

Does receiving care in a medical home reduce racial/ethnic disparities in ED visits among children with asthma in the United States?

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Abstract

Evidence has shown the implementation of medical home model improves care quality and outcomes. However, it is not clear whether receiving care from a medical home has any impact on racial/ethnic disparities in emergency department (ED) use by children with asthma. This study using the US National Survey of Children with Special Health Care Needs, 2009–2010, estimated racial/ethnic disparities in ED use. Generalized liner models were used to examine factors associated with ED use. Racial/ethnic differences in ED use were attenuated after adjusting for socio-economic variables. Ratios of prevalence ratios were calculated to examine the effect modification of medical home on ED use associated with race/ethnicity. The adjusted prevalence ratio of ED use of the Black to non-Hispanic White was 1.51 (95% confidence interval (CI): 1.36–1.67) with medical home and 1.35 (95% CI: 1.24–1.47) without medical home. Among those with care from a medical home Latino children had higher ED use compared with White children. There is no evidence that the self-reported care from a medical home narrows the gaps in ED use between non-Hispanic White and Black or Latino children with asthma.

Keywords

Access/availability, asthma, children, disparities, ED use, medical home, NS-CSHCN, paediatric care, race/ethnicity, United States

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Introduction

Asthma is a common chronic illness affecting at least seven million American children (Akinbami et al., 2012). The cost of asthma care is high, and the burden and lost work for family members extends asthma's costs (Kamble and Bharmal, 2009). The literature consistently reports racial and ethnic disparities in the prevalence, severity and morbidity of childhood asthma (Crespo et al., 2011; Erickson et al., 2007; Lozano et al., 1995; McDaniel et al., 2006; Stewart et al., 2010). Black children with asthma have higher rates of using emergency department (ED) services, hospitalizations and mortality compared to White children (Akinbami et al., 2009; Crocker et al., 2009; Oraka et al., 2013). There is heterogeneity in asthma and outcomes among Hispanic subgroups (Lara et al., 2006) and children from Puerto Rico had more frequent ED use than White children (Canino et al., 2012). The root cause of such disparities is not clear: bridging these gaps remains challenging. Conceptual frameworks that include the linkage of system and contextual factors to asthma disparities have been proposed (Hill et al., 2011; Wright and Subramanian, 2007).

In recent years, increased attention has been placed upon medical home as a promising approach to organize effective healthcare delivery, particularly for those with chronic conditions (Starfield and Shi, 2004). The history of the medical home concept can be traced back to 1960s and 1970s. The term has been evolved from the original description of a place to a concept of high quality of care in partnership with families (Sia et al., 2004). The American Academy of Pediatrics (AAP) defines medical home as providing care that is accessible, continuous, comprehensive, family centred, coordinated, compassionate and culturally effective (AAP, 2004). It is one of the strategies to address rising health cost, fragmentation of care and difficulty to access care. There is some evidence in the United States that asthmatic children who receive care in medical homes have better outcomes including reduced ED use and hospitalizations (Cooley et al., 2009; Diedhiou et al., 2010; Homer et al., 2008; McAllister et al., 2009; Raphael et al., 2009). Lack of access to good primary care is associated with poor outcomes and minority children are more likely to have poor access to good primary care that may contribute to disparities in adverse outcomes (Cabana et al., 2007; Davidson et al., 2010; Hill et al., 2011). Therefore, it is plausible to expect minority children with chronic conditions would benefit from the availability of high quality care in a medical home. To our knowledge, no previous studies have examined whether receiving care in a medical home is associated with decreasing disparities in ED use between non-Hispanic Whites and minority children with asthma. This study was designed to (1) estimate racial/ethnic disparities in ED use, (2) examine the association of various factors with ED use, (3) examine whether racial/ethnic disparities in ED use were attenuated in the models with different variables added and (4) estimate the effect modification of medical home on ED use associated with race/ethnicity.

Methods

Study design

We conducted a cross-sectional analysis of the US National Survey of Children with Special Health Care Needs (NS-CSHCN), 2009–2010. The NS-CSHCN was designed to obtain detailed information on health status, healthcare experiences and family impact of children aged 0–17 years with special healthcare needs in the United States. Households with children under 18 years were sampled nationally through randomly selected telephone calls. All these children were screened for special healthcare needs. Detailed information on the survey design is published elsewhere

(Bramlett et al., 2014). The data file and related information were obtained from the Resource Center for Child and Adolescent Health (www.childhealthdata.org).

Study population

We included children from less than 1 year old to 17 years old with diagnosed asthma as reported by the survey respondent, who is typically a parent. Of 40,242 children in the 2009–2010 survey, 15,959 children had diagnosed asthma and the final sample included 15,161 children with asthma after excluding the children with missing or unknown values of the study variables.

Study variables

The primary outcome variable is respondent-reported ED visits within the previous 12 months. We dichotomized this variable into 1 for any ED visits and 0 for no ED visits. Our race/ethnicity variable included four groups: non-Hispanic White, Hispanics, Black and Other racial/ethnic groups (comprised predominantly of Asians, Alaska Natives, American Indians, Native Hawaiians or Pacific Islanders). As the other racial/ethnic groups had mixed race/ethnicities, this study focused on Whites, Blacks and Hispanics.

While medical home is a complex construct, we used the dichotomous composite measure that was derived by the Data Resource Center for Child & Adolescent Health (<http://child-healthdata.org/docs/cshcn/outcome-2.pdf?Status=Master>). To be classified as receiving care in a medical home, the respondent needed to report that the child (1) had at least one personal doctor or nurse, (2) received family-centred care in the previous 12 months, (3) had no problems getting referrals when needed, (4) had usual source or sources of sick and well care and (5) received effective care coordination.

This study also examined the demographic and socio-economic variables that include age, gender, the presence of co-morbidities, insurance coverage for child, parental education level and family income. Age was categorized as 0–5 years, 6–11 years and 12–17 years. Family income categories included 0–99% of US federal poverty level (FPL), 100–199% FPL, 200–399% FPL, and $\geq 400\%$ FPL. The threshold of poverty in 2010 ranged from family income of US \$10,830 to US\$ 37,010 depending on the number of persons in the family. Parental educational level was categorized as less than high school, high school graduate and more than high school. Insurance was categorized as privately insured, publicly insured, both private/public, others and uninsured. Insurance coverage gaps are a marker for instability of health insurance. The number of additional health conditions present besides asthma has four categories: 0 or 1 condition, 2 conditions, 3 conditions, 4 or more additional health conditions.

Statistical analysis

We described the study sample size and characteristics of the study sample, using weighted data to make estimates in the statistical analyses. We used various analytical approaches to address our specific study aims. We examined the association of ED use with various factors using a series of generalized liner models (GLM) with probit link function to model the dichotomous outcome variable. Model 1 examines racial/ethnic disparities in ED use adjusting for any differences in the distribution of age, gender and number of other health conditions across race/ethnicity. Model 2 adds socio-economic variables to describe the impact of race/ethnicity, adjusting for differences in

the distribution of these variables. The final model includes care in a medical home to assess whether medical home attenuated racial/ethnic differences in ED use in the fully adjusted model. As cross-sectional survey data were used, we calculated prevalence of ED use in each racial/ethnic group stratified by medical home status. Prevalence ratios were used as estimates to quantify risk for ED use in White children as compared to minority children. We used regression risk analysis (Kleinman and Norton, 2009) to calculate risk differences in ED use between White and minority children with or without medical home. We used stratified analyses and calculated ratios of prevalence ratios to estimate the effect modification of medical home on ED use associated with race/ethnicity. Point estimates and 95% confidence interval (CI) of estimates were presented.

Results

Nearly half of these children (46.5%) had one or more ED visits (19.3% had one ED visit, 11.7% had two ED visits and 16.5% had three or more ED visits) in the past 12 months. About 45% (95% CI: 43.3–46.2%) received care in a medical home. ED use was associated with race/ethnicity, socio-economic and other variables (Table 1). Compared with younger children (0–5), children aged 6–11 and 12–17 were less likely to have used ED service (PR: 0.70 (95% CI: 0.65–0.75); PR: 0.67 (95% CI: 0.63–0.73)). African American children were more likely to have used ED service as compared with non-Hispanic White children (PR: 1.26 (95% CI: 1.17–1.35)). Children with public insurance coverage were more likely than children with private coverage to have made any ED visits (PR: 1.19 (95% CI: 1.08–1.31)); ED use was lower among children with higher family income (above 100% of the US FPL) compared with children that had lower family income (below 100% of the US FPL); children with three or more co-morbidities were more likely to have made any ED visits (PR ranges from 1.21 (95% CI: 1.09–1.34) to 1.49 (95% CI: 1.37–1.63)); children who received care in a medical home were less likely to have visited ED (PR: 0.90 (95% CI: 0.84–0.96)) after adjusting for other variables.

Table 2 shows racial disparities in ED use. Black children were 50% (95% CI: 40–61%) more likely, Hispanic children were 16% (95% CI: 6–28%) more likely than non-Hispanic White children to have used ED service. After adjusting for parental education level, family income, insurance coverage and gap in Model 2, prevalence ratio in ED use between Black children and non-Hispanic White children changed from 1.5 (95% CI: 1.4–1.6) to 1.27 (95% CI: 1.19–1.36); there was no difference in ED use between Hispanics and non-Hispanic White children with a prevalence ratio of 1.02 (95% CI: 0.93–1.36). In model 3 with further adjustment of demographic and comorbidities variables, Black children still had higher risk for ED use (PR: 1.26 (95% CI: 1.17–1.35)). When the full model included medical home variable, difference in ED use between non-Hispanic White children and Black children was not attenuated.

Table 3 presents racial disparities in ED use stratified by medical home status and the results from effect modification analyses. Of the children who received care in a medical home, Black and Hispanic children were more likely than non-Hispanic White children to have used ED service (adjusted PR of Black children to White children: 1.51 (95% CI: 1.36–1.67); adjusted PR of Hispanic children to White children: 1.23 (95% CI: 1.03–1.46)). In the unadjusted analysis, the disparities in ED use between Black and White children appeared to be greater for children in medical homes than those who were not (1.2 (95% CI: 1.05–1.39)). However, these differences were not statistically significant after adjustment for age, sex and number of health conditions (1.1 (95% CI: 0.99–1.29)). There were no statistically significant differences in ED use between Hispanic and White children without a medical home in both unadjusted and adjusted analysis.

Table 1. Use of ED services and associated factors among children with asthma.

	Prevalence of ED use %	Adjusted prevalence ratio (95% CI)
Age (years)		
0–5	60.7	Reference
6–11	43.4	0.70 (0.65–0.75)
12–17	42.3	0.67 (0.63–0.73)
Gender		
Male	46.9	Reference
Female	46.0	0.99 (0.93–1.05)
Race		
Non-Hispanic Whites	40.6	Reference
Blacks	60.9	1.26 (1.17–1.35)
Hispanics	47.3	1.01 (0.92–1.11)
Others	44.5	1.02 (0.91–1.14)
Parental education level		
Less than high school	57.4	Reference
High school graduate	57.4	1.05 (0.95–1.17)
More than high school	41.2	0.95 (0.86–1.05)
Family income, % FPL*		
0–99	63.1	Reference
100–199	50.4	0.89 (0.82–0.97)
200–399	42.2	0.88 (0.80–0.98)
400 or greater	32.4	0.75 (0.66–0.84)
Insurance coverage		
Private/commercial	36.3	Reference
Public	60.1	1.19 (1.08–1.31)
Public/private	56.1	1.17 (1.04–1.31)
Other	41.3	0.97 (0.81–1.17)
Uninsured	40.6	0.84 (0.67–1.07)
Insurance gap		
Insured entire year	45.9	Reference
Not insured some point during the year	52.1	1.06 (0.95–1.17)
Number of other health conditions		
0–1	41.3	Reference
2	42.1	1.08 (1.00–1.17)
3	48.2	1.21 (1.09–1.34)
4+	61.8	1.49 (1.37–1.63)
Received care that met medical home criteria		
No	51.4	Reference
Yes	40.5	0.90 (0.84–0.96)

Note: ED: emergency department; % FPL: percentage of federal poverty level; CI: confidence interval.

*Income is expressed in categories according to percentage of % FPL.

Discussion

This study provides consistent evidence that ED use was less likely to occur among children reported to have received care that is accessible, continuous, comprehensive, family centred, coordinated than among those whose care failed to meet the medical home care standard. However, there was no evidence that the self-reported care from a medical home narrows the gaps in ED use between non-Hispanic White and Black or Latino children with asthma.

Table 2. Racial/ethnic disparities in ED use among children with asthma.

	Unadjusted		Model 1		Model 2		Model 3	
	PR*	(95% CI)	PR*	(95% CI)	PR*	(95% CI)	PR*	(95% CI)
Race/ethnicity								
Non-Hispanic Whites	Reference		Reference		Reference		Reference	
Blacks	1.50	(1.40–1.61)	1.51	(1.36–1.68)	1.27	(1.19–1.36)	1.26	(1.17–1.35)
Hispanics	1.16	(1.06–1.28)	1.23	(1.03–1.46)	1.02	(0.93–1.36)	1.01	(0.92–1.11)
Others	1.10	(0.98–1.23)	1.02	(0.83–1.24)	1.02	(0.92–1.15)	1.02	(0.91–1.14)

Note: ED: emergency department; CI: confidence interval. Model 1 adjusted for age, sex and number of health conditions. Model 2 adjusted for age, sex and number of health conditions insurance coverage/coverage gap, parental education level, family income. Model 3 adjusted for age, sex and number of health conditions, insurance coverage/coverage gap, parental education level, family income and medical home.

*Prevalence ratio.

This study also reports that Black and Hispanic children were more likely than White children to use ED services when experiencing medical home care. The persistent disparities in ED use among Black and Latino children with asthma are striking but may not be surprising. Overwhelming evidence has demonstrated that socio-economic factors are associated with adverse outcomes in children with asthma (Crespo et al., 2011; Jones et al., 2008; Lozano et al., 1995; McDaniel et al., 2006). Our study findings corroborate with these studies to implicate socio-economic factors as important determinants for differences in adverse outcomes among children with asthma. Lack of insurance or without good insurance may increase ED use (Canino et al., 2012; Jaeger et al., 2015). Our study reveals the disparities in ED use were attenuated after adjusting for socio-economic variables such as parent education, insurance and poverty that in the United States typically correlate with race and/or ethnicity. Given the unfavourable distribution of socio-economic factors found among minority populations, the medical home is not a powerful enough intervention by itself to overcome the impact of these social determinants of health.

Our study findings should be interpreted in light of our methods and data source. The definition of care in a medical home we used lacks two of the seven components in the AAP definition of medical home. ED use and care that met medical home criteria are based upon a survey of the parent experience of the care for their children, rather than observation of the actual care delivered. The survey also lacks the measure of asthma care quality. Also we are unable to adjust our findings for biological aspects of asthma severity. Even acknowledging the differences in asthma severity between Black and White adults, racial differences in ED visits exist (Haselkorn et al., 2008). We are confident that our study findings are valid despite these limitations. The NS-CSHCN is an accepted source of national data to help to understand management and outcomes of children with asthma. Given the data sources, the study findings may not be generalized to other countries other than the USA, which may have different demographic characteristics and healthcare system.

As the implementation of medical home model to improve health care quality and outcomes in the United States is continuing, it is important to evaluate and monitor the impact of medical home care on minority children with chronic conditions. Tailored interventions are needed to enhance care delivered in medical homes that can address special needs of minority children in the United States. Other approaches should also be considered in addressing racial/ethnic disparities in ED use among children with asthma. For example, interventions delivered to enhance clinician adherence to National Asthma Education and Prevention Program recommendations can be an important

Table 3. Effect modification of medical home on racial/ethnic disparities in ED use.

	Medical home		No medical home		
	Prevalence of ED use % (95% CI)	Prevalence of ED use % (95% CI)			
Racial/ethnic groups					
Non-Hispanic Whites	35.2 (33.0–37.3)	46.3 (43.8–48.9)			
Blacks	57.7 (52.5–63.0)	62.8 (58.3–67.2)			
Hispanics	44.5 (37.4–51.6)	48.9 (43.8–54.0)			
Others	36.0 (29.3–42.8)	50.9 (44.4–57.4)			
	Prevalence ratio (95% CI)	Risk difference	Prevalence ratio (95% CI)	Risk difference	Effect modification (ratios of prevalence ratio)
Blacks (Whites as reference group)	1.64 (1.47–1.83)	22.5 (16.9–28.1)	1.35 (1.24–1.48)	16.4 (11.3–21.5)	1.2 (1.05–1.39)
Hispanics (Whites as reference group)	1.26 (1.06–1.50)	9.3 (1.9–16.7)	1.05 (0.94–1.19)	2.5 (–3.2–8.2)	1.2 (0.9–1.48)
	Medical home		No medical home		
Racial/ethnic groups	Adjusted prevalence of ED use* % (95% CI)	Adjusted prevalence of ED use* % (95% CI)			
Non-Hispanic Whites	35.9 (33.7–38.1)	46.5 (44.0–48.9)			
Blacks	54.2 (49.6–58.8)	62.7 (58.4–67.0)			
Hispanics	44.0 (36.9–51.1)	49.1 (44.2–53.9)			
	Adjusted Prevalence ratio	Risk difference	Adjusted Prevalence ratio	Risk difference	Effect modification (ratios of prevalence ratio)
Blacks (Whites as reference group)	1.51 (1.36–1.67)	18.8 (13.5–24.1)	1.35 (1.24–1.47)	16.2 (11.3–21.1)	1.1 (0.99–1.29)
Hispanics (Whites as reference group)	1.23 (1.03–1.46)	7.7 (0.3–15.1)	1.06 (0.95–1.18)	2.9 (–2.5–8.4)	1.16 (0.9–1.42)

Note: ED: emergency department; CI: confidence interval.

*Adjusted for age, sex, number of health conditions.

Table 4. Sample size and characteristics.

	Sample size (N)	%
Age (years)		
0–5	2739	18.1
6–11	5086	33.5
12–17	7336	48.4
Gender		
Male	9217	60.8
Female	5944	39.2
Race		
Non-Hispanic Whites	9658	63.7
Blacks	1861	12.3
Hispanics	2039	13.4
Others	1606	10.6
Parental education level		
Less than high school	837	5.5
High school graduate	2349	15.5
More than high school	11,975	79.0
Family income, % FPL*		
0–99	2756	18.2
100–199	2947	19.4
200–399	4677	30.9
400 or greater	4781	31.5
Insurance coverage		
Private/commercial	8930	58.9
Public	4381	28.9
Public/private	930	6.1
Other	492	3.3
Uninsured	428	2.8
Insurance gap		
Insured entire year	13,993	92.3
Not insured some point during the year	1168	7.7
Number of other health conditions		
0–1	4094	27.0
2	6503	42.9
3	2023	13.3
4+	2541	16.8
Received care that met medical home criteria		
No	7599	50.1
Yes	6777	49.9

Note: %FPL: percentage of federal poverty level.

*Income is expressed in categories according to %FPL.

strategy to decrease overall hospital and ED use among minority children (Cloutier et al., 2005; Piper et al., 2008). Increasing family involvement in their child's asthma management may reduce burdens of asthma (Lieu et al., 1997). Non-healthcare factors, including neighbourhood context, nutrition, stress and social support networks (Li and Guttman, 2009; Wright and Subramanian, 2007), may interact with care delivery contributing to disparities in ED use among asthmatic children. Leveraging of community resources and creating effective linkage between clinical

practice and community-based programs (such as school-based) may also help to reduce disparities in asthma care and outcomes (Fox et al., 2007; McMenamy and Perrin, 2004; Tapp et al., 2011). These recommendations may or may not be effective in the healthcare settings outside the United States.

Conclusion

Our study demonstrates risk for ED use was lower among children who received care from a medical home. But there was no impact of medical homes on reducing disparities in ED use between White and Black or Latino children with asthma. More efforts are needed to design and evaluate effective interventions that consider policy, practice and non-clinical contexts to reduce ED use among minority children with asthma.

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