



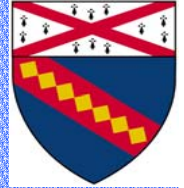
## Ethnic Variation in Asthma Diagnosis By Age Two in Children with Comparable Symptoms

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### INTRODUCTION

African American children are more likely to be diagnosed with asthma than white children. The Yale Childhood Asthma Study is following a cohort of 1,002 children from birth. The cohort includes a significant proportion of African American (14.3%) and Hispanic (24.2%) children. This report investigates physician-diagnosed asthma in the first two years of life, by ethnicity.

## METHODS

### *Cohort*

33,341 women delivering babies in five Connecticut hospitals and one hospital located in south central Massachusetts were screened for inclusion in the study. Only mothers who already had a child less than 11 years old, with a physician diagnosis of asthma, were invited to participate. At enrollment, a trained research assistant visited each home, obtained informed consent, and administered a detailed questionnaire lasting approximately 50 minutes to each mother. The index child was 2 – 3 months old at the time of the home visit. The questionnaire obtained extensive information about home and family characteristics, including: parents' education, ethnicity, asthma history and smoking habits. Mothers were asked during the home visit whether their child had experienced wheeze or persistent cough in each month of the child's life. If the child had these symptoms, mothers were asked the number of days in each month that symptoms occurred. The study population includes 896 children. Mothers reported a diagnosis of asthma for 173 children in the cohort. Currently, 147 physicians have responded to requests for confirmation of asthma diagnosis. The analysis focussed on physician confirmed cases

***Statistical Analysis:*** The study population were examined using life-table and survival methods to account for differing lengths of follow-up. Unadjusted relative risks (RR) and 95% confidence intervals (CI) were calculated for asthma diagnosis. Days of wheeze and persistent cough prior to diagnosis, or prior to censoring for undiagnosed children, were summed. Symptoms were categorized in some analyses as none, <30 days or  $\geq$ 30 days. These categories were based on a previously published asthma severity index (Ortega et al., *Ann All Asthma Immunol* 2001;86:405-13). Multivariate analyses used Cox proportional hazard models to examine time to asthma diagnosis by ethnicity, controlling for symptom severity, medication use, and other factors.

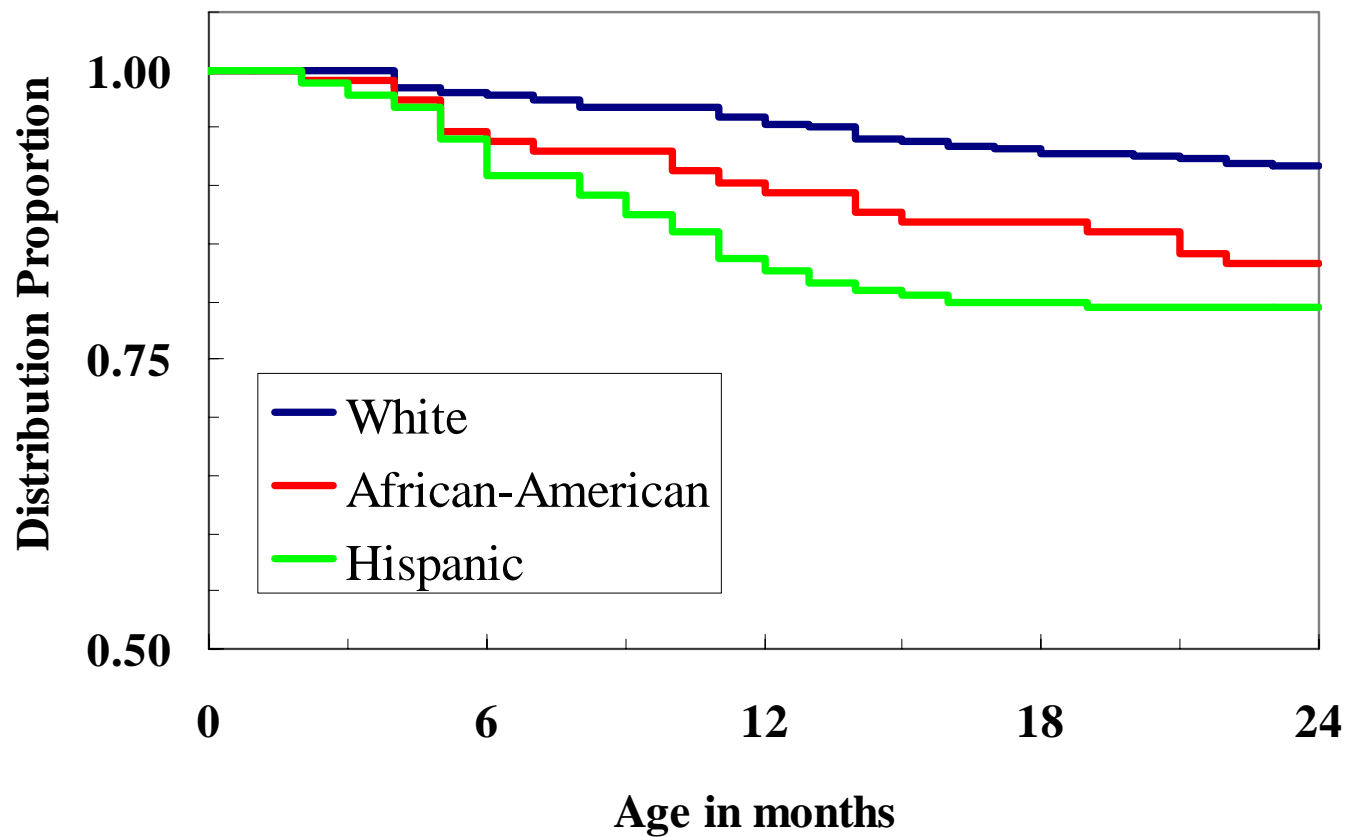
## ACKNOWLEDGEMENT

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## RESULTS

Figure 1 presents the survival function for time to asthma diagnosis by ethnic group. Minority children are consistently more likely to be diagnosed with asthma than white children. Asthma diagnosis appears to occur similarly among African American and Hispanic children during the first six to nine months of age, however, older Hispanic children are even more likely than African Americans to be diagnosed.

### Time to Asthma Diagnosis by Ethnicity



## RESULTS CONT'D

**Table 1. Selected Characteristics of the Study Population and Unadjusted Relative Risks for Asthma Diagnosis (mother reported),<sup>1</sup> Connecticut and Massachusetts, 1996 - 2000.**

Factor	N	Diagnosed %	Unadjusted Relative Risk	95% Confidence Interval
Child Gender				
male	434	8.51	1.85	1.27 - 2.71
female	418	15.8	R	
Ethnicity				
white	513	8.2	R	
African American	114	16.7	2.04	1.23 - 3.36
Hispanic	185	20.5	2.51	1.67 - 3.76
Mother has asthma				
no	595	9.9	R	
yes	257	17.1	1.73	1.20 - 2.48
Father has asthma				
no	681	11.4	R	
yes	166	15.1	1.31	0.87 - 2.00
Smoking in home				
no	738	12.1	R	
yes	114	12.3	1.02	0.60 - 1.73
Mother's education				
less than high school	105	22.9	2.35	1.43 - 3.85
high school/some college	449	11.1	1.14	0.74 - 1.77
college graduate	298	9.7	R	
Family Income				
< \$20,000	251	16.3	1.47	0.99 - 2.16
\$20,000 - \$50,000	179	8.4	0.75	0.43 - 1.31
> \$50,000	422	11.1	R	
Wheeze <sup>2</sup>				
none	398	7.0	R	
< 30 days	356	13.8	1.96	1.26 - 3.04
≥ 30 days	98	26.5	3.77	2.32 - 6.13
Persistent cough <sup>2</sup>				
none	309	9.7	R	
< 30 days	356	11.0	1.13	0.72 - 1.77
≥ 30 days	187	18.2	1.87	1.19 - 2.96
Albuterol use <sup>2</sup>				
no	464	0.9	R	
yes	388	25.5	29.60	10.99 - 79.69
Steroid use <sup>2</sup>				
no	710	6.9	R	
yes	142	38.0	5.51	3.91 - 7.76

<sup>1</sup>Some variables contain missing data.

<sup>2</sup>Symptoms and medication use prior to diagnosis, or until censoring for undiagnosed.

## RESULTS CONT'D

**Table 2. Association of Symptoms and Medication Use Before Diagnosis of Asthma with Ethnicity Connecticut and Massachusetts, 1996 - 2000.**

	N	White n=513 %	Black n=114 %	Hispanic n=185 %	p value
<b>Wheeze<sup>2</sup></b>					
None	380	46.4	51.7	44.9	.34
< 30 days	339	42.7	33.3	44.3	
≥ 30 days	93	10.9	14.9	10.8	
<b>Persistent cough<sup>2</sup></b>					
None	292	61.0	64.1	65.0	.27
< 30 days	340	17.5	11.5	13.3	
≥ 30 days	180	21.6	24.4	21.7	
<b>Albuterol use<sup>2</sup></b>					
No	437	54.6	56.1	50.3	.52
Yes	375	45.4	43.9	49.7	
<b>Steroid use<sup>2</sup></b>					
No	673	81.5	86.8	84.3	.33
Yes	139	18.5	13.2	15.7	

<sup>1</sup>Excludes children of other or unknown ethnicity.

<sup>2</sup>Symptoms and medication use prior to diagnosis, or until censoring for undiagnosed children.

## RESULTS CONT'D

**Table 3. Hazard Ratios and 95% Confidence Interval for Time to Asthma Diagnosis (physician confirmed) with Demographic Factors (Model 1) and Symptoms (Model 2) and Medication Use (Model 3), Connecticut and Massachusetts, 1996 - 2000.<sup>1</sup>**

Factor	Model 1		Model 2		Model 3	
	Ratio	95% CI	Hazard Ratio	95% CI	Hazard Ratio	95% CI
African American	2.27	1.29–3.98	2.24	1.28–3.93	2.87	1.63–5.07
Hispanic	2.36	1.42–3.94	2.49	1.51–4.12	2.58	1.54–4.31
Boy	2.07	1.38–3.10	2.01	1.34–3.01	1.42	0.93–2.16
Mother has asthma	1.80	1.21–2.67	1.76	1.18–2.63	1.44	0.96–2.16
Mother's education < high school	1.85	0.96–3.57	1.73	0.90–3.31	2.49	1.30–4.76
Wheeze < 30 days <sup>1</sup>			2.43	1.42–4.17	0.49	0.28–0.84
Wheeze ≥ 30 days			4.60	2.33–9.10	0.65	0.34–1.25
Persistent cough < 30 days			0.68	0.39–1.17	0.50	0.29–0.86
Persistent cough ≥ 30 days			0.72	0.39–1.34	0.54	0.31–0.95
Albuterol <sup>2</sup>					46.37	15.97–134.6
Steroid					3.57	2.36–5.41

<sup>1</sup>All models controlled for smoking in the home, and father's asthma, which were not significant predictors, in addition to all the listed variables.

<sup>2</sup>Symptoms and Medication use prior to diagnosis, or until censoring for undiagnosed children.

## RESULTS CONT'D

Model 1 demonstrates a decreased time to asthma diagnosis for African American (Hazard Ratio (HR) 2.27 95% CI 1.29 - 3.98) and Hispanic (HR 2.36 95% CI 1.42 - 3.94) children, boys, and children whose mothers have a history of asthma.

Since African American and Hispanic children were more likely to be diagnosed with asthma, we anticipated that they experienced more symptoms than white children. In Model 2 variables are added to control for symptoms (days of wheeze and persistent cough). Wheeze, but not cough, was strongly related to shorter time to physician diagnosis (wheeze  $\geq$  30 days, HR = 4.60 95% CI 2.33 - 9.10). Controlling for symptoms does not change the hazard ratio for minority groups, suggesting that frequency of symptoms is not the primary factor influencing asthma diagnosis.

Although African American and Hispanic children are more likely to receive an asthma diagnosis, they do not experience more days of wheeze or persistent cough than white children. Use of albuterol and steroid medication prior to diagnosis is also similar among children of different ethnic groups.

## SUMMARY

### CONCLUSIONS

1. African American (HR 2.27 95% CI 1.29 - 3.98) and Hispanic children (HR 2.36 95% CI 1.42 - 3.94) were over twice as likely to be diagnosed with asthma by age two as white children.
2. Controlling for symptoms of wheeze and persistent cough and use of prescribed medication (albuterol and steroids), increased rather than diminished the effect of ethnicity. These results were similar for both African American (HR 2.87 95% CI 1.63 - 5.07) and Hispanic (HR 2.58 95% CI 1.54 - 4.31) children compared to whites.
3. Although physician diagnosis differed significantly by ethnic group, frequency of wheeze, persistent cough and use of prescribed medication did not. This is the first study to report increased asthma diagnosis among Hispanic children, compared to white children with similar symptoms and medication use. Among Hispanic children in this cohort, 91% are Puerto Rican.

### DISCUSSION

Gergen has proposed other explanations for racial differences in the acquisition of an asthma diagnosis. He suggests that poor urban children are more likely to be treated by physicians who are unfamiliar with them. This may lead physicians to assign a label of asthma to insure that the child received asthma medication. Minority children are also more likely to receive care for wheezing or shortness of breath in an emergency room, and care in an emergency setting may be more likely to lead to an asthma diagnosis, although further research is needed to explore differential likelihood of diagnosis in emergency settings.