (IQR)	12	(11-14)
Beliefs summary ^e (max 45)	Median score (IQR)	37	(35-45)
Knowledge summary ^f (max 8)	Median score (IQR)	6	(5-7)
Pregnancy and preconception health characteristics			
Pregnancy intention	Currently pregnant	4	(1.8)
	Within next 3 months	114	(50.4)
	Within next 3 - 6 months	59	(26.1)
	After > 6 months or maybe no intention	49	(21.7)
Subfertility	Current or previous fertility treatment	21	(9.0)
Previous pregnancy	Yes	69	(29.2)
Adverse pregnancy outcomes ^g	Miscarriage	23	(33.3)
	Abortion	22	(31.9)
	Low birth weight baby (<2500gram)	7	(10.1)
	Child with congenital abnormalities	3	(4.3)
	Preterm birth (<37 weeks)	4	(5.8)
	Perinatal mortality	1	(1.5)

Table 2. “Predisposing, enabling and need” characteristics of participants of the cohort (*continued*)

Pregnancy and preconception health characteristics		N	(%)
Preconception lifestyle risks	No folic acid supplementation	83	(35.6)
	Smoking	30	(12.9)
	Alcohol consumption ≥ 1 /week	51	(22.2)
	Illicit drug use	6	(2.6)
	No daily vegetables or fruit consumption	66	(28.4)
Self-rated health ^h	Moderate – poor	24	(10.3)

a. In case of > 5% missing on an item, the number of participants that responded to the question is provided.

b. Self-defined ethnicity.

c. Educational attainment level was defined as the highest completed educational level classified according to the International Standard Classification of Education (ISCED) i.e. low (level 0-2: early childhood; primary education; lower secondary education); intermediate (level 3-5: upper secondary; post-secondary; short cycle tertiary); and high (level 6-8: bachelor; master; doctoral). Unesco institute for statistics 2014.

d. Median sum score of 5 questions on attitude and potential barriers for uptake of PCC (minimum 5 – maximum 25). High score indicates high level of potential barriers. N=214

e. Median sum score of 9 questions on beliefs regarding PCC (minimum 9 – maximum 45). High score indicates positive attitude. N=215

f. Median sum score of 8 questions on knowledge of PCC risk factors (minimum 0 – maximum 8). High score indicates good knowledge. N=220

g. Adverse pregnancy outcomes are presented as women who have experienced ≥ 1 time(s) specified outcomes.

h. Self-rated health was questioned as: How would you in general rate your health? (excellent-very good-good-moderate-poor)

Need and motivations for utilizing PCC services

Considering the need for PCC, we found that about half of the participants were planning to get pregnant within the next three months and about ten percent had fertility problems. Within the group who had been pregnant before ($n = 69$; 29%), considerably high percentages had experienced adverse pregnancy outcomes. In terms of behavioral risk levels, 82.3% had at least one of the five preconception lifestyle risk factors. To get an indication of women’s perceived need and motivation for uptake of PCC, we looked at which of the predefined reasons to utilize PCC applied (figure 3). Reasons relating to information and concerns about a healthy pregnancy and fertility were mentioned most. Additionally, women mentioned other reasons for utilizing PCC that included “because it was offered” and very specific questions regarding health issues or oocyte preservation.

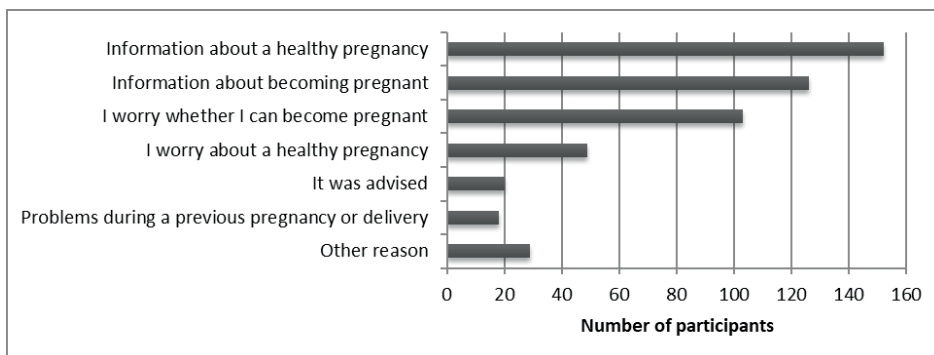


Figure 3. Reasons to apply for a PCC consultation

Participants could choose multiple reasons; three participants did not give any reason (n=234).

DISCUSSION

Principal findings

Our study illustrates how challenging it is to recruit women in the general population for PCC consultations in primary care. We measured the effect of the four-pronged outreach strategy in different ways. Firstly, regarding the uptake, the outreach resulted in a considerable number of applications for PCC (n= 587). To date, this is the largest preconception cohort recruited in primary care in the Netherlands. Most of the applications were a result of the large-scale mailing of letters targeting all women between 18 to 41 years. In relation to the reach of the outreach strategy, the effect seems small, but this is to be expected since the majority of these women would not actually consider becoming pregnant within the course of the study. We also found that the effect was mainly seen during a brief period of time following the mailing. Lastly, regarding the characteristics of women who applied for PCC, the strategy seems to have affected a diverse group of women. We reached a general population that aimed to conceive, as well as a subgroup of women with prior adverse pregnancy outcomes. Although more women with a higher educational attainment were recruited, the outreach strategy led to women with different socioeconomic backgrounds and different motivations applying for a PCC consultation.

Comparison to previous findings

Prior to the study, uptake of PCC consultations offered by GPs and midwives was low.⁹ In the absence of other outreach strategies, the consultations registered in our study can be attributed predominantly to the intervention. In other words, our outreach intervention resulted in a considerable increase of PCC delivery. The need for proactive outreach in order to educate about PCC services has also been illustrated by the low awareness regarding preconception health and PCC that has been found in previous studies.^{12,22-24} Combining PCC outreach or recruitment

strategies, such as in our intervention, has been suggested before to improve delivery of PCC both in daily practice as well as in PCC studies.^{10,25}

To our knowledge, a combination of the four outreach approaches in our strategy has not been evaluated before. However, some of the approaches have been implemented similarly before. Previous implementation of mailings about PCC from municipalities and GPs has also demonstrated a positive effect on uptake of PCC.^{19 18} One of these studies is in outline comparable to our approach of sending letters by GPs, but led to about 2.2% of the invited women attending PCC in contrast to 0.4% in our study.¹⁹ Possibly, women in our study underreported this approach due to overlap with the municipal letters. Other studies have also recommended our other two approaches of integrating PCC in child healthcare and peer education before.^{20,21,25-27} Regarding the effect of the different outreach or recruitment approaches, Velott, Baker, Hillemeyer, Weisman²⁵ have provided an overview of previous studies involving various types of health promotion. They indicate that there is not a single “best” method, but differentiate between active (or personal), and passive methods. Passive approaches such as mass mailings have the advantage of recruiting larger numbers of participants in absolute terms, as seen in our study as well. However, active approaches have the advantage of being able to give further information to the target population.²⁵ In our study, active approaches such as peer education hardly resulted in any PCC applications, but might in itself already have fulfilled part of the purpose of PCC by educating women about preconception health.

Besides the predefined components of our outreach strategy, about 17 percent of the women in our study reported that other factors triggered them to apply for PCC. The most mentioned factor was information from their GP or midwife. This could indicate that raised awareness of healthcare professionals improves uptake of PCC. Furthermore, this is in line with prior findings that women like to be informed about PCC by a (primary) healthcare professional.^{24,28,29} Opportunistic outreach by healthcare professionals during routine visits of clients may be complementary to the studied outreach strategy and valuable in reaching individuals with known risk factors, but on its own it does not guarantee reaching everyone.

In literature, it is often mentioned that reaching women who do not perceive a need for PCC (despite their risks) and who do not prepare for pregnancy is challenging.^{12,30} Our outreach intervention entailed a general approach since PCC is considered relevant for all women who consider getting pregnant.¹⁷ We applied Andersen’s model of healthcare utilization to reflect upon factors that likely influence application for PCC (see additional file 1). This shows that the PCC services mainly reached women with good preconception health knowledge and a positive attitude towards PCC. Two main reasons for utilizing PCC were optimizing chances for a healthy pregnancy and fertility concerns. It has been proposed to integrate fertility concerns into PCC

to meet the needs of women.²⁸ With respect to the objective need for PCC, our cohort included women with social, obstetric or behavioral risk factors.

Study strengths and limitations

Applying different outreach approaches for PCC simultaneously was a key attribute of the study and has not been performed at this scale in the Netherlands before. The four-pronged strategy was implemented and evaluated in a real-time setting of different municipalities. This provided the opportunity to create awareness on the importance of perinatal health and promote PCC in these communities via existing stakeholders across medical and social domains.³¹

At the same time, this design brought about challenges as well. Context factors (e.g. local policies) led to variation in the implementation of the outreach strategy across municipalities. For instance, not all municipalities and GP practices sent letters, and the targeted population included some women outside the designated areas and age range (e.g. peer education sessions could be integrated in other meetings where older women were present as well). Adapting the intended intervention to suit local settings reduces fidelity and completeness of the implementation.³² Understanding these mechanisms is important when evaluating effectiveness and qualitative analyses will be pursued to further explore the effect of the intervention.

There were a few limitations in the analysis of PCC uptake. We relied on participating practices to register appointments and respective outreach approaches, which was susceptible to unreliable registration. We did not have information about possible PCC consultations at non-participating practices and the outreach approach was not reported in nine percent of the appointments. In addition, we measured uptake for a brief, limited and varying period in each municipality. We believe we captured most of the effect, as we demonstrated that the effect faded out within the study period. Nevertheless, we only captured the effect of the outreach strategy in terms of uptake of PCC consultations and were not able to measure possible direct effects in terms of improved awareness or lifestyle changes regarding behavioral risks. For instance, the outreach approaches might have triggered women to look for more information without applying for a PCC consultation.

To reflect upon the population that utilized the PCC services, we relied on the cohort study.¹⁷ However, the participation rate in this cohort study was low (44 %). Consequently, data might have been susceptible to selection bias. Data considering behavioral risk factors could have been influenced by the timing of filling in the questionnaire in relation to the actual PCC consultation. Half of the participants filled in the questionnaires after the consultation. This would most likely have resulted in underreporting of behavioral risks. Ideally, this study would have been able to compare characteristics of women who applied for PCC after outreach compared to characteristics of women who did not respond to the outreach. However, as the mailing was

sent to all women 18-41 years, the Medical Ethical Committee deemed a non-response study too intrusive and inappropriate.

CONCLUSION

Implications for policy, practice and future research

Based on this large community based intervention studied in 'high risk' municipalities, we conclude that an extensive four-pronged outreach strategy amongst the general population promotes uptake of PCC. However, this effect seems temporary and small. Efforts need to be continued to maintain and enlarge the uptake of PCC. To increase uptake, repetition or the continuous application of simultaneous outreach strategies is needed.^{18,19} The effectiveness of outreach strategies needs to be evaluated in light of implementation data to fine-tune the strategies. Tailoring outreach strategies to the needs of the population could potentially increase effectiveness and ensure subgroups specifically at risk of adverse pregnancy outcomes are reached.

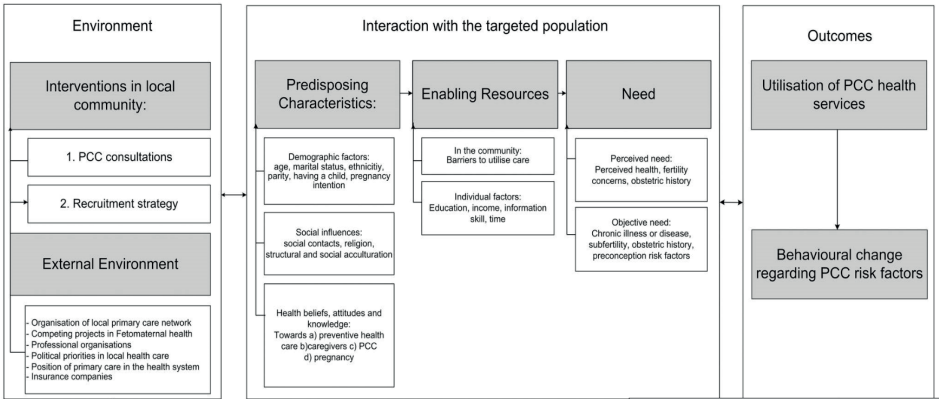
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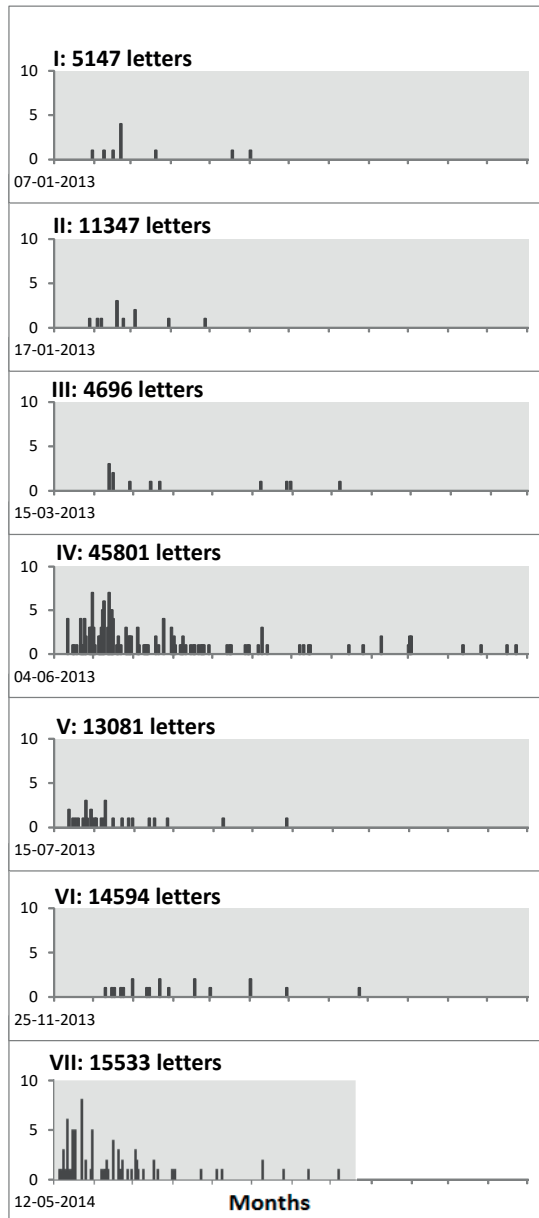
ADDENDUM

Additional file 1. The Framework of the Healthy Pregnancy 4 All PCC study¹



1. van Voorst SF, Vos AA, de Jong-Potjer LC, et al. Effectiveness of general preconception care accompanied by a recruitment approach: protocol of a community-based cohort study (the Healthy Pregnancy 4 All study). *BMJ Open* 2015;5(3):e006284.

Additional file 2. Uptake of PCC applications after sending municipal invitation letters diminishes over time



Date and number of municipal letters sent differed per municipality. Number of PCC applications are shown for a period of a year.*

*Follow up of municipality VII was limited due to ending of the study.

Additional file 3. Barrier, beliefs and knowledge response per statement (N=237)

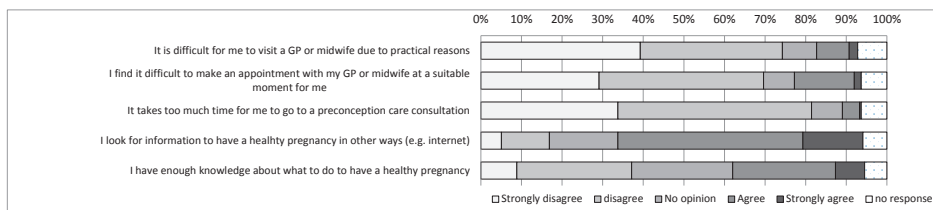


Figure 1. Barrier outcome per statement

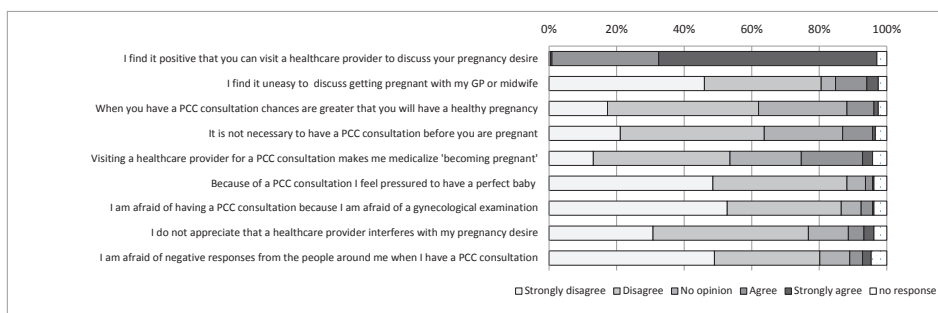


Figure 2. Beliefs outcome per statement

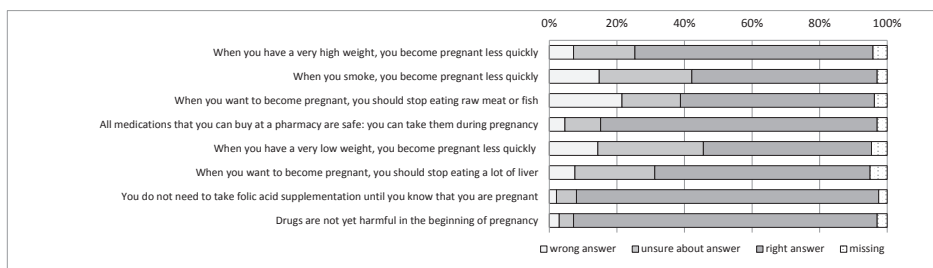


Figure 3. Knowledge outcome per statement

5

Perceptions of pregnancy preparation in women with a low to intermediate educational attainment: a qualitative study

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Midwifery 2018

ABSTRACT

Objective In the promotion of periconceptional health, appropriate attention has to be given to the perceptions of those who are most vulnerable, such as women with a relatively low socioeconomic status based on their educational attainment. The aim of this study was to explore these women's perceptions of pregnancy preparation and the role they attribute to healthcare professionals.

Design We conducted semi-structured interviews with women with a low to intermediate educational attainment and with a desire to conceive, of which a subgroup had experience with preconception care. Thematic content analysis was applied on the interview transcripts.

Findings The final sample consisted of 28 women. We identified four themes of pregnancy preparation perceptions: (i) "How to prepare for pregnancy?", which included health promotion and seeking healthcare; (ii) "Why prepare for pregnancy?", which mostly related to fertility and health concerns; (iii) "Barriers and facilitators regarding pregnancy preparation", such as having limited control over becoming pregnant as well as the health of the unborn; (iv) "The added value of preconception care", reported by women who had visited a consultation, which consisted mainly of reassurance and receiving information.

Key conclusions and Implications for practice The attained insights into the perceptions of women with a low to intermediate education are valuable for adapting the provision of preconception care to their views. We recommend the proactive offering of preconception care, including information on fertility, to stimulate adequate preparation for pregnancy and contribute to improving perinatal health among women who are socioeconomically more vulnerable.

INTRODUCTION

Optimizing preconception health does not only reduce the risk of poor pregnancy outcomes but also the risk of developing non-communicable diseases later in life ¹⁻³. This reduction of risk is paramount as many poor pregnancy outcomes as well as non-communicable diseases are to a great extent preventable. Despite high quality perinatal care in the Netherlands for example, perinatal mortality remains high compared to other European countries ⁴⁻⁶. Moreover, similar to other health outcomes there is a social gradient observable in pregnancy outcomes ⁷⁻⁹. People in the lowest part of the social gradient, typically people who live in a deprived neighbourhood, face substantially higher risks to have poor pregnancy outcomes ¹⁰⁻¹². Furthermore, the uptake of obstetric care has been shown to be lower among women who are socioeconomically disadvantaged ¹³. Therefore, attention has to be given to women who are socioeconomically vulnerable when promoting health at the start of pregnancy. A crucial period for health promotion is the periconception period, defined as the fourteen weeks before and ten weeks after conception, due to the processes of gametogenesis, organogenesis and placental development¹⁴.

An increasing body of evidence suggests that preconception care (PCC) interventions can contribute to better pregnancy outcomes by identifying biomedical, behavioural and psychosocial risk factors prior to conception ^{15 16}. However, delivery and uptake of preconception care is still low ^{17 18}. The improvement of the uptake of PCC and of perinatal health outcomes relies partly on the extent to which women prepare for pregnancy. Actively preparing for pregnancy is associated with positively changing lifestyle behaviours ¹⁹. The extent to which women prepare for pregnancy is related to their perceptions about pregnancy preparation. As behavioural research indicates, perceptions underpin behaviour to a certain extent, for example pregnancy related behaviour ^{20 21}. As such, perceptions may influence whether women would prepare for pregnancy and make use of PCC. Based on previous research, we assume that a lacking or an inadequate perception of the need of pregnancy preparation most probably leads to no, or inadequate, pregnancy preparation ^{22 23}. Women's lack of awareness and their perception of absence of risks have been frequently identified as barriers for PCC use ²³. Little is known about the perceptions and motivations of women who have used PCC ²⁴. Besides, most of the studies have focussed on attitudes towards PCC and on subgroups of women with a medical risk (e.g. diabetes), but less on women with a desire to conceive and their general notion of preparing for pregnancy ^{23 24}.

To study perceptions of pregnancy preparation, we focussed on women with desire to conceive who are socioeconomically more vulnerable for adverse pregnancy outcomes. We used low to intermediate educational attainment as a proxy measure for low to intermediate socioeconomic status (SES). Educational inequalities, as an indicator of socioeconomic inequalities, have

been demonstrated in various pregnancy outcomes, for instance birthweight^{25 26}. Assessing the perceptions of women with a relatively low educational background, with and without PCC experience, will provide insights into why and how these women prepare for pregnancy and whether this includes consulting a healthcare professional for PCC. These insights are valuable for the improvement of periconception health, in part via the improvement of the uptake and delivery of PCC. Therefore, the aim of this study was to explore perceptions of pregnancy preparation of women with a relatively low educational attainment and the role they attribute to healthcare professionals. We aimed at achieving this by interviewing women with a desire to conceive, of which a subgroup had received PCC.

METHODS

Study population

This study was approved by the Medical Ethics Committee of the Erasmus MC. Written informed consent was obtained from all participants. The study population consisted of two subgroups. One subgroup, the PCC-group, was recruited from the Healthy Pregnancy for All (HP4All) Preconception Care study²⁷. This study, conducted in 14 Dutch municipalities, aims to assess the effectiveness of a recruitment strategy for PCC and the effectiveness of individual PCC consultations. The recruitment strategy included an invitational letter for PCC from a general practitioner (GP) and/or from the municipality. Women aged 18 to 41 years who applied for a PCC consultation with their GP or midwife were asked to participate in a cohort study. For our study, a selection of eligible participants was made based on the following criteria: consent to be contacted for an additional study, having received a PCC consultation in 2014, and an indication for having a low to middle SES based on a low or intermediate educational attainment (International Standard Classification of Education up to and including level 4). The selection resulted in a sample of 36 participants eligible for an interview. The other subgroup, the non-PCC-group, was recruited using a professional recruitment service specialized in finding suitable participants for scientific research. This service has a database of people willing to participate in scientific research. From this database, participants were identified based on whether they had a low to middle SES, a low to intermediate education attainment (as explained for the PCC-group above) and a desire to conceive in the nearby future. This resulted in a sample of 18 eligible participants. We aimed at interviewing fifteen participants (thirty in sum) in both the PCC-group and the non-PCC-group, as we expected to reach saturation of responses at that number. We were able to conduct 15 interviews in each group, but we had to exclude two participants from the PCC-group as they did not meet the inclusion criteria after all (see figure 1). As a result, we had a final sample of 28 participants. Our aim was to have a sample with a variation in participant's characteristics such as age, ethnic background and prior experiences with pregnancy.

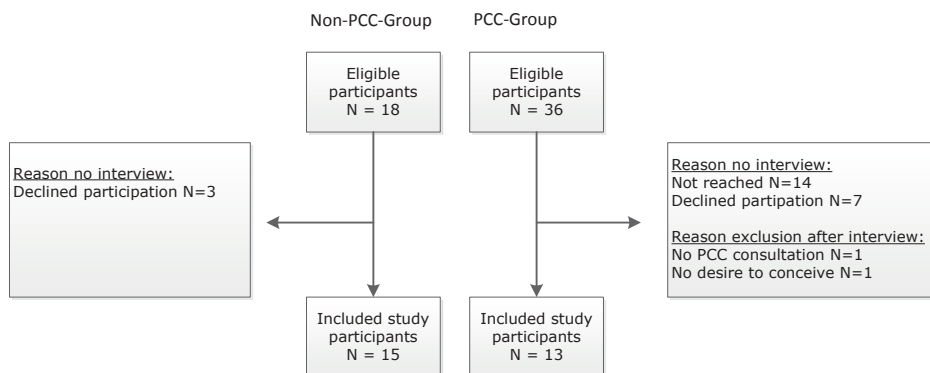


Figure 1: Enrolment of participants

Data collection

Semi-structured interviews were conducted in the spring of 2015 by four researchers in close collaboration. The interviews were carried out at the Erasmus MC, at participant's homes, or by telephone if preferred. The semi-structured interviews were conducted using a two-part topic list. The first part focused on perceptions and behaviour with regard to pregnancy preparation. The second part listed questions on perceptions concerning healthcare needs prior to pregnancy. For the PCC-group, this second part included questions about their experience with PCC. The interviews were audio recorded and transcribed verbatim for analysis.

Data analysis

We used an inductive process of thematic analysis as described by Braun and Clarke to identify the key themes of perceptions in the transcriptions²⁸. Firstly, we familiarised ourselves with the data and generated an initial coding scheme. Together, two researchers with experience in qualitative research adjusted the coding scheme through an iterative process of analysing the transcripts. We used NVivo10 software (QSR International, 2012) for the analysis. Subsequently, based on our coded fragments, themes and sub-themes were mapped in Excel. The two researchers performed this step together to discuss and refine the themes during the process. Representative citations were selected and translated to English.

RESULTS

Study participants' characteristics

With respect to our inclusion criteria of low to intermediate education attainment, our final sample of 28 participants consisted mainly of women who had attained or were currently attaining an intermediate education (n=24). Thirteen women did not have a paying job; three of them because they had not finished their education yet. We achieved variation of other

socio-demographic characteristics in our sample, with in both subgroups a similar composition: the women's age ranged from 24 to 41 years in the PCC-group (median 32) and 21 to 38 years (median 29) in the non-PCC-group; four women did not have a Dutch background in the PCC-group and five in the non-PCC-group; six women were mothers at the time of the interview in the PCC-group and eight in the non-PCC-group. The group of non-responders (referred to in figure 1) seemed to have similar background characteristics as the group of participants.

The perceptions

We identified three themes of pregnancy preparation perceptions in both groups which are perceptions about: (1) how to prepare for pregnancy? (2) why prepare for pregnancy? (3) barriers and facilitators regarding pregnancy preparation. We described one more perception theme in the PCC-group: (4) the added value of PCC.

(1) How to prepare for pregnancy?

1.1 Health related preparations

Participants from both groups mentioned similar ways to prepare for pregnancy such as; quitting smoking, moderating or abstaining from alcohol, reducing stress, the timely use of folic acid supplementation, losing weight and having a healthy diet. *"The moment I would like to become pregnant, I wouldn't go 'all out' at a party. I would abstain from drinking alcohol."* (Interview 7 non-PCC-group) *"First of all I would quit smoking, , furthermore I would eat healthy, so that the baby receives good nutrition which the baby needs."* (Interview 13 PCC-group)

1.2 Healthcare related preparations (non PCC-group)

We asked the participants of the non PCC-group about what they perceived to be the role of caregivers, especially the GP, in the period they are trying to conceive. Most participants mentioned that first and foremost it is in fact one's own responsibility to adequately prepare for pregnancy. *"First of all it depends on yourself, whether you go to the GP or midwife for information, because they won't just come to you.... but actually I don't think I would go, because I always think positive, no one thinks that their pregnancy would not go well."* (Interview 7 non-PCC-group) These participants consider that the future mother should seek care herself when she considers this to be necessary. *"I would contact my GP because I have used contraceptives for years, so I would like to know what the procedure is [emphasis added]"* (Interview 11 non-PCC-group)

The participants were nevertheless positive about the suggestion of a GP who proactively asks them about their desire to become pregnant, provided that these questions are asked when reproductive issues, such as contraception or teratogenic medications, are being discussed. *"As he [the GP] prescribes medication, he should tell you to be careful with this medication in case*

you want to become pregnant.” (Interview 4 non-PCC-group) “I actually think that a GP, Midwife, and gynaecologist could tell you [about pregnancy preparation], because many women do not know, or are ashamed to ask.” (Interview 7 non-PCC-group) Some participants referred to the mother-to-be and the healthcare professional as having a shared responsibility for the adequate preparation of pregnancy. These participants did however also emphasize that it is the mother-to-be who eventually has to follow the advice of the healthcare professional and therefore the ultimate responsibility falls on her. “A healthcare professional gives advice, but you have to follow that advice.” (Interview 8 non-PCC-group)

1.3 Healthcare related motivations and expectations (PCC-group)

We asked the PCC-group what their motivations and expectations were when they decided to visit a healthcare provider before pregnancy. For most participants, the PCC invitational letter, which they had received from their GP or municipality, was the trigger to make an appointment. *“We had received a letter... and then I thought let’s start with this PCC consultation, and all the information that we can get is welcome.” (Interview 6 PCC-group)* However, some participants already had plans to visit their GP because of pregnancy related questions. *“... I had been thinking, should I go to my GP or not, and that same week, a total coincidence, I received a letter about the start of consultations for women with a desire to become pregnant.” (Interview 11 PCC-group)* Most women went without specific expectations to their PCC appointment, as they were not familiar with PCC, but they perceived it as a possibility worth exploring. *“I didn’t know what it entailed, so I thought there is no harm in trying.” (Interview 14 PCC-group)* Some women expected to receive information, an examination, or a general check-up.

(2) Why prepare for pregnancy?

2.1 Questions about conception and fertility

For most participants questions about conception and fertility were the major reason to consider preparing for pregnancy. For both groups, the participants’ willingness to seek pregnancy related care such as consultation from a doctor seemed to increase in case they would experience problems with becoming pregnant. *“Yes I might go [to the GP]..... for example, if I would face difficulties getting pregnant.” (Interview 3 non-PCC-group) “We already had a desire to have child for some time but still had not succeeded. Therefore, we wanted an appointment with the GP...” (Interview 13 PCC-group)* In the PCC-group, questions about fertility and fertility problems were for about half the group the main reason to actually visit the healthcare professional for a PCC consultation.

2.2 Assuring health of the mother and child

In both groups, some participants mentioned that they would consider pregnancy preparation as it may benefit their own health and the health of their future children. In response

to their miscarriage for example, two participants mentioned that they would explore ways to adequately prepare for pregnancy in light of possible future pregnancies. *“Well yes [visiting a doctor] because of my miscarriage, see what is there, blood tests or something, check whether my belly is healthy, I assume it is, but you never know.” [When would you do that?] “Well, anyway before you are pregnant... I think maybe a month ahead, but yeah, you cannot really determine that.” (Interview 12 non-PCC-group)* The participants’ perceptions of adequate preparation consisted of checking their vitamin status, as well as making sure components of oral contraceptives and tobacco smoke were, as they phrased it, *“cleared out of the body.”* Working with potential harmful substances was also mentioned by a veterinary assistant as a reason to inform her employer about her desire to conceive and as a reason to have visited a PCC consultation. *“Because of my work [as a veterinary assistant] I wasn’t sure about what I could and could not do.... anaesthesia, x-rays....sedation using gas, is that dangerous?, these kind of questions..”(Interview 12 PCC-group)*

(3) Barriers and facilitators regarding pregnancy preparation

3.1 Facilitator

Most participants from both groups mentioned that they felt adequately prepared for pregnancy. They mentioned that ample information about pregnancy preparation is available, especially on the Internet, which enables them to adequately prepare for pregnancy. *“Yes [having sufficient possibilities to prepare for pregnancy], nowadays you can find everything on websites, health websites, Google, everywhere really.” (Interview 1 non-PCC-group)*

3.2 Barriers

Despite the fact that most participants felt adequately prepared for pregnancy, many also perceived barriers in terms of having limited control over their chances to conceive and the course of their pregnancy. *“You just hope, you cannot say ‘I want’, but you actually hope that God lets you become pregnant”. (Interview 2 non-PCC-group)* They also mentioned that they had limited control over their ability to ensure good health for their future children during pregnancy. *Well as far as I know you cannot do anything about it [actual pregnancy going well], but you can help it a bit.” (Interview 1 non-PCC-group)* The latter perception was more pronounced in the non-PCC-group than in the PCC-group.

Some participants, mainly of the non-PCC-group, mentioned that they experienced preparing for pregnancy and accessing pregnancy-related information as stressful and burdensome. *“I do not go looking for answers on the internet, because then I go crazy. (Interview 14 non-PCC-group)* This was also mentioned as a reason not to explore or to *“give up”* on ways to prepare for pregnancy, such as giving up folic acid supplementation when it takes too long to become pregnant, finding it difficult to commit to healthy food not knowing how long it takes to become

pregnant, and not succeeding in quitting smoking before and during pregnancy. *"I tried taking folic acid for a period, but you know, the longer it took [getting pregnant] the more I forgot taking it. Thus, yeah at a certain time you just stop taking it. (Interview 14 non-PCC-group)"* *"Yeah I tried quitting smoking but it took so long, so .. yeah... Well my mother also smoked during her pregnancy and here I am, so yeah..." (Interview 10 non-PCC-group)* In the PCC-group, a few participants also referred to the difficulty of committing to for instance a healthy lifestyle, since it may take a while to become pregnant.

Some participants from the non-PCC-group reported that pregnancy was a "natural" event that does not require any special preparation or planning if one is not ill. *"No, no [not going to a doctor before pregnancy unless there is a problem with becoming pregnant], it is different when I would be pregnant, then I would ask right away what I could do." (Interview 3 non-PCC-group)* *"Otherwise you are just planning all the time, I am against that, you should not plan something like this [pregnancy], if I prepare by for example eating healthy, then I am already planning a bit." (interview 3 non-PCC-group)*

Participants reported to perceive more urgency to be healthy and visit a healthcare provider once they would know they were actually pregnant rather than when they were preparing for pregnancy. *"...when you know you are pregnant, then you can begin, because then you know and then you have to do it [live healthy]." (Interview 12 non-PCC-group)* Furthermore, some women were sceptical about the effects of unhealthy behaviour, such as smoking and drinking alcohol, on pregnancy and the health of the unborn. *"But I did stop drinking alcohol. Regarding smoking, yes I'll consider that when I really am pregnant....I have started to smoke a bit less. (Interview 6 non-PCC-group)* Accordingly, there was a wide range in perceptions with regard to what pregnancy preparation would actually entail ranging from quitting smoking prior to pregnancy to lowering the number of cigarettes during pregnancy, and ranging from trying to have a healthy weight before pregnancy to not paying attention to weight at all because *"you get fat anyway during pregnancy"*.

(4) Added value of PCC

The perceived added value of PCC was only assessed in the group that received a PCC consultation. We asked whether the participants felt that PCC had influenced their pregnancy preparation. Most participants reported that they were already familiar with the information and advice that was provided during the consultation. *"No it did not really [change anything], but it was actually just a confirmation that the things I did and read were right." (Interview 7 PCC-group)*

However, a few participants mentioned that it changed their perceptions of pregnancy preparation, for example by learning about the importance of folic acid supplementation and quitting

smoking. In addition, some participants reported that it influenced their behaviour, e.g. drinking less alcohol and having a healthier diet. *“Yes, I don’t drink [alcohol] so much anymore at parties, less alcohol let’s put it that way. Not that I drink so much but now I will drink with moderation” (Interview 11 PCC-group)*

When we asked how they valued the PCC consultation, almost all participants were positive about their experience with PCC. They explained the value of PCC in terms of reassurance and confirmation, or receiving information and answers to questions. Knowing now what the consultation entailed, most participants reported that in hindsight they would have visited a PCC consultation again. *“Yes reassurance, I could ask more questions, I received a lot of information, heard how it all goes, so yes that was nice.” (Interview 9 PCC-group)*

DISCUSSION

This study provides new insights into the perceptions on pregnancy preparation of women with a low to intermediate educational attainment. We found that the participants predominantly associate pregnancy preparation with fertility and conception. Many participants perceived limited control over the chance of conception and reported to be motivated to seek care in case of fertility concerns. This finding is in line with the findings of van der Zee, et al.²¹, Tuomainen, et al.²⁹ and has been reported in the systematic review on PCC barriers and facilitators of Poels, et al.²³. Our study shows that women with a low to intermediate educational attainment and a desire to become pregnant put an emphasis on fertility and conception during the period they are trying to conceive. As women are more likely to engage in pregnancy preparation in case those issues that are relevant to them are addressed, we recommend making advice on fertility an important theme of PCC. Correspondingly, PCC could also be integrated in fertility care.

Most participants mentioned relevant and important health related ways to prepare for pregnancy such as the importance of having a good lifestyle and smoking and alcohol cessation. Despite this awareness there were also preconception care related topics that we did not find in our data. These include topics such as over-the-counter drugs, immunizations, sexual risk behaviours, family history, chronic illness, and mental health which are typically included in PCC^{16 30}. Frey and Files have also reported on this awareness of important pregnancy related issues on the one hand and what they call “knowledge gaps” on the other hand³¹. Our results suggest that awareness and knowledge alone about adequate pregnancy preparation, e.g. smoking cessation, does not necessarily lead to actual pregnancy preparation, e.g. actual smoking cessation. For example, consider the following response *“Yeah I tried quitting smoking [awareness] but it took so long, so .. yeah...”[actual behaviour] (Interview 10 non-PCC-group) and “I tried taking folic acid for a period [awareness], but you know, the longer it took [getting pregnant]*

the more I forgot taking it [actual behaviour] (Interview 14 non-PCC-group)." In other words, we suggest that poor pregnancy preparation is not only a matter of not knowing what to do, as participants typically displayed awareness of and knowledge about pregnancy preparation, but arguably also a matter of not experiencing the urgency to do what is known. Some women for example, were sceptical about the effects of unhealthy behaviour, such as smoking and drinking alcohol, on pregnancy and the health of the unborn and therefore did not stop smoking or drinking in the preconception period. However, the expressed scepticism could also be a form of self-justification. Further research should be done on this gap between knowledge about pregnancy preparation and actual pregnancy preparation in order to better understand, encourage and adequately help women with a desire to conceive to put in to practice the knowledge they have.

In addition, most participants felt sufficiently able to prepare for pregnancy because they could find information, especially on the internet, on pregnancy preparation, when deemed necessary. A conjecture, based on these outcomes, is that the educational background of our participants, and possibly a lower health literacy often associated with having this background, may lead to an underestimation of perinatal risks and an overestimation of abilities to reduce these risks. We based our assertion on responses such as *"Well my mother also smoked during her pregnancy and here I am, so yeah..." (Interview 10 non-PCC-group)*. In line with this conjecture, Lupattelli et al. found that low health-literacy women were more inclined to underestimate the detrimental effects of smoking during pregnancy³². Moreover, Endres, et al.³³ have reported on an association between low health literacy in women with pregestational diabetes and a reduced likeliness to prepare for pregnancy, such as taking folic acid supplementation and seeking medical advice before pregnancy. However, more research needs to be done about the relation between health-literacy and the estimation of pregnancy related risks to better understand whether and how health-literacy influences pregnancy preparation. In summary, taking up research on risk estimation is particularly important as women with lower education are more vulnerable to have adverse pregnancy outcomes^{25 26}. Furthermore, women living in socioeconomically deprived neighbourhoods have more preconceptional and perinatal risk factors for adverse pregnancy outcomes^{34 35}.

Our results show that the participants from the non-PCC-group were open to receiving information about pregnancy preparation from a healthcare professional provided that this information is presented in relevant situations, such as prescribing potential harmful medications. This is in line with the results of de Jong-Potjer et al. who found that women were interested in PCC-consultation of their GP should they decide to have children³⁶. We therefore recommend healthcare professionals to proactively integrate PCC in their consultations, in particular when pregnancy affecting issues are being discussed. This is warranted as most participants indicate they would not seek PCC without a, in their view, compelling reason to do so. This is in line with

the current limited use of PCC and with the results of the PCC-group in which most women also had a compelling reason to seek PCC. However, prudence is required as some participants perceived planned pregnancy preparation as burdensome and stressful. Consideration has to be given to these feelings of burden and stress, as they can become barriers to prepare for pregnancy and seek PCC. The 'naturalness' of pregnancy was also mentioned as a reason not to prepare for pregnancy. This concern regarding naturalness was also reported in the systematic review by Poels, et al.²³. Efforts need to be made to clarify that adequate pregnancy preparation is not at odds with the naturalness of pregnancy.

A remarkable result of our study was the PCC-group's experience of modest but relevant added value of having visited a PCC consultation. This experience may result from the fact that women who visited a PCC consultation may typically be women who were already motivated to prepare for pregnancy and therefore were relatively well-informed. This assertion is supported by the study of Barrett, et al.²² who describe different groups of women with three different levels of investment in pre-pregnancy healthcare being the prepared group, the poor knowledge group and the absent pre-pregnancy period group. To increase a sense of relevancy, they argue that individual groups will likely need different PCC approaches. We also recommend a custom-made approach based on the perceptions, abilities and needs of women.

The fact that half of the participants did visit and the other half did not visit a PCC consultation offered a unique opportunity to explore pregnancy preparation perceptions in both groups. It is important however to emphasize the explorative nature of this research, which is not meant to draw conclusions from any comparison between the two groups. Neither did we intend to draw conclusions on differences related to the level of educational background. A limitation of our study is that our participants' intention to get pregnant differed (i.e. actively trying to conceive, intention in the nearby future, or only an intention at the time of PCC), which could have influenced their current perceptions. In addition, participants of the PCC-group were included in the broader HP4ALL-study. This may have increased the possibility of participants giving socially desirable answers. However, given that most participants felt unhindered to express only a modest but relevant added value of the PCC-consultation, we assume that participants felt free to give their own opinion during the interview. Participants could also have been influenced in their responses by the different interview settings (i.e. on site, at home, and via telephone), yet we have not been able to detect such differences. We included mainly women with intermediate educational attainment and only a few women with low educational attainment, which may have affected our results. A final limitation is that our study was done in one country with a specific, mainly publicly financed, healthcare system that provides for primary care, which includes PCC. This may influence the perceptions people have about health in general and on pregnancy preparation in particular. That is, perceptions of pregnancy preparation may differ in situations where people have to carry the full financial burden of PCC from situations where this is not the case.

CONCLUSIONS

Our study provides insights into the perceptions about pregnancy preparation of women with a low to intermediate educational attainment. Understanding the perceptions of this group is of key importance as they have higher risk for adverse pregnancy outcomes. Based on our results, we recommend the proactive offering of custom-made PCC including information on fertility. Despite mentioning relevant ways to prepare for pregnancy, participants did not mention important topics such as over-the-counter drugs, immunizations, sexual risk behaviours, family history, chronic illness, and mental health. More effort, e.g. in the form of information and education, is required to bring these topics to the attention of women with a desire to become pregnant. In addition, more research needs to be done about how women can be motivated to prepare for pregnancy as knowledge about pregnancy preparation alone does not necessarily lead to actual pregnancy preparation. Special attention needs to be given to whether and if so, how low-health literacy influences pregnancy preparation. As participants were open to receiving information about pregnancy preparation provided that this information is presented in relevant situations, we also recommend that healthcare professionals proactively integrate PCC in their consultations, in particular when pregnancy affecting issues are being discussed.

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PART II

**Evaluating and advancing
interconception care**

6

Geographical differences in perinatal health and child welfare in the Netherlands: Rationale for the Healthy Pregnancy 4 All-2 Program

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ABSTRACT

Background Geographical inequalities in perinatal health and child welfare require attention. To improve the identification, and care, of mothers and young children at risk of adverse health outcomes, the HP4All-2 program was developed. The program consists of three studies, focusing on creating a continuum for risk selection and tailored care pathways from preconception and antenatal care towards 1) postpartum care, 2) early childhood care, as well as 3) interconception care. The program has been implemented in ten municipalities in the Netherlands, aiming to target communities with a relatively disadvantageous position with regard to perinatal and child health outcomes. To delineate the position of the ten participating municipalities, we present municipal and regional differences in the prevalence of perinatal mortality, perinatal morbidity, children living in deprived neighbourhoods, and children living in families on welfare.

Methods Data on all singleton births in the Netherlands between 2009 and 2014 were analysed for the prevalence of perinatal mortality and morbidity. In addition, national data on children living in deprived neighbourhoods and children living in families on welfare between 2009 and 2012 were analysed. The prevalence of these outcomes were calculated and ranked for 62 geographical areas: the 50 largest municipalities and the 12 provinces, to determine the position of the municipalities that participate in HP4All-2.

Results Considerable geographical differences were present for all four outcomes. The municipalities that participate in HP4All-2 are among the 25 municipalities with the highest prevalence of perinatal mortality, perinatal morbidity, children living in deprived neighbourhoods, or children in families on welfare.

Conclusion This study illustrates geographical differences in perinatal health and/or child welfare outcomes and demonstrates that the HP4All-2 program targets municipalities with a relative unfavourable position. By targeting these municipalities, the program is expected to contribute most to improving the care for young children and their mothers at risk, and hence to reducing their risks and health inequalities.

BACKGROUND

Suboptimal health before birth and in early life has long term consequences for children, their families, and next generations.¹ Moreover, substantial (perinatal) health inequalities are present between, and within, high-income countries. In the Netherlands, perinatal mortality rates are higher than in many other European countries², and these rates differ widely between regions and even between neighbourhoods.³⁻⁵

Living in a deprived region is acknowledged as an important risk factor for adverse birth outcomes, such as preterm birth and small-for-gestational age birth.^{3, 6, 7} In deprived regions the prevalence of risk factors, single or in combination, is higher than in non-deprived regions.^{8, 9} Not only medical risks, but also non-medical risk factors are involved, often related to poverty, such as low socioeconomic status, substance abuse including smoking, and psychological distress.⁹

Since 2008, in response to the awareness about the high prevalence of adverse perinatal outcomes in the Netherlands, much effort has been invested into improving perinatal health.¹⁰ This has led to research and policy programs that aim to increase attention for risk assessment and risk reduction before and during pregnancy. One such program, 'Ready for a Baby' (2008-2012), was initiated with the aim to improve perinatal health in Rotterdam, the second largest city in the Netherlands, especially in its deprived neighbourhoods.^{11, 12} Strengthening of the inter-professional collaboration between curative and the public health professionals and reaching-out to a more vulnerable population, consisting of low-educated and/or immigrant groups, were the stepping stones to reach this goal.

In 2011, building on the insights of the 'Ready for a Baby' program, we launched the Healthy Pregnancy 4 All (HP4All-1) program in 14 municipalities that had higher rates of adverse perinatal outcomes than the national average.⁴ The HP4All-1 program focused on: a) the implementation of preconception care via different recruitment strategies, and b) the introduction of systematic antenatal risk assessment (considering both medical and non-medical risk factors) with the antenatal Rotterdam Reproductive Risk Reduction (R4U) scorecard, followed by tailored multidisciplinary care pathways.^{13, 14} Again, optimal linkage between the curative and the public health domain was sought on preconception, prenatal and perinatal care.

Since 2014, this approach has been extended to cover postpartum care, early childhood care and interconception care in the Healthy Pregnancy for All 2 (HP4All-2) program.

HP4All-2 program

The HP4All-2 program focuses on creating a continuum of risk selection, followed by tailored (multidisciplinary) care pathways, from the preconception and prenatal period towards the postpartum and early childhood period. The rationale for this focus is that certain risk factors before and during pregnancy, such as neighbourhoods and individual social characteristics, often continue to exist after delivery, affecting both maternal and offspring health.^{6, 15} Moreover, perinatal health status in itself is an important determinant of child health and health in later life.¹ For example, high birth weight is positively associated with childhood overweight and low birth weight is negatively associated with developmental outcomes.^{16, 17} To translate this knowledge into practice, comprehensive care beyond the boundaries of the separate social and medical domains of care is needed in the preconception, prenatal, postpartum and early childhood period.¹⁸

Therefore, HP4All-2 aims to introduce integrated, risk-guided care, beyond separate domains of antenatal care, maternity care and Preventive Child Health Care (PCHC). In the Netherlands, professional maternity care is provided at home by maternity care assistants, who have completed a specialisation of ‘personal health care assistant’ at the level of secondary vocational education and are being supervised by community midwives.¹⁹ PCHC organizations promote children’s health up to the age of 19 years by providing immunisations, monitoring growth and development, offering health advice, and referring to specialised care if needed.^{20, 21} Maternity care and PCHC are used as the main settings for three risk assessment interventions that are studied within the HP4All-2 program. These three intervention studies are being implemented in ten municipalities that agreed to participate in one or more of the studies (**table 1**).

Table 1. An overview of the participation of municipalities in the HP4All-2 program, and its studies

Municipality	Maternity care study ^a	PCHC study ^b	Interconception care study ^c
Amsterdam*		X	X
Rotterdam*	X	X	X
Den Haag*			X
Utrecht*	X		
Tilburg*			X
Groningen*	X		X
Almere*	X		X
Arnhem	X		
Dordrecht		X	
Schiedam*	X		X

a) Structured risk assessment during pregnancy and customised maternity care study; b) Optimizing postnatal risk assessment in PCHC study; c) Interconception care study through PCHC; * selection based on their participation in earlier programs (‘Ready for a Baby’ or HP4All-1)

Study 1: Structured risk assessment during pregnancy and customised maternity care

Aim This study aims to timely plan customised maternity care to the individual needs of women at high risk for adverse pregnancy and child outcomes.

Rationale Previous research indicates that high risk women benefit more from intensive postpartum care than women with low risks.^{22, 23} This yields the need for a structured risk assessment during pregnancy in conjunction with custom fit maternity care.

Study Design This study is a cluster randomised controlled trial in six municipalities in the Netherlands. Within a municipality, two clusters are formed in the same geographical area; one intervention and one control cluster. Two municipalities were merged together to account for enough participants, resulting in a total number of 10 clusters. A cluster may consist of one or more maternity care organisations. The intervention under study is a systematic risk assessment during pregnancy of medical and non-medical risk factors for adverse maternal and child outcomes, in conjunction with client-tailored care during pregnancy and the postpartum period. In the control clusters this systematic risk assessment is introduced during pregnancy as well, yet is followed by conventional maternity care during pregnancy and in the postpartum period. All pregnant women cared for by participating maternity care organisations, who have a scheduled home visit during pregnancy, are invited to take part in the trial.

Outcomes Primary outcome is maternal empowerment assessed between day six and 14 postpartum. Secondary outcome measures include maternal health outcomes, maternal health behaviour and health care utilisation in the first months postpartum. In addition, we will assess the determinants of successful implementation by questionnaires addressed to managers of maternity care organisations and to maternity care assistants.

Study 2: Optimising postnatal risk assessment in Preventive Child Health Care

Aim This study aims to identify and reduce the risk of growth and developmental problems in children before the age of 18 months, during their postnatal visits to the PCHC centre.

Rationale Within PCHC centres, care is provided to all children and families free of charge, with population coverage of 95% during the first year of life. Therefore, it seems to be the ideal setting for early risk screening and indicating appropriate care for vulnerable families at risk of adverse child health outcomes. To ensure structured risk assessment, the 'postnatal R4U' has been developed (comparable to the 'antenatal R4U'¹³). This risk assessment instrument scores both medical and non-medical risk factors and combines information already documented by the PCHC, obstetric data and newly screened items. All items of the 'postnatal R4U' are based on an extensive literature search and expert consultations by focus group interviews. In sum-

mary, the items were categorised into six domains: the social ²⁴⁻²⁶, ethnicity ^{17, 27}, care status ²⁸, lifestyle ²⁹⁻³¹, obstetric ^{32, 33} and medical domains ^{34, 35}.

Study design In this prospective cohort study, the 'postnatal R4U' is introduced in the participating PCHC centres in three municipalities. All children aged zero to eight weeks old will be assessed with this instrument and, in case of detected risks, integrated care pathways will be offered to reduce the detected risks. A historical control group of children in the same four-digit postal code area will be constructed for comparison of the study outcomes.

Outcomes Primary outcomes are growth problems (defined as overweight, obesity and catch-up growth) and developmental problems in children until the age of 18 months. Developmental problems will be assessed using the 'Van Wiechen Scheme', a Dutch instrument for monitoring motor, language, cognitive and psychosocial development which is routinely applied from birth onward at visits to the PCHC centre.³⁶

Study 3: Interconception care through Preventive Child Health Care

Aim This study aims to implement and evaluate interconception care in PCHC centres.

Rationale Interconception care, also referred to as preconception care between pregnancies, aims to facilitate optimal preparation for pregnancy and minimise risk factors for an adverse pregnancy outcome. Delivery of interconception care is still uncommon.³⁷ A valuable opportunity to deliver interconception care can be through PCHC centres, since almost all parents and their young children visit PCHC centres regularly for routine well-child visits.³⁸

Study Design In this prospective cohort study, interconception care is implemented in participating PCHC centres in seven municipalities. PCHC professionals are instructed to inform women about the possibility of an interconception care consultation in case of a (future) pregnancy wish. They discuss this possibility with women who attend for a routine visit at their child's age of six months. Subsequently, women can make an appointment for a separate interconception care consultation. In three municipalities women are offered this consultation by the PCHC centre, in the other four municipalities they are referred to local midwives or general practitioners. Decisions on which approach was applied, were made in mutual agreement with stakeholders within the municipalities.

Professionals are requested to record each time they discuss the possibility of an interconception care consultation with women, as well as when they provide the actual consultation.

Outcomes Primary outcome is the effectiveness of the implementation of interconception care in PCHC, measured as the proportion of eligible women who were informed about an inter-

conception care consultation. Secondary outcomes include determinants of the implementation, effectiveness and utilisation of interconception care, studied by surveying women with a (future) pregnancy wish and PCHC professionals.

The HP4All-2 program is currently implementing these studies, aiming to target municipalities with a relatively disadvantageous position on perinatal and child health outcomes. In 2014 we presented data on regional perinatal health outcomes in the Netherlands during the period 2000-2008, based on which municipalities were invited to participate in the HP4All-1 program.⁴ To delineate the recent position of the ten currently participating municipalities relative to other regions in the Netherlands, we now present the municipal and regional prevalence of perinatal mortality and morbidity over the period 2009-2014. Additionally, given the focus of the HP4All-2 program on postnatal care in continuum with antenatal care, proxies for socioeconomic risk factors for adverse child health are included in our analyses, being the prevalence of children living in deprived neighbourhoods and of children living in families on welfare over the period 2009-2012.

METHODS

Data sources

National data on all singleton births from 22 weeks of gestation onwards between 2009 and 2014 were obtained from Perined (www.perined.nl) in April 2016. Perined contains information on more than 97% of all pregnancies in the Netherlands. Pregnancy, delivery, and neonatal data are routinely collected by midwives, gynaecologists and paediatricians.³⁹ A detailed description of the linkage procedures can be found on the Perined website (www.perined.nl).

Small area-level data on the proportion of children living in deprived neighbourhoods and of children living in families on welfare between 2009 and 2012, were provided by the 'Defense for Children' (www.defenseforchildren.nl), a Dutch non-governmental Coalition for Children's Rights. This coalition monitors data on child well-being, based on 'Kid's Count', a method used in the USA.^{40, 41} The data of both outcomes applied to the age group 0 up to and including 17 years, and were available per four-digit postal code per year. Details on the definitions of these outcomes are available at the website (www.defenseforchildren.nl).

Data from Statistics Netherlands (CBS, www.CBS.nl) were used to identify the 50 largest municipalities of the Netherlands, based on the number of inhabitants in January 2015 (all above 70,000 inhabitants).

The four-digit postal code from the Perined database was used to assign each pregnancy to one of these 50 municipalities or to one of the 12 provinces (excluding the 50 previously selected municipalities). In the same way, the data on children living in deprived neighbourhoods and living in families on welfare were assigned to one of these 62 geographical areas.

Data on socioeconomic status (SES) were based on an area-level SES indicator by four-digit postal code, constructed by the Netherlands Institute for Social Research (SCP, www.scp.nl) over the year 2014. The SES indicator had been composed by a principal component analysis of the following items: 1) mean annual income per household, 2) percentage of households with low income, 3) percentage of households with low education and (4) percentage of unemployed inhabitants.⁴²

The SES data were linked to the data on pregnancies using the four-digit postal code.

Outcomes

Perinatal mortality: was defined as death occurring between 22 weeks of gestational age and 7 days after birth. This determinant includes foetal mortality, intrapartum mortality and early neonatal mortality.

BIG2: was defined as small for gestational age (SGA) and/or preterm birth. **SGA** was defined as a birth weight below the 10th centile adjusted for ethnicity, parity, gestational age, and gender.⁴³

Preterm birth was defined as any birth occurring before 37+0 weeks of gestational age.

Proportion children living in deprived neighbourhoods: was defined as the number of children, in the age group zero up to and including 17 years, living in deprived neighbourhoods per municipality, divided by the total number of children of that age living in that municipality.

Proportion children living in families on welfare: was defined as the number of children in the age group 0-17 years, living in families on welfare per municipality, divided by the total number of children of that age living in that municipality.

Determinants

Ethnicity: the mothers' ethnicities were categorised into Western and non-Western. Western consisted of Dutch and other European nationalities. Non-western consisted of all other (i.e. non-European) ethnicities.

Socioeconomic status: the SES-scores were categorised into three groups: 'Low', a SES-score below the 20th centile; 'Medium', from the 20th up to and including the 80th centile; and 'High', above the 80th centile.

Parity: the mothers' parity was dichotomised into 2 categories: 'Primiparity' including all first time pregnancies; and 'Multiparity', including all subsequent pregnancies.

Missing data

The amount of missing data varied across determinants and ranged between 0.01% (parity) and 1.6% (ethnicity). In the data provided, there were no missing data on perinatal mortality, BIG2, children living in deprived neighbourhoods, and children living in families on welfare. Each determinant was assessed on unlikely or contradictory values. These unlikely values were found in the determinants 'age of the mother' (values below 10 years of age), and 'postal code' (if area code was officially labelled as uninhabited). Unlikely values were considered as missing data. Missing data were not imputed, as the determinants containing missing data were only used to describe the population and there were no missing data for each of the outcomes.

Statistical analyses

Firstly, demographic characteristics (i.e. age, ethnicity, parity, and SES) of all singleton births, as well as perinatal outcomes and child welfare outcomes were tabulated according to whether these occurred in one of the four largest cities of the Netherlands (Amsterdam, Rotterdam, The Hague, and Utrecht (the G4)), in analogy to Denktas et al.⁴

Secondly, to delineate the recent position of the participating HP4All-2 municipalities relative to other regions in the Netherlands, each birth was assigned to one of the 62 selected geographical areas (50 largest municipalities and 12 provinces), and the geographical prevalence (per 1000 births) of perinatal mortality, BIG2, children living in deprived neighbourhoods, and children living in families on welfare was calculated. Maps were constructed to graphically illustrate these distributions.

Thirdly, the calculated prevalence per geographical area for all four outcomes was used to construct a ranking of the geographical areas. For each outcome, rank 1 was assigned to the geographical area with the highest prevalence and rank 62 to the area with the lowest prevalence.

Finally, the prevalence of known socio-demographic risk factors for adverse perinatal outcomes for which we had data (i.e. age of mother below 20, non-Western ethnicity, primiparity, and low SES) were tabulated against the 62 geographical areas.

The analyses were based on non-blinded data, since we based our analyses on national registry data independent of the HP4All-2 program. Analyses were performed using R version 3.2.3 (2016, The R Foundation for Statistical Computing) and ArcGIS 9.3, a geographical information system (release NL-16m07).

RESULTS

Of the 1 027 556 births in the Netherlands registered with Perined over the period 2009 – 2014, 1 009 687 (98%) were singleton pregnancies, and used for the analyses. In **table 2** characteristics of these pregnancies are tabulated by whether women lived in one of the four largest cities or in the rest of the Netherlands (The Netherlands minus the four largest cities). Regarding the total number of the births in the Netherlands, the median age of the mother was 30 years (interquartile range: 27 – 40) and the mothers' ethnicity was predominantly Western (86%). The overall perinatal mortality over the period between 2009 and 2014 was 7.8 per 1000 births. Perinatal morbidity, represented by BIG2, was 142 per 1000 births.

In the four largest cities, considerably more mothers were of non-Western ethnicity (35% vs. 10%) and had low SES (40% vs. 16%) compared to the mothers in the rest of the Netherlands. Perinatal mortality and morbidity (i.e. BIG2) per 1000 was also higher in the four largest cities: 8.6 vs. 7.6 per 1000, and 157 vs. 139 per 1000, respectively.

The national prevalence of children living in deprived neighbourhoods and living in families on welfare were 173 and 53 per 1000 children in the Netherlands, respectively. Again, both were higher in the four largest cities; 438 vs. 137 per 1000 for children living in deprived neighbourhoods and 134 vs. 42 per 1000 for children living in families on welfare.

In **table 3** the prevalence of perinatal mortality, BIG2, children living in deprived neighbourhoods, and children living in families on welfare are shown for each of the 62 geographical areas. Between geographical areas, perinatal mortality ranged from 5.3 – 10.2 per 1000 births, and perinatal morbidity ranged between 117 and 195 per 1000 births. The prevalence of children living in deprived neighbourhoods ranged between 0 and 895 per 1000, and for children living in families on welfare between 23 and 174 per 1000. The prevalence of all four outcomes in the 62 geographical areas is illustrated in **figures 1a to 1d**. In **online supplementary table 1** the prevalence of maternal age below 20 years, parity, non-Western ethnicity, and low SES tabulated for each of 62 geographical areas are presented.

Table 2. Population characteristics of the singleton births between 2009 and 2014 and child welfare outcomes between 2009 and 2012, stratified by location in the four largest cities (G4) or in the rest of the Netherlands

	G4-cities	The Netherlands minus G4-cities	Total
Singleton births	174,989	834,698	1,009,687
<i>Parity</i>			
Primiparous	49.0	45.2	45.9
Multiparous	51.0	54.8	54.1
<i>Ethnicity</i>			
Western	65.1	89.7	85.5
Non- Western	34.9	10.3	14.5
<i>Maternal age</i>			
< 20 years	1.6	1.2	1.2
20-24 years	10.5	10.1	10.2
25-29 years	25.1	31.7	30.6
30-34 years	37.1	37.1	37.1
≥ 35 years	25.7	19.8	20.9
<i>Socioeconomic status score</i>			
Low (< p20)	39.5	16.0	20.1
Middle (p20 – p80)	32.3	65.7	59.9
High (> p80)	28.2	18.3	20.0
<i>Perinatal outcomes</i>			
Congenital anomalies	2.3	2.7	2.7
Preterm birth	6.2	6.1	6.1
Small for gestational age	10.2	8.3	8.7
Apgar score <7 (5min after birth)	2.3	1.9	1.9
Any BIG2*	15.7	13.9	14.2
Fetal mortality	0.32	0.30	0.30
Intrapartum mortality	0.20	0.17	0.18
Early neonatal mortality	0.34	0.29	0.30
Perinatal mortality†	0.86	0.76	0.78
Children 0-17 years (4 years**)	1,692,985	12,339,094	14,032,079
<i>Child welfare outcomes</i>			
Children living in deprived neighbourhoods	43.8	13.7	17.3
Children living in families on welfare	13.4	4.2	5.3

Data are presented as percentages. * = Individual BIG2 morbidities (combination of SGA and/or premature births) do not add up to 'Any BIG2' as newborns can have >1 BIG2 morbidity. † = Total of foetal (from 22 weeks gestational age), intrapartum, and neonatal mortality (up to 7 days after birth) ** Sum of Children 0-17 years in 2009, 2010, 2011 and 2012.

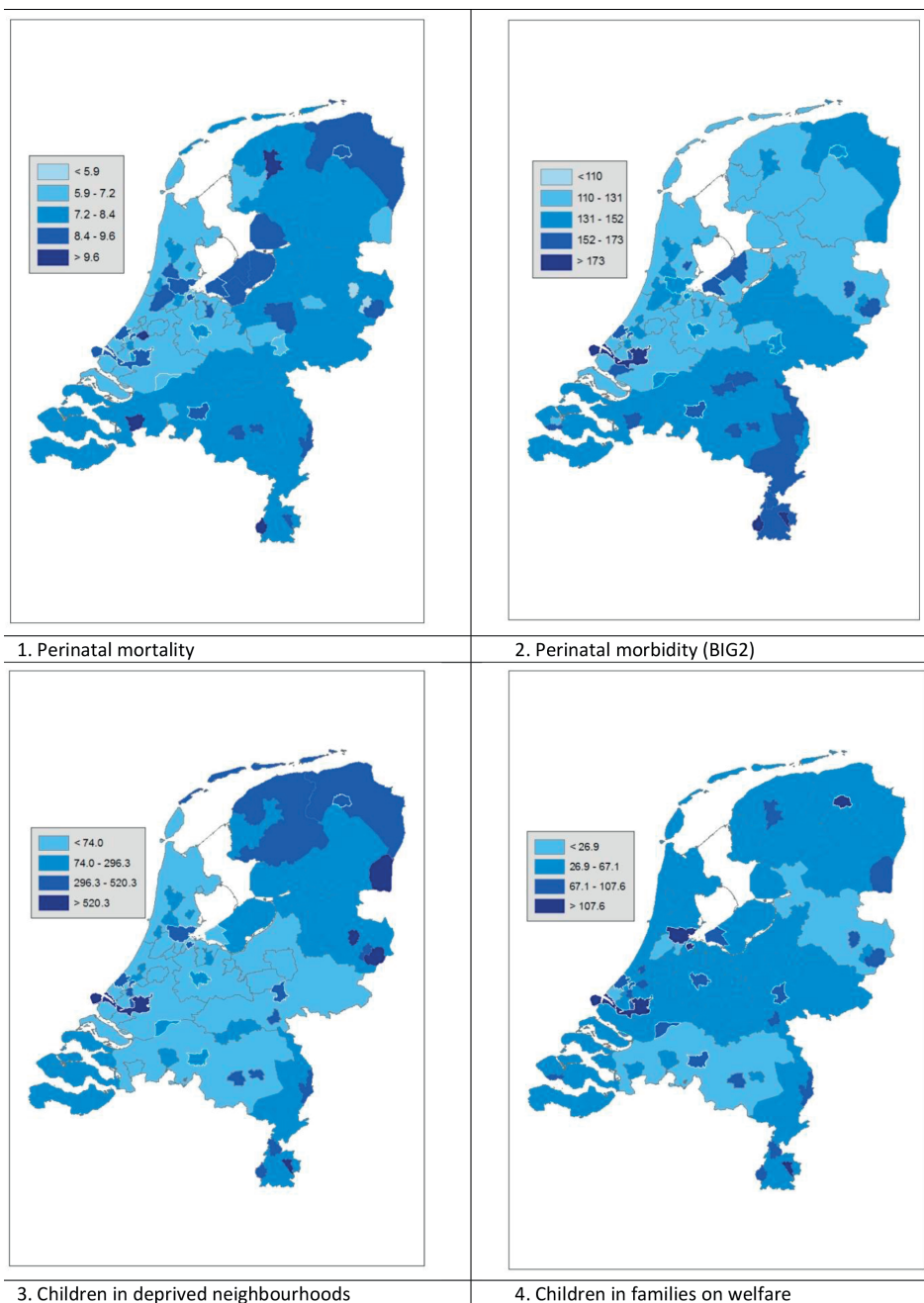


Figure 1a-d. Prevalence per 1000 for 62 geographical areas in the Netherlands

Legend: The maps are based on data from table 3, divided in five categories. The categories are formed based on the standard deviation (SD); the middle category being between -0.65 SD and 0.65 SD, the surrounding categories from plus and minus 0.65 to 1.96 SD and the outer categories below -1.96 SD and above 1.96 SD. In figure 1c and 1d the lowest category (values below -1.96 SD) does not exist due to skewedness of the data. The municipalities participating in HP4All-2 have a white border.

Table 3. Prevalence (per 1000) of perinatal mortality, morbidity (BIG2), between 2009 and 2014, and children living in deprived neighbourhoods, and children living in families on welfare between 2009 and 2012, for the Netherlands and the selected 62 geographical areas

	Perinatal mortality	BIG2*	Children in deprived neighbourhoods	Children in families on welfare
The Netherlands	7.8	141.7	173.1	53.4
<i>50 largest municipalities</i>				
Amsterdam	8.8	151.2	450.7	144.3
Rotterdam	8.9	173.4	595.0	174.4
Den Haag	8.7	165.5	373.5	105.8
Utrecht	7.6	132.5	206.9	74.0
Eindhoven	8.8	156.5	304.1	80.8
Tilburg	8.7	170.8	246.0	78.5
Groningen	9.1	138.8	325.2	120.8
Almere	8.9	163.6	65.7	70.6
Breda	6.5	146.9	160.5	58.2
Nijmegen	7.3	145.5	337.1	93.3
Apeldoorn	8.9	136.1	35.3	43.4
Enschede	8.7	164.0	563.6	103.1
Haarlem	7.4	133.2	193.8	47.8
Arnhem	6.7	146.9	360.1	106.8
Amersfoort	6.3	127.6	35.9	45.2
Zaanstad	8.6	151.7	262.6	49.0
Den Bosch	7.8	152.5	179.4	51.7
Haarlemmermeer	8.4	133.5	0.0	24.8
Zwolle	7.3	118.2	122.2	56.4
Zoetermeer	10.2	151.8	68.6	73.1
Leiden	6.9	137.5	122.7	71.1
Maastricht	9.7	174.1	354.0	83.2
Dordrecht	7.1	146.0	261.5	71.8
Ede	6.0	117.2	0.0	37.5
Alphen a/d Rijn	6.9	120.3	10.2	36.1
Leeuwarden	9.7	136.6	291.9	98.9
Alkmaar	7.3	134.9	80.3	43.9
Emmen	6.8	145.6	650.6	68.9
Westland	7.1	121.5	2.9	23.6
Delft	8.1	144.7	308.3	95.1
Venlo	9.5	149.7	373.7	72.7
Deventer	6.8	147.8	261.7	49.4
Sittard-Geleen	7.2	160.8	384.9	72.3
Helmond	8.9	158.3	316.3	64.5

Table 3. Prevalence (per 1000) of perinatal mortality, morbidity (BIG2), between 2009 and 2014, and children living in deprived neighbourhoods, and children living in families on welfare between 2009 and 2012, for the Netherlands and the selected 62 geographical areas (*continued*)

	Perinatal mortality	BIG2*	Children in deprived neighbourhoods	Children in families on welfare
Oss	7.4	157.2	186.8	33.6
Amstelveen	7.4	139.8	0.0	25.5
Hilversum	8.9	139.4	154.5	37.3
Heerlen	9.3	195.0	895.4	124.6
Nissewaard	6.3	166.1	18.5	62.4
Sudwest Friesland	6.7	118.2	280.0	42.2
Hengelo	5.3	137.6	380.9	56.5
Purmerend	7.5	156.0	113.8	38.1
Schiedam	8.0	167.1	328.3	101.2
Roosendaal	10.2	167.4	38.4	44.2
Lelystad	9.5	166.6	245.3	67.0
Leidschendam-Voorburg	6.5	132.5	133.6	61.2
Almelo	5.9	154.2	557.1	72.9
Hoorn	6.0	132.8	0.0	44.3
Middelburg	7.4	124.8	147.9	57.7
Vlissingen	7.4	160.2	182.2	75.5
<i>12 Provinces (minus 50 largest municipalities)</i>				
Groningen	8.9	139.0	462.2	49.8
Friesland	7.9	125.8	377.8	37.3
Drenthe	7.5	121.9	241.6	40.8
Overijssel	7.2	124.6	80.9	23.1
Gelderland	7.5	132.1	48.4	28.6
Utrecht	6.7	123.6	17.9	27.9
Noord-Holland	6.6	124.7	29.6	27.7
Zuid-Holland	7.1	131.1	55.4	32.3
Zeeland	7.7	137.6	83.9	27.2
Noord-Brabant	7.5	146.4	38.5	26.5
Limburg	8.3	159.1	136.2	44.2
Flevoland	8.8	125.6	112.1	35.0

Data are presented as promille (1 per 1000). Perinatal mortality and morbidity over the period 2009-2014 and children in deprived neighbourhoods and living in families on welfare over the period 2009-2012. Ordering of the 50 largest municipalities is based on the number of inhabitants per municipality, with the largest municipality displayed first. * = BIG2 combination of SGA and/or premature births.

Table 4 shows the relative ranking of the ten participating municipalities in HP4All-2 for each of the four outcomes presented in **table 3**.

Table 4. Ranking of the ten participating HP4All-2 municipalities on perinatal mortality, BIG2, children living in deprived neighbourhoods, and children living in families on welfare

	Perinatal mortality	BIG2*	Children in deprived neighbourhoods	Children in families on welfare
Amsterdam	15	23	7	2
Rotterdam	9	3	3	1
Den Haag	18	9	12	6
Utrecht	29	46	29	16
Tilburg	19	4	26	14
Groningen	8	36	17	4
Almere	13	11	47	23
Arnhem	52	27	13	5
Dordrecht	44	29	25	21
Schiedam	25	6	16	8

Data represent the relative ranking of the prevalence of each outcome for the ten participating HP4All-2 municipalities in the Netherlands. Rank 1 corresponds to the highest prevalence of that outcome, while rank 62 represents the lowest prevalence of that outcome.

Higher rankings correspond to higher prevalence for the corresponding outcome. Seven of the ten HP4All-2 municipalities are ranked in the top 10 for one or more of the outcomes, and all of them are placed in the top 25 for at least one of the outcomes.

DISCUSSION

We identified considerable variation between geographical areas within the Netherlands for perinatal mortality and morbidity, and the prevalence of children living in deprived neighbourhoods and children living in families on welfare (**table 3**). This study shows that even in a high-income country such as the Netherlands, important geographical inequalities in perinatal and child health exist. The results of this study also suggest associations between adverse perinatal health and socio-economic disadvantage of children. Furthermore, when relating area-level SES (online supplementary table 1) with the outcomes (table 3) it appears that the municipalities with a higher prevalence of the study outcomes also have a higher proportion of births occurring in women from a low SES area (statistically significant positive correlation; analysis not shown). The importance of area SES and deprivation in relation to poor health outcomes in general, and more specifically perinatal and child mortality has been recognised with regards to other western countries as well.^{7, 15, 44, 45} In addition to area SES and individual-level risk indicators, other area characteristics could contribute to explaining the geographical differences found in this study, such as environmental factors or population density (i.e. air pollution, minority density and distance to health care).⁴⁶⁻⁴⁸ Although the aim of the analyses was not to

unravel the potential causes of the geographical differences, it highlights the urgency to reduce these inequalities.

The municipalities that were approached and have agreed to participate in the HP4All-2 program are among the municipalities with the most unfavourable perinatal health and/or child welfare outcomes. In the predecessor program HP4All-1, similar types of analyses were performed to identify those municipalities that had the highest rates of adverse (birth) outcomes.⁴ The selection of HP4All-2 municipalities was not guided by formal analyses. Instead, selection of municipalities was guided by 1) participation in HP4All-1 and 'Ready for a Baby', and 2) interest shown by municipalities in the topic addressed in the program. A reason for selecting municipalities this way was that in the predecessor programs close collaboration with the participating municipalities had been established, which presumably facilitates the implementation of the HP4All-2 program studies. In these municipalities, the health care professionals, local government, and local public health services were already committed to improve perinatal outcomes via a broad multidisciplinary network.¹⁰ Both newly selected municipalities (Dordrecht and Arnhem) have improving care for more vulnerable women and children high on the political agenda. The selection was thus merely based on effective implementation of the program in those municipalities, which we expected to have a relatively unfavourable position, not on the actual position. Nevertheless, our analyses demonstrate that most of our selected municipalities are among the worst performing in the Netherlands, with the exception of Dordrecht with a highest ranking of 21.

The intention to target high-risk municipalities with the HP4All-2 program has been based on the assumption that geographical areas with a relatively large population being at risk of adverse perinatal and child health outcomes will benefit most from interventions aimed at reducing those adverse outcomes. Sharing knowledge on how to support the most vulnerable families in the society with all involved parties is crucial, but challenging.¹⁸ Therefore, the implementation of the HP4all-2 program, and its studies, is also expected to be challenging. Along with partnership with local parties, training sessions to share the required knowledge are being offered to health care professionals involved to help the implementation of the program.

CONCLUSION

The ten participating municipalities in HP4All-2 all had a relatively unfavourable position regarding perinatal health and/or child welfare outcomes prior to the start of the program. In these municipalities, HP4All-2 aims to improve the care for young children and their mothers by extending the continuum for risk selection and tailored care from the preconception and prenatal period towards the postpartum, early childhood and interconception period, beyond

the boundaries of separate domains of health care. By implementing and evaluating this enhanced risk management in high-risk populations, HP4All-2 aims to contribute to the reduction of (perinatal and childhood) health inequalities.

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7

Results of a Dutch national and subsequent international expert meeting on interconception care

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The Journal of Maternal-Fetal & Neonatal Medicine 2019

ABSTRACT

Introduction: The potential value of preconception care and interconception care is increasingly acknowledged, but delivery is generally uncommon. Reaching women for interconception care is potentially easier than for preconception care, however the concept is still unfamiliar. Expert consensus could facilitate guidelines, policies and subsequent implementation. A national and subsequent international expert meeting were organized to discuss the term, definition, content, relevant target groups, and ways to reach target groups for interconception care.

Methods: We performed a literature study to develop propositions for discussion in a national expert meeting in the Netherlands in October 2015. The outcomes of this meeting were discussed during an international congress on preconception care in Sweden in February 2016. Both meetings were recorded, transcribed and subsequently reviewed by participants.

Results: The experts argued that the term, definition, and content for interconception care should be in line with preconception care. They discussed that the target group for interconception care should be 'all women who have been pregnant and could be pregnant in the future and their (possible) partners'. In addition, they opted that any healthcare provider having contact with the target group should reach out and make every encounter a potential opportunity to promote interconception care.

Discussion: Expert discussions led to a description of the term, definition, content, and relevant target groups for interconception care. Opportunities to reach the target group were identified, but should be further developed and evaluated in policies and guidelines to determine the optimal way to deliver interconception care.

INTRODUCTION

In order to prevent adverse birth outcomes, the importance of preconception health and preconception care (PCC) has been recognized ¹. This applies to care before first pregnancies as well as to care before subsequent pregnancies, the latter often referred to as interconception care (ICC). However, more effort is needed to integrate PCC and ICC in current practice ². Compared to PCC, ICC could take advantage of available routine postnatal care, yet a complicating factor is that ICC is a rather unfamiliar concept, literature is scarce and different terms and definitions are used ³. Clarity, for instance in guidelines, has been described as a determinant for implementation of new concepts in healthcare ⁴. As such, achieving consensus on ICC could facilitate multidisciplinary guidelines and policies on ICC, which are currently not in place in many European countries ⁵. Consensus meetings have been organized on PCC previously ⁶⁻⁸, however to our knowledge, this has not been done for ICC. We therefore organized a national and subsequent international expert meeting to discuss different aspects of ICC.

MATERIALS AND METHODS

We used a similar approach for organizing and reporting on the ICC expert meetings, as was previously used for an expert meeting on PCC ⁶. Firstly, we carried out a comprehensive literature search [see addendum for more details] to develop propositions as a starting point for discussion in the national expert meeting. We formulated propositions for consensus on five items related to ICC: the term ICC, the definition of ICC, the content of ICC, relevant target groups for ICC and ways to reach the target groups. In addition, studies that specifically reported on the impact of ICC interventions were summarized by describing participants, the intervention, and key findings [Addendum]. Also, three papers that provided an overview of ICC and together covered many of the topics described in the other papers ^{2, 3, 9}, were sent in advance to the participants of the national expert meeting.

Secondly, during the national ICC expert meeting that we organized in the Netherlands in October 2015, the propositions based on the literature study were presented and discussed with nineteen participants. The results of this national meeting were subsequently discussed in an international meeting, which was organized during the Third European Congress on Preconception health and care (ECPHC) in Sweden in February 2016 and was joined by about 40 participants from seven countries. Different disciplines were involved in the meetings [see addendum for more details on the meetings]. Both meetings were chaired by members of the project team and were audio recorded. We produced transcripts and summarized the outcomes of the meetings that were reviewed by the participants of the national meeting and by country representatives of the international meeting.

The results will be presented per discussed ICC item in a fixed format: a summary of the *literature*; the *proposition* given as input for the national meeting; the *discussion outcomes* of the expert meetings; and lastly, a *summary of the expert's discussions* that had led to the outcome, including identified knowledge gaps.

RESULTS

ICC Term

Literature

Our starting point was the term interconception care, which was already described as interconceptional care in the late 1970s^{10, 11}. However, three different terms seem to be used interchangeably with ICC on a regular basis: preconception, interpregnancy, and internatal care^{2, 3}. Based on the meaning of terms, these terms could differ in the period of care they enclose (figure 1).

Proposition

The four different terms (figure 1) were introduced.

Expert discussion outcome

ICC should be referred to as ‘PCC between pregnancies’ (figure 1). This PCC can then be part of internatal care, which is the whole package of healthcare from birth until the next birth.

Figure 1. Different terms used in the context of Interconception care

Term	Period	Before conception Conception Pregnancy	End of pregnancy / childbirth	Before conception Conception Pregnancy	End of pregnancy / Childbirth
Preconception care (PCC)	before a pregnancy				
Interpregnancy care	from the end of one pregnancy to the conception of the next pregnancy				
Internatal care	from the birth of one child to the birth of the next child				
Interconception care (ICC)	from the conception of one pregnancy to the conception of the next pregnancy				
Discussion outcome			ICC = PCC between pregnancies		

Summary of the experts' discussions

The Dutch experts did not want to introduce another term for something that is actually the same as PCC. They argued that using just one term, PCC, would help in conveying the message of PCC. Furthermore, ICC can be a confusing term with regard to the period it covers, since it suggests care starting from conception onwards. Despite the period not being completely adequate, the experts preferred the term ICC when comparing it to the terms *internatal* and *interpregnancy* care. During the international meeting two other terms were also mentioned: 'prepregnancy care' and 'periconception care'. However, from a policymaker perspective, the helpfulness of using the same term was stressed again and it was argued that the WHO also uses the term PCC and the term ICC. From a public health point of view, using the term ICC instead of PCC can sometimes have an advantage, because ICC offers the opportunity to target a specific group of women (women who have been pregnant). The result of the expert meetings was to use the term 'PCC between pregnancies'. This is in line with the description of the WHO and the description used before by Lu et al in the context of *internatal* care.^{3, 7} Dutch experts thought that 'internatal care' fits the whole package of care to both women and children between births.

ICC Definition

Literature

Our literature search showed various descriptions for ICC. ICC is said to be in essence PCC for a subsequent pregnancy³. ICC has also been referred to as the identification and reduction of risks that affect the health of the woman and any future pregnancy, with additional intensive interventions in the interconception period for women who have had a prior adverse pregnancy outcome, such as fetal loss, preterm birth, low birth weight, congenital or genetic diseases and medical comorbidities^{2, 12}. The interconception period is generally interpreted as the interpregnancy period or as a bridge from the postpartum period to either a subsequent pregnancy or the decision not to conceive again^{8, 13, 14}.

For PCC, more comprehensive definitions have already been formed. The Dutch expert meeting on PCC in 2012 adapted the definition of the Centers for Disease Control and Prevention (CDC) and the March of Dimes from 2005 to the following definition: 'A set of interventions and/or programs that aims to identify and enable informed decision-making to modify biomedical, behavioral, and (psycho) social risks to parental health and the health of their future child, through counselling, prevention and management, emphasizing those factors that must be acted on before conception and in early pregnancy, to have maximal impact and/or choice'^{6, 8}. This definition included a footnote: *Preconception care may be a good opportunity to reduce perinatal mortality and morbidity*

Propositions

Two propositions were formed based on the PCC definition from 2012: 1) an adjusted version of the PCC definition including the aspects 'risk factors from prior pregnancies' and the period 'between two pregnancies'; 2) ICC described as a subtype of PCC.

Expert discussion outcome

The former definition of PCC was adjusted on several points (in bold), resulting in the following definition for ICC: Interconception care is preconception care* between pregnancies.

*A set of interventions and/or programs that aims to identify and enable informed decision-making to **optimize** biomedical, behavioral, and (psycho) social **factors** that can influence parental health (**including fertility potential**) and the health of their future child, through counselling, prevention and management, emphasizing those factors that must be acted on before conception and **continued** in early pregnancy, to have maximal impact and **enable informed choices**.

1. Preconception care may be a good opportunity to reduce perinatal and maternal mortality and morbidity

Summary of the experts' discussions

In line with the discussion on the term, the Dutch experts agreed to define ICC as a subtype of PCC. They preferred to keep the definition of PCC and thereby not focusing on risk factors from prior pregnancies in particular, as all the components of PCC stay relevant for ICC. In addition, they argued that a focus on health promotion instead of risk factors would facilitate implementation of PCC by policymakers, professionals and researchers. At the international meeting, a discussion arose on the words 'in early pregnancy' being part of the definition, because this might diminish the importance of the preconception period. In the end, participants agreed that PCC interventions have to continue into early pregnancy, because women do not yet receive regular antenatal care. During the international expert meeting the suggestion was made to add fertility potential to the definition, because it reflects the positive effects of PCC on the health of gametes. Someone argued that this was already included in 'parental health', but other experts argued to explicitly mention it and hence to create a stronger link between PCC and fertility care.

ICC Content

Literature

Evidence for risk factors to be taken up in PCC was provided by a review of Jack et al. from 2008 and an update of this review by Temel et al. in 2012, who also performed a systematic search to assess the effectiveness of preconceptional lifestyle interventions^{6, 15, 16}. This evidence is likely to be applicable to ICC as well, as often no distinction has been made between PCC and ICC. Few studies have specifically assessed the effectiveness of an ICC intervention on improved pregnancy outcomes or proxy outcomes such as behavior change (see addendum table)¹⁷. Only two studies have shown a positive impact; suggesting improved folic acid use and suggesting increased pregnancy intervals and less adverse outcomes in a high-risk population^{18, 19}.

Many ICC programs have been described without reporting on effectiveness or only providing feasibility and process evaluations ²⁰⁻²⁸.

The content of the reported ICC interventions is often widespread including social and medical services. In addition to the general content recommended for PCC ⁶, certain items have gained special attention for ICC based on risk factors in the period between pregnancies and the associations with pregnancy outcomes. Firstly, family planning should support effective use of contraception to avoid unintended pregnancies and short pregnancy intervals ^{2, 3, 29}. Since, these situations are associated with increased risk of adverse outcomes ^{3, 9, 30-35}. Secondly, previous pregnancy outcomes should be considered 'to reduce risks that may affect the woman's health and any future birth she may have' ². This includes outcomes such as preeclampsia and hypertensive disorders ^{36, 37}, gestational diabetes ³⁸⁻⁴¹, recurrent miscarriages ⁴², preterm birth ⁴³⁻⁴⁵, a small-for-gestational-age baby ⁴⁶, perinatal loss ^{13, 47-49}, and adolescent pregnancy ^{34, 50}. Thirdly, optimizing health status in the interconception period related to weight ⁵¹⁻⁵⁸, HIV ^{59, 60}, and chronic conditions ^{14, 61} has been recommended. Lastly, psychosocial and behavioral components of ICC have been mentioned, such as paying attention to stress, depression, family violence and substance abuse ^{2, 3, 9}. On the same note, parenting support and breastfeeding promotion have been suggested ³.

Proposition

Our proposition was to include the same content for ICC as was reached in the consensus for PCC previously ⁶. In addition, special attention should be given to risk groups and to the following items that are specifically relevant in ICC: outcomes of prior pregnancies, the interpregnancy interval, contraception, breastfeeding, physical recovery and mental health after pregnancy.

Expert discussion outcome

'Continuing preconception care as delivered before a first pregnancy, as well as paying attention to outcomes of prior pregnancies and future pregnancy planning.'

Summary of the experts' discussions

When the content of ICC was discussed during the Dutch meeting, the importance of both emphasizing the general PCC message, as well as leaving out the focus on risk groups was expressed. The international experts agreed that the content of ICC is the same as the content of PCC, but mentioned that it should in practice also be a continuation of received PCC before the first pregnancy. In addition, it was deemed relevant to raise awareness on timely health seeking in case of secondary infertility, and combine this with other aspects of reproductive health such as contraception and birth spacing in the term 'future pregnancy planning'. Lastly, in the international discussion topics such as future health, male health and domestic violence were identified as important, but considered covered by the general PCC content.

ICC Target Group

Literature

ICC has been advised for everyone, but specifically for high-risk mothers, for whom it would be particularly beneficial ^{2,3}. DeCesare et al. refer to the ‘every woman, every time’ slogan and include in ICC women actively trying get pregnant, women unsure of pregnancy plans, and women who are preventing pregnancy ⁹. Instead of just women, Moore et al. refer to the couple ¹³. Previous ICC interventions have often focused on specific risk groups (Addendum table), such as women with previous adverse outcomes, lower socio-economic status, minority background, or risk behavior, and adolescents, aiming to reduce disparities. Medical and behavioral risks (e.g. no folic acid supplementation) seem as relevant, if not more, in the interconception period as in the preconception period based on their prevalence ⁶²⁻⁶⁹.

Proposition

‘All fertile women who have ever been pregnant, with a focus on high-risk groups.’

Expert discussion outcome

‘All women who have been pregnant and could be pregnant in the future and their (possible) partners.’

Summary of the experts’ discussions

The Dutch experts thought that ICC should be offered to a broad target group and that it is unnecessary to say that you pay extra attention to high-risk groups. Both the Dutch and international experts agreed that ‘partners’ had to be added to the target group. In addition, the proposed formulation of ‘fertile women’ was adjusted in an effort to include women with fertility problems in the target group as well.

Reaching ICC Target Groups

Literature

Reaching parents before the (next) conception is essential for effective ICC. Women who have been pregnant can often be identified within the medical system. As such, Shannon et al. describe ICC as risk identification during a woman’s hospital visit for labor and delivery ¹². A frequently suggested way to reach parents for ICC is at postpartum visits ^{2,3,9}. However, use of postpartum care can be dependable on sociodemographic characteristics and perceived need ^{70,71}. The optimal frequency, timing, duration and intensity for postpartum visits is unknown ⁷². In the Netherlands, a single visit around six weeks postpartum is recommended, but Lu et al. have recommended expanding the number of visits to apply ICC ³. The role of maternity care providers in postpartum care and ICC has been described ^{11,73,74}, but also other healthcare

providers have been suggested to take part in ICC such as pediatric care providers^{19, 23, 75, 76}, internists⁶¹, sexually transmitted disease clinics⁷⁷, general practitioners and genetic counsellors⁷⁸. Actually, every office visit is an opportunity for ICC⁹. Also, group sessions such as Centering-Parenting⁷⁹ and home visits can be used for ICC. On a general note, ICC should be part of a life course approach^{78, 80-82}.

Proposition

We proposed three fixed moments: six weeks postpartum by a midwife, gynecologist or pediatrician; six months and twelve months postpartum by a preventive child healthcare physician (well-baby clinics).

Expert discussion outcome

The target group should be reached at different moments and as often as possible, for instance during postpartum visits by midwives, gynecologists or pediatricians, during regular check-up or vaccination moments by preventive child healthcare physicians or nurses, and during consultations with other healthcare professionals (e.g. general practitioners, nutritionists, and professionals at abortion and fertility clinics).

Summary of the experts' discussions

The Dutch experts discussed the difference between ICC and an ICC consultation; ICC can be integrated in regular care and (if necessary) result in a separate ICC consultation. This distinction might facilitate implementation of ICC. It gives the opportunity to involve many healthcare professionals in the delivery of ICC, who can offer a form of ICC and refer patients for a separate ICC consultation. All healthcare professionals should continuously be aware of the opportunity to offer PCC and ICC. In addition, other options to involve healthcare professionals and the target group were mentioned, such as via social media, medical curricula, municipal public health policies and integrating ICC in CenteringParenting. The international experts discussed a few other opportunities: ICC provided by abortion services and fertility clinics, and by occupational physicians. A discussion arose about women who might be missed when they have a miscarriage at home and do not visit a healthcare provider. Yet, experts suggested that PCC opportunities should be in place to reach these women. Unfortunately, both expert meetings did not achieve consensus on an elaborate plan to reach the target group.

DISCUSSION

The literature study showed how little uniformity there is in the implementation of ICC and how little literature is available on the evaluation of ICC. The expert meetings offered a unique opportunity to discuss the topic of ICC with experts of different disciplines and different na-

tionalities. Although we have to be careful in stating that we reached consensus on ICC, for instance since more official methods for reaching consensus exist ⁸³, the described results can give the necessary attention to this still uncommon form of care. The summarized expert discussions and the suggested international discussion outcomes on the definition, term, content, target group and ways to reach the target group for ICC will be helpful in bringing the implementation of ICC forward. In addition, the outcomes are graphically summarized in figure 2.

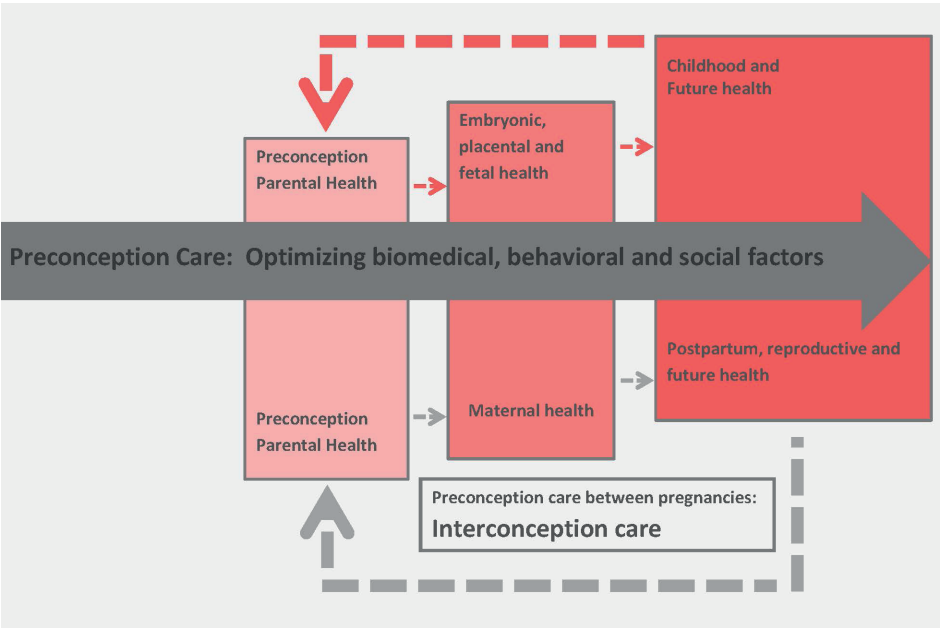


Figure 2. Preconception care and Interconception care impact

The prevailing opinion was to refrain from putting much emphasis on ICC, but focus on PCC. PCC is a more familiar term that is extensive in its definition and content, and includes ICC. Sometimes, referring specifically to ICC can be useful, for example when a specific focus is desired on the target group of women who have been pregnant. Yet, even then ICC should not be explained differently than ‘PCC between pregnancies’. This latter description has been used before by Lu et al, but they preferred the term internatal care to ICC in contrast to our experts ³. Another dominant view at the national expert meeting was to put less emphasis on risks, but put more emphasis on promoting health instead. Moreover, this way a more general approach of reaching the target group could be pursued, including ‘all women who have been pregnant and could be pregnant in the future and their (possible) partners’ and ‘any healthcare provider in contact with the target group’. Verbiest et al. have also advocated the importance of increasing the provision of comprehensive, woman-centered care to promote women’s health and wellness in the postpartum and interconception period and recently Barker et al referred to the postpartum or interpartum care opportunities to improve health behavior ^{84, 85}. A final

recurrent theme at the international meeting was to make a stronger connection between fertility care and PCC and ICC. Both expert meetings did not result in a detailed plan to reach the target group. Many opportunities were identified, but implementation of ICC should be further developed and evaluated in policies and guidelines to formulate the optimal way to deliver ICC.

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ADDENDUM

Methods

Literature study

In June 2015, we performed a literature study on ICC in different databases (Embase, Medline, Web-of-science, Scopus, Cinahl, Pubmed, Cochrane and Google Scholar) with combinations of the following keywords in different inflected forms: interconception, interpregnancy, internatal, multipara, multigravida, consecutive, repeat, following, prepregnancy and preconception care.

Due to the broad scope, our literature search followed the methodology of a scoping review. This is a way to develop a picture of the extent of the literature in a certain domain without narrowing down to a focused research question ¹.

The initial search identified 498 titles, to which we added 20 more through reference searching. We included papers published from 1995 onwards that were available in full text in the English language, generally based in western countries, not specific to rare conditions and that were relevant to our five ICC items. Three researchers were involved in reviewing the papers and selecting latest reviews when applicable. We included different kinds of papers (e.g. qualitative, quantitative, opinion papers) that provided information on the five predetermined ICC items: the term, the definition, the content, the relevant target groups and ways to reach the target groups. This resulted in a final selection of 81 papers that are referred to in the literature overview in the manuscript.

Expert meetings

In the Netherlands, we organized an afternoon meeting in October 2015 with nineteen participants. Participants were invited based on their expertise and/or their earlier participation in the PCC expert meeting in 2012.

During the Third European Congress on Preconception health and care (ECPHC), which was held in Uppsala in Sweden in February 2016, we organized a second meeting. This meeting, a workshop session, was joined by about 40 participants from seven countries; The United States of America, The United Kingdom, Belgium, Italy, Sweden, Ukraine, and The Netherlands.

Different disciplines were involved in the meetings, being professional caregivers (midwives, general practitioners, gynaecologists, geneticists, paediatricians / neonatologists, a preventive child healthcare physician, a psychologist, and an occupational physician), governmental representatives, representatives of healthcare expertise centres, researchers (e.g. epidemiologists, a medical ethicist, clinical researchers) and research funders.

Results

Table. Studies reporting impact of interconception care interventions (k =8)

Author (year); country	Study design	Intervention / focus	Participants description + N	Key findings / recommendations
Doyle et al (1999) ² ; UK	Intervention (pilot study)	Effectiveness of a 6-month period of nutrition counselling during the interpregnancy interval	Mothers who had a low-birthweight baby (<2,500 g) and planned to have another baby in the future N= 77 (51%); 70 inadequate diet;41 follow up completed	<ul style="list-style-type: none"> * High prevalence of inadequate nutrition among women who deliver low-birthweight babies in this inner-city community. * Mothers in this population are not receptive to an intervention program designed to improve their nutritional intake, but the trend was towards an improved dietary intake. * Poor awareness of the importance of nutrition in relation to pregnancy outcome
Loomis and Martin (2000) ³ ; USA	Intervention	<ul style="list-style-type: none"> * Case management and home visits from delivery up to 8 or >24 months postpartum * To improve participant's internal resilience, use of medical services and reproductive planning and to reduce or eliminate existing medical, nutritional, psychosocial, and behavioral risks * Through education, counselling, financial support, referral, and follow-up prior to the onset of another pregnancy to improve outcomes of subsequent pregnancies 	Women delivering an low-birthweight baby (<2,500 g) or with a congenital anomaly, or after having a perinatal fetal demise + prioritization criteria based on risk factors N=277 (59%); 151 follow up completed	<ul style="list-style-type: none"> * Because of the relatively small number of program cases, no definitive conclusions are drawn about its effectiveness in preventing recurrent preterm birth and LBW. * The fact that none of 26 infants born to participant women were admitted to the NICU is suggestive of a positive program effect. * Identification of high-risk women at the time of a poor reproductive outcome appeared to be an effective strategy to engage a traditionally hard-to-reach population.
Lumley and Donohue (2006) ⁴ ; Australia	Randomized controlled trial	<ul style="list-style-type: none"> * After randomization, a home visit by study midwife for everyone to discuss past pregnancy * In intervention arm: pre-pregnancy discussion of social, health or lifestyle problems and preparation for next pregnancy including a reminder card and referral if necessary. * To assess increase in birth weight 	Women attending local maternal and child health centers with their first child between May 1982 and July 1991 N =1688 randomized; 392 (intervention arm + 394 control arm) pregnant women	<ul style="list-style-type: none"> * More adverse outcomes in intervention arm (preterm birth and low birthweight), but no significant differences * Birth weight on average 97 g lighter in the intervention group, but may be (partly) explained by more preterm births

Table. Studies reporting impact of interconception care interventions (k =8) (*continued*)

Author (year); country	Study design	Intervention / focus	Participants description + N	Key findings / recommendations
Andrews et al. (2006) ⁵ ; USA	Randomized controlled trial	<p>* To estimate if antibiotic administration during the interpregnancy interval in women with a previous preterm birth before 34 weeks' gestational age reduces the rate of preterm birth in the subsequent pregnancy.</p> <p>* Randomization 4 months postpartum to receive oral azithromycin 1 g twice plus metronidazole 750 mg daily for 7 days, or placebo, every 4 months until pregnancy.</p>	Women with a spontaneous preterm birth <34 weeks' gestational age N =241 women randomized; 124 conceived a subsequent pregnancy	* Intermittent treatment with metronidazole plus azithromycin of non-pregnant women with a recent early spontaneous preterm birth does not significantly reduce subsequent preterm birth, and may be associated with a lower delivery gestational age and lower birth weight
Dunlop et al. (2007) ⁶ ; USA	Mixed prospective-retrospective cohort	<p>* Primary healthcare and social support for 24 months following a very-low birth weight delivery to improve subsequent child spacing and pregnancy outcomes</p>	African-Americans of lower socioeconomic status N = 29 prospective cohort (=intervention); 5 pregnant; 2003-2004 N = 58 retrospective cohort (= control); 29 pregnant; 2001-2002	* Control cohort: 2.6 (CI 1.1-5.8) times as many pregnancies within 18 months and 3.5 (CI 1.0-11.7) times as many adverse outcomes (late spontaneous abortion, stillbirth, ectopic or molar pregnancy, or a live born infant weighing <2500 g)
Livingood et al. (2010) ⁷ ; USA	Retrospective quasi-experimental design	<p>* Social determinant intervention, designed to mitigate the impact of social class and stress; building resilience to negative social forces through peer mentor-based case management</p> <p>* A secondary data analysis to assess impact of pre- and inter-conception case management on birth outcomes and related health factors; ICC specific outcome was a minimum of 2 year interval between births (yes/no/not pregnant)</p>	The Magnolia Project intervention group of African- American women from a socioeconomic high-risk area (n=217) and a closely matched comparison group of Medicaid-eligible clients (n=412)	* Chi square analyses of the frequency of successful and failed inter-conception periods (lengths) did not show statistically significant differences between the groups.
Salihu et al. (2011) ⁸ ; USA	Ecological study	<p>* ICC health education for young mothers through monthly home visits or monthly peer support group meetings addressing a range of topics to reduce repeat teen pregnancy</p> <p>* PCC services for teenagers (not further described here)</p>	Mothers <20 years for ICC N=3,155 between 1998-2007 (2000-2007 used for analyses of repeat pregnancies)	* Efforts to prevent repeat teenage pregnancy were not successful; it increased over time in both the target community as well as the comparison communities.

Table. Studies reporting impact of interconception care interventions (k =8) (*continued*)

Author (year); country	Study design	Intervention / focus	Participants description + N	Key findings / recommendations
de Smit et al. (2015) ⁹ ; The Netherlands	Controlled intervention study	* Intervention consisting of tailored provision of information (verbal and in writing) at the six month well-baby visit to promote the preconception use of folic acid supplements in mothers who expected to be pregnant again within 0–12 months	Mothers who visit a well-baby clinic for the 6-month and 11-month check-up of their child N = 198 (68%) intervention group N = 215 (84%) control group	* Folic acid use or usage intention was 65 % in the intervention group versus 42 % in the control group (95 % CI 4, 43 %, P <0.05). * Health education intervention at the 6-month well-baby visit is an effective means to promote the use of FA supplements or the intention to do so

References addendum

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8

Facilitators and barriers for successful implementation of interconception care in Preventive Child Health Care services in the Netherlands

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Maternal and Child Health Journal 2016

ABSTRACT

Objectives: Successful implementation of preconception and interconception care contributes to optimizing pregnancy outcomes. While interconception care to new mothers could potentially be provided by Preventive Child Health Care services, this care is currently not routinely available in the Netherlands. The purpose of this study was to identify facilitators and barriers for implementation of interconception care in Preventive Child Health Care services.

Methods: We organized four focus groups in which Preventive Child Health Care physicians and nurses, related health care professionals and policymakers participated. A semi-structured interview approach was used to guide the discussion. The transcribed discussions were analyzed.

Results: All four groups agreed that several facilitators are present, such as the unique position to reach women and the expertise in preventive health care. Identified barriers include unfamiliarity with interconception care among patients and health care providers, as well as lack of consensus about the concept of interconception care and how it should be organized. A broad educational campaign, local adaptation, and general agreement or a guideline for standard procedures were recognized as important for future implementation.

Conclusions: This study identifies potentially important facilitators and barriers for the implementation of interconception care in Preventive Child Health Care services or comparable pediatric settings. These factors should be considered and strategies developed to achieve successful implementation of interconception care.

INTRODUCTION

Interconception care, like preconception care, aims to improve pregnancy outcomes and thereby improve the health status of women and children. By offering care prior to pregnancy, the influence of potential risk factors for adverse pregnancy outcomes can be minimized. The advantages of providing this care before both first and subsequent pregnancies have already been demonstrated. There is growing evidence that preconceptionally delivered biomedical, psychosocial, and behavioral interventions are effective ¹⁻³. Furthermore, recent studies have shown a high prevalence of risk factors in the preconception and interconception period both in the Netherlands ⁴, as well as in the U.S. ⁵. Despite consensus on the importance of preconception and interconception care, this care is still rarely delivered. Clear strategies to deliver this care are needed to guarantee potential health benefits ^{6,7}.

Recommendations for delivering interventions prior to pregnancy comprise a wide range of possibilities, including opportunistic utilization of health care visits ⁸. This possibility is especially relevant to interconception care. Interconception care covers the period between pregnancies and is particularly valuable for women who have experienced an adverse pregnancy outcome ⁵. Most women who give birth receive some form of perinatal care, postpartum care, and pediatric care for their newborn child. These visits therefore provide a meaningful gateway to interconception care, but they are generally not optimally utilized ^{5,9}.

In the Netherlands, interconception care is still uncommon as well. The opportunity to integrate interconception care in regular visits to either maternal or child care services deserves more attention. In maternal care provided by gynecologists, midwives, and family doctors, interconception care is currently applied on a small scale. However, the fact that there is no system of regular (e.g. annual) visits to these health care providers complicates the ability to reach women after the initial postpartum period. Alternatively, Preventive Child Health Care (PCHC) services offer the possibility to reach women who accompany their child to frequent well-child visits.

The Dutch PCHC services have some distinct features ¹⁰⁻¹². PCHC is organized nationally while delivered and financed on the municipal level. PCHC is provided by teams consisting of special trained PCHC physicians, nurses and physician assistants rather than pediatricians or family doctors. The latter two are only consulted in case of specific concerns. PCHC is offered for free to all families with children from birth through 19 years. It follows a standard set of visits based on the child's age to monitor and promote optimal growth and development of the child. The care for 0 to 4 year-olds is organized in well-baby clinics with regular visits for vaccinations, screening and advice. These services have high (>95%) attendance rates.

The frequent encounters with nearly all children and their parents in comparison with other health disciplines, make the PCHC services a valuable additional opportunity to embed interconception care in the Netherlands. This potential role for PCHC services in delivering interconception care has been recognized in a Dutch governmental advisory report on preconception care ¹³. In addition, two recent studies acknowledged this opportunity and aimed at reaching women for advice on interconception care in well-baby clinics ^{14, 15}. Nevertheless, interconception care has not become standard care within PCHC services. Further exploration of the possibility of delivering interconception care through PCHC services is required.

Introducing interconception care in PCHC can be regarded as an innovative process which, within health care organizations, can be complex. In order for the innovation to be successful, it is essential to identify and consider important factors that facilitate or impede the proposed change ¹⁶. Several reasons for poor delivery and uptake of interconception care have been described previously ^{5, 17, 18}. However, no analysis has been carried out of factors that could influence the introduction of interconception care in well child care in the Netherlands.

Using qualitative, focus group research methodology, we sought to learn more about the barriers and facilitators to integrating interconception care for mothers into PCHC services for children between 0 to 4 years of age.

METHODS

To learn more about integrating interconception care into well child visits, we used a qualitative approach based on focus group discussions with professionals ¹⁹. We structured the study around a framework for determinants of innovation processes developed by Fleuren, Wiefferink, Paulussen ¹⁶. This framework distinguishes four categories of determinants that can influence the four main stages of an innovation process: dissemination, adoption, implementation and continuation. These categories are 1) characteristics of the innovation, 2) characteristics of the professional, 3) characteristics of the organization, and 4) characteristics of the socio-political context. The categories are based on the identification of originally 50 potentially relevant determinants of innovation processes within health care organizations. We expected to find similar determinants in our study.

Study population

We identified four subgroups of professionals potentially involved in interconception care: 1) PCHC physicians, 2) PCHC nurses, 3) Health care professionals other than PCHC professionals who could provide interconception care (e.g. midwives, gynecologists, pediatricians, family doctors and occupational physicians), and 4) policymakers from local and national institutions

concerned with interconception care or PCHC. For these subgroups we organized separate focus groups to minimize restraint in expressing opinions. We aimed to recruit 6 to 10 participants from different organizations, and with diverse experience with regards to interconception care for each group. We used different strategies to invite health care professionals to participate, including general invitations to organizations and personal invitations through contacts from a previous project¹⁵.

Data collection

The four 3-hour long meetings were held at a conference center in April 2015. Two researchers took turns guiding the discussions. Both researchers were present during all four meetings, as well as a third researcher conducting non-participant observation. The researchers took notes, and the sessions were also all recorded. The meeting started with a short introduction explaining the aim and assuring confidentiality. The discussion was set up as a semi-structured interview and was prompted with several statements that were sent to the participants in advance. These statements were chosen according to the determinants of the framework, i.e. statements regarding interconception care itself, interconception care for PCHC organizations and professionals, as well as the relationship with the socio-political context (see online supplementary file). We chose not to give a firm definition of interconception care in advance, in order to stimulate the discussion on facilitators and barriers.

Data analysis

The focus group discussions were transcribed and sent to the participants to check for correctness unless a participant specifically requested not to be involved in this verification process. Names of participants were omitted from the transcripts. Instead, participant numbers were used to link participants with their statements. NVivo10 software (QSR International) was used to analyze the transcripts. A set of preliminary codes was developed from the notes and transcripts. This list was discussed between the researchers and adjusted during further analysis. The codes were structured to the concepts of determinants as described in the framework that was used. All themes were also coded to differentiate between facilitators and barriers. Coding was primarily performed by one researcher and verified by the other.

Ethical Statement

The qualitative study was reviewed by the Daily Board of the Medical Ethics Committee Erasmus MC as part of a larger study on implementation of interconception care in the Netherlands (MEC-2015-182). As a result of this review, the Board declared that the rules laid down in the Medical Research Involving Human Subjects Act (also known by its Dutch abbreviation WMO) do not apply to the study. No additional approval was requested for the current study since it is not based upon a clinical study or patient data.

RESULTS

Study population

A total of thirty-three participants took part in the focus groups. The characteristics of these participants are presented in Table 1. The participants came from different regions of the country and represented 24 different organizations. In order to gather diverse groups for the discussions, we started with a wide approach of inviting participants (N=82). We approached several people from the same organization as we aimed to have at least one participant from that organization. Nineteen invitations received no response. Twenty-six people replied that they were unable to find space in their calendar, but they often tried to arrange a substitute instead. Four people were not interested.

Table 1. Characteristics of the participants

Characteristics	Group 1 n=6	Group 2 n=10	Group 3 n=8	Group 4 n=9
Profession	PCHC physician	PCHC nurse	Policymaker*	Health care professional other than PCHC**
Age (median, range)	41, 32-58	50, 38-59	53, 31-62	49, 31-61
Experience with preconception care/interconception care***				
Yes, as health care professional	1	2	0	8
Yes, as policymaker	0	0	5	1
Yes, as researcher	1	0	1	1
No experience	4	8	3	1
Organizations represented	5	6	8	9

* Policymakers were representatives of the professional organizations of midwives and PCHC physicians, the center of expertise for PCHC, a health insurance company, Municipal Health Services (2), the Commission for Perinatal Health, and management bodies of PCHC organizations. This included participants with a background as a midwife, PCHC physician, PCHC nurse and preconception care researcher.

** Family doctors (3), Midwives (2), Gynecologist (1), Pediatricians (2) and Occupational Physicians (1)

*** Numbers can add up to more than the total number of participants due to experience in different fields.

Facilitators and barriers for the implementation of interconception care

We identified a wide range of facilitators and barriers as described in Table 2. Topics that were mentioned in at least two groups were included.

Characteristics of interconception care

In all the discussions, unfamiliarity with the concept of interconception care was brought forward as an important impeding issue for both parents and health care professionals. Participants thought that a widespread approach was required to inform people of interconception care repeatedly and not just on one occasion. They mentioned using the following opportunities: community gatherings, the internet, popular television shows, and integration in existing

health care and education programs. It was argued that interconception care has to become 'normal' to both health care providers and the general population. Accordingly, interconception care should be provided systematically to everyone instead of exclusively to high risk groups. Another barrier was a lack of consensus on aspects of interconception care such as the terminology, the definition, the content, the implementation and the target audience.

Table 2. Facilitators and barriers for implementation of interconception care in PCHC services

<i>Categories of determinants</i>	<i>Facilitators</i>	<i>Barriers</i>
<i>Characteristics of interconception care</i>		
Appreciation of concept	<ul style="list-style-type: none"> • Repetition of message via opportunities with target audience and various media • Systematic general approach 	<ul style="list-style-type: none"> • Unfamiliarity with concept • Lack of consensus on meaning and use of the concept
Applicability	<ul style="list-style-type: none"> • Tools, guidelines for care • Option to offer care (1,2) • Clear evident general advice • Receptive period (1,4) • Personal approach 	<ul style="list-style-type: none"> • Different backgrounds and needs • Complex individual care • Sensitive topic (1,2,4)
<i>Characteristics of the (PCHC) professional</i>		
Competence and self efficacy	<ul style="list-style-type: none"> • Training/ education • Link task to current expertise • Familiarity with families (2,4) 	<ul style="list-style-type: none"> • New knowledge required • Uncertainty about self-efficacy (2,4)
Attitude and expectations	<ul style="list-style-type: none"> • Benefits for child in care, parents and future child (1,2,4) 	<ul style="list-style-type: none"> • Concern about response and cooperation (2,4) • Concern about feasibility
<i>Characteristics of the (PCHC) organization</i>		
Organizational structure	<ul style="list-style-type: none"> • Overall support in organization (2,3,4) 	<ul style="list-style-type: none"> • Complex decision making process (2,3,4) • Organizational differences
Organizational expertise	<ul style="list-style-type: none"> • Accessible care with high coverage of target population • Preventive care (including pre-natal) 	<ul style="list-style-type: none"> • Focus on child care (separated from maternal care) (3,4)
Reimbursement	<ul style="list-style-type: none"> • Providing insight in advantages 	<ul style="list-style-type: none"> • Costs of time and staff investment
Logistical procedures	<ul style="list-style-type: none"> • Local solutions for unavailable standard procedures (2,3,4) 	<ul style="list-style-type: none"> • Lack of suitable administration, planning and referral system (2,3,4)
<i>Characteristics of the context</i>		
Regulations and legislation	<ul style="list-style-type: none"> • National guideline for PCHC • Exploring health insurance options • Assuring continuation 	<ul style="list-style-type: none"> • Dependency on local priorities • Overlap of different health care and reimbursement systems
Societal relevance	<ul style="list-style-type: none"> • Awareness of perinatal health • Attention for preventive measures 	<ul style="list-style-type: none"> • Changes in organization of child care
Collaboration between professions	<ul style="list-style-type: none"> • Good cooperation and agreements on responsibilities 	<ul style="list-style-type: none"> • Lack of arrangements or structural contact (1,3,4)

The presented facilitators or barriers were identified in all four focus groups unless otherwise stated by numbering the relevant focus groups behind the specific facilitator or barrier.

Evidence-based guidelines for the provision of interconception care would enhance the ability of PCHC providers to offer services to new mothers. Participants suggested that mothers who are considering having another child are receptive to information that would improve the well-being of their future baby. To obtain high compliance, the use of incentives and a reminder system for appointments was suggested. A personal approach was thought to be important. The complexity of applying interconception care was stressed as well. Providers must deal with factors such as different individual backgrounds, medical needs and social needs, as well as challenging aspects of the content (e.g. behavioral change and discussing a desire to become pregnant). However, others pointed out that this complements PCHC professionals' expertise.

Characteristics of the Preventive Child Health Care professional

Current expertise of PCHC professionals is in part closely linked to aspects of interconception care. These skills include giving preventive advice, motivational interviewing and dealing with sensitive topics (e.g. social needs). There are also limitations to the competence of PCHC professionals with respect to interconception care since their professional focus is preventive health care for children and not for women. Even with extra training, doubt was expressed by both PCHC staff as well as other professionals about dealing with the mother's medical care, such as chronic disease and obstetric complications. On the other hand, PCHC professionals are often familiar with individual family backgrounds and needs because of regular child visits. This relationship is an advantage, but concerns about harming this relationship might impede the fulfillment of interconception care. Concerns included fear of stigmatizing and creating a sense of guilt and not being able to respect personal choices. At the same time, all the professionals acknowledged the health benefits of applying interconception care.

Characteristics of the Preventive Child Health Care organization

The participants recognized that an innovation like interconception care within PCHC organizations can be challenging because of a multiple tier system, which consists of an internal management structure closely tied to local and national government structures. In addition, PCHC health care professionals also clearly wanted to be involved in the introduction of any innovation. A uniform national implementation strategy would be complex since PCHC organizations differ in terms of size, personnel management, organization of care and specific focus areas. Regardless, the following common factors between these organizations were mentioned as facilitators for interconception care: 1) the regular and accessible form of care which covers and reaches almost the whole population with young children; and 2) the preventive aspect of this care for optimal child development, which often includes a form of prenatal education.

Given that maternal care is not part of PCHC expertise there are logistical and financial challenges, according to the participants. The participants also mentioned facilitating factors: 1) a current shift in care from the child only, towards the child including his/her context, the family;

2) the interpretation of interconception care as care for a future child, which fits in with the preventive health care task for children; 3) integration of interconception care in current appointments; and 4) local solutions to logistical challenges if possible. In some places such solutions already exist regarding the availability of a client medical record for an unborn child. With respect to the financial challenges, it was stressed that sufficient resources for interconception care are essential. Promoting the advantages and necessity of interconception care could help to acquire these resources.

Characteristics of the context

Arranging a sustainable financial compensatory system has several challenges but was considered to be important. A uniform national policy would be helpful to allow for reimbursement by local municipalities. Currently, PCHC organizations have to negotiate for reimbursement of extra care that is not covered by the national policy and are then dependent on local priorities regarding health care expenses. Several participants saw coverage by health insurance companies as an option, but this form of reimbursement is still uncommon for PCHC. Reorganization of child care within municipalities was seen as a potential opportunity for innovations in PCHC, but mainly judged as a potential limitation because of the uncertainty it implicates. Other facilitating factors mentioned include current societal attention for improvement of perinatal health and general preventive measures such as a healthy diet and lifestyle. Lastly, improvement of cooperation between health care providers was brought forward as a determinant for interconception care. Aspects such as regular contact, and clear agreements between different health care providers on responsibilities for interconception care were seen as valuable.

Interpretation of the concept of interconception care

Several common interpretations of the content and implementation of interconception care were identified. Regarding the content, most aspects of preconception care were mentioned for interconception care with additional attention to contraceptive counselling. With respect to the target audience, most participants argued for a broad general approach including mothers and their partners. Opinions on the timing of interconception care differed. Some participants thought interconception care could start at the first postpartum visit, but others thought people may not be receptive at this stage and suggested six months. A year postpartum was argued to be too late. Repeatedly giving information and following up on this in a flexible manner, accounting for individual parental needs, was considered a good approach.

All the health care providers acknowledged their responsibility for interconception care to some extent. Some of the policymakers debated the responsibilities of PCHC services regarding this form of preventive care.

DISCUSSION

Main findings

During the focus groups, many aspects were discussed regarding implementing interconception care for women in PCHC services for 0 to 4 year-olds in the Netherlands. All four groups appreciated the benefits of implementing interconception care in Dutch PCHC services, utilizing their unique position, which brings them into contact with almost all young children and their mothers, as well as their expertise in preventive health care. Participants also suggested informing the general public about interconception care, training professionals, and creating local as well as (inter)national agreement on how to organize and reimburse interconception care. The responsibility of many related professionals and public health or governmental bodies was considered of great importance in facilitating the implementation of interconception care.

Comparison to the literature

Our results reflect opportunities and barriers mentioned in the literature on preconception and interconception care. Concerns about the complexity of delivering interconception care are seen in studies in the U.S. such as described by Handler, Rankin, Peacock, Townsell, McGlynn, Issel¹⁸. Their study of two community high risk interconception care programs demonstrated that interconception care is 'a complex process of matching interventions and services to meet women's unique needs, including their socioeconomic needs'. They also described the importance of educating both women and health care providers about the benefits of this care. Hogan, Amamoo, Anderson, Webb, Mathews, Rowley, Culhane¹⁷ found that even when common barriers were actively removed, such as provision of transportation, childcare and free service, no consistent participation could be obtained for their interconception intervention aimed at vulnerable women. On the other hand, although it did not meet their aims, they did reach an average overall participation rate of 52% with their approach. Their analysis did not yield clear influencing factors. Velott, Baker, Hillemeier, Weisman²⁰ described the advantages of combining active and passive recruitment techniques, including partnering with local community organizations for the recruitment of hard-to-reach women. These studies all targeted high risk communities. In our discussions, a general standard care approach including low risk groups was preferred. To utilize every office visit as a potential educational opportunity for interconception counseling and discussing a personal reproductive life plan has been advocated before with "every woman every time"⁹. Although ideally a full package of health and social interventions would be delivered to all women and couples of reproductive age everywhere, interventions often need to be tailored to local realities as argued by Mason, Chandra-Mouli, Baltag, Christiansen, Lassi, Bhutta²¹ for low and middle income countries (LMIC). The challenge of organizing this preventive care for it to be fully realized is not confined to LMIC. To let preconception and interconception care become part of routine care, the need for policies, a reimbursement system and the empowerment of staff is clear^{1, 7, 22}. We structured the analysis

according to an existing framework which originally listed 50 potentially relevant determinants of innovation processes in four identified categories¹⁶. Later work, based on a combination of expert consultations and empirical studies in schools, PCHC and health promotion programs, modified the list to 29 determinants²³. We identified many determinants consistent with this list (e.g. content awareness, procedural clarity, expectations, relevance, social support, and aspects related to competence, regulation, the client, and the organization). However, determinants such as replacement of staff, a coordinator, and information on use of the innovation did not appear in our analysis. An explanation could be that these determinants are more essential in a stage when the innovation is already in use; the stage of continuation. Similarly in our study, assuring continuation of interconception care instead of limited project based implementation was recognized as an important facilitating determinant.

Strengths and limitations

The interaction within the focus groups helped to gain a comprehensive overview of determinants from different perspectives. When interpreting these results, certain limitations should be taken into account such as the relatively small sample size and the influence of potential bias. Although the sample size per group was small, we did obtain our stated aims for each group: a minimum of six participants, a mixture of different levels of experience with interconception care, and representation of the targeted disciplines, various organizations and regions. Therefore, we believe that the sample of professionals was a good reflection of the range of potential stakeholders. Bias may have resulted from a sample of participants who were interested in interconception care, as well as moderators who had prior interest in the research topic. In addition to these limitations, this study was primarily based on professionals' expectations, rather than actual experiences. If interconception care were to be implemented in PCHC, this could be a focus of future research. Future research could also include client perspectives.

Practical implications

This study applies specifically to PCHC services in the Netherlands, but the results could also be valuable to other health care settings that may play a role in interconception care. The opportunity to implement some form of interconception care for women in PCHC services was recognized by most participants. However, they also had clear reservations about what form and to what extent interconception in PCHC services could be offered. This justifies further evaluation of different possibilities for actual implementation in the Netherlands. We recommend targeting the identified facilitators and barriers within implementation strategies to achieve successful integration of interconception care in PCHC services, and seizing this opportunity to integrate health promotion for women and children in routine postpartum care.

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Integrating interconception care in Preventive Child Health Care services: the Healthy Pregnancy 4 All Program

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PLoS ONE 2019

ABSTRACT

Background: Most parents with young children pay routine visits to Well-Baby Clinics, or so-called Preventive Child Health Care (PCHC) services. This offers a unique opportunity to promote and deliver interconception care. This study aimed to integrate such care and perform an implementation evaluation.

Methods: In seven Dutch municipalities, PCHC professionals were instructed to discuss the possibility of an interconception care consultation during each routine six-months well-baby visit. The primary outcome of this study was coverage of the intervention, quantified as the proportion of visits during which women were informed about interconception care. Secondary outcomes included adoption, fidelity, feasibility, appropriateness, acceptability and effectiveness of the intervention, studied by surveying PCHC professionals and women considering becoming pregnant.

Results: The possibility of interconception care was discussed during 29% (n=1,849) of all visits, and 60% of the PCHC physicians adopted the promotion of interconception care by regularly informing women. About half of the PCHC professionals and most women judged integration of interconception care in PCHC appropriate and acceptable. Estimated feasibility was poor, since 13% of the professionals judged future integration in daily practice as probable. The uptake of interconception care consultations was low (n=4 consultations).

Conclusions: Promotion of interconception care was achieved in approximately one-third of the routine PCHC consultations and appeared promising with regards to adoption, appropriateness and acceptability. However, concerns on feasibility and uptake of interconception care consultations in daily practice remain. Suggestions for improvement may include further integration of interconception care health promotion in routine PCHC consultations, while allocating sufficient resources.

INTRODUCTION

Well-Baby Clinics, otherwise known as Preventive Child Health Care (PCHC, box 1) services, provide unique access to women between pregnancies. Most women with young children go to routinely scheduled PCHC appointments, which offers an opportunity for interconception care (ICC). ICC is a form of preconception care (PCC) between pregnancies, aiming to optimize parental health prior to pregnancy.¹ Currently, antenatal care usually starts too late to prevent that risk factors for adverse pregnancy outcomes affect the periconception period.^{2, 3} Many periconception risk factors are associated with the course of pregnancy and with child health outcomes,⁴⁻⁶ including behavioral, medical, and psychosocial risks.⁷ These risk factors are frequent among women who may become pregnant, and certain groups of women in particular, need extra attention in preventive preconception strategies.^{8, 9} For instance, large socio-economic inequalities exist in prevalence of risk factors such as smoking and inadequate folic acid intake.^{8, 10-12} In addition, some studies suggest that these specific risk factors are also more prevalent in parous women.^{13, 14} Besides, parous women may exhibit risks for recurrence of adverse pregnancy outcomes, such as preterm birth and fetal growth restriction. ICC could address all these risks, but delivery and uptake of both PCC and ICC remain uncommon.^{15, 16}

The idea that PCHC providers could contribute to the provision of ICC has been previously recognized in an advisory report on preconception care drafted by the Health Council of the Netherlands.¹⁷ Until recently, a few promising ICC intervention studies focusing on folic acid supplementation were conducted in both Dutch and international PCHC settings.^{18, 19} But to our knowledge, strategies to integrate more comprehensive ICC in PCHC are uncommon. We hypothesized that PCHC providers could promote and deliver comprehensive ICC consultations to increase the uptake of ICC and to improve preconceptional health. To understand how ICC could work in the real time practice of PCHC, implementation research is essential.²⁰ This study aimed to implement and evaluate promotion and delivery of ICC in PCHC centers in the Netherlands.

METHODS

Setting

The study was embedded in the HP4All-2 program.²¹ The HP4All programs aim to improve maternal and perinatal health by enhancing risk-guided care from the preconception period through to the interconception period.^{21, 22} In the preceding HP4All-1 program, recruitment for and delivery of PCC at general practitioners (GPs) and midwifery practices was employed, which included some PCHC services distributing information leaflets about PCC.^{23, 24} The HP4All-2 program focused specifically on ICC. Both programs intended to reduce perinatal health inequali-

ties by focusing on municipalities with higher rates of adverse pregnancy outcomes than the national average.^{21, 22} The current study was conducted in seven municipalities where, together with local government representatives, cooperation was sought with the PCHC services (box 1).²¹

The organization of Preventive Child Health Care (PCHC) in the Netherlands has some distinct characteristics.²⁵⁻²⁷ It is organized nationally, but formalized on the municipal level. PCHC teams, consisting of trained physicians and nurses, monitor and promote optimal growth and development of the child by providing immunizations, screenings and health advice. If needed, they refer directly to general practitioners or pediatricians. PCHC is offered free of charge to all children from birth until the age of nineteen years. The care for children up to the age of four years is organized along a standard set of consultations in local well-baby clinics, which have high (>95%) attendance rates.¹⁸

Box 1: Preventive Child Health Care in the Netherlands

Intervention

The ICC intervention consisted of two-parts (Fig 1), of which the first part was applied in one manner to all seven municipalities, while the second part could differ per municipality. In the first part of the intervention, we integrated promotion of ICC in routine well-baby consultations at the child’s age of six months, referred to as the ‘six-months consultation’. Promotion consisted of the PCHC physicians screening the mother for her intention to become pregnant in the future, while discussing the possibility of a separate ICC consultation. In addition, when women considered becoming pregnant, they were screened for the following reasons to direct these women to an ICC consultation at short notice: 1) currently trying to become pregnant, and 2) an obstetrical history of an adverse perinatal outcome (e.g. preterm birth). Following the promotion of ICC, women could themselves make an appointment for an ICC consultation. For the delivery of these ICC consultations, constituting the second part of the intervention, two different approaches were implemented (Fig 1): in three out of seven participating municipalities PCHC professionals provided ICC consultations themselves; in the other four municipalities PCHC teams referred to a GP or community midwife for an ICC consultation.

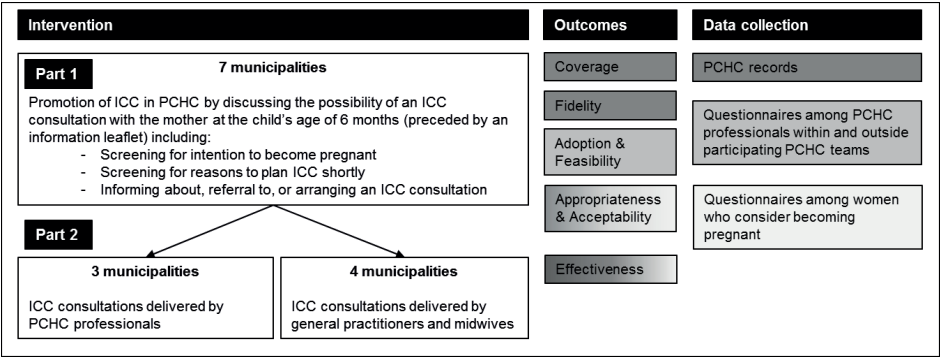


Fig 1. Outline of the study

Implementation strategy

In preparation of the implementation of the intervention, an analysis of its possible determinants was performed based on focus group discussions with various stakeholders (i.e. PCHC physicians, PCHC nurses, pediatricians, gynecologists, midwives, GPs, and policymakers).²⁸ An important expected barrier was the anticipated unfamiliarity with ICC among PCHC professionals and the target group of women who consider becoming pregnant again.²⁸ Therefore, prior to the delivery of our intervention, we provided several educational sessions and supporting materials. The educational sessions, offered to PCHC teams in all municipalities, consisted of a theoretical background lecture on the importance of ICC, and an interactive session with skills training in discussing ICC and pregnancy intention. In a separate session, the logistics of the study were explained. Supporting materials included information on ICC for the healthcare professionals, as well as information leaflets for women about ICC and what they could expect at the routine six-months consultation. In addition to the provided materials by our research team, one municipality developed a short promotional video, of which the link was sent to women who indicated to consider becoming pregnant. Lastly, during the project, one or two evaluation sessions were planned per PCHC team.

Participants

The main targets of the intervention were PCHC professionals and women who may become pregnant again. We have studied the integration of ICC in PCHC in both professionals and women.

The integration of ICC among PCHC professionals was studied in two subgroups. The first subgroup consisted of all PCHC physicians and nurses from the teams that were involved in the intervention; and the second consisted of a corresponding number of PCHC physicians and nurses from teams that were not involved in the HP4All programs, serving as a reference group.

All women who visited PCHC teams involved in the HP4All-2 program for the six-months consultation were eligible for the intervention. Additionally, in the first four municipalities that started the intervention (i.e. two of each ICC delivery approach; Fig 1), women who considered becoming pregnant were invited to participate in a questionnaire study if they met the inclusion criteria (i.e. age >18 years and sufficient understanding of the Dutch or English language).

Outcomes

An overview of all outcome measures is presented in S1 Table. The primary outcome of the study was *coverage* of the intervention, defined as the percentage of regular PCHC six-months consultations in which the possibility of an ICC consultation was discussed.²⁰ Secondary outcomes included the following other implementation outcomes: *Fidelity*, that is, adherence to screening for future pregnancy intention and specific reasons for short-term ICC, as well as

what action was taken per six-months consultation in which ICC was discussed); *Adoption*, defined as the uptake of discussing ICC measured among PCHC professionals; *Feasibility*, referred to as the expected possibility of ICC integration in PCHC among professionals; *Appropriateness*, being the desirability of ICC in PCHC among professionals and women; and *Acceptability*, that is, the agreeability on aspects of ICC in PCHC among professionals and women.^{20, 29} Lastly, the *effectiveness* of the intervention was studied as the uptake (i.e. the number) of separate ICC consultations.

Data collection

Data were collected at three levels (Fig 1): data from records kept at each PCHC well-baby clinic, questionnaires filled out by PCHC professionals and questionnaires filled out by participating women who considered becoming pregnant. From the different ways of data collection that were used, all items on the implementation outcomes are outlined in detail in S1 Table.

PCHC records were used to collect data on coverage: the total number of six-months consultations and whether during these consultations ICC was discussed. In addition, data about specific findings during this discussion (i.e. pregnancy intention and actions taken; referred to as fidelity) and certain background characteristics (i.e. age, ethnicity, parity, and 4-digit postal code to determine neighborhood deprivation 'yes'/'no' as previously defined³⁰) were collected if women gave consent. The uptake of ICC consultations was also registered through PCHC records. The data from PCHC records was either extracted from PCHC electronic records or took complementary place on paper (i.e. in case integration of data collection of ICC items was not possible in the electronic records). It was then anonymized and transferred into a Generic Medical Survey Tracking system called Gemstracker (<https://gemstracker.org/general-information>).

The questionnaire for PCHC professionals was similar for both subgroups of PCHC teams participating and not-participating in the intervention. It contained data on participation in ICC (i.e. adoption), determinants of implementation as developed in previous studies (i.e. feasibility, appropriateness, and acceptability),³¹ and background characteristics (e.g. age, work experience).

The professionals participating in the intervention were requested to respond to the digital questionnaire twice: once three months into the intervention and again at the end of the intervention period. At one single point of time during the program, non-participating PCHC teams from different municipalities were requested to respond to the digital questionnaire.

Participating women received two digital questionnaires. The first questionnaire, sent directly after inclusion, consisted of background characteristics (i.e. age, ethnicity, educational attain-

ment, number of children, income, civil status), medical and obstetrical history, and lifestyle behaviors. In addition, their opinion on two statements regarding appropriateness and acceptability of ICC was asked. In the second questionnaire, sent six months later, the uptake of ICC (i.e. effectiveness) was assessed.

The intervention and data collection started in alignment with preferences of each municipality. The first municipality started data collection in December 2015; the last municipality started in September 2016. The intervention lasted up to and including February 2017.

Data analyses

Descriptive statistics were performed to describe background characteristics of the municipal PCHC services, the PCHC professionals participating in the questionnaire study and the participating women. Frequencies and percentages were used to describe the implementation outcomes. In describing the coverage, we also showed minimum and maximum values over the different municipalities and presented the results per ICC delivery approach (i.e. PCHC or GPs and midwives; Fig 1). With respect to acceptability by PCHC professionals, we used a composite outcome based on the eight different questionnaire items (S1 Table) and determined both the median score and the percentage of professionals that based on the composite score agreed with the items (i.e. average ≥ 3.5 ; range 1-5). For the composite outcome we calculated the Cronbach's alpha to assess the internal consistency of items. Data analyses were performed with SPSS Statistics (version 21).

Ethics approval and consent to participate

The study was reviewed by the Daily Board of the Medical Ethics Committee Erasmus MC in the Netherlands (MEC-2015-182). As a result of this review, the Board declared that the rules laid down in the Medical Research Involving Human Subjects Act (also known by its Dutch abbreviation WMO) do not apply to the study. Written informed consent was obtained from the women who participated in the questionnaire study.

RESULTS

Organizational level

Organizational characteristics

The intervention period ranged from six to thirteen months per municipality. A total of 21 teams were trained at the beginning of the study and a total of 20 PCHC teams participated in the intervention throughout the study (Fig 2), ranging from one to ten per municipality. One trained PCHC-team did not start the intervention due to being understaffed because of sick

leave. The number of PCHC professionals involved was 112 and varied per municipality from 3 to 28. In total, 6,321 six-months consultations took place during the study period (ranging from 192 to 1,726 per municipality).

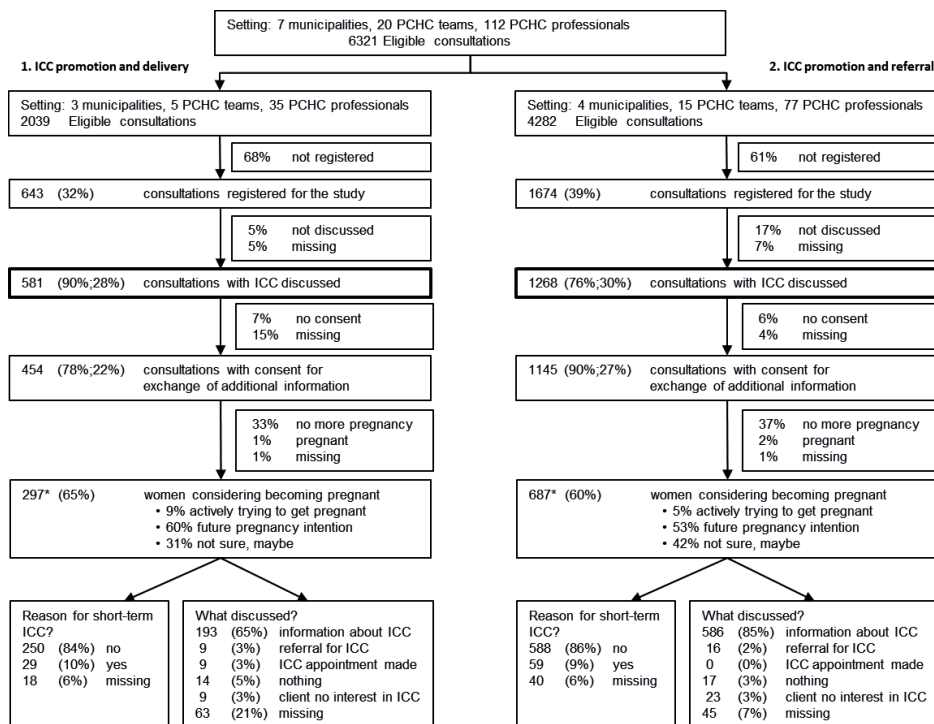


Fig 2. Overview of ICC implementation (coverage and fidelity) by ICC delivery approach

(% ; %): first % refers to the total number in de line above, the second % refers to the absolute total number of consultations.

*Total number of women considering a pregnancy is 984 (297+687).

Coverage, fidelity, and effectiveness

ICC was discussed in 1,849 consultations and as such the coverage of our intervention was 29% of the total amount of six-months consultations. The coverage did not differ per delivery approach (Fig 2), but did vary between 12% and 55% per municipality. Additional characteristics were available for 86% (n=1,599) of the women reached; 62% (n=984) of these women considered becoming pregnant again. Of these 984 women, the median age was 30 years (min-max: 16-43 years), 32% did not consider themselves of Dutch background, 19% lived in a deprived neighborhood, and 40% were multiparous.

In addition, PCHC professionals identified reasons for short-term ICC, which meant either already trying to get pregnant or having an obstetrical history of an adverse perinatal outcome, in 10% of these 984 women. Professionals' actions consisted of information provision about ICC in 80% of the 984 women. In only one municipality, professionals not only provided information,

but also proactively made nine separate ICC appointments for their clients, of which four ICC consultations actually took place.

PCHC professional level

Characteristics of the professionals

Of the total number of participating PCHC professionals (n=112), 70% (n=78) responded to the first questionnaire (Q1). At the time of the second questionnaire (Q2), 99 (88%) professionals were still working in the participating teams and 66% (n=65) of these professionals responded. Professionals from all seven municipalities were represented in the responses to both questionnaires. The questionnaire to non-participating teams was sent to 394 professionals, of which 116 (29%) responded. After excluding professionals who reported awareness of the HP4All program, 91 (78%) questionnaires were available.

Baseline characteristics of the PCHC professionals who responded to the questionnaires are presented in table 1. Relatively more PCHC nurses than physicians replied to the questionnaire in the non-participating teams (74%) than in the participating teams (54%).

Adoption, feasibility, appropriateness, and acceptability

The implementation outcomes based on the three questionnaires among PCHC professionals are presented in table 1. At the end of the study period (Q2), adoption of regularly informing clients about ICC was 46.9% overall. This was even higher among the 30 physicians (60.0%), who usually provide the six-months PCHC consultation. These physicians selected the following reasons for not discussing ICC most often: 'not enough time due to other tasks' (63.3%), 'difficult communication' (50%), and 'I forgot' (46.7%). With regards to possible suggested forms of ICC, the physicians agreed with the following forms of ICC most often: 'providing information materials' (83.3%), 'discussing referral for ICC at GPs or midwives' (67.7%), 'providing general advice during routine PCHC visits' (60.0%), and 'screening for risk factors and discussing these during routine visits' (46.7%). They agreed least often with 'Performing an actual ICC consultation' (23.3%).

Feasibility, appropriateness, and acceptability were similar in participating and non-participating PCHC teams (table 1). Feasibility was considerably lower than appropriateness and acceptability (table 1). In all groups, the majority was unsure about the feasibility (range 68.8-79.1%) and 3.9-11.0% expected integration of ICC in PHCH not to be feasible. The reported explanations for expected low feasibility were 'not enough resources' (i.e. time and financial compensation) and 'dependence on prioritizations of the PCHC organization and municipality', while 'sufficient training' was mentioned as a requirement. With regards to appropriateness, some professionals were unsure and mentioned that ICC 'does not fit in the current tasks of PCHC' and 'might

be more suitable for GPs and midwives', and that they 'expected little interest from the target group'. However, most explanations for appropriateness were along the lines that ICC in PCHC is 'relevant' (i.e. importance of prevention, reproductive planning, and reaching vulnerable groups) and 'suitable' within the preventive tasks and reach of PCHC. Regarding acceptability, very few professionals disagreed with the statement that 'it is important to contribute to ICC' (Q1: 1.3%, Q2: 1.7%, and non-participating teams: 7.8%).

Table 1. Characteristics and implementation outcomes of PCHC professionals in participating and non-participating teams

Characteristics and implementation outcomes of PCHC professionals	Participating team Q1 N = 78		Participating team Q2 N = 65		Non-participating team N = 91	
Age (years)	45.0	22 - 66	46.0	22- 66	44.0	21- 64
Profession						
physician	36	46.2%	30	46.2%	24	26.4%
nurse	42	53.8%	35	53.9%	67	73.6%
Work experience in current function (years)	9.0	1 – 37	10.0	1 – 35	9.0	0 – 35
Received training about ICC (yes)	62	79.5%	NA	NA	3	3.3%
How well-informed about ICC (well)	NA	NA	41	63.1%	4	4.4%
<i>Adoption</i> : Attention to promotion or delivery of ICC (quite some – a lot)	NA	NA	36	56.3%	14	15.4%
<i>Adoption</i> : Asking about intention to become pregnant (≥ 50% women)	31	41.3%	25	39.1%	7	7.7%
<i>Adoption</i> : Informing clients about ICC in case of known future pregnancy intention (≥ 50% women)	30	39.5%	30	46.9%	3	3.3%
<i>Feasibility</i> : ICC in PCHC probable (yes)*	21	27.3%	8	12.5%	11	12.1%
<i>Appropriateness</i> : ICC in PCHC desirable (yes)*	35	44.9%	30	46.9%	41	45.1%
<i>Acceptability</i> : Important to contribute to ICC (agree)**	48	61.5%	31	53.4% ¹	48	53.3%
<i>Acceptability</i> : Composite statement outcome (agree)**	31	39.7%	21	36.2% ¹	33	36.7%
<i>Acceptability</i> : Composite statement outcome (median) ***	3.38	2.5-5.0	3.31	2.4-4.8 ¹	3.25	2.0-4.4

Median, min – max or numbers and percentages of non-missing cases. Missing value <5% unless otherwise stated.

NA: Not available.

* Instead of 'maybe' or 'no'.

** Instead of neutral ' or 'disagree'

*** Possible scores ranged from 1-5.

¹ Missings > 5% (10.8%)

Level of participating women

Characteristics of the participants

Of the 984 women who considered a future pregnancy (Fig 2*), 793 women were eligible to participate in our study (Fig 3). In total, 385 women (49%) consented to participate in the

study, of whom 170 (44%) responded to the first questionnaire and 149 (37%) responded to the second questionnaire. Baseline characteristics of the participants are displayed in S2 Table. It shows the prevalence of potential interconceptional risk factors for adverse pregnancy outcomes, such as a complicated obstetric history (23.7%) and no preconceptional folic acid supplementation before a previous pregnancy (31.1%).

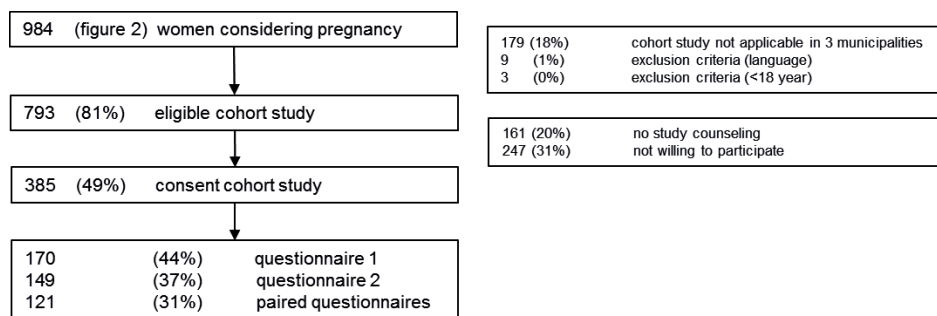


Fig 3. Flowchart of participants (women) in the study

Appropriateness, acceptability, and effectiveness

In questionnaire 1, with regards to appropriateness, most women ($n=129$, 94.2% of available responses) agreed to the statement “I should receive information about ICC via well-baby clinics”. With respect to acceptability, the majority ($n=93$, 66.4%) also agreed to the statement: “I find it acceptable that I was asked whether I consider becoming pregnant again”, whereas 4.2% disagreed and 29.3% was neutral.

In the second (follow-up) questionnaire, only one woman reported to have had an ICC consultation (effectiveness). To the question whether women considered making use of an ICC consultation in the future, two women (1.4%) replied “Yes”, 55 women (38.7%) “Maybe”, and 85 women (59.9%) “No”. When participants were asked about their reasons for not planning an ICC consultation, the following reasons were reported ($n=70$): 55.7% “was not convinced about the benefit”; 31.4% “did not know what it would entail”; 8.6% “was unable to go to an appointment”; and in 4.3% the “partner did not consider it to be necessary”.

DISCUSSION

Principal findings

This study has shown that it seems possible to promote ICC in PCHC, but at the same time it has illustrated that delivery of actual ICC in daily practice is challenging. After introducing the intervention, PCHC physicians discussed the possibility of an ICC consultation with mothers in about a third of the routine PCHC visits at the child’s age of six months. Promising is that the

majority of PCHC physicians adopted the promotion of ICC and that many professionals judged integrating ICC in PCHC as appropriate and acceptable. However, even in the best performing municipality coverage did not exceed 55%, showing room for improvement. Possibly, either the urgency of promoting ICC was not conveyed enough or feasibility concerns related to lack of time could not be solved. This shows, together with low uptake of ICC among women, the challenge of delivering ICC. Although women were positive with regards to being informed about ICC, they could not be convinced to make an appointment for an ICC consultation.

Comparison to literature

The field of implementation research is increasingly acknowledged in its attempt to optimize the translation of evidence-based insights into practice.^{20, 32} Implementation research may provide valuable insights with regards to PCC and ICC, since daily practice is still uncommon. One study based on implementation outcomes has recently suggested that the possibility of integrating a simple general preventive screening intervention for healthy lifestyles in primary care is promising.³³ This study showed higher overall coverage (52%) and adoption rates (75%) than our study.³³ More specifically for PCC and ICC, a few studies have already shown that acceptability of pregnancy intention screening in primary care is high.^{34, 35} As such, screening pregnancy intention in primary care has been advocated as a strategy to promote both preconception care as well as contraceptive care for women.³⁶

However, with regards to the effectiveness of such screening on uptake of care, little remains known.³⁴

In our study, uptake of ICC was low as only few women had an appointment for an ICC consultation. Appointments only occurred in one municipality where the PCHC professionals pro-actively arranged it. Women themselves did not seem to make ICC appointments and they reported a low need and unfamiliarity with ICC as barriers for making an appointment. These barriers for uptake of ICC have been recognized as important barriers before.³⁷ Even though the aim of our intervention was to overcome these barriers by promotion of ICC by PCHC professionals, it appeared not to be enough to substantially improve the uptake of ICC.

Possibly, ICC could become more common by further integration of general ICC health promotion within routine care provided by PCHC teams. It would diminish the currently found barrier among women of organizing a separate appointment and could also reduce the barriers among professionals when this routine care would be sufficiently compensated. At the same time, the acceptability among both groups seemed to be good with regards to integration of ICC topics in routine care. While a separate ICC consultation with other professionals such as GPs, midwives, or gynecologists could still be an opportunity in case of detected higher risk for adverse pregnancy outcomes, awareness of certain ICC topics among professionals and

women would at least be secured. For instance, other studies focusing on the promotion of folic acid supplementation in routine PCHC practice have shown promising results with regards to increased use and intention.^{18, 19} Other encouraging, recently reported, ICC related practices that were aimed at mothers during well-child visits, include screening and addressing tobacco use, depression risk and contraception use.^{38, 39} As such, standardization of certain ICC items in PCHC could make it accessible for all women while warranting sufficient management support and resources, which could improve feasibility.

Strengths and limitations

Strengths of this study are introducing the ICC intervention in the real-time practice of PCHC, including training of professionals, and evaluating this intervention in a comprehensive way. We included data from different sources, representing different stakeholders, which contributed to such comprehensive evaluation, as has been suggested for implementation research.^{20, 29, 32} Our study also has some limitations. Firstly, the implementation outcomes costs and sustainability were not included in our study. Secondly, we only measured limited effectiveness of our intervention on uptake of ICC and we could not measure the effectiveness on health outcomes. Thirdly, a selection bias may have occurred in participating professionals and women with regards to their opinion on ICC, since participation rates in some of the questionnaires were rather low. Also, registration in the PCHC records seemed often only performed in case ICC was discussed and hence certain study outcomes were only available in 37% of the total six-months consultations. Lastly, municipal differences in for instance management involvement, time constraints, staffing issues, and other context factors such as restructuring PCHC, likely influenced differences between municipalities, but separate analyses on these factors were outside the scope of this study.

CONCLUSION

Only promoting ICC in routine PCHC visits, which was achieved in 29%, is likely not enough to reach women with ICC. Suggestions for improvement include further integration of ICC health promotion in routine PCHC consultations, while allocating sufficient resources (e.g. time, financial compensation and training) to increase feasibility. These possibilities are worthwhile to further investigate, given the unique opportunity of PCHC services to access women of reproductive age with preventive ICC.

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ADDENDUM

1. Outline of implementation outcomes as derived from the questionnaires

Outcomes	Data collection / source	Items	Response categories	Scoring / reporting
Coverage	PCHC records	Was the possibility of ICC discussed?	Yes – no – unknown/missing	% yes
Fidelity	PCHC records	Screening for intention to become pregnant?	Actively trying to become pregnant – future pregnancy intention – not sure yet, maybe – currently pregnant – no more pregnancy intention – unknown/missing	% response to answer categories
Adoption	PCHC provider questionnaires (2/3) ^a	In case of possible pregnancy intention; reasons for short-term ICC (e.g. actively trying to become pregnant or obstetrical history of adverse pregnancy outcome)	Yes – no – unknown/missing	% response to answer categories
		In case of possible pregnancy intention, what action was taken during the six-month consultation?	Just information provision about ICC – referral for ICC – ICC appointment made – nothing – client had no interest – unknown/missing	% response to answer categories
		How much attention do you pay to providing ICC?	very little - little - not little / not much - much - very much	not little / not much - much - very much
		With how many women do you discuss whether she intends/considers to become pregnant again?	none - a minority - half - a majority - everyone	≥ 50% women
Feasibility	PCHC provider questionnaires (1/3) ^b	With how many women do you discuss the possibility of an ICC consultation?	none - a minority - half - a majority - everyone	≥ 50% women
		In case you are not able to discuss ICC, what was the main reason?	Lack of time due to my other tasks Lack of time due to late arrival of the client I experience not enough expertise I do not consider it my task It feels not right due to circumstances of the client The client does not want to discuss it Difficult communication (e.g. language barrier) I forgot Other reason	Multiple answers possible, reported if >33% responses
		Do you expect that ICC will actually be integrated in PCHC in the future?	very certainly not - certainly not - maybe not/yes - certainly yes - very certainly yes	certainly yes - very certainly yes
		Explanation		Summary of responses
Appropriateness	PCHC provider questionnaires	Do you consider it desirable that ICC will actually be integrated in PCHC in the future?	very certainly not - certainly not - maybe not/yes - certainly yes - very certainly yes.	certainly yes - very certainly yes
		Explain		Summary of responses
		If ICC becomes integrated in PCHC, do you find these forms appropriate? ³	very certainly not - certainly not - maybe not/yes - certainly yes - very certainly yes.	certainly yes - very certainly yes.
		- providing information materials - providing general advice during routine PCHC visits - screening for risk factors and discussing these during routine visits - performing an actual ICC consultation - discussing referral for ICC at GPs or midwives		
Participant Q1		How do you think that you should receive information about the existence of an ICC consultation?	"PCHC - well-baby" clinic could be selected	yes

1. Outline of implementation outcomes as derived from the questionnaires (*continued*)

Outcomes	Data collection / source	Items	Response categories	Scoring / reporting
Acceptability	PCHC provider questionnaires	ICC is as far as I know based on empirical evidence	strongly disagree - disagree - neutral - agree - strongly agree	agree - strongly agree
		ICC is in line with how I am used to work	strongly disagree - disagree - neutral - agree - strongly agree	agree - strongly agree
		I think it is important to contribute to ICC	strongly disagree - disagree - neutral - agree - strongly agree	agree - strongly agree
		I think it is my job to provide ICC	strongly disagree - disagree - neutral - agree - strongly agree	agree - strongly agree
		I have sufficient knowledge and skills to be able to provide ICC	strongly disagree - disagree - neutral - agree - strongly agree	agree - strongly agree
		I find interconception care suitable for my clients	strongly disagree - disagree - neutral - agree - strongly agree	agree - strongly agree
		I expect that clients will generally be satisfied if I provide ICC	strongly disagree - disagree - neutral - agree - strongly agree	agree - strongly agree
		I expect that clients will generally cooperate if I provide ICC	strongly disagree - disagree - neutral - agree - strongly agree	agree - strongly agree
Effectiveness	Participant Q1	I think that it is good that I was asked whether I consider becoming pregnant again	strongly disagree - disagree - neutral - agree - strongly agree	agree - strongly agree
	PCHC records and records from GP and midwifery practices	Registration of ICC consultations		Total number
	Participant Q2	Did you have an appointment for an ICC consultation?	yes - no	% response to answer categories
		Do you intend to have an ICC consultation in the future?	yes- maybe- no	% response to answer categories
		What was the most important reason for you to decide <u>not</u> to have an ICC consultation?	I dreaded having an appointment - I was not convinced about the benefit - I did not know what it would entail - I was unable to go to an appointment - I could not get an appointment with the healthcare provider that I wanted to visit - my partner did not consider it necessary	% response to answer categories

Questionnaires:

Participant Q1 + Q2. PCHC providers: Participating team Q1 + Q2 and Non-participating team Q1.

a. not participating team Q1

b. only participating team Q2

2. Characteristics of participants

Characteristics at baseline (Q1) N= 170 ^a		N	%
Age	Median age in years (min- max)	30.5	20-43
Ethnicity ^b	Dutch	133	85.3
	Other	23	14.7
Educational attainment ^c	Missing	14	8.2
	Low	6	3.9
	Intermediate	47	30.3
	High	102	65.8
Pregnancy intention	Missing	15	8.8
	Currently pregnant	1	0.7
	Within next 6 months	14	9.3
	Within next 6 - 12 months	23	15.2
	After > 12 months	78	51.6
	In doubt about becoming pregnant again	35	23.2
How many living children	Missing	19	11.2
	One child	124	81
	Missing	17	10
Paid job	Yes	136	87.7
	No	19	12.3
Monthly household income	Missing	15	8.8
	Low (<1500€)	7	4.1
	Middle (1500 - 3000€)	55	32.4
	High (>3000€)	91	53.5
	Missing	17	10.0
Civil status	Living together	148	96.1
	In a relationship, not living together	4	2.6
	Not in a relationship	2	1.3
	Missing	16	9.4
Obstetric history	Low birth weight baby (<2500gram)	13	9.4
	Child with congenital abnormalities	4	2.9
	Preterm birth (<37 weeks)	16	11.5
	Medical concerns of the neonate following birth	15	10.9
	Perinatal mortality	3	2.2
	Composite outcomes (1 of 5 outcomes above)	33	23.7
Diabetes, hypertension or pre-eclampsia	Missing	33	19.4
	Yes	15	10.7
	No	125	89.3
Preconception lifestyle risks	Missing	30	17.6
	No folic acid supplementation	132	86.8
	No folic acid before last pregnancy	46	31.1
	Smoking	15	9.8
	Alcohol consumption ≥ 1/week	104	68
	Illicit drug use	1	0.7
Chronic medical condition	Missing	18	10.6
	Yes	15	10.1
	No	134	89.9
Contraception	Missing	21	12.3
	Yes	115	76.2
	No	36	23.8
	Missing	19	11.2

a. Data are expressed as numbers and percentages of non-missing cases unless otherwise specified. Missing value percent- age of total.

b. Self-defined ethnicity

c. Educational attainment level was defined as the highest completed educational level classified according to the Interna- tional Standard Classification of Education (ISCED) i.e. low (level 0-2: early childhood; primary education; lower secondary education); intermediate (level 3-5: upper secondary; post-secondary; short cycle tertiary); and high (level 6-8: bachelor; master; doctoral). Unesco institute for statistics 2014.

10

General discussion

The overall aim of this thesis was to evaluate and advance the implementation of PCC and ICC in primary care settings. The studies described in the thesis were conducted within or parallel to the Healthy Pregnancy 4 All (HP4All 1&2) programs. In community-based intervention studies, we have evaluated opportunities to advance the outreach and effects of PCC and ICC. In addition, in qualitative studies with women and healthcare professionals, we have explored factors influencing the implementation of PCC and ICC.

This last chapter reflects on the principal findings. It relates the results from the two parts of this thesis and its different chapters, structured around four domains associated with implementation (i.e. the innovation, the consumer, the provider and the organization or setting). Besides, methodological considerations and future perspectives are discussed.

PROMOTING THE OUTREACH AND EFFECT OF PCC AND ICC

Preconception health offers a genuine case for prevention

There is ample evidence on periconception risk factors associated with an adverse pregnancy course and adverse maternal and neonatal health outcomes.¹⁻³ Our studies have shown once again that both such risk factors as well as adverse pregnancy outcomes are highly prevalent (**chapter 2, 3, 6 and 9**). At the same time, geographical differences in the prevalence of premature and small for-gestational-age births indicate inequalities in adverse birth outcomes (**chapter 6**). Inequalities in behavioral risk factors were found in **chapter 3**. In line with other research, this suggests that women who are younger, have an ethnic minority background, or have a lower socio-economic status need more attention to prevent, for instance, inadequate folic acid supplementation and smoking.⁴⁻⁷ Parous women need attention as well, since they may display more inadequate preconceptional behavior than nulliparous women and prior obstetrical complications can affect their future health and future pregnancies.⁸ These findings demonstrate an important opportunity for prevention of risk factors before the start of pregnancy. PCC and ICC are thought to achieve this by optimizing preconception health; thereby regarding ICC not being substantially different from PCC (**chapter 7**). In a recent lancet series on preconception health, the authors also advocate the urge to ensure that women (or couples) are healthy before conception, for instance by identifying women contemplating pregnancy and simultaneous population-level initiatives reducing determinants of preconception risks, to “improve maternal and child health and reduce the growing burden of non-communicable diseases”.⁹⁻¹¹ In another lately published paper on Interpregnancy Care by the American Journal of Obstetrics and Gynecology, the authors state that all women of reproductive age who have been pregnant should receive interpregnancy care as a continuum from postpartum care to well-women care since it is an important opportunity for the prevention of many adverse health outcomes.¹²

PCC and ICC consultations can affect preconception health

Evidence that PCC and ICC interventions improve preconception health and pregnancy outcomes is scarce as illustrated in previous systematic reviews on PCC and the scoping review on ICC specifically, in **chapter 7**.^{3 13 14} Our intervention study of PCC consultations with GPs and midwives contributes to the small number of previous studies that have suggested a positive change in folic acid supplementation and alcohol reduction after comprehensive PCC in primary care (**chapter 3**).¹³ With the intervention, we aimed at areas with a higher prevalence of adverse pregnancy outcomes than the national average to include women who would benefit most. Although we assume that more attention may have been necessary for vulnerable women, behavior change and non-medical risk factors, it is hard to demonstrate the impact of the intervention on these specific components due to the small sample size. This points at the currently self-sustaining situation in which on the one hand proper implementation is needed to further study effectiveness, and on the other, evidence on effectiveness is required to support implementation. This impedes large-scale implementation of PCC and ICC. However, there is enough evidence on the possible harm of periconceptual risk factors that we should not wait to translate into practice the available knowledge on risk factors associated with adverse pregnancy or health outcomes.¹⁵ It has societal and medical implications, as a way of disease prevention.¹⁰ We should continue to increase the perceived importance of preconception health and care.

Promotion is necessary to increase outreach of PCC and ICC

The percentage of pregnant women reporting to have discussed at least one risk factor with a healthcare provider before pregnancy varies from 25% in a Dutch study to 51% in a British study.^{5 16} The percentage of pregnant women who had a more comprehensive PCC consultation is likely to be much lower. Standardized delivery of PCC and ICC is uncommon in The Netherlands, as well as in other comparable western European countries.^{17 18} An important barrier to the delivery and uptake of PCC is low awareness about PCC of both healthcare providers as well as the target group, which indicates the need for promotion of PCC.¹⁹⁻²¹ Many promising suggestions had been made or studied, but earlier Dutch initiatives such as community-based research projects, web-based tools, and guidelines supporting the delivery of PCC had not resulted in routine practice of PCC at the time when the HP4All-1 program was started.^{17 22-24}

In the HP4All programs, several of these ideas for PCC promotion have been combined and rolled out in multiple municipalities. We have shown that it is possible to promote delivery and uptake of PCC and ICC via different outreach strategies, but that it is challenging (**chapter 2, 4 and 9**). It is challenging in terms of the execution (i.e. adoption of the strategy) and in terms of the effect. In absolute numbers, recruitment for PCC through large-scale mailings of invitation letters by municipalities and GPs resulted in the highest uptake of consultations. Yet, the effect was small relative to the number of pregnancies in these areas and diminished after three

months. More active recruitment by peer educators, GPs, midwives, and PCHC professionals resulted scarcely in registered consultations. Still, this active recruitment has the advantage to be able to give further information and to reach vulnerable populations directly. As suggested by Velott et al., there is probably not a single “best” method for PCC promotion.²⁵

Should we aim for different methods to promote preconception health?

To attain good population preconception health, requires either ensuring that the health of the total reproductive population is good, or ensuring that prospective parents prepare for pregnancy by aiming for good preconception health. In this thesis, the focus is on the latter by encouraging PCC and ICC consultations. However, the question is whether PCC or ICC consultations should be the single goal in the promotion of preconception health. The different outreach methods in **chapter 2 and 9** can have contributed to awareness about preparing for pregnancy in a much larger number of women than the number of PCC consultations may suggest. Unfortunately, this was outside the scope of our studies, but other Dutch studies have suggested that after local promotional campaigns more women are aware of the importance of folic acid and prepare for pregnancy.^{26 27} Preparing for pregnancy by searching information and discussing single risk factors with a healthcare provider have been associated with improved preconception health behavior.^{5 16}

Maybe the goal should be that prospective parents prepare for pregnancy, which can include a PCC or ICC consultation. This can also stimulate involvement of other parties that should offer a form of PCC, but not necessarily a comprehensive consultation, as suggested in the expert discussions reported on in **chapter 7**.

We can make a distinction between providing preconception information and preconception care. For instance, neurologists should address medication risks to ensure their patients prepare for pregnancy. In case the patient is actively considering becoming pregnant, the neurologist can refer to a comprehensive specialist PCC consultation. Although evidence is limited, there is a case for reproductive intention screening in routine general and specialist care.^{28 29} Promoting comprehensive PCC consultations could then be part of a larger approach to promote preparing for pregnancy, since both can contribute to preconception health. This promotion has to serve the different needs of all couples and not unintentionally enlarge inequalities as found before in case of folic acid interventions.^{30 31} Every woman should be informed about preventive options before pregnancy and be guided to informed choices.

CHALLENGES AND OPPORTUNITIES AT DIFFERENT LEVELS OF STAKEHOLDERS

To understand and improve implementation PCC and ICC, analysis at the level of the target group, the healthcare professionals, and organizations or settings is essential.^{32 33}

Women

Our studies involved women of reproductive age (≥ 18 years) who were considering a future pregnancy (**chapter 2,3,5 and 9**). In **chapter 9**, we report on a study in which women were specifically recruited who were eligible for ICC and in **chapter 5**, we describe a study in which we recruited women with a low to intermediate education of which a subgroup had experience with PCC or ICC. Barrett et al. have described three different groups of women with varying levels of investment in pre-pregnancy healthcare, being the prepared group, the poor knowledge group and the absent pre-pregnancy period group.³⁴ We assume to have a representation of these different groups in this thesis, but we included probably few women from the so called absent pre-pregnancy period group. In our study populations, we studied attitude, knowledge, motivations, and constraints regarding preparing for pregnancy and PCC.

In general, women were positive about promotion of pregnancy preparation and PCC by healthcare providers (**chapter 5 and 9**). However, this did not necessarily lead to adequate preparation for pregnancy and rarely led to uptake of PCC. A recent systematic review has given an overview of barriers for the uptake of PCC; the most frequently identified barriers were not (fully) planning pregnancy, perceived absence of risks, lack of awareness and having pregnancy experience.¹⁹ Facilitators were believing in benefits and availability of PCC.¹⁹ The barriers identified in our studies show great overlap with the results of previous studies. Barriers included: 1) not wanting to plan pregnancy as it could lead to stress and could take away its 'naturalness', and 2) not being convinced of need to prepare because of perceived limited control over becoming pregnant and the health of the unborn (**chapter 5**). Furthermore, reasons not to make use of PCC included not knowing what to expect and not seeing the added value because of prior pregnancy experience (**chapter 9**). Women who received PCC also mentioned not knowing what to expect prior to the consultation and experiencing only modest added value (**chapter 3 and 5**). Many women mentioned that they would search for information themselves, for instance on Internet (**chapter 5 and 2**). Previous studies have shown that women are inclined to acquire preconception health information themselves, but that women still indicate interest in PCC by healthcare providers.^{26 35} Reasons to prepare for pregnancy and (possibly) use PCC often relate to concerns about a healthy pregnancy and fertility (**chapter 2, 5 and 9**). Besides, women who used PCC suggested to include more examinations on general health and fertility in a PCC consultation, and to provide a more personalized approach responding to individual needs (**chapter 3**). Apart from these suggestions for improvement, women generally appreciated the

PCC consultation (**chapter 3**). It offered an opportunity to ask questions, get confirmation and be reassured (**chapter 5**). Patient experience with PCC has hardly been studied before, except studies that showed that general and specialist PCC did not induce anxiety.³⁶⁻³⁸ Women had generally good knowledge of preconception health, yet knowledge gaps were also identified (**chapter 2 and 5**) and the meaning of 'PCC' was generally unknown. As suggested earlier in a systematic review, knowledge and awareness do not lead to healthy preconception behavior per se.³⁹ Different PCC approaches are probably needed for different individuals.³⁴ Overall, because of low awareness, promotion of preconception health and PCC is still necessary. Promoting preparing for pregnancy by raising preconception health at relevant encounters with the target group is a start.⁴⁰ Triggering knowledge gaps related to health concerns and fertility (e.g. the negative effects of smoking on the success of conception (**chapter 2 and 5**)) may motivate women for PCC and promote preconception health. In addition, illustrating ICC as opportunity to discuss prior pregnancy experiences, future pregnancies, and future health may promote uptake of ICC. These potential promoting factors were also identified in a previous study on consumer preferences for PCC.³⁵ Specific attention has to be given to aspects such as poor health literacy, perceived limited control and fear of medicalization to support all women in obtaining good preconception health. Lastly, including men's preconception health in PCC approaches, may promote preconception health at large.⁴⁰

Healthcare providers

In this thesis we aimed at advancing PCC and ICC via GPs, midwives and PCHC providers.

Around the start of the HP4All-1 program, just one in four GPs had provided a PCC consultation in the past two months before they responded to a survey.¹⁷ More GPs, about two thirds of them, had pointed out to patients a risk factor for in a future pregnancy. Relatively fewer midwives delivered a form of PCC.¹⁷ In PCHC, ICC was still an unknown concept (**chapter 9**). The interventions had to change daily practice. Since healthcare providers in PCHC were unfamiliar with ICC, we started off by discussing possible facilitators and barriers for ICC. Resulting from these discussions, we expected that PCHC providers would acknowledge their unique positions in reaching women for ICC, but that the unfamiliarity with ICC would be a barrier (**chapter 8**). Therefore, we arranged local training sessions and supporting material (**chapter 9**). In HP4All1, midwives and GPs also received information and an explanation about delivering PCC consultations (**chapter 4**). Subsequent adoption of the interventions was fairly good, but varied as not all practices and providers decided to adhere to the intervention (**chapter 4 and chapter 9**). Some GP practices decided to refer to the local midwives for PCC. Low affiliation of GPs with PCC has been described before in another municipal project.²⁶ Roles and responsibility in PCC should be further outlined, as they appear not always clear both nationally as well as internationally.^{5 18 20 41} As expected, most PCHC providers were positive about having a role in

ICC, but the majority preferred responsibility in giving advice about ICC consultations instead of delivering an individual ICC consultation.

However, the advice by PCHC providers resulted hardly in any ICC consultations. Also, the effects of the delivered consultations by midwives and GPs on behavior change should be improved (**chapter 3**). It would have been good to use observations of the consultations to study actual execution of the interventions. Some healthcare providers said that the low uptake made it difficult to become skilled in delivery of PCC. To promote uptake and normalize talking about ICC, we therefore advised PCHC to routinely inform women about ICC. In one PCHC center, they also routinely and proactively arranged an appointment for ICC in case women were interested after the regular PCHC visit, which might have helped both the PCHC provider and women in delivery and uptake of PCHC. Nevertheless, since it appears so difficult to increase uptake of individual PCC and ICC consultations, healthcare providers can optimize integration of PCC and ICC in their regular encounters with women. Studies that included few ICC items in routine preventive pediatric care show a promising role for PCHC providers.⁴²⁻⁴⁵ In addition, midwives and gynecologists should optimally use the postpartum visit. This visit offers the possibility to reflect on the previous pregnancy and adapt ICC accordingly, but currently the postpartum visit is often a missed opportunity.⁴⁶ For GPs, many opportunities exist to integrate PCC and ICC when women of reproductive age visit them for a consultation. Especially, when these visits include consultations about chronic (or hereditary) diseases, drug prescriptions, contraceptive questions and fertility matters.

Organizations and settings

In the PCC and ICC interventions of this thesis, different healthcare organizations were involved. Local municipal project managers were recruited to facilitate local collaboration (**chapter 4**). Despite their involvement, it took effort to convince parties of their responsibility in promoting preconception health. Plenty studies and reports have advised that many parties should take responsibility in the implementation of PCC and ICC.²⁴ “Preconception interventions need to be supported by a social movement and political will, both of which require skilful engagement with powerful commercial interests.”¹¹ This was also a common theme in our qualitative studies on ICC in which different representatives were involved (e.g. gynecologists, pediatricians, occupational physicians, policymakers, health insurance providers, members of national healthcare expertise centers and members of representative bodies) (**chapter 7 and 8**). One could argue that even the corporate sector may take responsibility in promoting preconception health, for instance of employees. Nevertheless, most parties currently actually take only moderate responsibility. It was promising that the national representative body of PCHC physicians and pediatricians showed their intention to promote PCC in their routine practice, however they have still not reached consensus on their plans.⁴⁷

With the interventions and consensus on ICC described in this thesis, we have contributed to awareness about the importance of preconception health, preparing for pregnancy and PCC. However, context or setting factors proved to impede implementation. Firstly, this included limited resources (e.g. time and funding), for which we arranged some financial compensation during the HP4All programs (e.g. reimbursement for consultations). For PCC by midwives, reimbursement has been improved since 2017, however for PCHC reimbursement still depends on municipal negotiations. Secondly, the tendency towards a demand-driven approach in PCHC and general practice is not compatible with primary prevention such as PCC. Thirdly, segregated preventive care for women and children makes it difficult to integrate the two. Fourthly, culture norms make it unusual to discuss reproductive plans and this even applies to medical settings. Lastly, we lag behind in strategies to change behavior and reach the most vulnerable in society. The focus on areas with higher rates of adverse pregnancy outcomes and socio-economic deprivation is likely a good approach, but healthcare providers may need extra support. On a setting level, PCC implementation could be encouraged by normalizing preparing for pregnancy with political attention, campaigns, education and taking up PCC in quality measures. Current guidelines, the prospective 'Preconception Indication List' (mutual agreement by different health care disciplines about the content of and cooperation around PCC and ICC), and web-based tools such as 'Zwangerwijzer'^{48 49} and 'Slimmer Zwanger'^{50 51} are helpful, but need sufficient promotion. Although implementation outcomes at different levels of stakeholders are related to implementation success, we also realized the importance of contributions by individual persons. Some individual managers and healthcare providers really contributed to PCC and ICC and proved to be change leaders.

METHODOLOGICAL CONSIDERATIONS

Study designs

The studies in this thesis comprise a combination of different study populations, data sources, and study designs when evaluating various factors related to the implementation of PCC. This thesis included quantitative and qualitative studies, which involved data collected from women, healthcare providers and other stakeholders as well as registration-based data. Besides, different primary care settings for PCC and ICC were studied. As a result, a comprehensive overview of challenges and opportunities for the implementation of PCC and ICC is provided.

The fact that the intervention studies described in **chapter 2,3 and 9** were 'real-time' community-based studies can be seen as a strength, as it reflects 'real circumstances' instead of a controlled situation. This is useful for further refinement, applicability, and sustainability of the intervention, however it also has limitations. Firstly, since the GPs, midwives, and PCHC providers were neither familiar with the proposed intervention (PCC and ICC), nor with being

involved in research, it was challenging to execute the intervention and study as intended. It required balancing between adapting to the study setting and not changing the intervention too much.⁵² In addition, it resulted in difficulty to obtain data; healthcare providers had to register information that we subsequently had to obtain, and they had to include participants to the studies. This led to logistic challenges and especially obtaining written informed-consent form participants proved to be complex. In HP4All-1, the problem was receiving informed consent forms by mail after study counseling by telephone by the research team (chapter 2 and 3). In HP4-All2, counseling and retrieving informed consent forms was done locally by the healthcare providers, yet this took place on a small scale. As a result, study populations were smaller than intended and entailed probably a selected group of women, which was a second limitation of our cohort studies. Women with a high socio-economic status seemed to be participating more often. Lastly, our cohort studies had a follow-up period limited to six months and had no comparative aspect. Altogether, this made it hard to disentangle the actual effect of the PCC and ICC interventions. Many studies in this thesis merely an exploratory character, which was the case for the described qualitative analyses as well. Besides, the qualitative studies may have included participants who were more positive about PCC than non-responders.

Implementation approach

We have applied an implementation research approach in this thesis. This includes applying and describing different stages described in implementation research. For instance we planned our interventions by means of using the framework of healthcare utilization of Andersen (**chapter 2**), analyzing possible determinants of implementation (**chapter 8**) and aligning with local stakeholders.⁵³ We have used multiple implementation research methods as described by Peters et al.⁵⁴ Accordingly, we studied various types of implementation outcomes, to some extent service outcomes (i.e. effectiveness), and client outcomes (i.e. experience or satisfaction).^{33 54} We could have given more attention to observing the delivery of care and to other patients outcomes, since PCC comprises such comprehensive content. We explored multiple stakeholders' perspectives as suggested in the literature on implementation research.^{33 53} Unfortunately, we were not able to study long-term outcomes such as sustainability, long-term health outcomes, equity and cost-effectiveness, which could yield valuable insights for the implementation of PCC.⁵³

Specific conditions

We studied specific PCC and ICC situations, which included first of all primary care settings of GPs, midwives and PCHC. Secondly, we aimed at reaching more vulnerable populations for adverse pregnancy outcomes within a general population approach. Thirdly, we focused on individual PCC and ICC consultations and promotion thereof. Other approaches such as integration of PCC and ICC in routine primary, as well as specialist care could also be worthwhile. Our studies were embedded in the HP4All programs, and therefore project-based. This meant that

logistic, financial and motivational support was guaranteed, but only temporarily. Nonetheless, the interventions and results described in this thesis can be of value to other situations as well.

FUTURE PERSPECTIVES

In summary, this thesis shows that it is necessary and possible to include promotion of PCC and ICC in municipal, GP, and PCHC services. It also shows the potential of individual consultations at GPs and midwifery practices. At the same time, it demonstrates that the outreach and effect of PCC and ICC should be further enhanced. More should be done to inform prospective parents about preventive options before pregnancy and offer possibilities to make informed choices. Preparing for pregnancy (or conception), including PCC and ICC, needs continuous active and passive promotion to optimize preconception health. The limited adoption of PCC and ICC by healthcare professionals indicates room for improvement. While implementing PCC and ICC, special attention is warranted for vulnerable populations, difficult lifestyle behavior changes such as smoking, and socio-economically related risk factors. The importance of social determinants of health in the delivery of reproductive healthcare has also recently been underlined by American College of Obstetricians and Gynecologists.⁵⁵

The observations in this thesis and reflection thereupon lead to the following recommendations for the implementation of PCC and ICC:

- Individual comprehensive PCC consultations with GPs and midwives should become more common. Simultaneously integrating PCC in different settings is necessary to promote preparing for pregnancy and PCC consultations. Integrate PCC in...
 - o ... collective prevention strategies, routine primary care and specialist care.
 - o ... a life course approach with multiple hits, i.e. 'every woman every time'.
 - o ... an active approach instead of 'demand driven' approach in providing care
 - o ... particular in contraceptive care, fertility care, chronic care and psychosocial.
 - o ... related health education programs, websites and mobile applications.
 - o ... postpartum care for mother and child.
- Prerequisites for effective implementation of PCC and ICC in terms of delivery, uptake and improvements of health outcomes include the following:
 - o Involvement of (local) stakeholders (couples trying to achieve pregnancy, care providers, organizations and policymakers).
 - o Continuous education for all stakeholders on the importance of preparing for pregnancy in relation to fertility, embryonic development in first weeks of pregnancy and future health outcomes. This should be integrated in all forms of regular education and training curricula.

- o Personalized PCC, responsive to individual needs such as health concerns, fertility concerns, and non-medical concerns. This needs further research, including research on different forms of PCC (e.g. individual consultations, integration in routine care, e-health, peer education) patient experience, behavior change and involvement of the partner.
- o Increasing the role of the public healthcare system in response to health inequalities related to socio-economic inequalities, which may require specific support for vulnerable populations and changing context factors that keep these inequalities in place (i.e. promoting a healthy environment).
- o Further integration of care by the curative domain and public health domain, from the preconception period, through pregnancy, into the interconception period. This requires further integration of maternal (or parental) care and pediatric care. It should be supported by more collaboration, less inefficient paper work, and sufficient reimbursement. Steps are taken on further integrated obstetric care (between the different tiers within obstetric care), reimbursement of PCC for midwives, and the formulation of the Preconception Indication List (PIL), but more efforts are needed.
- o Available measures on preconception health and PCC. This requires better registration of preconception and prenatal risk factors for adverse pregnancy outcomes, as well as routine registration of PCC performance. Prioritization of certain measures is likely needed to integrate these measures in the existing Dutch Perinatal Registry called Perined. A suggestion of nine measures has been made in the USA: 1) pregnancy intention, 2) access to care, 3) preconception multivitamin with folic acid use, 4) tobacco avoidance, 5) absence of uncontrolled depression, 6) healthy weight, 7) absence of sexually transmitted infections, 8) optimal glycemic control in women with pregestational diabetes, and 9) teratogenic medication avoidance.⁵⁶ Ideally, registration would start preconceptionally and be linked to future pregnancies to evaluate and advance implementation of PCC and ultimately preconception health.

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11

Summary / samenvatting

SUMMARY

Preconception care (PCC) has been acknowledged as an essential intervention to reduce perinatal mortality and morbidity. In short, PCC entails supporting women or couples in obtaining optimal health prior to pregnancy. However, utilization of PCC is low because of low awareness of availability and benefits of the service. Different possibilities to enhance the delivery and uptake of PCC were studied within two successive national programs called Healthy Pregnancy 4 All (HP4All) 1 and 2. The studies conducted as part of these programs formed the basis of this thesis. The overall aim of this thesis is to evaluate and advance the implementation of PCC in primary care settings. The background for this thesis is provided in **chapter 1**.

In **chapter 2**, we describe and evaluate an outreach strategy that was employed in 14 municipalities with relatively high perinatal morbidity and mortality rates. This outreach strategy aimed to promote uptake of PCC consultations among women aged 18 to 41 years and included four approaches: (1) letters from municipal health services; (2) letters from general practitioners; (3) information leaflets by preventive child healthcare services (PCHC) and (4) encouragement by peer health educators. The outreach strategy led to 587 applications for PCC consultations. The majority of applications (72%) were prompted by the invitation letters (132,129) from the municipalities and general practitioners. The strategy seemed to have succeeded in recruiting women considering becoming pregnant for a PCC consultation, yet on a relatively small scale and with a temporary effect.

In **chapter 3**, we evaluate the effects of these PCC consultations in terms of change in lifestyle behaviors after three months. We assessed initiation of folic acid supplementation, and cessation of smoking, alcohol consumption, and illicit drug use using self-reported data and biomarker data. Baseline self-reported prevalence of no folic acid use was 36%, smoking 12%, weekly alcohol use 22%, and binge drinking 17%. The changes in prevalence that we found after 3 months suggest that PCC contributes to initiation of folic acid supplementation and cessation of binge drinking in women who intend to become pregnant.

The implementation of PCC in the first HP4All program is evaluated in **chapter 4** by means of a process evaluation. Different aspects of the program were assessed: The program succeeded in engaging municipal stakeholders sufficiently in all but one municipality. Implementation of the outreach strategy was good regarding 3 of the 4 components. Although participation of the general practitioners and midwives was only adequate in half of the municipalities, when PCC was delivered it fulfilled criteria for the standardized concept of the program in nearly all municipalities. Overall implementation was good but varied per aspect across municipalities, showing room for improvement. Factors that influenced implementation negatively were lack

of local networks and low sense of ownership regarding PCC. Facilitating factors were training and logistical support to resolve the complexity of PCC.

When promoting periconceptional health, appropriate attention has to be given to those who are most vulnerable, such as women with relatively low educational attainment. In **chapter 5**, we explore these women's perceptions of pregnancy preparation and the role they attribute to healthcare professionals. We interviewed 28 women with a desire to conceive, of which a subgroup had experience with PCC. Four themes of pregnancy preparation perceptions were identified: (i) "How to prepare for pregnancy?", including health promotion and seeking healthcare; (ii) "Why prepare for pregnancy?", often related to fertility and health concerns; (iii) "Barriers and facilitators", referring to having limited control over becoming pregnant as well as the health of the unborn; and (iv) "The added value of PCC", which consisted mainly of reassurance and receiving information (reported by women who had had a consultation). These perceptions indicate that proactive offering of PCC, including information on fertility, could stimulate adequate preparation for pregnancy.

In **chapter 6**, Dutch geographical inequalities in perinatal health and child welfare are shown, while introducing the HP4All-2 program. The HP4All-2 program was developed to improve the identification and care of mothers and young children at risk of adverse health outcomes in ten 'high-risk' municipalities. To illustrate the position of the ten participating municipalities, we present geographical differences in the prevalence of perinatal mortality, perinatal morbidity, children living in deprived neighborhoods, and children living in families on welfare. This chapter demonstrates that the HP4All-2 program targets municipalities with a relative unfavorable position. By targeting these municipalities, the program is expected to contribute most to improving the care for young children and their mothers at risk, and hence to reducing health inequalities.

The HP4All-2 program focused on a subtype of PCC between pregnancies, also referred to as interconception care (ICC). Reaching women for ICC is potentially easier than for PCC, however the concept is still unfamiliar. In **chapter 7**, we present the results of a scoping review and of a national and subsequent international expert meeting organized to achieve consensus on different aspects of ICC. The experts argued that the term, definition, and content for ICC should be in line with PCC. They discussed that the target group for ICC should be 'all women who have been pregnant and could be pregnant in the future and their (possible) partners'. In addition, they opted that any healthcare provider having contact with the target group should reach out and make every encounter a potential opportunity to promote ICC. The identified consensus on ICC should be practiced and evaluated in policies and guidelines to further explore the optimal way to deliver ICC.

ICC could potentially be provided by PCHC services during routine well-baby visits. In **chapter 8**, we describe potential facilitators and barriers for implementation of ICC in PCHC services based on four focus groups in which PCHC physicians and nurses, related health care professionals and policymakers participated. All four groups agreed on several facilitators, such as the unique position to reach women and the expertise in preventive health care. Identified barriers included unfamiliarity with ICC among patients and health care providers, as well as lack of consensus about the concept of ICC and how it should be organized. A broad educational campaign, local adaptation, and general agreement or a guideline for standard procedures were recognized as important for future implementation.

Since PCHC seemed to be a valuable opportunity for the promotion and delivery of ICC, we implemented and evaluated the integration of ICC in PCHC centers, as outlined in **chapter 9**. PCHC professionals were instructed to discuss the possibility of an ICC consultation with women who attend for a routine visit at their child's age of six months. PCHC professionals either also offered the separate ICC consultations within their center, or they referred women to local midwives or general practitioners. In 29% of the routine visits, the possibility of ICC was discussed (coverage). Adoption of this ICC promotion by PCHC physicians was 61.7%. Appropriateness and acceptability of the intervention among professionals and women was good. Feasibility and fidelity were low. Effectiveness on ICC uptake was small. Suggestions for improvement may include adapting the intervention such that feasibility and fidelity increase, for example by integrating specific items of ICC within the routine visits and creating sufficient resources.

Chapter 10 discusses the main findings of this thesis. In community-based intervention studies, we have evaluated possibilities to advance the outreach and effects of PCC and ICC. In qualitative studies with women and healthcare professionals, we have explored factors influencing the implementation of PCC and ICC. This thesis shows, in line with other research, that it is necessary and possible to include promotion of PCC and ICC in municipal, general practitioner, and PCHC services. However, it also illustrates once again the challenges involved with enhancing the outreach and effect of PCC and ICC. Preparing for pregnancy, including PCC and ICC, needs continuous active and passive promotion to optimize preconception health.

SAMENVATTING

Preconceptiezorg wordt gezien als een essentiële interventie om perinatale sterfte en morbiditeit te verminderen. Globaal houdt dit in vrouwen of paren te ondersteunen bij het verkrijgen van een optimale gezondheid voorafgaand aan de zwangerschap. Het gebruik van preconceptiezorg is echter laag vanwege beperkt bewustzijn van de beschikbaarheid en voordelen. Verschillende mogelijkheden om het aanbod en gebruik van preconceptiezorg te verbeteren zijn bestudeerd in twee opeenvolgende nationale programma's, genaamd Healthy Pregnancy 4 All (HP4All) 1 en 2. De studies uitgevoerd als onderdeel van deze programma's vormen de basis van dit proefschrift. Het doel van dit proefschrift is het evalueren en bevorderen van de implementatie van preconceptiezorg in eerstelijnszorg. In **hoofdstuk 1** wordt de achtergrond van het proefschrift toegelicht.

In **hoofdstuk 2** beschrijven en evalueren we een strategie om vrouwen voor preconceptiezorg te bereiken die werd toegepast in 14 gemeenten met relatief hoge perinatale morbiditeit en mortaliteit. Deze 'outreach-strategie' was gericht op het bevorderen van het gebruik van preconceptiezorgconsulten bij vrouwen van 18 tot 41 jaar en omvatte vier benaderingen: (1) brieven van gemeentelijke gezondheidsdiensten; (2) brieven van huisartsen; (3) voorlichtingsbrochures door de Jeugdgezondheidszorg (JGZ) en (4) advies van voorlichters perinatale gezondheid. De outreach-strategie leidde tot 587 preconceptiezorgconsulten. De meeste aanmeldingen ($n = 424$; 72%) waren het gevolg van de uitnodigingsbrieven van de gemeenten en huisartsen (132,129). De strategie lijkt vrouwen met een kinderwens te hebben bereikt voor preconceptiezorgconsulten, maar op kleine schaal en met een tijdelijk effect.

In **hoofdstuk 3** evalueren we de effecten van deze preconceptiezorgconsulten op veranderingen in leefstijl na drie maanden. We hebben foliumzuursuppletie, roken, alcoholconsumptie en gebruik van drugs beoordeeld door middel van zelfgerapporteerde data en biomarker data. Zelfgerapporteerde baseline prevalentie van geen foliumzuurgebruik was 36%, van roken 12%, wekelijks alcoholgebruik 22% en binge drinking 17%. De veranderingen in prevalentie na drie maanden suggereren dat preconceptiezorg bijdraagt aan het gebruik van foliumzuursuppletie en het stoppen van alcoholmisbruik bij vrouwen die van plan zijn zwanger te worden.

Implementatie van preconceptiezorg in het eerste HP4All-programma wordt geëvalueerd in **hoofdstuk 4** door middel van een procesevaluatie. Verschillende aspecten van het programma werden beoordeeld: het programma slaagde erin de gemeentelijke belanghebbenden voldoende te betrekken in alle gemeenten, met één uitzonderd. De implementatie van de outreach-strategie was goed ten aanzien van drie van de vier componenten. Hoewel de deelname van de huisartsen en verloskundigen slechts toereikend was in de helft van de gemeenten, voldeed de geleverde preconceptiezorg aan de criteria voor het gestandaardiseerde concept van het

programma in bijna alle gemeenten. De algehele implementatie was goed, maar varieerde binnen de verschillende gemeenten en liet aldus ruimte voor verbetering zien. Factoren die van invloed waren op de implementatie in negatieve zin waren gebrek aan lokale netwerken en een laag gevoel van eigenaarschap met betrekking tot preconceptionele zorg. Bevorderende factoren waren training en logistieke ondersteuning om de complexiteit van preconceptionele zorg op te lossen.

Bij de bevordering van gezondheid ten tijde van de conceptie (periconceptioneel) moet voldoende aandacht worden besteed aan degenen die het meest kwetsbaar zijn, zoals vrouwen met een relatief laag opleidingsniveau. In **hoofdstuk 5** verkennen we de percepties van deze vrouwen ten aanzien van de voorbereiding op zwangerschap en de rol die zij toeschrijven aan gezondheidszorgprofessionals. We interviewden 28 vrouwen met een wens om zwanger te worden, waarvan een subgroep ervaring had met preconceptionele zorg. Vier thema's werden geïdentificeerd: (i) "Hoe zich voor te bereiden op zwangerschap?", inclusief gezondheidsbevordering en gebruik maken van gezondheidszorg; (ii) "Waarom voorbereiden op zwangerschap?", vaak gerelateerd aan zorgen over de vruchtbaarheid en de gezondheid; (iii) "belemmeringen en facilitators", verwijzend naar beperkte controle over zwanger worden en de gezondheid van de ongeboren vrucht; en (iv) "De meerwaarde van preconceptionele zorg", wat voornamelijk bestond uit geruststelling en het ontvangen van informatie (gerapporteerd door vrouwen die een preconceptionele zorgconsult hadden gehad). Deze percepties geven aan dat een proactief aanbod van preconceptionele zorg, inclusief informatie over vruchtbaarheid, een adequate voorbereiding op zwangerschap zou kunnen stimuleren.

In **hoofdstuk 6** wordt het HP4All-2 programma beschreven in relatie tot Nederlandse geografische ongelijkheden in perinatale gezondheid en kindermortaliteit. Het HP4All-2-programma is ontwikkeld om de identificatie van en zorg voor moeders en jonge kinderen die risico lopen op nadelige perinatale gezondheidsuitkomsten te verbeteren in tien 'risicovolle' gemeenten. Om de positie van de tien deelnemende gemeenten te illustreren, presenteren we geografische verschillen in de prevalentie van perinatale sterfte, perinatale morbiditeit, kinderen in achterstandswijken en kinderen in gezinnen met een uitkering. Dit hoofdstuk laat zien dat het HP4All-2 programma zich richt op gemeenten met een relatief ongunstige positie. Door zich op deze gemeenten te richten, wordt verwacht dat het programma het meest bijdraagt aan de verbetering van de zorg voor jonge kinderen en hun moeders die risico lopen, en daarmee ongelijkheden in gezondheidsuitkomsten te verminderen.

Het HP4All-2-programma concentreerde zich onder meer op een subtype van preconceptionele zorg tussen zwangerschappen in, ook wel interconceptionele zorg genoemd. Het bereiken van vrouwen voor interconceptionele zorg is mogelijk gemakkelijker dan voor preconceptionele zorg, maar het concept is nog onbekend bij zowel zorgverleners als de doelgroep. **Hoofdstuk 7** laat de resultaten zien

van een scoping review en van een nationale en daaropvolgende internationale expertmeeting georganiseerd om consensus te bereiken over verschillende aspecten van interconceptiezorg. De experts voerden aan dat de term, definitie en inhoud voor interconceptiezorg in overeenstemming moeten zijn met preconceptiezorg. Ze bespraken dat de doelgroep voor interconceptiezorg zou moeten bestaan uit 'alle vrouwen die zwanger zijn geweest en in de toekomst zwanger zouden kunnen worden en hun (mogelijke) partners'. Bovendien werd gesuggereerd dat elke zorgverlener die contact heeft met de doelgroep, de doelgroep zou moeten benaderen en van elke ontmoeting gebruik zou moeten maken om interconceptiezorg te promoten. De geïdentificeerde consensus over interconceptiezorg moet worden toegepast en geëvalueerd in beleid en richtlijnen om de optimale manier om interconceptiezorg te leveren nader te onderzoeken.

Interconceptiezorg kan mogelijk worden aangeboden door de JGZ tijdens routinematige consultatiebureau bezoeken. In **hoofdstuk 8** beschrijven we mogelijke facilitators en barrières voor de implementatie van interconceptiezorg binnen de JGZ op basis van vier focusgroepen waaraan JGZ-artsen en verpleegkundigen, gerelateerde zorgverleners en beleidsmakers hebben deelgenomen. De vier groepen waren het eens over verschillende facilitators, zoals de unieke positie om vrouwen te bereiken en de expertise in preventieve gezondheidszorg. Geïdentificeerde barrières omvatten onbekendheid met interconceptiezorg bij patiënten en zorgverleners, evenals gebrek aan consensus over het concept van interconceptiezorg en hoe het zou moeten worden georganiseerd. Een brede educatieve campagne, lokale logistieke aanpassingen (o.a. in het medische dossier) en algemene overeenstemming of een richtlijn voor standaardprocedures werden als belangrijk beschouwd voor toekomstige implementatie.

Aangezien de JGZ een waardevolle gelegenheid lijkt te zijn voor de promotie en uitvoering van interconceptiezorg, hebben we de interconceptiezorg in consultatiebureaus geïmplementeerd en geëvalueerd, zoals uiteengezet in **hoofdstuk 9**. JGZ-professionals kregen de opdracht om de mogelijkheid van een interconceptiezorgconsult te bespreken met vrouwen die voor een routinebezoek naar het consultatiebureau komen met hun kind van zes maanden oud. De JGZ-professionals boden dan ook de afzonderlijke interconceptiezorgconsulten aan in hun centrum, of ze verwezen de vrouwen naar verloskundigen of huisartsen. De dekking van de interventie was 29%, wat betekent dat in 29% van de routinebezoeken de mogelijkheid van interconceptiezorg werd besproken. De adoptie van deze interconceptiezorgpromotie door JGZ-artsen was 61,7%. De geschiktheid en acceptatie van de interventie bij JGZ-professionals en vrouwen was goed. Haalbaarheid en betrouwbaarheid waren laag. De effectiviteit ten aanzien van het aantal daadwerkelijk plaatsgevonden interconceptiezorgconsulten was klein. Een suggestie voor verbetering kan zijn het aanpassen van de interventie, zodat haalbaarheid en betrouwbaarheid toenemen, bijvoorbeeld door specifieke items van interconceptiezorg te integreren in de routinebezoeken en voldoende middelen te creëren.

Hoofdstuk 10 bediscussieert de hoofdbevindingen van dit proefschrift. In community-based interventiestudies hebben we mogelijkheden onderzocht om het bereik en effect van preconceptiezorg en interconceptiezorg te verbeteren. In kwalitatieve studies met vrouwen en gezondheidszorgprofessionals hebben we factoren onderzocht die van invloed zijn op de implementatie van preconceptiezorg en interconceptiezorg. Dit proefschrift laat zien dat het noodzakelijk en mogelijk is om promotie van preconceptiezorg en interconceptiezorg op te nemen in gemeentelijke activiteiten, huisartsenzorg en de JGZ. Het illustreert echter ook de uitdagingen die gepaard gaan met het verbeteren van het bereik en effect van preconceptiezorg en interconceptiezorg. Voorbereiden op zwangerschap, inclusief preconceptiezorg en interconceptiezorg, heeft continue actieve en passieve promotie nodig om preconceptionele gezondheid te bevorderen.

Addendum

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BIBLIOGRAPHY

Manuscripts related to this thesis

Integrating Interconception Care in Preventive Child Health Care Services: the Healthy Pregnancy 4 All Program.

Sijpkens MK, Lagendijk J, van Minde MRC, de Kroon MLA, Bertens LCM, Rosman AN, Steegers EAP.

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The effect of a preconception care outreach strategy: the Healthy Pregnancy 4 All study.

Sijpkens MK, van Voorst SF, de Jong-Potjer LC, Denktas S, Verhoeff AP, Bertens LCM, Rosman AN, Steegers EAP.

BMC Health Serv Res. 2019 Jan 23;19(1):60.

Results of a Dutch national and subsequent international expert meeting on interconception care.

Sijpkens MK, van den Hazel CZ, Delbaere I, Tydén T, Mogilevkina I, Steegers EAP, Shawe J, Rosman AN.

J Matern Fetal Neonatal Med. 2019 Jan 3:1-9.

Perceptions of pregnancy preparation in women with a low to intermediate educational attainment: A qualitative study.

M'hamdi HI*, **Sijpkens MK***, de Beaufort I, Rosman AN, Steegers EA.

Midwifery. 2018 Apr;59:62-67.

(*Shared first authorship)

Geographical differences in perinatal health and child welfare in the Netherlands: rationale for the healthy pregnancy 4 all-2 program.

Waelput AJM, **Sijpkens MK**, Lagendijk J, van Minde MRC, Raat H, Ernst-Smelt HE, de Kroon MLA, Rosman AN, Been JV, Bertens LCM, Steegers EAP.

BMC Pregnancy Childbirth. 2017 Aug 1;17(1):254.

Facilitators and Barriers for Successful Implementation of Interconception Care in Preventive Child Health Care Services in the Netherlands.

Sijpkens MK, Steegers EA, Rosman AN.

Matern Child Health J. 2016 Nov;20(Suppl 1):117-124.

Change in Lifestyle Behaviors after Preconception Care: the Healthy Pregnancy 4 All study.

Sijpkens MK, van Voorst SF, Rosman AN, de Jong-Potjer LC, Denktas S, Koch BCP, Bertens LCM, Steegers EAP.

Submitted for publication

Implementation of a multi-city preconception care program in the Netherlands - within the Healthy Pregnancy 4 All program.

van Voorst SF, **Sijpkens MK**, Vos AA, de Jong-Potjer LC, Denktas S, Steegers EAP.

Submitted for publication

Other manuscripts

Meeting Report: Ethical Issues Surrounding Preconception Care.

M'hamdi HI, **Sijpkens MK**, de Beaufort I, Hilhorst M, Jack B, Pennings G, Pinxten W, Shawe J, Steegers-Theunissen RPM, van Vliet-Lachotzki E, Steegers EAP.

Submitted for publication

Enhancing maternal empowerment postpartum: a cluster randomised controlled trial.

Lagendijk J, **Sijpkens MK**, Ernst-Smelt HE, Verbiest SB, Been JV, Steegers EAP.

Submitted for publication

Associations between socio-economic status and unfavourable social indicators of child wellbeing; a neighbourhood level data design.

van Minde MRC, de Kroon MLA, **Sijpkens MK**, Raat H, Steegers EAP, Bertens LCM.

Submitted for publication

Reversal of rivaroxaban and dabigatran by prothrombin complex concentrate: a randomized, placebo-controlled, crossover study in healthy subjects.

Eerenberg ES, Kamphuisen PW, **Sijpkens MK**, Meijers JC, Buller HR, Levi M.

Circulation. 2011 Oct 4;124(14):1573-9.

New anticoagulants: moving on from scientific results to clinical implementation.

Eerenberg ES, van Es J, **Sijpkens MK**, Buller HR, Kamphuisen PW.

Ann Med. 2011 Dec;43(8):606-16.

PHD PORTFOLIO

Erasmus MC Department	Obstetrics & Gynaecology
Research School	Netherlands Institute of Health Sciences (NIHES)
PhD period	May 2014 - March 2018
Promotor(s)	Prof. dr. E.A.P. Steegers
Co-promotor	Dr. A.N. Schonewille - Rosman

1. PhD training	Year	Workload (ECTS)
General and specific courses		
BROK (Basiscursus Regelgeving Klinisch Onderzoek)	2014	1.0
for Patient-Oriented research (CPO) course, Erasmus MC	2014	0.2
Integrity in Science, Erasmus MC	2015	0.3
Biomedical English Writing and Communication, Erasmus MC	2015-2016	3.0
International comparison of health care systems, NIHES	2015	1.4
Master's degree Health Sciences – specialization Epidemiology, NIHES	2015-2017	70
International conferences		
3rd European Congress on Preconception Health and Care, Uppsala, Sweden: <i>two oral presentations</i>	2016	1
10th World Congress Developmental Origins of Health and Disease (DOHaD), Rotterdam, the Netherlands: <i>poster presentation</i>	2017	1
10th European Public Health Conference, Stockholm, Sweden: <i>workshop presentation</i>	2017	1
65th Annual Scientific Meeting of the Society for Reproductive Investigation (SRI), San Diego, USA: <i>poster presentation</i>	2018	1
National conferences		
Healthy Pregnancy 4 All symposium, The Hague	2014	0.2
Congress Early Pregnancy, Utrecht	2015	0.2
Symposium Preconception care: quo vadis, VUMC, Amsterdam	2015	0.1
3rd Symposium Urban Perinatal Health, Rotterdam	2015	0.2
4th Symposium Urban Perinatal Health, Rotterdam - <i>oral presentation</i>	2017	0.2
Seminars, workshops and research meetings		
Workshop on Work-related risks and pregnancy, RIVM, Utrecht	2014	0.1
Expert meeting on preconception care, zonMW, The Hague	2014	0.1
Workshop media contact for researchers, Erasmus MC	2015	0.1
Erasmus MC PhD day	2015	0.2
Expert meeting on Ethical Issues Surrounding Preconception Care	2016	0.1
Weekly and biweekly obstetric research meetings of the Department of Obstetrics and Gynaecology, Erasmus MC	2014-2018	5.0
Three-monthly research meetings Rotterdam Gynaecologists Teaching Hospitals (RGOC)	2015-2018	0.5
Annual RGOC award meeting: 'Wladimiroff symposium'	2015-2018	0.3
Reports and other writing		
Contributed to writing of the report for the Dutch Ministry of Health on Healthy Pregnancy 4 All	2016	0.2
Contributed to writing of the report for the Dutch Ministry of Health on Healthy Pregnancy 4 All-2	2018	0.2
Contributed to writing of the Cahier 3 Stichting Biowetenschappen en Maatschappij (BWM) 'Van slaapkamer naar laboratorium'; chapter on preconception care.	2017	0.1

2. Teaching	Year	Workload (ECTS)
Lecturing		
Lecture on Interconception care for Preventive Child Healthcare physicians	2014	0.5
Lecture on Preconception care for Midwifery students	2015	0.5
Lecture on Preconception care for NIHES students	2015	0.5
Tutoring / training		
Training Preventive Child Healthcare professionals on interconception care (within the Healthy Pregnancy 4 All program and municipal policy of Rotterdam)	2014-2016	1.0
Supervising Master's theses		
Supervising master thesis of Lotte Huitema, student Master Management, Policy-analysis and entrepreneurship in Health and Life Science, VUMC.	2015	2.0
Title: <i>'Improve utilization of preconception care in the Netherlands through evaluation of experiences and satisfaction of women with Preconception care.'</i>	2015	1.0
Partly supervising master thesis of Céline van den Hazel, medical student, Erasmus MC. Title: <i>'How to deal with interconception care?'</i>	2016	2.0
Supervising master thesis of Suzan Hulst, medical student, Erasmus MC Title: <i>'Interconception care as part of the Preventive Child Health care: a baseline survey.'</i>		
3. Other	Year	Workload (ECTS)
Treasurer of the association for PhD student of Erasmus MC - Promeras	2014-2016	1
Member of the PhD committee, Erasmus MC	2014-2016	0.5

Denson