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### A National Assessment Of Racial And Ethnic Disparities In Cleft Lip Repair

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**YALE SCHOOL OF PUBLIC HEALTH THESIS**

**Title**

A National Assessment of Racial and Ethnic Disparities in Cleft Lip Repair

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## **Abstract**

**Purpose:** This study examined the impact of patient race/ethnicity on the likelihood of experiencing delays to surgery, post-operative surgical complications, and prolonged hospital length of stay (LOS) following primary cleft lip (CL) repair.

**Methods:** Patients who underwent CL repair were identified in the 2006-2012 Kids' Inpatient Database. Primary outcomes were defined as treatment after 6-months-old, presence of any surgical complication, LOS >1 day, and total hospital charges. Multivariable analyses were performed to adjust for sociodemographic and clinical characteristics that might account for differences in outcomes.

**Results:** There were 5927 eligible patients with cleft lip: 3724 White, 279 Black, 1316 Hispanic, 277 Asian/Pacific-Islander, and 331 other race/ethnicity. Across all outcomes, there were significant unadjusted differences ( $p < 0.001$ ) by race/ethnicity, with White children having the lowest odds of delayed surgery, complications, and prolonged LOS, and the lowest charges. Multivariable analyses suggested that differences in baseline health status may explain disparities in complication rates across race/ethnicity, as well as delays, prolonged LOS, and charge differences in Black and other patients. Even after adjusting for co-variables, however, significantly increased odds of delayed surgery and higher charges remained for Hispanic and Asian/PI patients.

## **Conclusion**

There are significant differences in the odds of delays, complications, prolonged hospital stays, and total charges among CL patients of different race/ethnicity. Advocacy efforts to ameliorate disparity in early infant health may subsequently improve care outcomes.

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**Table 2. The Association between Race/Ethnicity and Primary Study Outcomes.**

The symbol \* indicates statistical significance ( $p < 0.05$ ) in comparison to White patients.

†Adjusted for patient race/ethnicity, the presence of a bilateral cleft or cleft palate, primary payor, income quartile of ZIP code, hospital type, region in the United States, and disease severity class.

‡Rounded to the nearest dollar.

**Table 3. Multivariable models for Delays, Complications, Prolonged Stay, and Charge of CL**

**Repair.** Statistically significant values are indicated in bold.

## **Introduction**

Proper surgical treatment of CLP can help overcome these challenges and significantly improves long-term functional, aesthetic, and psychosocial outcomes.<sup>1-3</sup> Despite the importance of surgical treatment for all CLP children, studies have demonstrated that various socioeconomic and sociodemographic factors can influence access to and quality of longitudinal CLP care.<sup>4-9</sup> For example, a recent single-institution study showed that children from racial/ethnic minority groups tended to experience significant delays in primary cleft lip (CL) repair, with African American and Hispanic children undergoing surgery almost 2 months later, on average, than Caucasian children.<sup>9</sup> These previous studies have rarely, however, examined the impact of such delays—nor the impact of social factors broadly—on the actual outcomes of CLP care in either the short-term or long-term post-operative period. While a recent national study did identify higher short-term complication rates, longer hospital length of stay, and greater hospital costs associated with non-white patient race/ethnicity in cleft palate (CP) repair<sup>8</sup>, there remains a need for further investigation in the context of CL repair.

This study aimed to expand on previous studies by evaluating the impact of patient race/ethnicity on not only timing of surgery, but also immediate post-operative outcomes measures. Specifically, we evaluated the association between patient race/ethnicity and delays to surgery, short-term complication rates, prolonged hospital stays, and total costs of hospital care. We hypothesize that, compared with White children, children from various racial/ethnic minority groups will experience delays to surgery, increases in post-operative complications, extended hospital stays, and higher overall charges following CL repair.

## **Methods:**

### ***Data Source and Patient Selection:***

We performed a retrospective analysis of the Kids' Inpatient Database (KID), which is released every 3 years as a part of the Healthcare Cost and Utilization Project (H-CUP). KID is the largest publicly

available pediatric inpatient care database in the United States, collecting data millions of pediatric discharges (age < 21 years) across 48 states.<sup>10</sup> For the current study, databases from 2006, 2009, and 2012 were included; databases released prior to 2006 and since 2012 were excluded due to heterogeneity in variables collected and inconsistency in diagnosis and complication coding variables.

Patients with CL repair were identified from KID via International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes and ICD-9-CM procedure codes. Diagnosis codes included 749.10-749.14 (CL only) and 749.20-749.25 (CLP), and the procedure codes included 27.54 (Repair of CL). Patients receiving concurrent procedures of either the palate or the mandible were excluded from the study sample.

### ***Measures***

The primary independent variable of interest was race/ethnicity. The KID database categorized patients' race/ethnicity as White, Black, Hispanic, Asian/Pacific Islander, or Other (including multiracial). Patients with missing race/ethnicity data were excluded from analysis (n=1,173, 16.5%).

The primary study outcomes of interest were as follows: the proportion of children receiving surgery at an age greater than 6 months (Y/N), the proportion of children experiencing one or more post-operative complications during the primary hospital stay (Y/N), and the proportion of children with a post-operative hospital stay greater than 1 day (Y/N). The composite category of "any complication" was selected given the low overall frequency of any individual complication type, which precluded adequately powered statistical comparisons for complication subtypes. This category included any of the following ICD-9 complication codes: 998.2 (accidental puncture); 998.6 (post-op fistula); 997.1 (cardiac complication); 998.3 (wound disruption); 998.12 (hematoma); 998.11 (hemorrhage); 997.39 (respiratory complication); 518.81, 96.7, 96.71, 96.72 (airway/respiratory failure); 997.32, 997.31 (pneumonia); 998.13 (seroma); 998.51 (infected seroma); 998.59, 998.3 (post-op infection); 998.83 (nonhealing wound); 998.8, 998.89, 998.9 (unspecified complication). The outcome of "charges" refers to the total dollar amount charged to insurers by the hospital, excluding professional fees and non-covered charges.

All multivariable analyses included each of the following categorical co-variables: the presence of a bilateral cleft (Y/N), the presence of a concurrent CP deformity (Y/N), the primary expected payor (Medicare or Medicaid, Private, or Other), the income quartile of the patient's residential ZIP code (1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> quartile), the hospital's location/status (rural, urban non-teaching, urban teaching), region of the hospital in the US (Northeast, Midwest, South, West), and the disease severity class (1-4; 1 = lowest, 4 = highest). The covariate "disease severity class" refers to the All Patient Refined Diagnosis Related Group (AP-DRG) of the patient, a classification system used by Medicare to adjust for patient comorbidity and case complexity when reimbursing hospitals for care.<sup>11</sup> Thus, a higher disease severity class refers to greater overall patient comorbidity, not the severity of the cleft deformity.

### ***Statistical Analysis***

We began by describing the characteristics of the sample. Unadjusted racial/ethnic differences in outcomes were examined using the chi-squared test for delayed surgery, complications, and prolonged LOS, and the Kruskal-Wallis test for median charges. We performed logistic and linear regression analyses, as appropriate, to assess the impact of race/ethnicity on the study outcomes. Multivariable analyses included adjustment for each of the patient covariates described above. In addition, given the potential cascading effects of delayed surgery on complications, complications on prolonged LOS, and prolonged LOS on charges, the analysis of each subsequent outcome included the previous outcomes.

For analyses related to hospital charges, a log transformation was performed prior to linear regression, followed by a back transformation for ease of interpretation. Estimations of charge differences were calculated by multiplying the back-transformed regression coefficient by the median charge in the reference group (White).

All statistical analyses were performed using R Open Access Statistical Software (Vienna, Austria).  $P < 0.05$  was set as significant throughout.



## Results

### *Patient Characteristics*

There were 5927 cases of CL repair included in our analysis. The majority of patients were White (62.8%), followed by Hispanic (22.2%), Other (5.6%), Black (4.7%), and Asian/PI (4.7%). The majority of patients were male (70.2%). Most patients paid via Medicare/Medicaid (56.7%). Surgery was most frequently performed at urban nonteaching hospitals (37.9%), and in the South (33.2%). Overall, 81.8% of patients were classified as having the lowest overall disease severity.

There were several significant differences in patient characteristics based on patient race/ethnicity (**Table 1**). Patient sex differed across groups ( $p < 0.001$ ), with White patients the most likely to be male (77.0%). White patients were also less likely to have a diagnosis of bilateral CL ( $p < 0.001$ ), but more frequently had a concurrent diagnosis of CP ( $p < 0.001$ ). Across groups, overall disease severity tended to be higher ( $p < 0.001$ ) among Black and Other patients.

Payment differed across races ( $p < 0.001$ ), with the highest rates of private insurance use among Asian/PI patients, and highest rates of public insurance among Black patients. Patients also differed with respect to income quartile ( $p < 0.001$ ), with Black and Hispanic patients being the most likely to live in ZIP codes in the bottom income quartile and Asian/PI patients the least likely. There were significant differences in the type and location of treatment ( $p < 0.001$ ), with treatment at rural hospitals more frequent among White and Black patients, and treatment at urban teaching hospitals higher among Asian/PI and Other patients. Geographic differences ( $p < 0.001$ ) showed higher numbers of White patients in the South, Black and Other patients in the Midwest, and higher numbers of Hispanic and Asian/PI patients in the West.

**Table 1**

Parameter	Overall	White	Black	Hispanic	Asian/PI	Other	p-value
<b>N (%)</b>	5927	3724 (62.8)	279 (4.7)	1316 (22.2)	277 (4.7)	331 (5.6)	-
<b>Male Sex (%)</b>	70.2	77.0	58.7	59.2	54.5	59.8	<0.001
<b>Bilateral Cleft (%)</b>	20.8	16.6	26.5	29.7	27.1	26.5	<0.001
<b>Concurrent Cleft Palate (%)*</b>	67.2	70.4	51.1	66.2	58.8	55.4	<0.001
<b>Primary Expected Payor (%)</b>	-	-	-	-	-	-	<0.001
Medicare/Medicaid	56.7	55.7	69.4	65.7	28.5	43.3	-
Private	36.1	39.4	26.3	20.8	62.1	46.4	-
Other	7.2	4.9	4.3	13.5	9.4	10.3	-
<b>Income Quartile of ZIP Code (%)</b>	-	-	-	-	-	-	<0.001
1 (lowest income quartile)	20.5	20.5	45.9	42.5	14.7	27.5	-
2	27.9	27.9	26.8	26.1	13.0	23.1	-
3	27.1	27.1	16.8	21.7	23.2	25.9	-
4 (highest income quartile)	24.5	24.5	10.5	9.7	49.1	23.5	-
<b>Hospital Location/Status (%)</b>	-	-	-	-	-	-	<0.001
Rural	31.0	32.5	31.5	27.5	27.4	30.8	-
Urban nonteaching	37.9	38.4	34.8	38.8	35.4	33.2	-
Urban teaching	31.1	29.1	33.7	33.7	37.2	36.0	-
<b>Region in US (%)</b>	-	-	-	-	-	-	<0.001
Northeast	12.9	15.4	8.6	7.2	8.3	8.5	-
Midwest	25.4	23.9	36.9	27.3	24.9	58.3	-
South	33.2	36.5	29.8	25.5	30.3	31.5	-
West	28.5	24.2	24.7	40.1	36.5	27.2	-
<b>Disease Severity Class (%)</b>	-	-	-	-	-	-	<0.001
1 (least severe)	81.8	81.4	78.4	82.9	85.9	79.6	-
2	13.1	13.9	12.2	12.4	11.5	12.7	-
3	4.3	4.2	8.1	3.7	2.2	5.5	-
4 (most severe)	0.8	0.5	1.4	1.0	0.4	2.2	-

### ***Delay to Surgery***

The majority of children (86.62%) received surgical CL repair prior to 6 months of age. However, there were significant differences ( $p < 0.001$ ) in the unadjusted odds of a childhood being delayed to surgery (>6 months) based on patient race/ethnicity (**Table 2**). Relative to White children (8.09%), delays were significantly more frequent ( $p < 0.001$ ) among Asian/PI (29.14%), Hispanic (25.35%), Other (24.42%), and Black (22.79%) patients.

**Table 2.**

Parameter	Overall	White	Black	Hispanic	Asian/PI	Other	p-value
N	5927	3724	279	1316	277	331	-
<b>Delayed Surgery (&gt;6 months, %)</b>	13.38	8.09	22.79	25.35	29.14	24.42	<0.001
Unadjusted OR	-	1.00	3.35*	3.86*	4.67*	3.67*	-
Adjusted <sup>†</sup> OR	-	1.00	1.29	1.88*	2.71	1.66	-
<b>Complication Rate (%)</b>	1.54	1.13	1.43	2.36	2.17	2.42	<0.001
Unadjusted OR	-	1.00	1.28	2.11*	1.28	1.81*	-
Adjusted <sup>†</sup> OR	-	1.00	0.99	1.00	1.00	0.99	-
<b>Prolonged Length of Stay (&gt;1 day, %)</b>	21.99	19.17	36.20	23.25	23.91	35.05	<0.001
Unadjusted OR	-	1.00	2.39*	1.28*	1.32*	2.27*	-
Adjusted <sup>†</sup> OR	-	1.00	0.99	0.85*	0.95	1.09	-
<b>Charges (Median)<sup>‡</sup></b>	\$11,698	\$8,612	\$13,592	\$16,331	\$18,496	\$15,682	<0.001
Unadjusted Charge Difference		-	\$5,617*	\$6,976*	\$7,148*	\$5,770*	-
Adjusted <sup>†</sup> Charge Difference		-	-\$861	\$1,981*	\$3,359*	\$172	-

**Table 3**

Variable	Delay (OR)	P value	Complications (OR)	P value	Prolonged Stay (OR)	P value	Charge (Multiplier)	P value
<b>Race</b>								
White	(reference)							
Black	1.29	0.375	0.99	0.296	0.99	0.844	0.90	0.111
Hispanic	<b>1.88</b>	<b>&lt;0.001</b>	1.00	0.815	<b>0.85</b>	<b>&lt;0.001</b>	<b>1.23</b>	<b>&lt;0.001</b>
Asian/PI	<b>2.71</b>	<b>&lt;0.001</b>	1.00	0.702	0.95	0.256	<b>1.39</b>	<b>&lt;0.001</b>
Other	1.66	0.050	0.99	0.801	1.09	0.057	1.02	0.788
<b>Diagnosis (%)</b>								
Bilateral Cleft (vs unilateral)	1.28	0.090	1.00	0.744	1.02	0.460	1.06	0.096
Concurrent Palate (vs lip only)	1.00	0.997	1.00	0.897	1.04	0.101	1.04	0.222
<b>Primary Payor (%)</b>								
Medicare/Medicaid	(reference)							
Private	1.26	0.126	0.99	0.946	1.04	0.107	<b>0.92</b>	<b>0.012</b>
Other	<b>1.64</b>	<b>0.023</b>	1.01	0.467	1.00	0.957	1.10	0.091
<b>Income Quartile</b>								
1 (lowest quartile)	(reference)							
2	0.83	0.279	1.00	0.756	0.96	0.213	0.94	0.134
3	<b>0.68</b>	<b>0.032</b>	1.00	0.846	0.96	0.174	1.09	0.059
4 (highest quartile)	0.81	0.279	1.00	0.967	1.00	0.988	<b>1.11</b>	<b>0.019</b>
<b>Hospital Type</b>								
Rural	(reference)							
Urban nonteaching	0.86	0.323	1.01	0.502	1.00	0.893	<b>0.93</b>	<b>0.048</b>
Urban teaching	0.94	0.739	1.00	0.714	1.03	0.364	0.96	0.392
<b>Region in US</b>								
Northeast	(reference)							
Midwest	0.76	0.311	1.01	0.440	<b>1.13</b>	<b>0.011</b>	1.01	0.928
South	0.90	0.685	1.01	0.355	<b>1.12</b>	<b>0.018</b>	1.05	0.430
West	0.80	0.420	1.01	0.553	1.09	0.087	1.04	0.595
<b>Disease Severity Class</b>								
1 (least severe)	(reference)							
2	<b>1.89</b>	<b>&lt;0.001</b>	<b>1.02</b>	<b>0.047</b>	<b>1.13</b>	<b>&lt;0.001</b>	1.09	0.053
3	<b>3.09</b>	<b>&lt;0.001</b>	<b>1.09</b>	<b>&lt;0.001</b>	<b>1.41</b>	<b>&lt;0.001</b>	<b>1.48</b>	<b>&lt;0.001</b>
4 (most severe)	3.98	0.058	<b>1.45</b>	<b>&lt;0.001</b>	<b>1.82</b>	<b>&lt;0.001</b>	<b>5.45</b>	<b>&lt;0.001</b>
<b>Delay</b>	-	-	1.00	0.951	0.99	0.605	0.975	0.496
<b>Complication</b>	-	-	-	-	<b>1.23</b>	<b>0.012</b>	1.15	0.241
<b>Prolonged Stay</b>	-	-	-	-	-	-	<b>1.54</b>	<b>&lt;0.001</b>

After adjusting for co-variables, the odds of experiencing delays in care were no longer significantly higher than White patients among Black ( $p = 0.375$ ) or Other ( $p = 0.050$ ) patients, but were still higher for Hispanic ( $p < 0.001$ ) and Asian/PI ( $p < 0.001$ ) patients (**Table 3**). Increased odds of delayed surgery were also independently associated with “other” primary expected payor ( $p = 0.023$ ) and disease severity classes of 2 ( $p < 0.001$ ) or 3 ( $p < 0.001$ ). Decreased odds of delayed surgery were also associated with living in 3<sup>rd</sup> quartile income areas (in comparison to 1<sup>st</sup> quartile,  $p = 0.032$ ).

### ***Risk of Complication***

The majority of children in the study (98.46%) had no recorded post-operative complications; however, the percentage of children experiencing complications differed by race/ethnicity ( $p < 0.001$ ). Relative to White children (1.13%), the rates of any complication occurring were significantly increased in Other (2.42%,  $p = 0.04$ ) and Hispanic (2.36%,  $p = 0.001$ ) children. Complications rates were also higher in Asian/PI (2.17%) and Black (1.43%) patients; however, these differences were not statistically significant ( $p > 0.05$ ).

After adjusting for co-variables, the odds of experiencing a post-operative complication were no longer increased ( $p > 0.05$ ) in any of the racial/ethnic minority groups. Instead, increased odds of complications were independently associated with disease severity score of 2 ( $p = 0.047$ ), 3 ( $p < 0.001$ ), or 4 ( $p < 0.001$ ).

### ***Prolonged Length of Stay***

The majority of children in the study (78.01%) had a hospital LOS of one day or less. However, there were significant differences ( $p < 0.001$ ) in the proportion of children with a prolonged LOS associated with race/ethnicity. In comparison to White patients (19.17%), prolonged LOS was significantly more common among Black (36.20%,  $p < 0.001$ ), Other (35.05%,  $p < 0.001$ ), and Hispanic

(23.25%,  $p = 0.002$ ) patients. Prolonged LOS was also increased among Asian/PI (23.91%) patients; however, this difference was not statistically significant ( $p = 0.06$ ).

After adjusting for co-variables (including complications), the odds of experiencing a prolonged hospital stay were no longer increased in any race/ethnicity group, and were actually decreased in Hispanic patients in comparison to White patients ( $p < 0.001$ ). Increased hospital stays were also independently associated with treatment in the Midwest ( $p < 0.011$ ) or South ( $p = 0.018$ ) in comparison to the Northeast, and were also associated with disease severity classes of 2 ( $p < 0.001$ ), 3 ( $p < 0.001$ ), or 4 ( $p < 0.001$ ).

### ***Cost of Hospitalization***

The median total charge of the surgical admission was \$11,698. Charges differed widely across race/ethnicity cohorts ( $p < 0.001$ ). In comparison to White patients (\$8,612), median charges were significantly increased ( $p < 0.001$ ) in all other race/ethnicity groups: Asian/PI (\$18,496), Hispanic (\$16,331), Other (\$15,682), and Black (\$13,592).

After adjusting for all other co-variables, charges were still significantly increased among Hispanic ( $p < 0.001$ ) and Asian/PI ( $p < 0.001$ ) patients. Higher charges were also associated with living in highest income quartile areas ( $p < 0.019$ ), disease severity classes of 3 ( $p < 0.001$ ) or 4 ( $p < 0.001$ ), and prolonged hospital stays ( $p < 0.001$ ). Decreased charges were associated with private insurance type ( $p = 0.012$ ).

### **Discussion**

Previous studies have demonstrated disparities in various aspects of cleft care in the United States, especially relating to timing of cleft care.<sup>4-6,8,9</sup> The data in the current study build upon previous investigations, demonstrating significant differences in the likelihood of not only delays, but also complications and extended hospital stays among CL patients of different race or ethnicity. Notably, the unadjusted odds of events occurring were lowest among White patients for every outcome measure, a

pattern similar to that previously demonstrated in the CP population.<sup>8</sup> While the root causes of these findings are multifactorial, multivariable regression suggested a strong confounding influence of various factors such as payor, income status, and patient co-morbidities. The causes and implications of each finding warrant further discussion.

Timely repair of CLP is critical for achieving optimal outcomes.<sup>1-3</sup> Our data support previous studies which have demonstrated delays in CLP treatment among minority populations.<sup>4,8,12</sup> Among other factors, delays in care have been attributed to a lack of resources available (i.e. inadequate transportation, work obligations etc.), disparate geographic access to cleft centers, public insurance usage, language barriers, and medical mistrust.<sup>4-6,8,9,13-17</sup> The data in our study reinforce some of these findings, as patients living in higher income areas were less likely to experience delayed care, and uninsured patients more likely. However, our data also suggested a strong association between the severity of patient co-morbidities and timing of surgery. This finding may be explained by conscious decisions to delay surgery among children who may be at greater risk for surgical complication, akin to the “rule of 10s” used to screen patients prior to performing CL repair.<sup>18</sup> Alternatively, children who are prone to delays in CL repair may also be prone to delays and/or poorer outcomes in general pediatric care, resulting in poorer overall health status. Regardless, these underlying differences in pre-operative health and income status likely may explain delays among Black and Other children, who, relative to White patients, did not experience significantly more delays in care after adjusting for these factors.

Even after adjusting for covariates, however, the odds of delays were still elevated among Hispanic and Asian/PI patients, suggesting additional influences on timing of care. Delays among Hispanic patients could be attributed to language barriers. Zaluzec et al. identified a 2-month delay in seeking CL repair in non-English speaking families listing Spanish as the primary language.<sup>9</sup> Among Asian patients, delays in care may be associated with the large number of older age Asian adoptees, who constitute a large number of patients at some cleft centers.<sup>19,20</sup> While not well studied in cleft populations, insurance and/or immigration status may also prevent certain patients from accessing timely care.<sup>21</sup> Future studies should seek to better understand why delays are seen in these specific populations.

In addition to delayed surgery, non-White patients were also more likely to experience complications following CL repair. Disparate outcomes may be largely attributable to differences in disease severity (baseline comorbidity), which was the only independent predictor of increased complications in multivariable regression. Inequities in underlying health are not surprising, as many previous studies have demonstrated that minority children—particularly those from low-income families—are disproportionately exposed to early negative health events, including significantly increased rates of preterm delivery and low birthweight.<sup>22</sup> These early adverse health events can predispose a wide range of poor health outcomes later on,<sup>23</sup> with data in the current study extending that evidence into the CL population. Thus, greater equity in CL repair may be best achieved through efforts to ameliorate structural and/or interpersonal disparity across all domains of pediatric health. Notably, despite differences in complication risk, overall complication rates following CL repair were relatively low for all patients, highlighting the relative safety of the procedure. Future studies should aim to determine the impact of race or ethnicity on long-term aesthetic and functional outcomes, which are paramount for evaluating the overall quality of CLP care.

In comparison to White children, non-White CL children were also far more likely than White patients to experience prolonged hospital stays, in turn contributing to greater hospital charges. These findings are likely largely attributable to both increased baseline disease complexity and increased complication risk, as greater disease complexity was found to be a predictor of both LOS and costs, and the presence of complications a predictor for increased LOS. Increased costs were also associated with living in high income areas, and decreased costs associated with private insurance and treatment at urban nonteaching hospitals. However, even when controlling for these covariates, increased costs were still seen among Hispanic and Asian/PI patients. The explanation for these findings is unclear, but may be secondary to variation among insurers, hospital and cleft teams, and geography that are not fully captured by the study co-variables. Future research in more tightly controlled settings—for example, a comparison of charges within a single health system—may be beneficial for identifying specific causes of differences in charge.



Taken together, these data suggest a significant but complicated relationship between patient race/ethnicity and basic outcomes in CL repair. Specifically, these data suggest a powerful role of pre-operative patient health in dictating short-term CL outcomes, highlighting the importance of holistic clinical approach to CL care. Advocacy for policies and systems that combat inequities in all forms of infant health may help ameliorate disparities in cleft care. Within cleft centers and teams, research and policies should be pursued to understand and address population-specific barriers to care. For example, education efforts and/or funding of health organizations that provide care to underinsured or uninsured individuals may help mitigate delays in care among socioeconomically disadvantaged minority patients. Free or reduced transportation services might also help overcome geographic barriers to care and improve timely access.<sup>24</sup> Additional resources such as implementation of social workers or cleft care nurses to help coordinate the care patients require may prove beneficial.<sup>24</sup> Wagner et al. found that the implementation of a Cleft Nurse Navigator (CNN) program increased communication between family and cleft team members, improved timing of care, and optimized feeding outcomes for patients with CLP.<sup>7</sup> Similar efforts in all cleft centers may help to define and ameliorate disparities within specific patient groups.

This manuscript is not without limitations. First, while the use of a heterogeneous national patient population increases statistical power (decreasing the possibility for type 2 error), this approach inherently limits study granularity. Many patients within the database were also excluded due to missing race/ethnicity data. Additionally, although the database captures hospital-based same day procedures, cleft care administered in an outpatient setting may not be fully represented, leading to an over-representation of complex cases in the study database. Lastly, this database does not utilize Current Procedural Terminology (CPT) codes to convey procedures being performed on these patients, which may have provided the authors with more information regarding immediate care or adjunctive procedures, such as correction of a nasal deformity or nasoalveolar molding.

## **Conclusion**

Non-White children were significantly more likely to experience delays in care, complications, and prolonged hospital stays than White children undergoing CL repair. These differences appear to be explained by a wide variety of factors, including baseline comorbidities and socioeconomic status.

Advocacy for policies and structures designed to improve early infant health and streamline cleft care may help ameliorate disparities in care.

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