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Maternal Health

Primary Cesarean Delivery Patterns among Women with Physical, Sensory, or Intellectual Disabilities

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A B S T R A C T

Background: Little is known about the relationship between disability and mode of delivery. Prior research has indicated elevated risk of cesarean delivery among women with certain disabilities, but has not examined patterns across multiple types of disability or by parity.
Objective: This study sought to determine whether physical, sensory, or intellectual and developmental disabilities are independently associated with primary cesarean delivery.
Methods: We conducted a retrospective cohort study of all deliveries in California from 2000 to 2010 using linked birth certificate and hospital discharge data. We identified physical, sensory, and intellectual and developmental disabilities using *International Classification of Diseases, 9th revision, clinical modification* codes. We used logistic regression to examine the association of these disabilities and primary cesarean delivery, controlling for sociodemographic characteristics and comorbidities, and stratified by parity.
Results: In our sample, 0.45% of deliveries (20,894/4,610,955) were to women with disabilities. A greater proportion of women with disabilities were nulliparous, had public insurance, and had comorbidities (e.g., gestational diabetes) compared with women without disabilities ($p < .001$ for all). The proportion of primary cesarean in women with disabilities was twice that in women without disabilities (32.7% vs. 16.3%; $p < .001$; adjusted odds ratio, 2.05; 95% confidence interval, 1.94–2.17). The proportion of deliveries by cesarean was highest among women with physical disabilities due to injuries compared with women without disabilities (57.8% vs. 16.3%; $p < .001$; adjusted odds ratio, 6.83; 95% confidence interval, 5.46–8.53).
Conclusions: Women across disability subgroups have higher odds of cesarean delivery, and there is heterogeneity by disability type. More attention is needed to this population to ensure better understanding of care practices that may impact maternal and perinatal outcomes.

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An estimated 12% of women of reproductive age have a disability (Brault, Hootman, Helmick, Theis, & Armour, 2009). Recent research indicates that pregnancy is as common among women with disabilities as among women without disabilities (Horner-Johnson, Darney, Kulkarni-Rajasekhara, Quigley, & Caughey, 2016). However, the use of prenatal care is lower among women with disabilities (Gavin, Benedict, & Adams, 2006). Although limited evidence suggests that many women

with disabilities have favorable pregnancy outcomes (Signore, Spong, Krotoski, Shinowara, & Blackwell, 2011), studies have shown higher rates of preterm birth and low birth weight in this population (Mitra, Clements, et al., 2015). Further, increased cesarean delivery has been documented among women with specific types of physical disability, including spinal cord injury, rheumatoid arthritis, multiple sclerosis, cerebral palsy, spina bifida, and neuromuscular disorders (Arata, Grover, Dunne, & Bryan, 2000; Argov & de Visser, 2009; Chakravarty, Nelson, & Krishnan, 2006; Chambers, Johsnon, & Jones, 2004; Kelly, Nelson, & Chakravarty, 2009; Rudnik-Schoneborn & Zerres, 2004; Skomsvoll, Ostensen, Irgens, & Baste, 1998; Winch, Bengston, McLaughlin, Fitzsimmons, & Budden, 1993). Research to date also suggests that women with intellectual and developmental disabilities are at increased risk for cesarean delivery (Brown, Kirkham, Cobigo, Lunsky, & Vigod, 2016; Mitra, Parish, et al., 2015; Parish et al., 2015).

Small sample sizes in some studies and different approaches to measuring disability make it difficult to draw conclusions to guide clinical practice. Moreover, examination of more than one type of disability within a single study is rare, so very little is known about how disability subpopulations differ. Cesarean delivery and surgical recovery may be more complicated in women with disabilities (Jackson, Lindsey, Klebine, & Poczatek, 2004) and it is, therefore, important to understand the use of cesarean delivery among a range of disability types—including physical, sensory, and intellectual and developmental disabilities (IDD)—in comparison with the nondisabled population.

The purpose of this study was to describe primary cesarean delivery among women with and without disabilities and disaggregated by disability subgroups, and to test the association between disability status and cesarean delivery. We hypothesized that disability status would be associated independently with cesarean delivery, controlling for sociodemographics and health care use.

Methods

We conducted a retrospective cohort study using linked hospital discharge and vital records data (birth certificates and death files; California Department of Health Services, 2006) for all births in the state of California between 2000 and 2010 ($N = 5,772,198$). The dataset contains linked birth and delivery records with deidentified information for a mother and neonate pair from the neonatal and maternal hospital discharge record and the birth certificate. The study was approved by the California Office of Statewide Health Planning and Development, and the Institutional Review Board of Oregon Health & Science University.

Consistent with prior obstetric literature (e.g., Darney et al., 2013), we excluded women with prior cesarean deliveries from our analytic sample because prior cesarean is strongly associated with subsequent cesarean delivery. We also excluded multiple gestations and breech presentation because these are indications for cesarean delivery and could confound the relationship between disability and cesarean delivery. Figure 1 shows the number of cases excluded to arrive at our final analytic sample.

We identified our key independent variables—disability status and type—using the *International Classification of Diseases, 9th revision, clinical modification* (ICD-9) diagnosis and procedure codes from the patient discharge data file. Conceptually, disability is a complex interplay of body structures, functions, activities, and participation as impacted by contextual factors
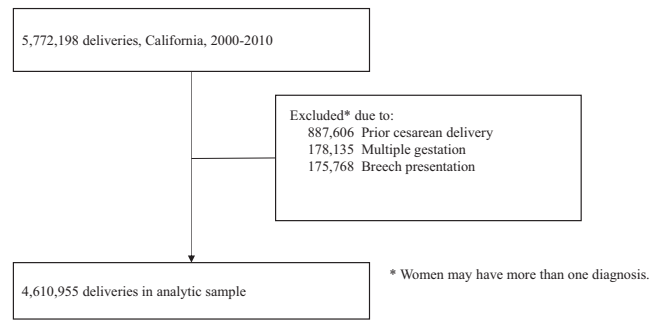

Figure 1. Exclusion flow diagram.

(World Health Organization, 2001). Diagnoses alone cannot provide information about restrictions in functioning or participation and are an imperfect means of attempting to identify disability. While acknowledging the limitations of diagnosis codes, various authors have published lists of codes likely to be associated with broad functional categories of disability, which can be used when no other data on disability are available. We built on these prior efforts in creating our algorithm (see Appendix A).

Khoury et al. (2013) developed a list of conditions associated with mobility disability and validated the list through review by a disability epidemiologist and a physician. This list served as the starting point for our physical disability codes. In consultation with clinicians and disability researchers, we added several other conditions (e.g., cystic fibrosis) that may be associated with some level of physical disability, although not necessarily a mobility restriction. We also removed some codes for acute injuries that may not have lasting impact (e.g., fracture of the spinal column without spinal cord injury). Our list of hearing disability codes was drawn from Mann, Zhou, McKee, and McDermott (2007) to which we added "other specified forms of hearing loss," "congenital anomalies of ear causing impairment of hearing," and "Deaf, nonspeaking, not elsewhere classifiable." Javitt, Zhou, and Willke (2007) categorized vision loss codes by severity and tested their classification in relation to Medicare costs associated with vision care. We used all codes associated with moderate and severe vision loss and blindness, and added codes for vision conditions that often lead to vison loss (e.g., macular degeneration and other retinal disorders). Lin et al. (2013) consulted with clinicians and policy makers to create a list of codes for identifying intellectual/developmental disabilities, consistent with criteria for service eligibility; we used their list without alteration.

Our dataset was limited to diagnoses coded at or near the time of delivery as opposed to a woman's entire medical record. Therefore, we erred on the side of inclusivity in deciding what codes to categorize as "disability," incorporating some milder conditions that we assumed must have been deemed salient if they were coded in the delivery discharge file. Appendix A contains a full list of ICD-9 codes included in our definition, along with sample frequencies.

We classified disability in several ways. First, we created a binary indictor of presence of any of our target disability types versus none. Second, we created broad disability subgroups: physical, hearing, vision, and IDD. Finally, given the heterogeneity of conditions within the physical disability group and potential differential association with cesarean delivery, we examined subgroups of physical disability: nervous system