Inequalities in uptake of prenatal screening according to ethnicity and socio-economic status in the four largest cities of the Netherlands (2011-2013)

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ABSTRACT

Objectives: in the Netherlands, all women are claimed to have equal access to prenatal screening (PS). Prior research demonstrated substantial inequalities in PS uptake associated with socioeconomic status (SES) and ethnic background. The suggested pathway was a lack of intention to participate in PS among these subgroups. We studied the background of inequalities in PS participation, challenging intention heterogeneity as the single explanation.

Methods: multivariable logistic regression analyses of the national PS registry, focusing on the four largest cities in the Netherlands (n = 4578, years 2011-2013), stratified by SES.

Outcome measures: (1) any uptake of PS (yes/no) and (2) uptake (one/two tests) for women who intended to participate in two tests. Determinants included intention, ethnicity, practice, and age.

Results: of non-Western women, 85.7% were screened versus 89.7% of Western women. Intention was an important explanatory factor in all models. However, after correction for intention, ethnicity remained a significant determinant for differences in uptake. Ethnicity and SES also interacted, indicating that non-Western women in low SES areas had the lowest uptake (corrected for intention).

*Conclusions for practice: s*ocioeconomic status and ethnicity related inequalities in PS uptake are only partially explained by intention heterogeneity; other pathways, in particular provider-related determinants, may play a role.

INTRODUCTION

In 2007, a nationwide program on prenatal screening (PS) for congenital anomalies was introduced in the Netherlands, supported by a legislative framework (Population Screening Act.[1] PS informs pregnant women and their partners in a timely manner about the likelihood of having a child affected by Down's syndrome or structural congenital anomalies. If the fetus is diagnosed with a syndrome or disorder, prospective parents have the opportunity to either prepare for the birth of a child with this disorder or to consider termination of pregnancy.

Under Dutch law, all pregnant women should be offered the opportunity to receive information from a certified counselor, on the possibility of having PS.[2] Only if the pregnant woman indicates she wants to be informed on PS, the initial consultation is followed by counseling on the first trimester Combined Test (CT) and the second trimester Fetal Anomaly Scan (FAS). This information 'triage' stage, preceding the actual screening, embodies the principle of 'the right not to know'.

For those consenting, the first option, the CT calculates the chance of carrying a child with Down's syndrome or the lethal syndromes of Patau and Edwards based on biochemistry, serum concentrations of PAPP-A and fβ-hCG, the sonographic fetal nuchal translucency measurement, and maternal age. [3] The FAS, an ultrasound screening test for fetal anomalies at 20 weeks of gestation, primarily aims at the detection of fetal neural tube defects.[4] If the result of the PS is suggestive for a syndrome or disorder, women are offered additional prenatal diagnostic tests.

All women have to pay approximately €165 for the participation in CT; however, before 2015 (data shown in this paper) women over 36 years were exempted from this copayment because of their supposed higher chances of having a positive test. The FAS is freely available. See figure 4.1 for an overview of the Dutch PS program.

Despite the assumption of a barrier free choice for PS in the Netherlands, available data suggest selective barriers to exist as substantial heterogeneity in participation rates are present. Fransen *et al.* showed that non-Western women were less likely to make an informed choice and were less likely to participate in the CT, without any evidence of a different attitude to PS as such.[5,6] In other western countries women from low socioeconomic status (SES) or non-Western ethnic backgrounds were less likely to receive PS, even in the absence of out-of-pocket costs.[7-11] Generally, contributing factors to these inequalities could be patient-related (i.e. language barriers, the inability to afford the deductible, or preference effects following one's cultural or personal background) and provider-related (lack of time for proper counseling, logistic barriers, personal view of the professional). Only heterogeneity due to true preference of the client should be present.

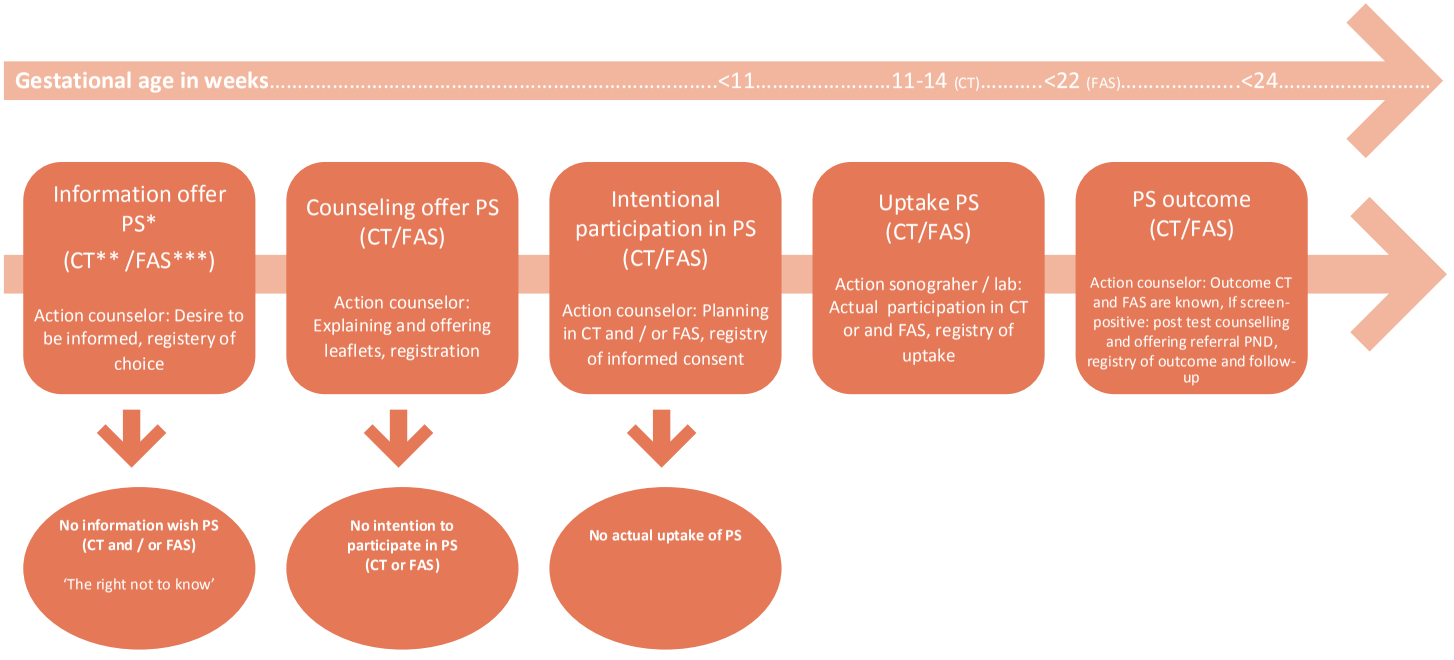

Figure 4.1. Dutch prenatal screening on Down's syndrome and congenital anomalies
PS: Prenatal Screening
CT: first trimester combined test
FAS: second trimester Fetal Anomaly Scan

The aim of this study was to investigate the presence of inequalities in the actual uptake of both CT and FAS as related to SES and ethnicity in the four largest cities in the Netherlands. These cities harbor large non-Western subpopulations (>15%). Also substantial SES gradients are present in these cities. Because prior studies revealed significant differences in perinatal health outcomes and care utilization within these areas [12, 13], registry data on PS in these cities were regarded suitable to investigate whether ethnicity- and SES-related PS inequality were present here, and whether heterogeneity in preference of these groups was the single explanation for inequalities.

METHODS

To investigate the presence of inequalities in women's uptake of PS in relation to SES and ethnicity in the four largest cities in the Netherlands, we extracted records with a small set of individual-level variables from the national Peridos database for the years 2012 to 2013. This web-based database contains data on different aspects of PS in the Netherlands.[14] This includes information on patient characteristics, counseling, informed choice (preference), and actual uptake of the CT and of the FAS. Data are provided by healthcare professionals involved in PS (counselors and sonographers). Not all data fields in Peridos are mandatory and internal validation of the data is yet to be carried out.

The completeness of recording showed practice variation. We excluded practices with more than 10% missing overall information in the client records, as for our analyses data needed to be reasonably complete on the procedural steps. Additionally we excluded individual cases with missing information on gravidity, ethnicity, postal code and uptake of prenatal screening. See figure 4.2 for an overview of exclusions.

Outcome variable

In our analyses we focused on two outcome variables. The first variable was 'actual uptake of PS'. The response variable was dichotomous (non-participation in PS: 0; having participated in some form of PS: 1). The latter could be the CT solely, the FAS solely, or both tests.

As an intermediate variable we included the woman's preference for PS as expressed after being counseled. The options were: no screening, CT, FAS, or both tests.

The second dichotomous outcome variable was the 'comprehensiveness of PS' in women who preferred both forms of screening after counseling (uptake of both the CT *and* the FAS: 1; uptake of only one test (CT *or* FAS): 0).

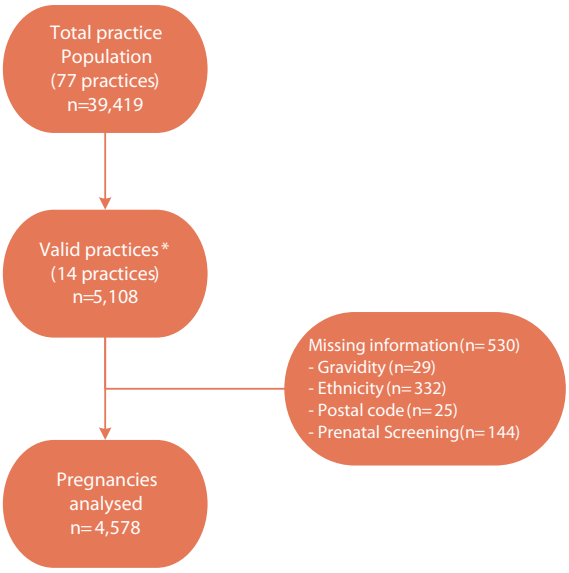

Figure 4.2 Exclusion of pregnancies.
* Practices with <10% missings in registry
This figure shows the number of pregnancies excluded from the analysis.

Determinants

Based on previous studies on the association of maternal covariates and actual uptake of PS, we included the following maternal covariates: maternal age (in categories, as a strictly linear relationship could not be assumed in the statistical models) and ethnicity. In Peridos the ethnic categories were not mutually exclusive. Therefore we dichotomized ethnicity into being from 'Western' or 'non-Western' descent. Moreover this dichotomization usually provides the most contrasting results in the Netherlands. Gravidity was included because prior experience with pregnancy is known to influence behavior in the current pregnancy. Data on neighborhood SES were obtained from the Netherlands Institute for Social Research.[15] The status scores were calculated based on (1) average income, (2) proportion of people with low income, (3) proportion of people with a low education and (4) proportion of unemployed people in a neighborhood. Higher values of this continuous variable indicate a higher SES. Because the maternal zip codes were missing in 85% of the records, we used the address of the counseling practice as a proxy for the woman's neighborhood of residency. Lastly, an uptake variable at the practice level was included. For each counseling practice in the study we calculated a CT-ratio: number of women who participated in the CT divided by the total number of women in this counseling practice. In this way, we obtained an indication of uptake of PS at practice level. This may be relevant because caregivers may unintentionally influence uptake themselves.

Ethics and consent

The legal use of Peridos data is based on 'implied consent'.[16] Pregnant women who received an information offer on PS were informed about the use of the anonymized data for quality assessment and research purposes and the right to object to information disclosure for this purpose (opt out). Permission for the current analysis was obtained from the 'Centraal Orgaan Prenatale Screening', the national steering committee.

Analytical strategy

We started with descriptive analyses of the maternal demographic characteristics. Hereafter, in all explanatory analyses the study population was stratified according to SES (low SES: ≤50th percentile of all SES values, high SES: >50th percentile of all SES values). The first set of explanatory analyses was based on the entire study population. Univariate logistic regression analyses established the crude odds ratios (OR, 95% CI) between the demographic characteristics and the uptake of PS (model 1). The same determinants were subsequently included in a multivariable logistic regression model (model 2).

Our second set of analyses focused on the subgroup of women who preferred both forms of PS (CT *and* FAS). Again, at first univariate logistic analyses were performed to determine the crude odds ratios (OR, 95% CI) between the demographic characteristics and the participation in either one (CT *or* FAS) or both tests (CT *and* FAS) of PS (model 3). The determinants were subsequently included simultaneously in a multivariable logistic regression model. All analyses were performed using IBM SPSS Statistics version 20.0 (IBM Corp., Armonk, NY, USA) or SAS 9.3 (SAS Institute, Cary, NC, USA).

RESULTS

Demographic characteristics

Between 2012 and 2013, 96.6% of pregnant women in our study sample had indicated after counseling that they wanted any PS. 88.3% actually received either one or both tests.

Table 4.1 shows the demographic characteristics of the study population. Western women received PS slightly more often than non-western women (89.6% versus 85.7%, p<0.01). In non-western women, the uptake of CT was only 12.2%. This was 31.4% in western women. A similar, yet more subtle pattern was seen for SES with CT uptake being lower in low SES women. The proportion of women preferring a CT (with or without FAS) increased with age. Additionally in primigravid women, the uptake of PS was slightly higher than in multigravid women.

Table 4.1 Population Characteristics

		Actual uptake of screening at 24 weeks of gestation				
4578	**Total** N (column %)	**Combined Test (CT)**	**Fetal Anomaly Scan (FAS)**	**Both CT and FAS**	**No Screening**	**p-value**
		N (row %)	N (row %)	N (row %)	N (row %)	
Age		138 (3.0)	3030 (66.2)	876 (19.1)	534 (11.7)	<0.01
<20 years	89 (1.9)	0 (0)	75 (84.3)	1 (1.1)	13 (14.6)	
20 - 30 years	1640 (35.8)	19 (1.2)	1267 (77.3)	137 (8.4)	217 (13.2)	
≥30 - 36 years	2155 (47.1)	84 (3.9)	1327 (61.6)	526 (24.4)	218 (10.1)	
≥36 years	694 (15.2)	35 (5.0)	361 (52.0)	212 (30.5)	86 (12.4)	
Gravidity						<0.01
Primigravida	2042 (44.6)	64 (3.1)	1347 (66.0)	424 (20.8)	207 (10.1)	
Multigravida	2536 (55.4)	74 (2.9)	1683 (66.4)	452 (17.8)	327 (12.9)	
Ethnicity						<0.01
Non-Western	1563 (34.1)	19 (1.2)	1176 (75.2)	145 (9.3)	223 (14.3)	
Western	3015 (65.9)	119 (3.9)	1854 (61.5)	731 (24.2)	311 (10.3)	
Socioeconomic Status						<0.01
SES <50th percentile	2224 (48.6)	48 (2.2)	1571 (70.6)	335 (15.1)	270 (12.1)	
SES ≥50th percentile	2354 (51.4)	90 (3.8)	1459 (62.0)	541 (23.0)	264 (11.2)	
Stated screening preference at 10 weeks of gestation						<0.01
FAS	2711 (59.2)	0 (0)	2332 (86.0)	58 (2.1)	321 (11.8)	
CT + FAS	1727 (37.7)	138 (8.0)	652 (37.8)	813 (47.1)	124 (7.2)	
Unknown	140 (3.1)	0 (0)	46 (32.9)	5 (3.6)	89 (63.6)	

CT, Combined Test
FAS, Fetal anomaly scan

The stated screening preference was strongly associated with the actual uptake of screening. In advance 37.7% of women preferred both CT *and* FAS: in these women the uptake of both tests was 47.0%, the uptake of CT *or* FAS was 45.8% and 7.2% declined all tests. This means that more than half of the women who preferred both tests after counseling, participated in only 1 or none. Also, women who had not stated their preference after counseling, did not receive screening in 63.6% of the cases. In table 4.2 the stated screening preference at ten weeks of gestation is indicated per SES stratum and per ethnicity stratum. A considerably lower proportion of non-western women wanted both screening tests, in favor of FAS only. Preference in low SES women showed the same pattern.

Table 4.2 Stated screening preference at 10 weeks of gestation, according to ethnicity and socioeconomic status.

	Total N (column %)	**FAS** N (row %)	**Both tests (CT+FAS)** N (row %)	**Unknown** N (row %)	**p-value**
Total	4578	2711 (59.2)	1727 (37.7)	140 (3.1)	<0.01
Ethnicity					<0.01
Non-Western	1563 (34.1)	1197 (76.6)	317 (20.3)	49 (3.1)	
Western	3015 (65.9)	1514 (50.2)	1410 (46.8)	91 (3.0)	
Socioeconomic Status					<0.01
SES <50th percentile	2224 (48.6)	1602 (72.0)	553 (24.9)	69 (3.1)	
SES >50th percentile	2354	1109 (47.1)	1174 (49.9)	71 (3.0)	

CT, Combined Test
FAS, Fetal anomaly scan

Logistic regression

Tables 4.3a and b show the univariate and multivariable logistic regression analyses for the outcome variable 'no screening' in low (Table 4.3a) and high (Table 4.3b) SES women respectively. In low SES women non-Western ethnicity was strongly associated with higher odds of receiving no PS (OR 1.77). Advanced maternal age, primigravity and a preference for either FAS or both types of screening were associated with reduced odds of no screening. Counseling practice appeared to be a strong provider related determinant as well. Univariate and multivariable regression results were comparable. In high SES women, the individual's preference and the counseling practice both were significant determinants, and only the first remained significant in the multivariable model. Unlike the low SES model, other determinants showed little effect. Therefore, the patterns in significant determinants for non- participation in screening were quite different for the two SES strata.

Table 4.4a shows the univariate and multivariable logistic regression analyses on 'uptake of one or two types of screening tests' for low SES women who preferred two types of screening after counseling. Non-Western women had higher odds of participating in only one type of screening test than Western women. The opposite effect was seen for primigravida, who had lower odds of participating in one type of screening test. These effects remained significant in the multivariable model. Counseling practice again was a significant provider related factor in both models. The same analyses for the high SES stratum is presented in table 4.4b. Non-Western ethnicity and advanced maternal age were associated with higher odds of receiving only one type of screening in the univariate model. However this effect did not remain significant after correction for the other determinants. This means that non-Western ethnicity was not an additional factor for the uptake of PS in high SES women.

Table 4.3a Logistic regression models of individual level determinants and uptake of prenatal screening (no / yes, reference category) for low socioeconomic status women.

	N = 2224	Model 1 (crude)		Model 2 (Forced entry)	
Determinants		**OR**	**95% CI**	**OR**	**95% CI**
Age *(ref. 20 – 30 years)*	**30 - 36 years**	0.68	(0.51-0.92)*	0.69	(0.51 - 0.95)$^{+}$
	≥36 years	0.86	(0.58-1.28)	0.79	(0.51 - 1.22)
Gravidity *(ref. Multigrav.)*	**Primigravida**	0.54	(0.41 - 0.72)**	0.58	(0.43 - 0.78)**
Ethnicity *(ref. Western)*	**Non-Western**	1.77	(1.33 - 2.35)**	1.47	(1.09 - 1.98)*
Preference *(ref. Other)*	**FAS**	0.19	(0.11 - 0.31)**	0.15	(0.09 - 0.26)**
	Both	0.14	(0.08 - 0.25)	0.13	(0.07 - 0.23)
Practice		0.00	(0.00 - 0.00)**	0.00	(0.00 - 0.00)**

(Odds ratios, 95% confidence intervals in parentheses)
Level of significance:
* p<0.10,
* p<0.05,
** p<0.01

Table 4.3b Logistic regression models of individual level determinants and uptake of prenatal screening (no / yes, reference category) for high socioeconomic status women.

	N = 2354	Model 1 (crude)		Model 2 (Forced entry)	
Determinants		**OR**	**95% CI**	**OR**	**95% CI**
Age *(ref. 20 – 30 years)*	**30 - 36 years**	0.80	(0.59 - 1.10)	1.02	(0.71 - 1.46)
	≥36 years	1.02	(0.69 - 1.50)	1.35	(0.84 - 2.16)
Gravidity *(ref. Multigrav.)*	**Primigravida**	1.04	(0.81 - 1.35)	1.14	(0.85 - 1.53)
Ethnicity *(ref. Western)*	**Non-Western**	1.34	(0.86 - 2.09)	1.40	(0.86 - 2.28)
Preference *(ref. Other)*	**FAS**	0.03	(0.01 - 0.05)**	0.03	(0.01 - 0.05)**
	Both	0.01	(0.01 - 0.02)	0.01	(0.01 - 0.03)
Practice		0.10	(0.02 - 0.64)*	0.40	(0.06 - 2.93)

(Odds ratios, 95% confidence intervals in parentheses)
Level of significance:
* p<0.01.
** p<0.05.

Table 4.4a Logistic regression models of individual level determinants and uptake of one *or* two forms of prenatal screening (CT *or* FAS / CT *and* FAS, reference category) in low socioeconomic status women who preferred both types of screening.

	N = 553	**Model 1 (crude)**		**Model 2 (Forced entry)**	
Determinants		**OR**	**95% CI**	**OR**	**95% CI**
Age *(ref. 20 – 30 years)*	**<20 years**	1.12	(0.24 - 5.28)$^{+}$	8.88	(1.09 - 72.32)
	30 - 36 years	0.25	(0.05 - 1.27)	0.49	(0.31 - 0.79)**
	≥36 years	0.62	(0.13 - 3.07)	0.73	(0.43 - 1.23)
Gravidity *(ref. Multigrav.)*	**Primigravida**	0.31	(0.16 - 0.60)**	0.78	(0.52 - 1.16)
Ethnicity *(ref. Western)*	**Non-Western**	2.24	(1.23 - 4.08)**	2.37	(1.59 - 3.52)**
Practice		0.00	(0.00 - 0.00)**	0.00	(0.00 - 0.00)**

(Odds ratios, 95% confidence intervals in parentheses)
Level of significance:
* p<0.10,
** p<0.01

Table 4.4b Logistic regression models of individual level determinants and uptake of one *or* two forms of prenatal screening (CT *or* FAS / CT *and* FAS, reference category) in high socioeconomic status women who preferred both types of screening.

	N = 1174	**Model 1 (crude)**		**Model 2 (Forced entry)**	
Determinants		**OR**	**95% CI**	**OR**	**95% CI**
Age *(ref. 20 – 30 years)*	**30 - 36 years**	2.16	(1.28 - 3.67)*	0.69	(0.46 - 1.04)
	≥36 years	2.19	(1.10 - 4.34)	0.65	(0.41 - 1.04)
Gravidity *(ref. Multigrav.)*	**Primigravida**	0.84	(0.52 - 1.36)	0.79	(0.61 - 1.02)**
Ethnicity *(ref. Western)*	**Non-Western**	3.02	(1.42 - 6.42)***	1.41	(0.80 - 2.50)
Practice		0.14	(0.00 - 4.70)	0.00	(0.00 - 0.00)***

(Odds ratios, 95% confidence intervals in parentheses)
Level of significance:
* p<0.05.
** p<0.10.
*** p<0.01.

DISCUSSION

Our study demonstrated that inequalities in the actual uptake of PS are present in pregnant women living in the four largest cities of the Netherlands. These inequalities persisted after correction for screening preference. Ethnicity and SES showed an interacting effect: women with a non-Western ethnic background from low SES areas were the least likely to take PS. Stratifying for SES showed different patterns for the remaining risk factors, essentially suggesting that participation in the tests in women with low SES was due to material and personal constraints, and was more personal in the high SES group.

Our findings concerning a barrier effect of lower SES and a lower preference for and uptake of PS in women with a non-Western ethnic background (corrected for SES) are both in line with previous studies. Dormandy et al. investigated attitudes on and uptake of PS in the UK and also concluded that participation was less in low SES women. [8] Alderdice et al reported that individual level SES did not significantly predict uptake of screening, but area level deprivation did.(Alderdice et al., 2008) In our study we used area level deprivation to define SES as well.

By contrast, in another study from the UK in pregnancies affected by Down's syndrome, there was no significant difference between the SES quintiles in uptake of PS.[10] However, this group of women carrying a fetus with proven Down's syndrome is possibly not comparable to the general pregnant population. Rowe et al. did not find a difference according to SES either.[17] This study also investigated ethnicity and found that in the UK Asian women were less likely to prefer PS. A Dutch study focusing on the CT found a lower uptake in Non-Western women after adjustment for SES.[6] This study was carried out in part of the same geographical area as our study. Dormandy et al. investigated attitudes and uptake of PS in the UK and also found that participation was lower in non-Western women.[8]

Lastly, a recent Dutch study by Gitsels et al. also found contrasting results, with non-Western women being more likely to prefer screening.[18] This study included participants by means of purposive sampling, therefore the study population may not reflect the general population. Moreover, in this study no results were reported on preference. Preference was an important determinant for participation in PS in our study. Compared to Western women, a smaller proportion of non-Western women preferred to receive PS. This has previously been attributed to lower levels of education, lower levels of knowledge and religious background.[11] We do not have information on these determinants in our study population, but it is plausible that these factors also play a significant role in our study population. Concerning preference, we also saw that low SES women preferred FAS only (without CT), more often than high SES women. One of the possible explanations for this difference is the costs of the CT for younger

women. High SES women may experience less of a financial threshold to participate, thus leading to an inequality in access. However this inequality is unlikely to have major implications: Until 2015 the CT was reimbursed in pregnant women of advanced maternal age (>= 36 years of age) as an alternative for invasive prenatal testing.

Our study showed that preference is not the only explanation for differences in the uptake of PS. After correction for preference, the unequal outcome for non-Western women remained. In these women a stronger deviation was present than in Western women between stated preference for PS after counseling and the actual uptake of PS at the time of testing. There are a number of possible explanations. First, women might reconsider their initial choice after discussing it with her partner, family or peers. Because family ties in many non-Western cultures are often stronger, opinions of significant others mays be valued more. Secondly, in non-Western women language-barriers are more prevalent. Women may not always understand the counseling, make a non-informed choice and then opt out at the time of testing.[5] Another underlying mechanism may be that these women have difficulties navigating the health care system. The actual PS test is performed on a separate appointment, mostly at another location than where they were counseled. This may form an extra barrier for some women, which they will not always discuss with their care provider.

Our data suggest that health care professionals also play a role in the inequalities. By failing to reduce potential logistic barriers experienced by women, they may unintentionally make access to care more difficult for certain groups of women. Additionally, because of an experienced lack of time to explain what PS entails and what the results mean, or by overestimating the understanding women have of PS, care providers may contribute to the deviation between preference and realization. By knowing that these women are at higher risk of receiving less care, and that this is not solely based on their preference, care providers may place more emphasis on guiding women through the counseling process. However, improving support should not merely depend on the goodwill of health caregivers directly involved. Structured support by means of culturally competent leaflets are available, but not widely used. Innovative methods such as audiovisual tools are currently being explored and show promising results.

In all models except the high SES yes/no screening model, practice was a significant determinant for PS, albeit with a very small effect size. In high SES women no effect was found. This was either because caregiver support was perfectly in accordance with their needs concerning PS or if this was not the case, these women still managed. For the other groups of women this was less so, even though the influence was minimal.

Our study has a number of strengths that merit discussion. Firstly, the Peridos registry is filled out at the time of counseling and at the time of screening. Therefore there is little

risk of recall bias and there is no need to depend on self-report by the participating women. Secondly, by using a stratified approach to SES in our analysis, we were able to tease apart the interaction between SES and ethnicity.

Our study should also be viewed in the light of its limitations. The large number of missing values may reduce the generalizability of our findings to the rest of the population. The proportion of women with non-Western ethnicity and a low SES status are however comparable to the numbers in other national databases, suggesting the population may be comparable. [12] The large number of missings in Peridos is partly caused by the newness of the system, and registration is expected to improve in the coming years. Additionally, only women who gave consent for counseling on PS and gave permission to use their data are included in the database. Therefore we have no information on the number and characteristics of the women who did not wish to receive information on PS or of those who denied the use of their data (following informal communication the latter is a small fraction).

Because postal codes were missing in the majority of the records, we assigned the postal code of the practice or hospital to the pregnant woman. It is reasonable to assume that women seek obstetric care in their direct vicinity. Especially for low SES women, the travelling distance to a practice of choice would entail an additional financial burden. If high SES women did choose to travel a greater distance to a 'low SES' practice, this would mean that the effect we found in the study is a dilution of the true effect. Concerning information on prior pregnancies, the registry only contained information on gravidity, not parity. Ideally both would be available, because it gives insight in the occurrence of fetal demise. This may in turn influence choices in PS. The information on gravidity is however a good starting point.

Because the ethnic categories were not mutually exclusive, we had to reduce ethnicity to a dichotomous variable (crude dichotomization). This may have led to grouping together women from distinctively different ethnic and cultural backgrounds. Different backgrounds may in turn have led to differences in uptake of PS, as was demonstrated by Fransen *et al*.[6] Our inability to distinguish between these subgroups, does not detract from the fact that overall substantial differences in uptake between Western and non-Western women are present, justifying dichotomization if - like here - focus is on the potential role of provider factors.

Conclusions for practice

In all, our study rejects the assumption that the WHO universal health care coverage principle is applicable to PS in the Netherlands. There is unequal participation in PS between non-Western and Western women and women from low and high SES areas, at least in the four largest cities of the Netherlands that cover about 15% of all pregnancies. The pattern of observed effects suggest cumulative disadvantage for women

combining vulnerability characteristics. Most disturbing is that these inequalities exist after full account of the woman's' preference. In a health system that claims equal access, these outcomes urge for further follow-up and improvement, in particular as these inequalities are part of the perinatal outcome gap in the four large cities. All stakeholders should take responsibility here, caregivers, screening organizations and health insurance parties.

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