Social deprivation and adverse perinatal outcomes among Western and non-Western pregnant women in a Dutch urban population

Jashvant Poeran [a,*], Arno F.G. Maas [a], Erwin Birnie [a,b], Semiha Denktas [a], Eric A.P. Steegers [a], Gouke J. Bonsel [a,c,d]

[a] Department of Obstetrics and Gynaecology, Division of Obstetrics & Prenatal Medicine, Erasmus MC, Rotterdam, The Netherlands
[b] Institute of Health Policy and Management, Erasmus University Rotterdam, The Netherlands
[c] University of Applied Sciences Rotterdam, Midwifery Academy, Rotterdam, The Netherlands
[d] Department of Public Health, Erasmus MC, Rotterdam, The Netherlands

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ABSTRACT

Social deprivation is considered a key factor in adverse perinatal outcomes. Rotterdam, the second largest city in The Netherlands, has large inequalities in perinatal health and a high number of deprived neighbourhoods. Social deprivation is measured here through a composite variable: 'Social Index' (SI). We studied the impact of the SI (2008–2009; 5 categories) in terms of perinatal mortality, congenital anomalies, preterm birth, small for gestational age (SGA) and low 5-minute Apgar score as registered in The Netherlands Perinatal Registry (Rotterdam 2000–2007, $n = 56,443$ singleton pregnancies). We applied ethnic dichotomisation as Western (European/North-American/Australian) vs. Non-Western (all others) ethnicity was expected to interact with the impact of SI. Tests for trend and multilevel regression analysis were applied. Gradually decreasing prevalence of adverse perinatal outcomes was observed in Western women from the lowest SI category (low social quality) to the highest SI category (high social quality). In Western women the low-high SI gradient for prevalence of spontaneous preterm birth (per 1000) changed from 57.2 to 34.1, for iatrogenic preterm birth from 35.2 to 19.0, for SGA from 119.6 to 59.4, for low Apgar score from 10.9 to 8.2, and for perinatal mortality from 14.9 to 7.6. These trends were statistically confirmed by Chi2-tests for trend ($p < 0.001$). For non-Western women such trends were absent. These strong effects for Western women were confirmed by significant odds ratios for almost all adverse perinatal outcomes estimated from multilevel regression analysis. We conclude social deprivation to play a different role among Western vs. non-Western women. Our results suggest that improvements in social quality may improve perinatal outcomes in Western women, but alternative approaches may be necessary for non-Western groups. Suggested explanations for non-Western 'migrant' groups include the presence of 'protective' effects through knowledge systems or intrinsic resilience. Implications concern both general and targeted policies.

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Introduction

In The Netherlands perinatal mortality exceeds the European average, despite a high standard of mother and child healthcare with free access (Mohangoo et al., 2008). Perinatal health in the larger cities is even worse, with the highest rates of perinatal mortality and morbidity being observed in deprived neighbourhoods (de Graaf et al., 2008). The high prevalence of ethnic minority groups and disseminated social deprivation in urban areas are generally put forward as key aetiologic factors (Agyemang et al., 2009; Goedhart, van Eijsden, van der Wal, & Bonsel, 2008a, 2008b; de Graaf et al., 2008; Poeran, Denktas, Birnie, Bonsel, & Steegers, 2011). Social deprivation is a very broad term and can be defined as 'reduction or prevention of culturally normal interaction with the rest of society'. Indeed, aspects of social deprivation such as material poverty and lack of social cohesion are both related to ill health, and also strongly connected; the combined reinforcing presence of these factors might be particularly important for perinatal ill health (Fang, Madhavan, Bosworth, & Alderman, 1998; Halpern & Nazroo, 2000; Jonkers, Richters, Zwart, Ory, & van Roosmalen, 2011). Numerous studies have shown ethnicity and social deprivation to be strongly related to adverse perinatal outcomes such as preterm birth and small for gestational age (Agyemang et al., 2009; Auger, Giraud, & Daniel, 2009;

* Corresponding author. Department of Obstetrics and Gynaecology, Division of Obstetrics & Prenatal Medicine, Room Wk-221, Erasmus MC, PO Box 2040, 27 3000 CA Rotterdam, The Netherlands. Tel.: +31 107038712; fax: +31 107032109.
E-mail address: v.j.j.poeran@gmail.com (J. Poeran).

Elo et al., 2009; Farley et al., 2006; Goedhart et al., 2008a; O'Campo et al., 2008; Timmermans et al., 2011). However, many recent studies have been conducted in the United States and Canada where ethnic minorities differ considerably from those in Europe and, more specifically, The Netherlands (Agyemang et al., 2009; Elo et al., 2009; Genereux, Auger, Goneau, & Daniel, 2008; Goedhart et al., 2008a, 2008b; de Graaf et al., 2008; Janevic et al., 2010; O'Campo et al., 2008; Poeran et al., 2011). In the United States, the majority of ethnic minorities either comprise African Americans or Hispanics; in Europe, they mainly originate from former colonies (for example in the United Kingdom or The Netherlands) or they result from the 1960s labour migration from countries such as Turkey or Morocco (for example in Germany and France, respectively). Findings from these studies do not necessarily apply to European countries.

Another motivation for our study pertains to findings from a recent Dutch study, which showed Western (European/North-American/Australian) women in deprived neighbourhoods to have an increased risk of adverse perinatal outcomes as opposed to non-Western women (de Graaf et al., 2008).

Rotterdam, the second largest city of The Netherlands, has the highest proportion of non-Western inhabitants as well as the highest number of deprived neighbourhoods, and the highest rate of adverse perinatal outcomes, creating a suitable population in which to study the effect of social deprivation on perinatal outcomes (de Graaf et al., 2008). In continuation of previous work, we investigated the background and the association of social deprivation with adverse perinatal outcomes, for Western and non-Western women separately, as we hypothesise differential effects. We use a composite variable, the so-called 'Social Index' (SI) as deprivation indicator at the neighbourhood level in the city of Rotterdam. As social deprivation is considered an important metric of neighbourhood quality, policy makers have created the SI and its underlying domains to measure this. It is used to measure the effectiveness of efforts to reduce area-based social deprivation. The SI conceptually resembles the less detailed Scottish Carstairs index (Carstairs & Morris, 1990). We use the unaltered SI values to facilitate communication of study results to policy makers.

Methods

Outcome data

Data from all single pregnancies in Rotterdam over the period 2000–2007 were derived from The Netherlands Perinatal Registry. This registry contains population-based information of 97% of all pregnancies in The Netherlands (The Netherlands Perinatal Registry, 2009). Source data are collected by 94% of midwives, 99% of gynaecologists and 68% of paediatricians, including 100% of Neonatal Intensive Care Unit paediatricians (The Netherlands Perinatal Registry, 2009). The mission of The Netherlands Perinatal Registry is to improve the quality of healthcare by giving insight into the perinatal care process and outcomes (see also www.perinatreg.nl).

The Netherlands Perinatal Registry provided individual-level information on adverse perinatal outcomes, along with the four-digit zip codes of the mothers' places of residence. The number of pregnancies per zip code area (neighbourhood) ranged from 127 to 2611. Adverse perinatal outcome was defined as the occurrence of either perinatal mortality or perinatal morbidity. Perinatal mortality was defined as death from 22 weeks of gestational age until 7 days postpartum. We also defined four outcome variables of perinatal morbidity: congenital anomalies (list defined), small for gestational age (SGA, birthweight below the 10th percentile for gestational age (Kloosterman, 1970)), preterm birth (<37th week of gestation) or low 5-min Apgar score (<7). As previously described

(Goedhart et al., 2008a), preterm birth was subdivided into spontaneous and iatrogenic preterm birth, the latter being defined as birth < 37th week of gestation and an elective caesarean section or induction of labour. The remainder of births < 37th week of gestation were classified as spontaneous preterm birth. We assume iatrogenic preterm birth and low Apgar score to be related to both maternal factors as well as peripartum healthcare factors, whereas the remaining morbidity conditions are assumed to be primarily related to individual (maternal) characteristics.

Social Index

Neighbourhood social quality was assessed making use of a combined variable, the so-called 'Social Index' (SI). This index was created in 2008 and is calculated annually for the Rotterdam municipal authorities by the Centre for Research and Statistics Rotterdam (COS-Rotterdam, http://www.rotterdam.nl/onderzoek) as a policy measure. All underlying data are empirical. The SI is a composite multidimensional variable indicating neighbourhood social quality on a 1–10 scale. As is depicted in Fig. 1 the SI sum score combines scores from 4 'domains': (1) (personal) capacities, (2) living environment, (3) participation and (4) neighbourhood commitment ('social cohesion'). In turn, these 'domain' scores are a sum of 'item' scores which are based on a combination of registration data and questionnaire data. The questionnaire data are obtained from respondents from a random sample of the Rotterdam population. Per neighbourhood 900 persons were sampled, proportionally stratified for age group, sex and ethnicity. The number of inhabitants per neighbourhood ranged from 1579 to 21,200. The aim was to have 175 respondents (who completed the questionnaire) per neighbourhood. The initial format was an online questionnaire; if response was not sufficient, respondents were approached with a paper-and-pencil questionnaire or by telephone. Overall, response was 52% online, 21% by paper and pencil, and 27% by telephone.

The SI and its underlying domains are considered important metrics of the effectiveness of policy makers' efforts to reduce area-based social deprivation. More in-depth information on the Social Index and its construction is provided in the Appendix. In this study, we used the average SI for 2008 and 2009 as a proxy for neighbourhood social quality, both as a continuous measure and as an ordinal measure (5 categories) with the following 'COS-Rotterdam' thresholds:

<3.9 highest social deprivation (I);
3.9–4.9 problematic social deprivation (II);
5.0–5.9 moderate social deprivation (III);
6.0–7.0 adequate social quality (IV);
>7.0 high social quality (V).

Ethnicity

Dutch law does not permit the routine utilisation or registration of ethnicity data. As yet, The Netherlands Perinatal Registry is exempt from this restriction. The ethnic classification in this professional-based registry recognises seven possible categories: Western Dutch, Western other (including women from other European countries, Australia and the US), Mediterranean, (East) Asian, African, South Asian, or other non-Western. The African and South Asian group mainly comprises women from the former Dutch colonies Suriname and The Netherlands Antilles. The group of East Asian women mainly originate from Indonesia, also a former Dutch colony.

Classification of clients is done by the healthcare professional with an absence of strict coding rules in applying the category labels. Current classification is therefore crudely based on a mixture of self-declared ethnicity, race and known country of birth of the