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## Racial disparities in family-provider interactions for pediatric asthma care

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### Abstract

**Objective:** Black and Latino children experience significantly worse asthma morbidity than their white peers for multifactorial reasons. This study investigated differences in family-provider interactions for pediatric asthma, based on race/ethnicity.

**Methods:** This was a cross-sectional study of parent surveys of asthmatic children within the Population-Based Effectiveness in Asthma and Lung Diseases Network. Our study population comprised 647 parents with survey response data. Data on self-reported race/ethnicity of the child were collected from parents of the children with asthma. Outcomes studied were responses to the questions about family-provider interactions in the previous 12 months:(1) number of visits with asthma provider; (2) number of times provider reviewed asthma medications with patient/family;

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(3) review of a written asthma treatment plan with provider; and (4) preferences about making asthma decisions.

**Results:** In multivariate adjusted analyses controlling for asthma control and other comorbidities, black children had fewer visits in the previous 12 months for asthma than white children: OR 0.63 (95% CI 0.40, 0.99). Additionally, black children were less likely to have a written asthma treatment plan given/reviewed by a provider than their white peers, OR 0.44 (95% CI 0.26, 0.75). There were no significant differences by race in preferences about asthma decision-making nor in the frequency of asthma medication review.

**Conclusion:** Black children with asthma have fewer visits with their providers and are less likely to have a written asthma treatment plan than white children. Asthma providers could focus on improving these specific family-provider interactions in minority children.

### Keywords

Children; lung disease; race; disparity; treatment plan

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### Introduction

The number of children with asthma in the United States has reached 7 million [1–3]. As compared to white, non-Latinos, racial and ethnic minorities experience higher rates of asthma diagnoses and significantly worse asthma morbidity, including more hospital admissions, readmissions, emergency room visits and deaths from asthma [4–6]. While racial disparities in childhood asthma have been well described for decades, the underlying reasons are not clearly understood.

Studies of childhood asthma suggest that patient-caregiver interactions are a potential contributor to racial disparities; thus studying the differences in patient-caregiver communication by race is important [7, 8]. Prior studies have demonstrated that communication between provider and patient can significantly impact asthma outcomes [9]. Current national asthma guidelines emphasize the importance of regular visits to an asthma provider at a minimum of 1–6-month intervals as well as the development of a written Asthma Action Plan in partnership with the patient [10]. Nevertheless, minorities are less likely to be prescribed guideline-based treatments [11] and are more likely to leave consultations without care plans or appropriate prescriptions [6, 12].

For these reasons, we hypothesized that there may be differences in the provider-family interactions based on race for children with asthma. Specifically, we hypothesized that black and Latino children had less asthma visits with their provider, less review of their asthma medications and asthma treatment plan with a provider, and their families preferred to make asthma decisions more on their own, as compared to white children. The objectives of this study were to investigate whether there are differences by child race in the following family-provider interactions that may be important to asthma, in the previous 12 months: 1) number of visits with asthma provider; 2) number of times provider reviewed asthma medications with family; 3) preferences about making asthma decisions; and 4) review of a written asthma treatment plan.

## Methods

This was a cross-sectional, linked survey of parents and providers of children with asthma within the Population-Based Effectiveness in Asthma and Lung Diseases (PEAL) Network, a distributed data network that was created for research on lung diseases and built on currently available computerized data sets from the TennCare Medicaid population at Vanderbilt Medical Center (TENN) and four large integrated health systems: Harvard Pilgrim Health Care (HPHC), Health Partners Medical Group (HPMG), Kaiser Permanente of Georgia (KPGA), and Kaiser Permanente of Northern California (KPNC). Details of the study have been previously published [13]. The study was approved by the institutional review board of each site and all participants provided written informed consent. This study merges parent-reported data, provider-reported data, and administrative claims data.

### Data collection

Electronic medical records or claims data from the four integrated health systems were used to identify children with asthma and parents. More specifically, we used computerized data to first identify children with asthma. The target population included parents of members aged 4–11 years on January 1, 2011, with 1 or more diagnosis of asthma (International Classification of Diseases, Ninth Revision, Clinical Modification code 493.xx) between the years 2004 and 2010 and 1 or more controller medicine dispensed in 2011 (i.e, inhaled corticosteroid, leukotriene receptor antagonist, inhaled corticosteroid combined with long acting beta-agonist).

We excluded children receiving omalizumab or chronic oral corticosteroids (180 continuous days of supply) to exclude children with the most severe asthma. We also excluded children with diagnoses of cystic fibrosis, bronchiectasis, pulmonary hypertension, pulmonary embolism, immunodeficiency, hereditary and degenerative diseases, psychoses, and mental retardation. This analysis focused on parent surveys. Details of the surveys and administration processes were previously published [13].

### Measures

The predictor variable of “child race” was based on self-report in the parent survey. Our main outcomes were obtained from the parent survey:

1. number of visits with provider in the previous 12 months;
2. number of times provider reviewed asthma medications with patient/family in the previous 12 months based on parent report;
3. preferences about making asthma decisions;
4. review of a written asthma treatment plan with provider in the previous 12 months.

We assessed these four primary outcomes related to family-provider interactions in asthma, determining whether the responses differed by race: For question 1 “How many times has your child seen his/her asthma provider in the last 12 months” the patient response was a free text number. For analysis we organized the response into three ordinal variables (0 = 0

visits, 1 = 1–3 visits, 2 = more than 3 visits). For question 2, we asked “In the last 12 months, how often has this provider reviewed your child’s asthma medications with you?” The patient checked a box for one of five responses (every, most, some, very few, or no visits), and for analysis we organized responses into three ordinal variables: (1 = every visit, 2 = most or some visits, 3 = very few visits or no visits). For question 3 we asked, “In the last 12 months, has this provider given or reviewed with you a written treatment plan for your child’s asthma?” The patient response was binary (yes or no) and we kept it as such for analysis (0 = no, 1 = yes). For question 4, we asked, “Thinking about making decisions about your child’s asthma care, which of the following statements best describes your preference?” The five possible responses were, “I prefer to make the decision on my own,” “I prefer to make the decision after hearing the provider’s opinion,” “I prefer to make the decision together with the provider,” and “I prefer the provider to make the decision after talking to me,” “I prefer the provider to make the decision on his/her own.” For analysis, the responses were organized into three categories (decision on own, decision together with provider, provider makes decision). To assess asthma control at the time of the interview, the Asthma Control Test (ACT) was administered [14, 15]. The Childhood Asthma Control Test is a seven-question survey of asthma symptoms and daily functioning. The ACT is a validated tool used to measure asthma control in individuals, with specific assessment of the frequency of shortness of breath, the use of rescue medication, and the effect of asthma symptoms on daily functioning. We have used the Childhood ACT in telephone surveys in a previous study [16].

### Statistical methods

Analyses were conducted in SAS version 9.4 (SAS Institute, Cary, NC). We evaluated differences in parent/child demographic factors and each outcome measure by race using nonparametric Wilcoxon tests, with no specific reference group (Table 1). We then evaluated the association of race with family-provider interaction questions on the patient survey using univariate and multinomial ordinal logistic regression models, with white race as the reference group (Tables 2 and 3). In the multivariable ordinal regression models, we included variables that had a  $p$ -value of  $<0.2$  in univariate analyses and that were not collinear with other variables. For the outcome of “written asthma treatment plan reviewed,” we also included “number of provider visits” as a variable in the model in order to adjust for the frequency of provider visits.

## Results

### Study population

Sixty two percent (1321) of the parents that were contacted completed the parent survey. Of the 1321 completed parent surveys, 1242 (94%) provided consent for us to contact the child’s provider, whereas 30 parents did not. Of the 1242 providers contacted, 770 (62%) completed the survey. After removing the providers for whom parents did not give consent to link the surveys to their child’s electronic data, there were a total of 740 parent-provider pairs. Of the 740 parent-provider pairs, the 647 (87%) with complete racial data and responses to the questions about family-provider interactions comprised the sample for our study.

Our population characteristics are described in Table 1. Of the 149 black patient participants, 46% were female. Of the 359 white patient participants, 37% were female. Of the 63 Asian patient participants, 24% were female. There were significant differences in ACT score between black and white children. Forty-six percent of black children had poor asthma control (ACT score <19), whereas 36% of white participants had poor asthma control ( $p = 0.03$ ). Thirty-seven percent of black children had household income > \$70,000, whereas 55% of white and 70% of Asians had household incomes above \$70,000. Regarding educational attainment: 19% of black parents and 44% of white parents achieved a college degree.

In the unadjusted analysis of each outcome by race, there were significant differences by race for number of visits with an asthma provider and the delivery of a written asthma treatment plan (Table 2). Black children had fewer visits in the previous 12 months for asthma than whites: OR 0.63 (95% CI 0.43, 0.92). Black children were less likely to have a written asthma treatment plan given or reviewed than whites: OR 0.47 (0.31, 0.73).

When adjusting for child age, sex, practice location, ACT score, limited English proficiency, household income, and educational attainment in the multivariable analysis: there remained a significant difference between black and white participants in the number of visits with an asthma provider and in the review of a written asthma treatment plan (Table 3). Specifically, in the preceding 12 months, black children had significantly fewer visits with their asthma provider (OR 0.63, 95% CI 0.40, 0.99) and were less likely to have their asthma treatment plan reviewed with a provider (OR 0.48, 95% CI 0.28, 0.82), as compared to their white peers. In this analysis, there was no significant difference seen among the responses of Latino versus white participants. The only difference seen among Asian and white participants was in the provider reviewing medications. Asian children were more likely to have their medications reviewed with a provider than their white peers (OR 2.01, 95% CI 1.07, 3.79).

There were no significant differences by race in preferences regarding shared asthma decision-making.

## Discussion

Our study demonstrates that racial disparities exist in the interactions between patient-families of children with asthma and their providers. First, we found that black children with asthma were seen less by an asthma provider than white children with asthma. Second, we found that black children were less likely to have a written asthma treatment plan reviewed with their provider than white children, in the previous 12 months.

Our findings wherein black children were less likely to receive a written asthma treatment plan than white children, contradict the findings of a recent study on asthma action plan receipt in children. This prior study examined the National Health Interview Survey in 2013 and found that a greater percentage of non-Latino black children with asthma received an asthma action plan (58.4%) than non-Latino white children (47.4%) ( $p = 0.028$ ). This result was seen despite their findings that children with public insurance were less likely to receive

an asthma action plan than those with private insurance (children of lower socioeconomic status tend to utilize public insurance more and 39% of this prior study's black population was living below 100% of the federal poverty level compared with 13% of white's). The authors explored this counterintuitive result by controlling for control of asthma as well as using interaction terms for other covariates, however their result remained the same [17]. One reason to explain the discrepancy between our results and the prior study is that we specified a time frame of "the last 12 months" whereas the prior study asked if the family "ever received an asthma action plan." It is more likely that a family will have *ever* received an asthma action plan than it is that they received and reviewed one in the last 12 months. Given that asthma is a dynamic and evolving disease, current national guidelines recommend a recent written treatment plan given within the past 12 months. Additionally, there were differences in the prior study population and ours. The prior study used a national sample which included children without insurance (whereas all of our study population were insured); they studied a wider age range of 2–17 years (whereas we studied children aged 4–11 years); and almost half of the children in this prior study population were not on preventative medications (whereas the children in our study were all prescribed a daily preventative asthma medication). These study population differences may have contributed to the discrepant results.

Our study sheds light on two specific family-provider interactions that may be widening the morbidity gap between black and white asthmatic children: number of visits to an asthma provider and review of a written treatment plan.

Asthma providers could partner with families to focus specifically on increasing the number of asthma-related visits and delivery/review of an updated written asthma treatment plan. This could help reduce the racial disparities among black and white asthmatic children.

We did not see significant racial disparities related to asthma decision-making. To our knowledge there are no prior studies comparing racial differences of asthma decision-making practices. However, a prior study of black adults with persistent asthma demonstrated that this cohort had a mistrust of the medical establishment and reliance on their own assessments of asthma control rather than their provider [18]. This was not a study in children and there was no comparison group to determine beliefs of other racial groups. Another study of Dominican American mothers of children with asthma also had a distrust of physicians in America and preferred to use folk remedies rather than prescription medicines for asthma episodes [19]. Similarly, there was no comparison group of other racial or ethnic backgrounds. Thus our finding of the lack of significant difference in asthma decision-making may shed light on an area of similarity among different racial groups in family-provider interactions.

### **Strengths and limitations**

Strengths of our study include a diverse population of children and providers from geographic locations around the country and self-reported race/ethnicity of the child. Additionally, to our knowledge, this is the first study assessing differences by race/ethnicity in family-provider asthma decision-making practices. Nevertheless, a few limitations deserve mention. First, only two sites offered the survey in Spanish, thus we did not have

full representation of the Latino population and we did not have data specifying Puerto Rican ethnicity. While there were no significant differences seen between Latino and white participants, we likely did not have sufficient power to detect this difference. We did not know the race of the providers, which is a limitation to this study and concordance/discordance between child and provider race in interactions about asthma is important and merits further study. Our study is limited to insured patients from a few large health systems; thus the results may not be generalizable to other populations. Given that the TENN population was a bit unique in that they have separate asthma educators in some of the pediatric clinics, we did perform a sensitivity analysis with removal of the TENN population and our results remained the same. In addition, as with all observational studies, we were unable to assess causality between race and our outcomes of interest. Our outcome assessment was also limited in that it included 12 months of recall, which could have introduced recall bias. Finally, given that we did not include children on omalizumab and those with co-morbid illness, we cannot generalize our findings to children with the most severe asthma or other co-morbid illnesses, however very few children were excluded based on these criteria. In fact, there were no children excluded from the study for being on omalizumab.

## Conclusion

Our study demonstrates racial disparities in the interactions between families and providers for pediatric asthma care. We found that in the previous 12 months, black children with asthma were seen less frequently by asthma providers and were less likely to have a written asthma treatment plan reviewed than white children with asthma. This study identifies specific areas where we could improve family-provider interactions and potentially narrow the widening racial gap in pediatric asthma.

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**Table 1.**

Population characteristics by race/ethnicity.

Characteristic	Total	Black	Latino	Asian	White	Global p-value
n (%)	647 (100)	149 (23)	76 (12)	63 (10)	359 (55)	
Child age in years mean (SD)	8.6 (2.7)	8.4 (2.7)	9.3 (2.9)	8.3 (2.6)	8.5 (2.6)	0.07
Female n (%)	244 (38)	69 (46)	28 (37)	15 (24)	132 (37)	0.02
Limited English proficiency n (%)	118 (18)	35 (23)	20 (26)	14 (22)	49 (14)	0.006
Practice location n (%)						<0.001
HPHC	54(8)	6(4)	1(1)	0(0)	47(13)	
HPMG	53(8)	9(6)	1(1)	2(3)	41(11)	
KPNC	450(70)	87(58)	64(85)	59(94)	240(67)	
KPGA	21(3)	13(9)	1(1)	0(0)	7(2)	
TENN	69(11)	34(23)	9(12)	2(3)	24(7)	
Poor asthma control (ACT <= 19) n (%)	39%	68(46)	25(33)	21(33)	131(36)	0.09
Household income >70,000 n (%)	38%	55(37)	18(23)	44(70)	197(55)	<0.001
Parent college graduate n (%)	49%	29(19)	11(14)	35(56)	158(44)	<0.001
<i>Outcome</i>						
No. visits with asthma provider						0.13
0 visits	29(4)	10(7)	3(4)	2(3)	14(4)	
1–3 visits	388(60)	90(60)	40(53)	46(73)	212(59)	
>3 visits	230(36)	49(33)	33(43)	15(24)	133(37)	
No. visits provider reviewed asthma meds						0.28
Every visit	416(64)	107(72)	46(60)	41(65)	222(62)	
Most/some visits	164(25)	25(17)	21(28)	16(25)	102(28)	
Very few/no visits	67(11)	17(11)	9(12)	6(10)	35(10)	
Written asthma treatment						<0.001
Plan reviewed	421(65)	83(56)	49(64)	44(70)	245(68)	
Preference on who makes asthma decisions						0.36
Patient decides	103(16)	19(13)	16(21)	14(22)	54(15)	

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Characteristic	Total	Black	Latino	Asian	White	Global <i>p</i> -value
Together with provider	452 (70)	106 (71)	49 (65)	40 (63)	257 (72)	
Provider decides	92 (14)	24 (16)	11 (15)	9 (14)	48 (13)	

**Table 2.**

Family-provider interactions by race: univariate analysis.

Family-provider interaction	OR (95%CI)			
	Black	Latino	Asian	White (ref)
N = 647				
Number of visits with asthma provider	0.63 (0.43, 0.92) $p = 0.02$	0.66 (0.40, 1.10) $p = 0.10$	1.43(0.81,2.55) $p = 0.22$	1.00
Provider reviewed medications	1.45 (0.97, 2.18) $p = 0.07$	0.92 (0.56,1.52) $p = 0.76$	1.13(0.65,1.96) $p = 0.66$	1.00
Written asthma treatment plan reviewed	0.47 (0.31,0.73) $p < 0.0001$	0.74 (0.44,1.25) $p = 0.26$	1.46 (0.85, 2.49) $p = 0.17$	1.00
Asthma decisions	0.82(0.55,1.24) $p = 0.35$	1.22 (0.72,2.08) $p = 0.46$	1.29 (0.73, 2.29) $p = 0.38$	1.00

The reference group is self-reported white race.

**Table 3.**

Family-provider interactions by race: multivariate analysis.

Family-provider interaction	OR (95%CI)				
	Black	Latino	Asian	White (ref)	
N = 647					
Number of visits with provider	0.63 (0.40, 0.99) <i>p</i> = 0.048	0.62 (0.34, 1.10) <i>p</i> = 0.10	1.15 (0.61, 2.16) <i>p</i> = 0.67	1.00	
Provider reviewed medication	1.29 (0.80, 2.12) <i>p</i> = 0.30	0.87(0.49, 1.54) <i>p</i> = 0.62	2.01 (1.07, 3.79) <i>p</i> = 0.03	1.00	
Written asthma treatment plan reviewed	0.48 (0.28, 0.82) <i>p</i> = 0.008**	0.81 (0.43, 1.51) <i>p</i> = 0.50	0.79 (0.41, 1.49) <i>p</i> = 0.46	1.00	
Asthma decisions	1.04 (0.64, 1.68) <i>p</i> = 0.88	1.09 (0.59, 2.00) <i>p</i> = 0.78	1.49 (0.78, 2.83) <i>p</i> = 0.22	1.00	

The reference group is self-reported white race.

\* Adjusted for child's age, child's sex, household income, parent education, English language, practice location, ACT score.

\*\* Adjusted for child's age, child's sex, household income, parent education, English language, practice location, ACT score, and number of provider visits.