



Mode of birth and social inequalities in health: The effect of maternal education and access to hospital care on cesarean delivery



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ABSTRACT

Access to health care is an important factor in explaining health inequalities. This study focuses on the issue of access to health care as a driving force behind the social discrepancies in cesarean delivery using data from 707 newborn children in the 2006–2011 birth cohorts of the German Socio-Economic Panel Study (SOEP). Data on individual birth outcomes are linked to hospital data using extracts of the quality assessment reports of nearly all German hospitals. Geographic Information Systems (GIS) are used to assess hospital service clusters within a 20-km radius buffer around mother's homes. Logistic regression models adjusting for maternal characteristics indicate that the likelihood to deliver by a cesarean section increases for the least educated women when they face constraints with regard to access to hospital care. No differences between the education groups are observed when access to obstetric care is high, thus a high access to hospital care seems to balance out health inequalities that are related to differences in education. The results emphasize the importance of focusing on unequal access to hospital care in explaining differences in birth outcomes.

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1. Introduction

In most countries, health is distributed unequally. This can be explained mainly by socio-economic factors as well as differences in health hazards, health resources, health care provision, and health behavior, all of which are interconnected throughout the life course (Lampert and Schenk, 2004; Mielck and Janssen, 2008). As health at birth and during the first years of a child's life may have an effect on future health outcomes, it is of utmost importance to ensure fetal and maternal health (Currie, 2011). This includes a childbirth that provides the best health outcomes for the mother and her child. Although a cesarean delivery can undoubtedly be a life-saving surgical procedure which also has led to a huge decline in maternal and fetal mortality in the 20th century, it is also associated with adverse health effects for both mother and child (Hyde et al., 2012; Mander, 2007). Even though upper limits for cesarean rates are controversial, studies find that countries with cesarean section rates exceeding 15 percent do not have significantly better health outcomes for mothers and children than countries with lower cesarean section rates (Althabe et al., 2006; Villar et al., 2006). Nevertheless, cesarean section rates

exceed 30 percent in many developed countries (Kolip et al., 2012; MacDorman et al., 2008; Bragg et al., 2010; Brick and Layte, 2009).

Increasing cesarean section rates are also the focus of much attention in Germany. The rate was 15.7 percent in 1990 and doubled to 31.9 percent by 2010. There is also considerable variation in cesarean rates between the more than 400 German administrative district levels with rates varying between 17 and 51 percent (Kolip et al., 2012). The existing literature explains the changes in modes of delivery in several ways, but a consensus on the underlying reasons behind the enormous rise and regional variation in cesarean section rates has not yet been achieved. Although regional distributions of age, socio-demographic factors, women's insurance status, maternal risk factors, or premature births do not predominately influence varying cesarean rates across districts, one plausible explanation for differing rates could be hospital factors (Kolip et al., 2012). Thus, the individual risk to deliver by a cesarean section seems to be driven not only by individual factors but also by factors that can be attributed to the health care system. Provision of health services (for example hospitals), social inequalities in health, and disparities in access to these services have been covered by previous research (Pilkington et al., 2012; Grzybowski et al., 2011; Kravdal, 2006). However, little is known about how access to hospital care influences cesarean sections. Analyzing potential insufficient access to obstetric care is central to research into health inequalities that are linked to individuals' area of residence. Hence, this

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study contributes to the literature on health inequalities and access to health care by addressing the following research question:

- Does the effect of access to hospital care on the probability of a cesarean section vary by maternal education?

The German Socio-Economic Panel Study (SOEP) with individual data on socio-economic characteristics, birth outcomes and birth-related control variables is used to answer this question. As the SOEP does not contain information on hospitals where women gave birth, hospital data from the quality assessment reports, covering nearly all German hospitals in 2008 (“Qualitätsberichte der Krankenhäuser 2008”), is linked to the individual records using “Geographic Information Systems” (GIS).

The paper is structured as follows. Section 1 gives a brief introduction to the conceptual framework of the study, including a brief description of factors explaining cesarean deliveries. In addition, access to health care will be discussed, and how it might be related to maternal education. Section 2 describes the data and methods used. The final parts of the present article provide the empirical findings, discussion, and conclusions.

2. Background and conceptual framework

Previous studies have explained the rise in cesarean section rates in several ways. One hypothesis is that more and more women schedule a cesarean birth for reasons of convenience. However, empirical evidence has not been able to prove that maternal requests are a major factor underlying increasing cesarean section rates (Lutz and Kolip, 2006; McCourt et al., 2007). Instead, this trend can be explained by medical factors such as maternal or fetal indications. Factors influencing a cesarean birth are obesity, diabetes mellitus, the increased age of primiparous women, failure to progress during labor, fetal distress, malpresentation (such as breech presentation), and previous cesarean sections (Crane et al., 1997; Grivell and Dodd, 2011; Leitch and Walker, 1998; Porreco and Thorp, 1996). It is also possible that social factors lead to increased risks in obstetrics: women with lower social status are more likely to have an unhealthy diet, to smoke, and to have lower prenatal care participation (Goeckenjan et al., 2009; Günter et al., 2007; Lynch et al., 1997; Fingerhut et al., 1990; Wen et al., 2010). These women more frequently live in deprived neighborhoods with poor access to recreational spaces, a higher exposure to traffic- or industrial-related air pollution and noise, and are thus more likely to be exposed to harmful environmental pollutants through the presence of lead, carbon dioxide, asbestos or pesticides (Voigtlander et al., 2010; Adler and Newman, 2002) – all of which are factors that may have an impact on the pregnant women's health status. However, in many studies, medical factors do not fully explain the increased probability of a cesarean section (O'Leary et al., 2007). Even after keeping obstetric risk constant, differences in the mode of delivery across socio-economic groups persist (Tollånes et al., 2007). Previous empirical results on the probability of a cesarean section and the woman's socio-economic status – mostly measured by education, income, or occupation – are not conclusive. Some studies suggest that privately insured women (Barros et al., 2011; Keeler and Brodie, 1993) and women from a higher social class are more likely to have a cesarean section (Gould et al., 1989; Fairley et al., 2011). However, secular trends reflect a shift from higher reported cesarean section rates for women of higher socio-economic status in the 1980s/1990s to higher reported cesarean section rates for women of lower socio-economic status in South Korea (Lee et al., 2005), in France (Guihard and Blondel, 2001), and, since the end of

1990s, in the US (Linton et al., 2004). In Norway, the least educated women had the highest probability of a cesarean section throughout the 1967–2004 period (Tollånes et al., 2007). In Germany, the relationship between socio-economic characteristics and delivery mode has rarely been investigated to date. Most assumptions on how a cesarean section and the socio-economic status of German women might be related stem from the universal findings of research on health inequalities or empirical findings from other countries (Goeckenjan et al., 2009).

It has also been argued that not only maternal but also provider characteristics are responsible for an increased cesarean section risk, such as fear of legal redress as a consequence of malpractice compensation payments, advances in medical technology, private hospitals, human resources and organizational conditions, as well as younger, less experienced physicians (Hickl and Pelz, 2008; Krause, 2004; Alfirevic et al., 2006; Lutz and Kolip, 2006; Taljaard et al., 2009). Organizational and human resource factors are especially important measures that have an impact on treatment quality and thus the avoidance of unnecessary medical interventions (Bailit, 2012). In a meta-analysis, Chaillet and Dumont (2007) found that several strategies successfully reduced hospitals' cesarean section rates. These strategies included medical audits and feedback, quality improvement interventions, guideline education, hospital payment and malpractice reform, and identification of barriers to change (Chaillet and Dumont, 2007). Also other quality improvement strategies that aim to refine data collection, identify goals and strengthen communication were found to be effective in reducing hospitals' cesarean rates (Dunn et al., 2013).

Not only are the provision of hospital service and good quality care important but also how pregnant women gain access to hospital services and whether there are social disparities in access to health care. Unlike emergency hospital admissions, such as for cardiovascular diseases, childbirth and the choice of hospital can be planned several months in advance.¹ As women can theoretically choose freely among all hospitals in Germany, it is unlikely that all of them choose the hospital located nearest to their homes, especially if there is more than one hospital nearby. Considering the aforementioned factors at the health service level, it is plausible that access to health service providers might affect individual birth outcomes. For the conceptual framework, this study makes use of the concept of *access* as defined by Penchansky and Thomas (1981). They assessed five dimensions of access to health services: *availability*, *accessibility*, *affordability*, *accommodation*, and *acceptability*. These dimensions are ideal for the conceptual framework of the present analysis as they combine health care provider as well as patient characteristics. *Availability* describes the density of medical services and facilities (such as the number of hospitals, their technical equipment, pediatric units, personnel resources, quality of care, facility equipment, and variety of treatment options) within a specified spatial area. *Accessibility* is usually described in terms of travel time or distance to the health service provider. *Accommodation* describes the extent to which the provider facilities are organized (such as maternity facilities that meet women's comfort and convenience including scheduling of prenatal classes or information sessions for mothers-to-be). *Acceptability* or “choice” of health care providers is based on their characteristics (such as appearance of hospitals and physician's age) and an individual's willingness to travel certain distances to a particular hospital for childbearing or to accept the method of treatment offered. *Affordability*, defined by the ability to pay for health care or existing health insurance coverage (see also Aday and Andersen, 1981), is of less importance in the German

¹ Out-of-hospital births still play a minor role in Germany. Around 98 percent of all children are born in hospitals (Kreyenfeld et al., 2010).

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