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ORIGINAL ARTICLE

Determinants of the intention of preconception care use: lessons from a multi-ethnic urban population in the Netherlands

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Abstract
Objectives To investigate the determinants of the intention of preconception care use of women in a multi-ethnic urban population.
Methods The ASE-model—a health behaviour model—was used as an explanatory framework. A representative sample was taken from the municipal population registers of two districts in Rotterdam, the Netherlands, 2009–2010. 3,225 women (aged 15–60 years) received a questionnaire, which was returned by 631: 133 Dutch, 157 Turkish and Moroccan, and 341 Surinamese and Antillean. Descriptive, univariate and multivariate analyses were performed.
Results The multiple logistic analyses showed that intention to attend preconception care was significantly higher in women with a Turkish and Moroccan background (β 1.02, $P = 0.006$), a higher maternal age (β 0.04, $P = 0.008$) and a positive attitude (β 0.50, $P < 0.001$). Having no relationship (β −1.16, $P = 0.004$), multiparity with previous adverse perinatal outcome (β −1.32, $P = 0.001$), a high educational level (β −1.23, $P = 0.03$), having paid work (β −0.72, $P = 0.01$) and experienced barriers level (β −0.15, $P = 0.003$) were associated with less intention to use preconception care.
Conclusions Modifiable determinants as attitude and barriers can be addressed to enhance preconception care attendance.

Keywords Preconception care · Ethnicity · Attitude · Social-influences · Barriers · Intention

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Introduction

Despite major advances in medical care and the relatively high level of prosperity, poor perinatal outcomes continue to be a problem in the Netherlands (Grant et al. 2011). Adverse outcome comprises perinatal mortality and morbidity. For many adverse conditions, antenatal care is often too late (de Weerd and Steegers 2002). Evidence accumulates on the periconceptional period as the critical stage of exposure to subsequent perinatal risks (Barker 1995, 2007). Therefore, to the extent that risks are modifiable and effective interventions are available, interventions should start before conception. The main goals of preconception care (PCC) are health promotion, risk assessment, counselling, and interventions to eliminate risk factors or to reduce their impact. For example, there is ample evidence on specific components such as the importance of periconceptional folic-acid supplementation (Brandenburg et al. 1999; Chacko et al. 2003; de Jong-Van den Berg et al. 2005; Morin et al. 2002). Despite significant prospective benefits of PCC, the number of consultations is very low (Coonrod et al. 2009; Delgado 2008; Frey and Files 2006). Insight in the determinants that encourage or discourage use of PCC is essential to design tailored interventions.

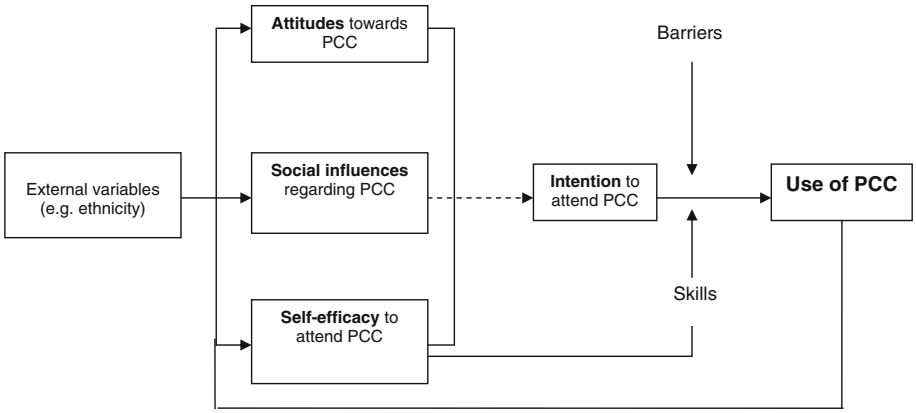

Fig. 1 Determinants of the intention of preconception care (PCC) use according to the Attitude, Social influences, Self-efficacy model

So far, information about determinants of the intention of PCC use among the general population and high-risk groups, such as immigrants, is absent or limited to one or two subgroups (Coonrod et al. 2009; Delgado 2008; Frey and Files 2006).

The aim of the present study was to investigate the determinants of the intention of PCC use in women of a large urban multi-ethnic population, with the social-psychological Attitude–Social Influence–Self Efficacy (ASE) model as point of departure (De Vries et al. 1998).

Methods

Theoretical framework

The ASE-model (de Vries et al. 1988, 1995; see Fig. 1) postulates that intention to behaviour predicts subsequent behaviour and that intention to behaviour is primarily determined by *attitudes*, *social influences, and self-efficacy* expectations. The ASE-model has been successfully applied in several studies to explain various aspects of health behaviour, such as smoking cessation (Bolman and de Vries 1998; Bolman et al. 2002), fruit and vegetable consumption (Brug et al. 1995; Lechner and Brug 1997), and fat intake (Van Wechem et al. 1997). A person's *attitude* towards a specific behaviour (e.g. PCC use) is the result of the consequences that a person expects from performing that behaviour (e.g. ''PCC will enhance a healthier pregnancy''). *Social influences* are the processes whereby people directly or indirectly influence thoughts, feelings, and actions of others (e.g. husbands of women considering pregnancy). *Self-efficacy* expectations pertain to a person's belief in his or her own ability to perform the behaviour successfully and relates to one's skill-level. The model additionally emphasizes the importance of minimizing barriers for an intention to be transformed into behaviour. *Barriers* to attend PCC include, e.g. being afraid of blood withdrawal. Parallel to it, a person needs to have the appropriate skills for practising the specified behaviour. *Skills* include both a sufficient educational level and other abilities, e.g. knowledge of risk factors and Dutch language proficiency. Age, gender, and ethnicity are considered *external variables* influencing both ASE-determinants and the desired behaviour.

Development of the questionnaire

A team of experts (psychologist, gynaecologist, epidemiologist, statistician, specialist in health education) took part in the process of the questionnaire development. The literature was searched for validated questionnaires (Lakeman et al. 2009; Nierkens et al. 2005; Poppelaars et al. 2003, 2004) to compose the questions in the concepts of the ASE-model. An initial 123-item questionnaire was developed. The feasibility of the pilot version of the questionnaire was tested in six multi-ethnic subjects with a various level of education (mean age: 37 years; range 29–48 years). Subjects were questioned regarding their impressions of the questionnaire; the clarity of the instructions, items and response choices; and their interpretations and opinions of the relevance of each question. Individuals were also asked to provide suggestions on how to reword the instructions, questions, and response options. Overall, subjects were positive regarding the questionnaire. Based on their suggestions minor wording changes were made to the instructions and questions. 1 question was split into 2 questions, yielding 124 questions.

Measurements

Ethnicity was based on the country of birth of the individual registered in the civil administration. We categorised respondents living in a deprived *neighbourhood* based on the postal code, which can be converted appropriately by the published Dutch index of deprivation 2007. *Multiparity* was measured by asking if the woman had living children. *Adverse perinatal health outcomes*

were assessed by asking for the presence of at least five indicators of perinatal morbidities: preterm birth (<37 weeks of gestation); low birth weight (<2,500 g); congenital anomalies; low Apgar (<7, 5 min after birth); admission to NICU.

ASE-determinants

Cronbach's α was used to test the internal consistency of the ASE-determinants questions with an increasing Cronbach's α indicating a higher intercorrelation among the questions.

Women's *attitude* towards PCC was measured by whether they rated each of the following statements as strongly disagree, disagree, neither agree nor disagree, agree, strongly agree: (1) PCC before pregnancy is unnecessary, (2) PCC should be free of charge for everyone planning to conceive, and (3) if you visit PCC, you know how to become pregnant in a healthy manner. High scores indicate a positive attitude towards PCC (Cronbach's α in this sample = 0.31).

Women's *social-influences* regarding seeking advice for attending a visit of PCC was assessed whether they rated each of the following statements as strongly disagree, disagree, neither agree nor disagree, agree, strongly agree: (1) My husband's opinion is important to me, (2) My family's opinion is important to me, (3) My friends' opinion are important to me, (4) My neighbours' opinion are important to me, and (5) I am afraid of negative reactions if I have a baby with problems. High scores indicate a high degree of perceived social influences (Cronbach's α in this sample = 0.86).

Women's expectations towards their own belief in the ability to perform the demanded behaviour successfully before pregnancy—*self-efficacy*—was measured by asking them to rate the following statements as very difficult, a bit difficult, easy, very easy, and I'm not overweight or don't smoke/drink/use drugs: (1) if you have overweight, how difficult is it to lose weight? (2) If you smoke, how difficult is it to quit? (3) If you drink alcohol, how difficult is it to quit? (4) If you use (soft) drugs, how difficult is it to stop using? (5) How difficult is it to take folic-acid daily? And also (6) how difficult is it to attend PCC regularly (e.g. once per month) to seek advice or get information? High scores indicate positive expectations of women to realise the desired behaviour (Cronbach's α in this sample = 0.58).

Skills

Educational and *household income* levels were used as indicators of socio-economic position indicating high/low level of skills. Educational level was defined as the highest completed education (no education/primary education, lower secondary education, higher secondary education, and higher vocational college/university) and classified into three categories: (1) low, (2) moderate, and (3) high. Household income was recorded on a scale from 0 to >2,500€ on which respondents could mark the net household income. The marked amount was divided into three categories (<1,000€, 1,000–2,500€, and 2,500€ and more) with standardization by household size.

Dutch language proficiency was measured by asking: When someone talks to you in Dutch, are you able to understand? yes often/always, yes sometimes, no. A summated score was calculated which was subsequently recoded in low, moderate or high mastery of Dutch language.

Women's knowledge of risk factors for a healthy pregnancy was measured by whether they rated each of the following statements as true: (1) pregnancies close behind each other are good for baby's health, (2) smoking adversely affects fertility, (3) being underweight or overweight adversely affects fertility, (4) sexually transmitted disease must be treated before pregnancy, (5) all medications from drugstores are safe and can be used during pregnancy, and (6) the best moment to start with folic-acid supplementation is when you got pregnant. High scores indicate a high knowledge of perinatal risk factors (Cronbach's α in this sample = 0.59).

Barriers

Perceived *barriers* were measured by asking respondents to rate the following statements as: strongly disagree, disagree, neither agree nor disagree, agree, strongly agree: (1) I am afraid to attend PCC if blood is withdrawn, (2) PCC takes too much time and effort, (3) I am reluctant regarding PCC, (4) PCC is useless, (5) if I attend PCC I feel pressured to have a perfect baby, (6) I'm afraid of negative reactions from my husband or family when I attend PCC, and (7) Religion forbids attendance of PCC. High sum-scores indicate that women perceive more barriers (Cronbach's α in this sample = 0.69).

Intention to attend

Intention to attend PCC was assessed by asking to rate the following statements as: strongly disagree, disagree, neither agree nor disagree, agree, strongly agree: (1) If I have access to free PCC counselling before pregnancy, I would definitely go, (2) If I have access to PCC counselling before pregnancy and it costs 15€, I would definitely go, (3) If I have to quit smoking and/or drinking before pregnancy, I would definitely quit (4) If I have access to PCC every month before pregnancy for advice and a free test, I would definitely go, and (5) If I have to take daily folic-acid

before pregnancy, I would definitely do it. High scores indicate a high intention to incline for PCC (Cronbach's α in this sample = 0.83).

Participants and data collection

We included a northern and southern district in the city of Rotterdam consisting of 120,000 inhabitants of whom 60 % is of immigrant origin and 30 % lives below welfare standard with mean perinatal mortality rates of 8.9 per 1,000 births (north) and 11.3 per 1,000 births (south). Perinatal morbidity comprised of preterm birth, intrauterine growth restriction, congenital anomalies and low Apgar (<7, 5 min after birth) exists in 17.4 % and in 18.1 % of all births in the northern and southern district, respectively (Poeran et al. 2010). In Rotterdam perinatal mortality rates range from 2 to 37 per 1,000 births in neighbourhoods (Poeran et al. 2011).

To obtain a representative sample, we predefined 15 strata consisting of three age categories (15 to ≤30, 30 to ≤45, 45 to ≤60 years) and five ethnic groups (the four largest immigrant groups: Turkish, Moroccan, Surinamese and Antillean, and a Dutch reference group). The oldest (and partially non-fertile) age categories were also included as it seemed interesting considering the importance of social influence of older persons/family members on behaviour of the fertile age group (Demirtas et al. 2012). For each stratum, 75 women were drawn from the municipal population registers.

Between January 2009 and October 2010, 3,225 women received a questionnaire in Dutch accompanied by an English or Turkish translation depending on the respondent's ethnic background. In general, Surinamese and Antilleans speak fluently Dutch whereas Turks and Moroccans who were born abroad do not always master the Dutch language. Arab translations were not used since most Moroccans in the Netherlands speak Berber-Moroccan which is an oral language. After 2 weeks, respondents received a reminder. In case of insufficient response, trained interviewers contacted non-responders for oral interviews by home visits. The characteristics of the non-responders are comparable with the characteristics of the population in the two districts of Rotterdam (Table 1).

Statistical analyses

First, we compared baseline characteristics according to ethnic background using the Chi-Square or Fisher's Exact tests for categorical variables and the Mann–Whitney *U* Test for age. Measured by statements, we compared ASE-determinants regarding intention to attend PCC using the Mann–Whitney *U* Test and the Chi-square test for social influences and barriers. The skewed variables ('knowledge of risk factors', 'attitude', 'self-efficacy' and 'intention') were stated in a median.

Table 1 Characteristics of the population in the northern and the southern district of Rotterdam, the Netherlands, 2010

	Northern district (n = 50,321)	Southern district (n = 70,422)
Ethnicity (%)		
Dutch	49	34
Turkish and Moroccan	19	29
Surinamese and Antillean	10	15
Age (%)		
0–14 years	14	19
15–64 years	76	70
>65 years	10	11
Type of relationship (%)		
Married	24	31
Relationship/unmarried	1	1
No relationship	63	53
Educational level (%)		
Low	29	17
Moderate	51	33
High	20	50
Income level (%)		
Low	55	60
Moderate	33	31
High	12	9

The regression model was built choosing the dependent (external variables, ASE, skills, and barriers) and independent (intention of attending PCC) variables using the 'enter' method. To avoid selection due to missing values, we included the category 'not reported' as separate category for the independent variables 'educational level' and 'Dutch language proficiency'. All tests were two-sided, and *P* values of 0.05 were considered statistically significant. The analysis was performed with the SPSS software for Windows, version 15.0.

Results

Questionnaires were filled out by 631 women (overall response rate 20 %: Dutch 21 %, Turkish and Moroccan 25 %, and Surinamese and Antillean 54 %) of which 42 women (6.7 %) completed the questionnaire by oral administration.

Of all ethnic groups, Turkish and Moroccan were the oldest ($P = 0.004$), more often married ($P < 0.001$) and more frequently living in deprived neighbourhoods ($P < 0.001$). More immigrant women had at least one child ($P < 0.001$) and had more frequently experienced an

Table 2 Baseline characteristics of the participants by ethnic background ($n = 631$); Rotterdam, the Netherlands, 2009 and 2010

	Dutch ($n = 133$)	Turkish and Moroccan ($n = 157$)	Surinamese and Antillean ($n = 341$)	P
External variable				<0.001
District, *n* (%)				
Northern	70 (53)	54 (34)	186 (55)	
Southern	63 (47)	103 (66)	155 (45)	
Median age (years, range)	37	[18–62]	42 [21–62]	41
[16–62]	0.004			
Type of relationship, *n* (%)				<0.001
Married	45 (34)	102 (65)	76 (22)	
Relationship/ unmarried	47 (35)	12 (8)	106 (31)	
No relationship	41 (31)	43 (27)	158 (47)	
Neighbourhood, *n* (%)				<0.001
Deprived	59 (44)	110 (70)	214 (63)	
Parity, *n* (%)				<0.001
1 or more	56 (42)	114 (73)	227 (68)	
Adverse outcome, *n* (%)	33 (25)	58 (37)	187 (55)	<0.001
Skills				
Educational level, *n* (%)				<0.001
Low	12 (9)	72 (50)	47 (15)	
Moderate	48 (37)	60 (41)	193 (60)	
High	70 (54)	13 (9)	84 (26)	
Income level, *n* (%)				<0.001
Low	57 (43)	119 (76)	148 (43)	
Moderate	53 (40)	33 (21)	177 (52)	
High	23 (17)	5 (3)	16 (5)	
Paid work, *n* (%)	99 (77)	52 (35)	231 (72)	<0.001
Dutch language proficiency, *n* (%)				<0.001
Low	0	17 (11)	2 (1)	
Moderate	7 (5)	63 (40)	20 (6)	
High	124 (95)	75 (49)	315 (93)	

Chi-Square test or Fisher's exact test was performed

Differences in age were tested with Mann–Whitney *U* test

adverse perinatal outcome ($P < 0.001$) in a previous pregnancy when compared to Dutch women. Turkish and Moroccan women were more often low to moderately educated ($P < 0.001$). Dutch, Surinamese and Antillean women more frequently had a low to moderate income level ($P < 0.001$) and more frequently paid work ($P < 0.001$). The Dutch language proficiency of Turkish and Moroccan women differed from the other groups, they reported more often a moderate language proficiency ($P < 0.001$) (Table 2).

About half of the women had little knowledge of the adverse effect of smoking (Dutch 58 %, Turkish and Moroccan 54 % and Surinamese and Antillean 45 %; $P = 0.04$) and over-underweight (Dutch 60 %, Turkish and Moroccan 44 % and Surinamese and Antillean 60 %; $P = 0.003$) on fertility (Fig. 2). Adequate knowledge of folic-acid use was especially low for immigrant women (Dutch 76 %, Turkish and Moroccan 62 % and Surinamese and Antillean 57 %; $P < 0.001$). Furthermore, knowledge levels differed across ethnic groups. Turkish and Moroccan women overall had the lowest knowledge levels while the Dutch women had high knowledge levels. The Surinamese and Antillean group took an intermediate position.

Women reported their husband ($P = 0.21$) as the most important social influence; the ethnic groups did not differ in this respect. Significant ethnic differences however exist in the influence of family ($P < 0.001$), friends ($P = 0.01$) and neighbours ($P < 0.001$), these are playing a more influential role for Turkish and Moroccan women. In accordance with Fig. 2, knowledge about risk factors was significantly ($P < 0.001$) higher for Dutch women (Table 3); the immigrant groups did not differ in this aspect. Often reported barriers were time and effort ($P = 0.35$) and, to lesser extent blood withdrawal ($P = 0.06$) and ethnic groups did not differ in this respect. Moreover, about 50 % of Dutch women regarded PCC as useless, a significantly higher proportion compared to the immigrant groups ($P < 0.001$). Turkish and Moroccan women reported a significantly higher proportion of feeling pressured to have a perfect baby ($P = 0.05$). Significant ethnic differences existed in the intention to attend PCC, immigrant women being more positive (Dutch 6.33; Turkish and Moroccan 8.0, and Surinamese and Antillean 7.33; $P < 0.001$).

The multivariate regression analyses showed that Turkish and Moroccan background, higher age and a positive attitude were significantly associated with higher intention to attend PCC (Table 4). Variables contributing to a significantly lower intention to attend PCC were having no relationship, multiparity with previous adverse outcome, high educational level, having paid work and experienced barriers level.

Analysis of interaction between variables

Investigation of the correlation between variables included in the multiple linear regression model was performed using Spearman correlation. As expected, strong positive

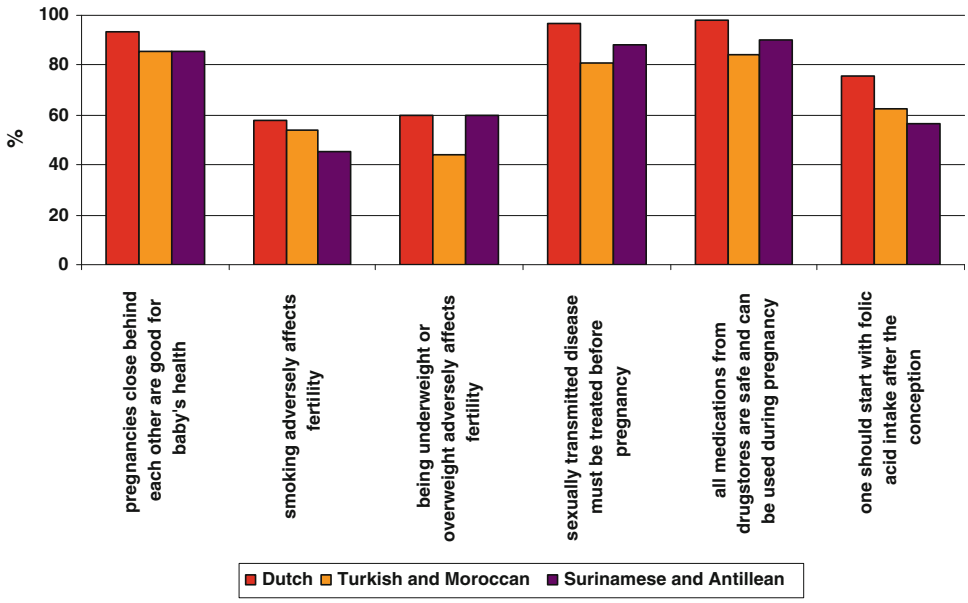

Fig. 2 Knowledge of risk factors (% of correct answers, $n = 631$) Rotterdam, the Netherlands, 2009 and 2010

association was found between the variables of social influences: family–friends ($r = 0.80$), family–neighbours ($r = 0.74$), neighbours–friends ($r = 0.84$), and friends-negative reactions ($r = 0.73$). Further, adverse outcome was correlated with parity ($r = 0.87$); these variables were converted to an interaction variable multiparity with/without adverse outcome.

Discussion

This study is one of the first population-based studies investigating determinants of the intention of PCC use. First, Turkish and Moroccan background, higher age and a positive attitude are related to a *higher* intention to attend PCC and secondly having no relationship, multiparity with adverse outcome, high educational level, having paid work and a high barrier experience are related to a *lower* intention. These results give insight into the determinants of the intention of PCC use and they provide information about how women can be stimulated and reached to attend PCC. For example, multiparous women with adverse outcome in the past could be proactively referred by doctors in the Centre for Youth and Family to interconception care. Highly educated women could be addressed on schools, education programs and campaigns on the importance of PCC. Evening consultation hours could be introduced by health care professionals to make PCC more accessible for working women.

Before discussing the results we review possible limitations of our study. Although possible response bias should be taken into account, we do not believe any response bias has been introduced. The non-responders were not a selective group; no significant differences in characteristics (gender, age, neighbourhood, education) between responders and non-responders were found. The most frequent reason for non-response was returned incomplete or not filled out questionnaires, due to removal, wrong address in the registry or death. Compared to the immigrant women, Dutch women were less represented; 21 % in our study versus 55 % in the population of Rotterdam. The representativeness of Turkish and Moroccan women (25 % in our study vs. 12 % in the population of Rotterdam) and Surinamese and Antillean women (54 % in our study vs. 12 % in the population of Rotterdam) was relatively higher in our sample. However, we do not expect that this had affected our results. There is a study on the effect of selective ethnicity-related non-response. The ABCD-study on ethnicity-related perinatal health (Tromp et al. 2009) was able to pursue an empirical approach of non-response effects: data on non-respondents (outcomes and determinants) could be retrieved anonymously from national registries. It was observed that the prevalence of outcomes and determinants (e.g. education) were affected due to selective participation. However, associations and results from regression analysis for a number of known perinatal relations of social and medical determinants with perinatal health were not affected to any relevant degree. Although, the outcome of our study is a different outcome than the ABCD-study we assume that the relation studied is not affected by differential non-response selection bias.

Retrospective data, e.g. adverse clinical outcomes in our questionnaire, are often subjected to recall bias and could lead to a potential for over- or underestimation. Pregnancy and delivery are very important for most women and not easily to forget. However, there can be very well difference

Table 3 Attitudes, social influences, self-efficacy, knowledge of risk factors, barriers regarding PCC and intention to use PCC ($n = 631$); Rotterdam, the Netherlands, 2009 and 2010

	Dutch ($n = 133$)	Turkish and Moroccan ($n = 157$)	Surinamese and Antillean ($n = 341$)	*P*
Attitude towards PCC (median; range 0–10)	7.5 [0–10]	7.4 [2.5–10]	7.5 [0–10]	0.29
Social influences regarding PCC, *n* (%)				
Husband is important	82 (67.8)	98 (77.8)	236 (73.6)	0.21
Family is important	36 (29.8)	68 (54.8)	121 (38.8)	*<0.001*
Friends are important	23 (19.0)	42 (35.0)	72 (23.2)	*0.01*
Neighbours are important	2 (1.7)	23 (19.2)	16 (5.2)	*<0.001*
Being afraid for negative reactions	10 (8.3)	15 (12.2)	46 (14.6)	0.21
Self-efficacy to attend PCC (median; range 6–27)[a]	11 [6–20]	11 [6–22]	11 [6–27]	0.92
Knowledge of risk factors for a healthy pregnancy (skills) (median; range 0–10)	8.6 [0–10]	7.1 [0–10]	7.1 [0–10]	*<0.001*
Barriers regarding PCC, *n* (%)[b]				
Fear for blood withdrawal	5 (7.4)	12 (22.2)	25 (14.1)	0.06
Time and effort	23 (33.8)	12 (22.2)	48 (27.1)	0.35
Reluctance to PCC	4 (5.9)	4 (7.5)	17 (9.7)	0.62
Preconception care is useless	31 (45.6)	7 (13.2)	35 (20.1)	*<0.001*
Feeling pressured to have a perfect baby	7 (10.3)	12 (22.6)	18 (10.3)	*0.05*
Being afraid of negative reactions	2 (2.9)	5 (9.4)	13 (7.5)	0.32
Forbidden by religion	0 (0)	3 (5.7)	4 (2.3)	0.13
Intention to use PCC (median; range 0–10)	6.33 [0–10]	8.0 [0–10]	7.33 [0–10]	*<0.001*

Italic values are statistically significant at $P < 0.05$

PCC = preconception care

[a] A higher score represents larger degree of self-efficacy

[b] A higher score represents more barriers

of interpretation of an outcome between doctor and the mother. This could have an effect on the estimation of adverse outcomes in our (sub) study group. The Generation R study showed that among Antilleans and Surinamese a lower prevalence of SGA (Troe et al. 2007) and a higher prevalence of preterm deliveries (Troe et al. 2008) exist.

Our results are comparable to a recent study (van Elderen et al. 2010) exploring the *intentions* of Turkish female immigrants to participate in preconception carrier screening for haemoglobinopathies. The wish to reduce uncertainty induced the intention to participate in preconception carrier screening (Atkin et al. 1998). Secondly, we found that increasing age is associated with higher intention to attend PCC. Possibly because of a higher awareness of perinatal risk factors prior to pregnancy and higher health literacy compared to young adults. Women with a low level of health literacy have higher disease outcomes (Schillinger et al. 2002) and have less knowledge of preventive health practices (Lindau et al. 2002), and are less motivated in preventive activities. Additional research has to explore the relation between risk-perception, knowledge and intention of PCC use. Thirdly, women without a relationship—as expected—had less intention to attend PCC, possibly because they feel it is not their concern yet. Nonetheless, women without a relationship can become pregnant too and therefore should be informed about preconceptional health. Fourthly, multiparous women with a previous adverse perinatal outcome are less inclined to attend PCC. In a study (Kupek et al. 2002) identifying factors that are predictive of late initiation of antenatal care, a high obstetric risk was significantly associated with late initiation of antenatal care by primiparous women. One might reason that less intention to attend PCC is the result of negative experience of the adverse outcome. This might be due to the negative experience with health professionals or the expectation that PCC can not influence outcome in a positive way.

Furthermore, the vast majority of women reported a positive attitude regarding PCC. As in our study, in two other studies (Canady et al. 2008; Mazza and Chapman 2010), a great willingness on the part of women to optimise their health in preparation for pregnancy was reported.

Higher educated women were *less* intended to attend PCC. This finding is consistent with a qualitative study (Hosli et al. 2008) exploring why women did not respond to an invitation to attend for PCC. These women perceived

Table 4 Results of the multiple linear regression analysis of the intention to attend PCC ($n = 631$); Rotterdam, the Netherlands, 2009 and 2010

	β	95 % CI	P
External variables			
Ethnicity (reference: Dutch)			
Turkish and Moroccan	1.02	0.30 to 1.73	*0.006*
Surinamese and Antillean	0.70	−0.20 to 1.60	0.13
Higher maternal age (every increase of age in years)	0.04	0.01 to 0.07	*0.008*
Type of relationship (reference: married)			
Relationship/unmarried	−0.58	−1.43 to 0.28	0.19
No relationship	−1.16	−1.95 to −0.37	*0.004*
Neighbourhood (reference: non-deprived)			
Deprived	0.19	−0.37 to 0.74	0.50
Multiparity with or without previous adverse perinatal outcome (reference: nulliparity)			
Multiparity with adverse outcome	−1.32	−2.09 to −0.55	*0.001*
Multiparity without adverse outcome	−0.30	−1.62 to 1.02	0.65
ASE-determinants			
Attitude level towards desired behaviour (range 0–10)	0.50	0.36 to 0.65	*<0.001*
Social influences towards desired behaviour (importance)			
Husband	0.06	−0.20 to 0.31	0.67
Family	0.08	−0.25 to 0.40	0.64
Friends	0.19	−0.21 to 0.58	0.35
Neighbours	−0.34	−0.80 to 0.11	0.14
Being afraid for negative reactions	0.04	−0.31 to 0.40	0.81
Self-efficacy level towards desired behaviour (range 6–27)	−0.02	−0.09 to 0.06	0.68
Skills			
Educational level (reference: low)			
Moderate	−0.98	−1.95 to 0.004	0.05
High	−1.23	−2.31 to −0.15	*0.03*
'not reported'	−2.38	−4.61 to −0.16	*0.04*
Income level (reference: low)			
Moderate	0.11	−0.63 to 0.84	0.77
High	0.51	−0.67 to 1.69	0.39
Paid work (yes)	−0.72	−1.29 to −0.15	*0.01*
Dutch language proficiency (reference: low)			
Moderate	2.40	−0.31 to 5.11	0.08
High	1.87	−0.84 to 4.58	0.17
'not reported'	1.75	−1.54 to 5.04	0.30
Knowledge level of perinatal risk factors (range 0–10)	0.09	−0.05 to 0.23	0.19
Barriers			
Barriers level (range 7–22)	−0.15	−0.25 to −0.05	*0.003*

Italic values are statistically significant at $P < 0.05$

PCC preconception care

CI Confidence Interval

Adjusted R^2 0.46

themselves as having sufficient knowledge of PCC and/or not being at risk. In two other studies (Coonrod et al. 2009; Frey and Files 2006) evaluating knowledge and beliefs of women about PCC demonstrated that a majority of women do understand the importance of optimising their health prior to conception. These aforementioned studied populations demonstrated deficiencies in knowledge of risk factors that impact maternal and fetal health. Although, in

our study the level of knowledge of risk factors appeared low, it was not a determinant of intention of PCC use.

We expected a relationship between Dutch language proficiency as a *skill* and intention of PCC use. We, however, found no such relationship in contrast to a previous Dutch study on folic acid knowledge and use in a multiethnic pregnancy cohort (van Eijsden et al. 2006). In our study the majority of Turkish and Moroccan women considered their Dutch language proficiency as good which is in accordance with the annual national survey of the Social and Cultural Planning (Mérove Gijsberts 2009, The Hague), 45–50 % of both Turkish and Moroccan reported no difficulty with the Dutch language. We calculated the correlation between Dutch language proficiency and intention to attend PCC and the highest association was found for moderate language proficiency. We don't believe low literacy was a barrier, because questionnaires were accompanied with a translation and non-responders were visited at home for oral administration by interviewers in their own language.

Although we found clear ethnic differences in the influence of family in the decision of women to attend PCC, it had insufficient explanatory power of intention of PCC use. Lakeman et al. (2009) explored the determinants of participation in preconceptional ancestry-based carrier couple screening for cystic fibrosis and haemoglobinopathies. Similar with our findings a higher social influence for participants of non-Western origin was found.

Furthermore, *self-efficacy* is an important independent predictor for other behaviours such as smoking cessation (Bolman and de Vries 1998; Bolman et al. 2002), but we found no independent influence on the intention to attend PCC. Apparently, women consider themselves capable enough to visit a GP or a midwife which is of course quite different then smoking cessation or losing weight.

Finally, we found a clear relationship between experienced *barrier* and intention of PCC use. Working women were less inclined to visit a PCC consult, maybe because work complicates visiting PCC during office hours. This result is an important signal to health care professionals who should facilitate access to PCC services. Health professionals could introduce evening consultation hours to facilitate access to PCC.

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Conflict of interest The authors declare that they have no competing interests.

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