

**Appendix**  
**Differences in Prenatal Care by Presence and Type of Maternal Disability**  
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**Appendix 1.** List of ICD-9 Codes Used to Identify Maternal Disability

ICD-9 code	Condition
<b>PHYSICAL DISABILITIES</b>	
<b>Miscellaneous Physical Disabilities</b>	
138	Late effects of polio
V46.3	Wheelchair dependence
V46.8	Dependence on other enabling machine
<b>Nervous System Disabilities</b>	
<i>Hereditary and Degenerative Diseases of Central Nervous System (CNS)</i>	
237.7	Neurofibromatosis (von Recklinghausen's Disease)
331.89	Cerebral ataxia
332.0–332.1	Parkinson's Disease
333	Other extrapyramidal disease and abnormal movement disorders
334	Spinocerebellar disease
335.1	Spinal muscular atrophy
335.2	Motor neuron disease
335.8, 335.9	Other anterior horn cell diseases
336	Other diseases of the spinal cord
337	Disorders of the autonomic nervous system
<i>Other Disorders of the Central Nervous System</i>	
340	Multiple Sclerosis
341	Other demyelinating diseases of CNS
342	Hemiplegia and hemiparesis
343	Infantile cerebral palsy
344	Other paralytic syndromes
345	Epilepsy
<i>Peripheral Nervous System Disorders</i>	
353	Nerve root and plexus disorders
356	Hereditary and idiopathic peripheral neuropathy
357	Inflammatory and toxic neuropathy
358	Myasthenia gravis
359	Muscular dystrophies and other myopathies
<b>Diseases of the Musculoskeletal System and Connective Tissue</b>	
253.0	Acromegaly and gigantism
438	Late effects of cerebrovascular disease
714	Rheumatoid arthritis
715	Osteoarthritis
717	Internal derangement of the knee
720	Ankylosing spondylitis and other inflammatory spondylopathies
721	Spondylosis and allied disorders

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722	Disc disorders
723	Other disorders of the cervical region
725	Polymyalgia rheumatica
728	Disorders of muscle ligament and fascia
732	Osteochondropathies
<b>Injuries</b>	
806	Fracture of the vertebral column with spinal cord injury
905	Late effect of musculoskeletal and connective tissue injuries
907	Late effect of injury to the nervous system
928	Crushing injury of the lower limb
952	Spinal cord injury
736.89	Other acquired limb deformity of unspecified limb
V49.6	Amputation of upper limb
V49.7	Amputation of lower limb
<b>Congenital Anomalies</b>	
277.0	Cystic fibrosis
253.4	Pituitary dwarfism
259.4	Dwarfism, not elsewhere classified
741	Spina Bifida
742	Other congenital anomalies of nervous system
754.8	Larsen syndrome
755.2	Congenital reduction deformities of upper limb
755.3	Congenital reduction deformities of lower limb
755.1	Syndactyly
755.55	Acrocephalosyndactyly (Apert syndrome)
754.51–754.7	Club foot and other congenital valgus deformities of feet
756	Other congenital musculoskeletal anomalies
<b>HEARING DISABILITIES</b>	
389.0	Conductive hearing loss
389.1	Sensorineural hearing loss
389.2	Mixed conductive and sensorineural hearing loss
389.7	Deaf, nonspeaking, not elsewhere classifiable
389.8	Other specified forms of hearing loss
389.9	Unspecified hearing loss
744.0	Congenital anomalies of ear causing impairment of hearing
<b>VISION DISABILITIES</b>	
360	Disorders of the globe
362	Other retinal disorders
363	Chorioretinal inflammation, scars and other disorders of choroid
364	Disorders of iris and ciliary body

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365	Glaucoma
366	Cataract
369	Blindness and low vision
377.7	Disorders of visual cortex
<b>INTELLECTUAL AND DEVELOPMENTAL DISABILITIES (IDD)</b>	
279.11	DiGeorge syndrome (22q11.2 deletion)
299	Pervasive developmental disorders
317	Mild intellectual disabilities
318	Other specified intellectual disabilities
319	Unspecified intellectual disabilities
330	Cerebral degenerations usually manifest in childhood
758.0–758.3	Chromosomal anomalies for which a developmental disability is typically present
758.5	Other conditions due to autosomal anomalies
758.89	Other conditions due to chromosomal anomalies
758.9	Conditions due to anomaly of unspecified chromosome
759.5	Tuberous sclerosis
759.6	Other hamartomas
759.7	Multiple congenital anomalies not otherwise specified
759.8	Other specified congenital anomalies
760.71	Alcohol affecting fetus or newborn via placenta or breast milk

## REFERENCES

The code lists above were previously published in:

Darney BG, Biel FM, Quigley BP, Caughey AB, Horner-Johnson W. Primary cesarean delivery patterns among women with physical, sensory, or intellectual disabilities. *Womens Health Issues*. 2017;27(3):336–344. <https://doi.org/10.1016/j.whi.2016.12.007>.

The IDD codes were originally drawn from:

Lin E, Balogh R, Cobigo V, Ouellette-Kuntz H, Wilton AS, Lunskey Y. Using administrative health data to identify individuals with intellectual and developmental disabilities: a comparison of algorithms. *J Intellect Disabil Res*. 2013;57(5):462–477. <https://doi.org/10.1111/jir.12002>.

The physical disability code list was modified from one used by:

Khoury AJ, Hall A, Andresen E, Zhang J, Ward R, Jarjoura C. The association between chronic disease and physical disability among female Medicaid beneficiaries 18–64 years of age. *Disabil Health J*. 2013;6(2):141–148. <https://doi.org/10.1016/j.dhjo.2012.11.006>.

## **APPENDIX 2: SENSITIVITY ANALYSES**

Sensitivity analyses involved conducting our regression analyses with alternate versions of the disability categories. The alternate versions analyzed were: (1) Making disability categories mutually exclusive and adding a separate category of women with multiple types of disabilities; (2) Including cerebral palsy in the intellectual and developmental disability (IDD) category instead of the physical disability category.

As in the main analyses, sensitivity analyses used modified Poisson regression with robust variance estimation and adjusted for maternal race, education, insurance, age, parity, gestational hypertension/preeclampsia, gestational diabetes, mental health diagnosis, and data year. Analyses of number of prenatal care visits were additionally adjusted for gestational age.

### **Sensitivity Analysis 1: Mutually Exclusive Disability Categories**

In the main analyses, disability groups were not mutually exclusive. If women had diagnosis codes associated with more than one type of disability, they were analyzed as part of each applicable group. However, that did not allow provision of information about women with more than one type of disability as a separate group. For this set of sensitivity analyses, mutually exclusive physical, hearing, vision, and IDD categories were constructed, as well as an additional category of women with multiple disability types. The counts in each disability group were as follows:

<b>Disability type</b>	<b>N</b>
Physical	27,643
Hearing	2,670
Vision	1,242
IDD	1,534
Multiple	294

Results of regression analyses with these disability categories are shown below, side-by-side with results from the original disability categories for comparison purposes.

Late Prenatal Care Initiation (second/third trimester versus first)

<b>Disability type</b>	<b>Original disability categories: Adjusted RR (95% CI)</b>	<b>Mutually exclusive categories: Adjusted RR (95% CI)</b>
Physical	0.91 (0.88, 0.94)	0.91 (0.88, 0.94)
Hearing	1.11 (1.02, 1.21)	1.11 (1.02, 1.22)
Vision	0.85 (0.73, 0.99)	0.85 (0.72, 0.99)
IDD	1.21 (1.09, 1.33)	1.20 (1.08, 1.34)
Multiple	–	1.15 (0.89, 1.47)

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**Fewer Prenatal Visits Than Recommended (0–10 versus 11–14)**

<b>Disability type</b>	<b>Original disability categories: Mutually exclusive categories:</b>	
	<b>Adjusted RR (95% CI)</b>	<b>Adjusted RR (95% CI)</b>
Physical	1.00 (0.99, 1.02)	1.00 (0.98, 1.02)
Hearing	1.12 (1.07, 1.17)	1.11 (1.05, 1.16)
Vision	1.08 (1.01, 1.16)	1.08 (1.01, 1.16)
IDD	1.08 (1.01, 1.15)	1.05 (0.99, 1.13)
Multiple	–	1.30 (1.14, 1.48)

**More Prenatal Visits Than Typical ( $\geq 15$  versus 11–14)**

<b>Disability type</b>	<b>Original disability categories: Mutually exclusive categories:</b>	
	<b>Adjusted RR (95% CI)</b>	<b>Adjusted RR (95% CI)</b>
Physical	1.14 (1.12, 1.16)	1.14 (1.12, 1.16)
Hearing	0.98 (0.91, 1.05)	0.97 (0.90, 1.05)
Vision	1.01 (0.92, 1.12)	1.01 (0.92, 1.12)
IDD	1.23 (1.14, 1.32)	1.19 (1.10, 1.29)
Multiple	–	1.24 (1.02, 1.50)

In the above analyses, women with multiple disabilities were significantly over-represented at both ends of the distribution of number of prenatal care visits, relative to women without disabilities. Proportionally, women with IDD were the most likely to have multiple types of disabilities recorded. When these women were moved out of the IDD category and into the separate multiple disability category, the effects previously seen for the IDD group were slightly attenuated. In the case of receiving too few prenatal visits (0–10 instead of 11–14), the effect was no longer statistically significant for women with IDD when women with multiple disabilities were separated out. These findings suggest that women with IDD who also have other types of disabilities are a particularly at-risk group.

**Sensitivity Analysis 2: Grouping Cerebral Palsy With IDD**

In the main analyses, cerebral palsy (CP) was grouped with physical disability rather than with IDD, because CP always affects physical functioning to some degree but only sometimes affects cognitive functioning. This definition of IDD was consistent with that used in several other studies of pregnancy outcomes (see references 2, 13, 14, and 24 in the body of the paper). However, another set of pregnancy outcome studies has included CP in the IDD category (references 1, 7, and 10 in the paper). For comparison purposes, this set of sensitivity analyses grouped CP with IDD instead of with physical disability. This resulted in 678 cases being moved into the IDD category. Regression results for physical disability and IDD groups are shown below, with results of the main analyses and the sensitivity analyses shown side-by-side.

Late Prenatal Care Initiation (second/third trimester versus first)

Disability type	Original disability categories:	CP grouped with IDD:
	Adjusted RR (95% CI)	Adjusted RR (95% CI)
Physical	0.91 (0.88, 0.94)	0.91 (0.88, 0.94)
IDD	1.21 (1.09, 1.33)	1.09 (1.00, 1.19)

Fewer Prenatal Visits Than Recommended (0–10 versus 11–14)

Disability type	Original disability categories:	CP grouped with IDD:
	Adjusted RR (95% CI)	Adjusted RR (95% CI)
Physical	1.00 (0.99, 1.02)	1.00 (0.99, 1.02)
IDD	1.08 (1.01, 1.15)	1.05 (1.00, 1.11)

More Prenatal Visits Than Typical ( $\geq 15$  versus 11–14)

Disability type	Original disability categories:	CP grouped with IDD:
	Adjusted RR (95% CI)	Adjusted RR (95% CI)
Physical	1.14 (1.12, 1.16)	1.15 (1.12, 1.17)
IDD	1.23 (1.14, 1.32)	1.17 (1.10, 1.25)

Effects seen for the IDD group in the main analysis were attenuated when CP was added to the IDD group. This suggests that women with non-CP IDD diagnoses experience greater disparities in initiation of prenatal care and number of visits than is the case for women with CP.