

## 21 Services and safety-net burden of Black-serving hospitals and related Severe Maternal Morbidity



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**OBJECTIVE:** More detailed evaluation of hospital factors related to obstetric outcomes may be important in understanding disparities. We aimed to examine detailed characteristics of Black-serving hospitals and associated risk for severe maternal morbidity (SMM).

**STUDY DESIGN:** In this cross-sectional study, we linked the 2010-2011 Nationwide Inpatient Sample and the 2013 American Hospital Association Annual Survey databases. Delivery hospitalizations occurring to women 15-54 years of age were identified. The proportions of non-Hispanic Black (nHB) women within a hospital were categorized into quartiles, and hospital factors such as specialized medical, surgical and safety net services were compared across these quartiles. Log-linear models based on the Poisson distribution, with Black-serving hospital (term previously described) quartile as the primary exposure and SMM as the outcome were performed with unadjusted and adjusted risk ratios (aRR) as measures of effect.

**RESULTS:** Overall 965,202 deliveries from 430 hospitals met inclusion criteria and were included in the analysis. By quartile, nHB patients accounted for 1.3%, 5.4%, 13.4%, and 33.8% of patients. Many services were less common in the lowest compared to the highest Black-serving hospital quartile including cardiac intensive care (48.9% versus 74.5%), neonatal intensive care (28.9% versus 64.9%), pediatric intensive care in (20.0% versus 45.7%), and HIV/AIDS services (36.3% versus 71.3%) (Table 1). Safety-net services were more common at Black-serving hospitals as was Medicaid payer. Following adjustment, the lowest Black-serving hospital quartile carried the lowest risk for SMM. However, SMM risks were similar across other quartiles: 2nd (aRR 1.23, 95% CI 1.14, 1.34), 3rd (aRR 1.12, 95% CI 1.02, 1.23), and 4th (aRR 1.05, 95% CI 0.94, 1.18) (Table 2).

**CONCLUSION:** Black-serving hospitals were more likely to provide a range of specialized medical and surgical services and to have a higher safety-net burden. Case-mix associated with specialized services and Medicaid burden may account for some of the maternal risk associated with Black-serving hospitals.

**Table 1.** Medical/surgical, safety net services, and Medicaid burden by Black-serving hospital quartile

	Black-serving hospital quartile				P value
	1 <sup>st</sup> (lowest)	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup> (highest)	
Number of hospitals	135	103	98	94	
<b>Medical and surgical services (% of hospitals)</b>					
Medical surgical intensive care	82.2%	85.4%	92.9%	90.4%	0.07
Cardiac intensive care	48.9%	55.3%	62.2%	74.5%	<0.01
Neonatal intensive care	28.9%	39.8%	46.9%	64.9%	<0.01
Pediatric intensive care	20.0%	31.1%	39.8%	45.7%	<0.01
Psychiatric care	49.6%	59.2%	68.4%	69.1%	<0.01
Adult cardiology	79.3%	82.5%	89.8%	86.2%	0.16
Pediatric cardiology	29.6%	43.7%	49.0%	44.7%	0.01
Adult interventional cardiac catheterization	62.2%	76.7%	84.7%	79.8%	<0.01
Adult cardiac surgery	54.8%	65.0%	68.4%	72.3%	0.03
Genetic testing and counseling	35.6%	49.5%	57.1%	58.5%	<0.01
Hemodialysis	74.8%	86.4%	87.8%	86.2%	0.02
Certified trauma center	48.2%	47.6%	50.0%	61.7%	0.15
HIV/AIDS	36.3%	53.4%	63.3%	71.3%	<0.01
Oncology	80.7%	82.5%	86.7%	86.2%	0.56
Neurology	73.3%	82.5%	85.7%	83.0%	0.08
Magnetic resonance imaging	88.9%	88.3%	91.8%	89.4%	0.86
Ultrasound radiology	88.1%	88.3%	91.8%	90.4%	0.79
<b>Safety net services (% of hospitals)</b>					
Indigent care clinic	34.1%	52.4%	62.2%	64.9%	<0.01
Enrollment services	77.0%	79.6%	86.7%	80.9%	0.32
Crisis prevention	43.0%	50.5%	62.2%	61.7%	0.01
Enabling services*	38.5%	50.5%	54.1%	61.7%	<0.01
Social work services	87.4%	89.3%	87.8%	89.4%	0.95
<b>Ownership</b>					
Investor	14.8%	15.5%	10.2%	19.1%	<0.01
Nonprofit, nongovernment	77.0%	77.7%	78.6%	57.5%	
Government	8.2%	6.8%	11.2%	23.4%	
<b>Obstetric Medicaid burden (% of hospitals)</b>					
1 <sup>st</sup> quartile (lowest)	25.2%	22.3%	16.3%	7.4%	<0.01
2 <sup>nd</sup> quartile	28.1%	28.2%	26.5%	16.0%	
3 <sup>rd</sup> quartile	23.7%	27.2%	25.5%	31.9%	
4 <sup>th</sup> quartile (highest)	23.0%	22.3%	31.6%	44.7%	

\*Non-clinical services that aim to increase access to healthcare and to improve health outcomes including, but not limited to health education, language interpretation, transportation.

**Table 2.** Adjusted and unadjusted model for severe maternal morbidity\*

	Unadjusted risk ratio (95% CI)	Adjusted risk ratio (95% CI)
<b>Black-serving hospital quartile</b>		
1st quartile (lowest)	Referent	Referent
2nd quartile	1.40 (1.30, 1.51)	1.23 (1.14, 1.34)
3rd quartile	1.35 (1.26, 1.46)	1.12 (1.02, 1.23)
4th quartile (highest)	1.57 (1.46, 1.69)	1.05 (0.94, 1.18)
<b>Race and ethnicity</b>		
Non-Hispanic White	Referent	Referent
Non-Hispanic Black	1.62 (1.52, 1.73)	1.48 (1.38, 1.59)
Hispanic	1.02 (0.96, 1.09)	1.11 (1.04, 1.19)
Asian	0.83 (0.67, 1.03)	0.86 (0.69, 1.08)
Other	1.26 (1.13, 1.41)	1.24 (1.11, 1.39)
Unknown	0.78 (0.65, 0.94)	0.82 (0.68, 0.98)
<b>Obstetric comorbidity index<sup>†</sup> score</b>		
0	Referent	Referent
1	2.41 (2.26, 2.56)	2.37 (2.23, 2.53)
2	3.74 (3.48, 4.03)	3.70 (3.44, 3.99)
≥3	13.35 (12.45, 14.32)	12.94 (12.05, 13.89)
<b>Obstetric Medicaid burden</b>		
1st quartile (lowest)	Referent	Referent
2nd quartile	1.34 (1.25, 1.44)	1.32 (1.22, 1.43)
3rd quartile	1.25 (1.16, 1.34)	1.15 (1.06, 1.25)
4th quartile (highest)	1.20 (1.11, 1.29)	1.22 (1.12, 1.33)
<b>Urban location of hospital</b>		
	1.61 (1.41, 1.83)	1.43 (1.24, 1.65)
<b>Region</b>		
Northeast	Referent	Referent
South	1.14 (1.07, 1.22)	1.02 (0.92, 1.13)
West	0.87 (0.81, 0.93)	1.18 (1.09, 1.28)
Midwest	0.94 (0.85, 1.03)	1.05 (0.96, 1.14)
<b>Medical surgical intensive care</b>		
Neonatal intensive care	1.57 (1.42, 1.73)	1.13 (0.98, 1.31)
Trauma center	1.20 (1.14, 1.26)	0.99 (0.93, 1.05)
Genetic testing and counseling	1.44 (1.37, 1.52)	1.40 (1.31, 1.51)
HIV/AIDS services	1.29 (1.23, 1.37)	0.96 (0.89, 1.04)
Indigent care clinic	1.24 (1.18, 1.31)	1.04 (0.97, 1.11)
Enrollment services	1.17 (1.11, 1.23)	0.90 (0.84, 0.96)
Crisis prevention	1.44 (1.33, 1.56)	1.14 (1.01, 1.28)
Enabling services	1.01 (0.96, 1.06)	0.83 (0.78, 0.89)
	1.20 (1.14, 1.26)	0.98 (0.91, 1.05)
<b>Ownership</b>		
Investor	Referent	Referent
Nonprofit, nongovernment	1.23 (1.13, 1.34)	1.12 (0.99, 1.26)
Government	1.46 (1.31, 1.62)	1.11 (1.00, 1.22)

RR's were adjusted for all factors in the table in addition to bed volume (not shown)

The models account for hospital-level clustering.

\*Severe maternal morbidity is based on CDC's criteria excluding transfusion

<sup>†</sup>The comorbidity index measures patient comorbidity based on medical, obstetric, and demographic risk factors with higher scores associated with increased underlying comorbidity