Neighborhood Level Vulnerability: A Key Factor in Maternal and Neonatal Outcomes for Pregnancies Complicated by Congenital Heart Disease

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Introduction

- Congenital Heart Disease (CHD) affects approximately 1% of live births and carries a high rate of neonatal morbidity and mortality.
- Specialty care centers that provide high level coordinated obstetric, neonatal, and cardiac care are crucial to optimize maternal and neonatal outcomes, and should be accessible to all high-risk CHD pregnancies.
- Race and health insurance status have been shown to correlate with longer lengths of hospitalization and higher neonatal mortality rates.
- Evidence reveals that higher vulnerability (greater social disadvantage) correlates with worse health and surgical outcomes.
- Limited research exists on the effects of neighborhood level vulnerability on maternal and neonatal outcomes in pregnancies affected by CHD.

Methods

Figure 1: Study Design

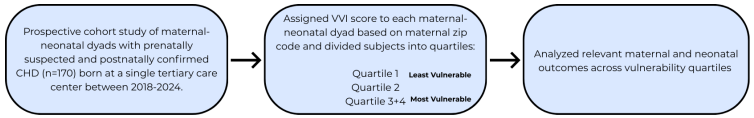
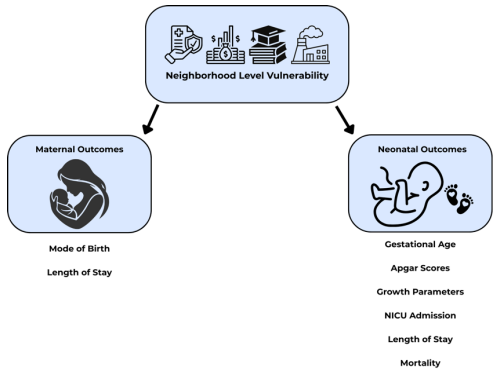


Figure 2: Components of Vizient Vulnerability Index (VVI), a composite neighborhood-level score assigned based on maternal residence (zip code)

Figure 3: Outcomes of Interest



Results

Table 1: Baseline Study Characteristics

Table 1	Q1 n(%)	Q2 n(%)	Q3+4 n(%)	p-value
n=170	94 (55)	45 (26)	31 (18)	
Maternal Age	34 (31-38)	29 (26-35)	30 (27-38)	0.0032[b]
Race				
Asian	10 (11)	3 (7)	0 (0)	0.0036[a]
Black or African American	7 (7)	2 (4)	4 (13)	
White	37 (39)	16 (36)	9 (29)	
Unknown/ Not reported	9 (10)	16 (36)	10 (32)	
Other race	31 (33)	8 (18)	8 (26)	
Ethnicity				
Hispanic or Latino	24 (26)	28 (62)	18 (58)	0.0002[a]
Not Hispanic or Latino	65 (69)	14 (31)	11 (36)	
Unknown/ Not reported	5 (5)	3 (7)	2 (7)	
Insurance Status				
Private	56 (60)	16 (36)	6 (19)	0.0002[a]
Public	30 (32)	23 (51)	24 (77)	
Uninsured	3 (3)	0 (0)	1 (3)	
Unknown	5 (5)	6 (13)	0 (0)	
Maternal Primary Language				
English	82 (88)	35 (78)	26 (84)	0.1[a]
Spanish	7 (7)	10 (22)	5 (16)	
Other	4 (4)	0 (0)	0 (0)	
Cardiac Categorization**				
Category 1	19 (20)	8 (18)	4 (13)	0.817[a]
Category 2	46 (49)	25 (56)	20 (64)	
Category 3	12 (13)	7 (16)	4 (13)	
Category 4	12 (13)	2 (4)	2 (7)	
Unknown	5 (5)	3 (7)	1 (3)	
Received PGE infusion				
Yes	45 (48)	23 (52)	13 (42)	0.8[a]
No	48 (52)	21 (48)	18 (58)	
Cardiac Surgery Required				
Yes	31 (33)	19 (42)	12 (41)	0.3[a]
No	62 (67)	26 (58)	17 (59)	

[a]Chi-Square test
[b]Kruskal-Wallis test
** Prenatal Level of Care Assignment and Coordinating Action Plan

Table 2: Clinical Outcomes

Table 2	Q1 n(%)	Q2 n(%)	Q3+4 n(%)	p-value
n=170	94 (55)	45 (26)	31 (18)	
Planned Mode of Birth				
Vaginal	72 (77)	32 (71)	18 (58)	0.14[a]
Cesarean	22 (23)	13 (29)	13 (42)	
Actual Mode of Birth				
Vaginal	56 (60)	29 (64)	16 (52)	0.53[a]
Cesarean	38 (40)	16 (36)	15 (48)	
Length of Stay				
Maternal	3 (2-4)	3 (3-4)	3 (3-4)	0.11[b]
Gestational Age	39 (37-39)	39 (37-39)	38 (37-39)	0.36[b]
Apgars Score				
1 minute	8 (8-8)	8 (8-8)	8 (7-8)	0.67[b]
5 minute	9 (8-9)	9 (9-9)	9 (8-9)	0.12[b]
Growth Parameters				
Birthweight	3.111 (2.469-3.518)	3.009 (2.710-3.539)	3.104 (2.494-3.351)	0.788[b]
Length	49 (47-51)	49 (46-51)	48 (46-51)	0.83[b]
Circumference	33 (32-34)	33 (33-35)	33 (32-34)	0.8[b]
Admitted to NICU				
Yes	91 (97)	43 (96)	30 (97)	0.9[a]
No	3 (3)	2 (4)	1 (3)	
Nutrition by mouth at discharge				
Yes	68 (74)	29 (64)	20 (71)	0.14[a]
No	24 (26)	16 (36)	8 (29)	
Unknown	2 (2)	0 (0)	3 (10)	
Length of Hospital Stay				
Neonatal	10 (3-26)	23 (6-44)	16 (3-56)	0.03[b]
Survived to Discharge				
Yes	93 (99)	45 (100)	28 (90)	0.02[a]
No	1 (1)	0 (0)	3 (10)	

Conclusions

- Baseline study characteristics (maternal age, race, ethnicity, insurance status) were significantly different across VVI quartiles, although indicators of neonatal CHD severity (category, PGE requirement, cardiac surgery requirement) were not.
- Neonatal median length of stay differed based on vulnerability quartile, with 10 days in Q1, 23 days in Q2, and 16 days in Q3+Q4 (p = 0.03) but without a consistent trend.
- Survival to discharge was lower in the most vulnerable quartile group, 3+4 (p = 0.02).
- Overall, we did not detect differences in maternal or neonatal outcomes based on vulnerability index in our study population born at a single institution.
- While we did not observe an association between neighborhood level vulnerability and maternal and neonatal outcomes, it is important to consider that access to a specialized care center may serve as a buffer to diminish the effects of neighborhood disadvantage in this study population.

Next Steps

- Next, we will increase our sample size and incorporate neonates that were born at an outside hospital and were transported to a specialized tertiary care center to see if neighborhood vulnerability influences outcomes of out born neonates.

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