Geographic Differences in Allergic Sensitization and Environmental Exposures among Children with Asthma: Comparing Patient Differences in a Study of Three Geographically-Distinct Federally Qualified Healthcare Centers (FQHCs)



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Abstract

Allergic sensitization and asthma morbidity are influenced by geographic factors including environmental exposures, climate, socioeconomic conditions, urbanicity, and population ethnicity. What is less clear is how the unique characteristics of a given location impact allergic sensitization and household exposures of the local patient population with asthma.

CHAMPS (Community Healthcare for Asthma Management and Prevention of Symptoms) is a translational research study evaluating the effectiveness of an evidence-based childhood asthma intervention in 3 federally-qualified health centers (FQHCs) in Arizona, Michigan, and Puerto Rico.

CHAMPS enrolled 319 children with asthma between 5 and 12 years of age. Allergic sensitization was assessed by either skin prick test (Arizona) or IgE testing. Puerto Rican children had a higher prevalence of sensitization to all allergens tested, except for mold, where the highest prevalence was found in Arizona (37%), followed by Michigan (32%), and Puerto Rico (19%). In Puerto Rico, 77% of children were sensitized to Dust Mite, compared to 38% in Michigan and 34% in Arizona. Cockroach sensitization was 34% in Puerto Rico, 22% in Arizona, and 17% in Michigan. Housing type also varied by site. Nearly 60% of children in Arizona and Michigan lived in detached houses compared to only 24% in Puerto Rico. Over 30% of the children in Puerto Rico were living in a "handmade" house. Household exposures varied by site with Puerto Rico having more rodent exposure, 61% compared to 24% in Michigan and 18% in Arizona. Cockroach exposure varied the most by site (78% in Puerto Rico, 32% in Arizona, and 13% in Michigan); however, exposure to mildew, moisture, and water damage varied less across sites (84% in Puerto Rico, 73% in Michigan, and 63% in Arizona). Sensitivities and exposures vary by site; clinicians should consider local geographic and environmental influences when treating their patients with asthma.

Introduction

. The reasons for childhood asthma disparities are complex and involve many factors.

Allergen exposure can lead to both acute and chronic symptoms in sensitized asthmatics.

. These exposures have been well studied in inner-city environments across the US, but less so in other urban and rural environments.

. The CHAMPS study was designed to translate evidence-based asthma interventions from two successful NIH-funded clinical trials into the primary care practices at FQHCs serving diverse and underserved populations in three distinct geographic locations.

Methods

Figure 1: Agreed-Upon Intervention Visits

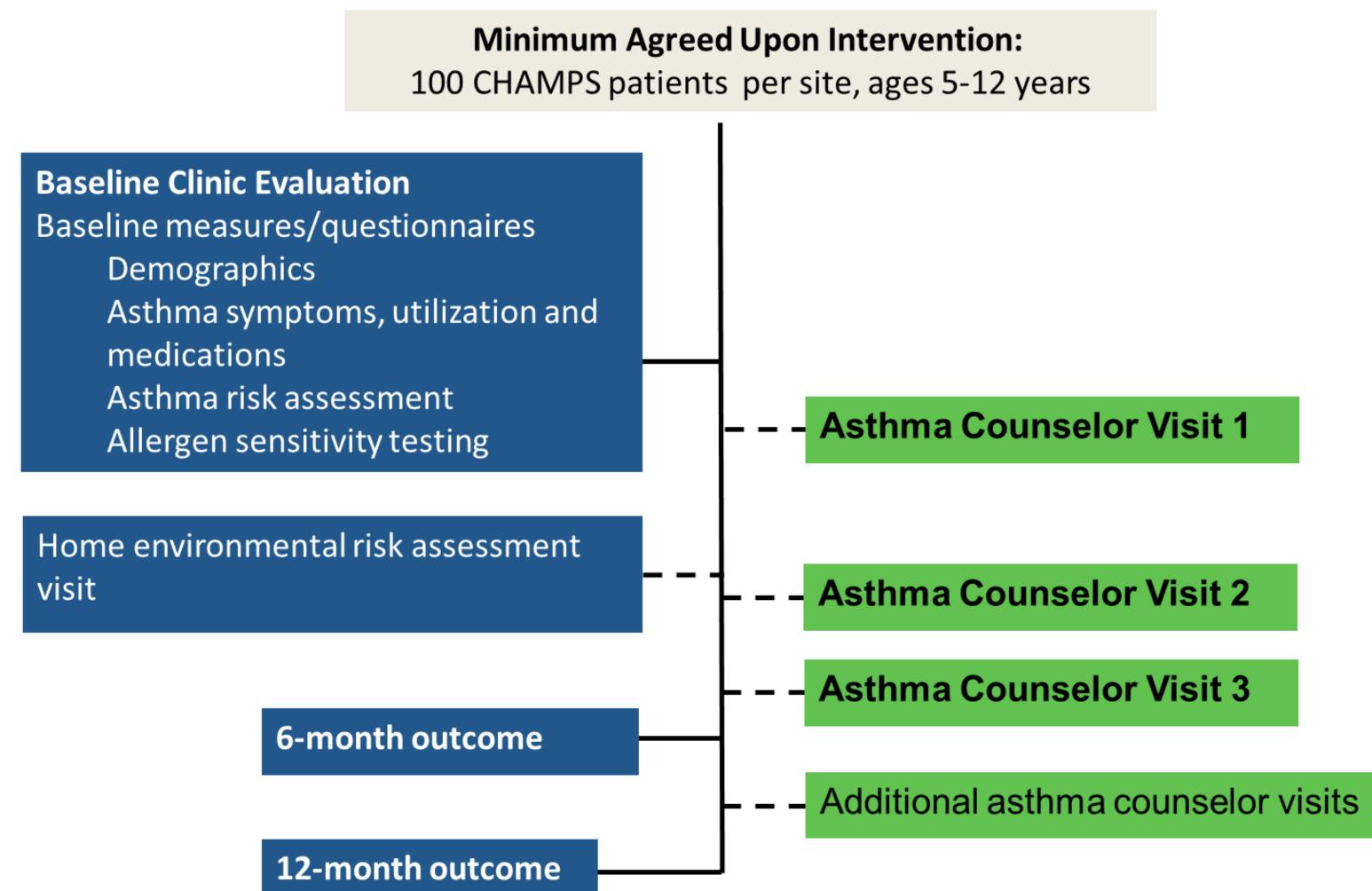


Table 1: Site Differences at Time of Site Selection

	Puerto Rico	Arizona	Michigan
Population type	Rural	Urban, in flux	Mix
Estimated pediatric asthma population	700	4850	1800
Electronic Medical Records in use	No	Yes	Transitioning
Asthma Counselors on staff	No	Yes	Yes
Existing asthma care program	No	Clinic program	Clinic program Community program
Allergen testing resources	Blood testing off site	Skin testing in clinic	Blood testing in clinic

Results

Table 2: Study Population Demographics by Site

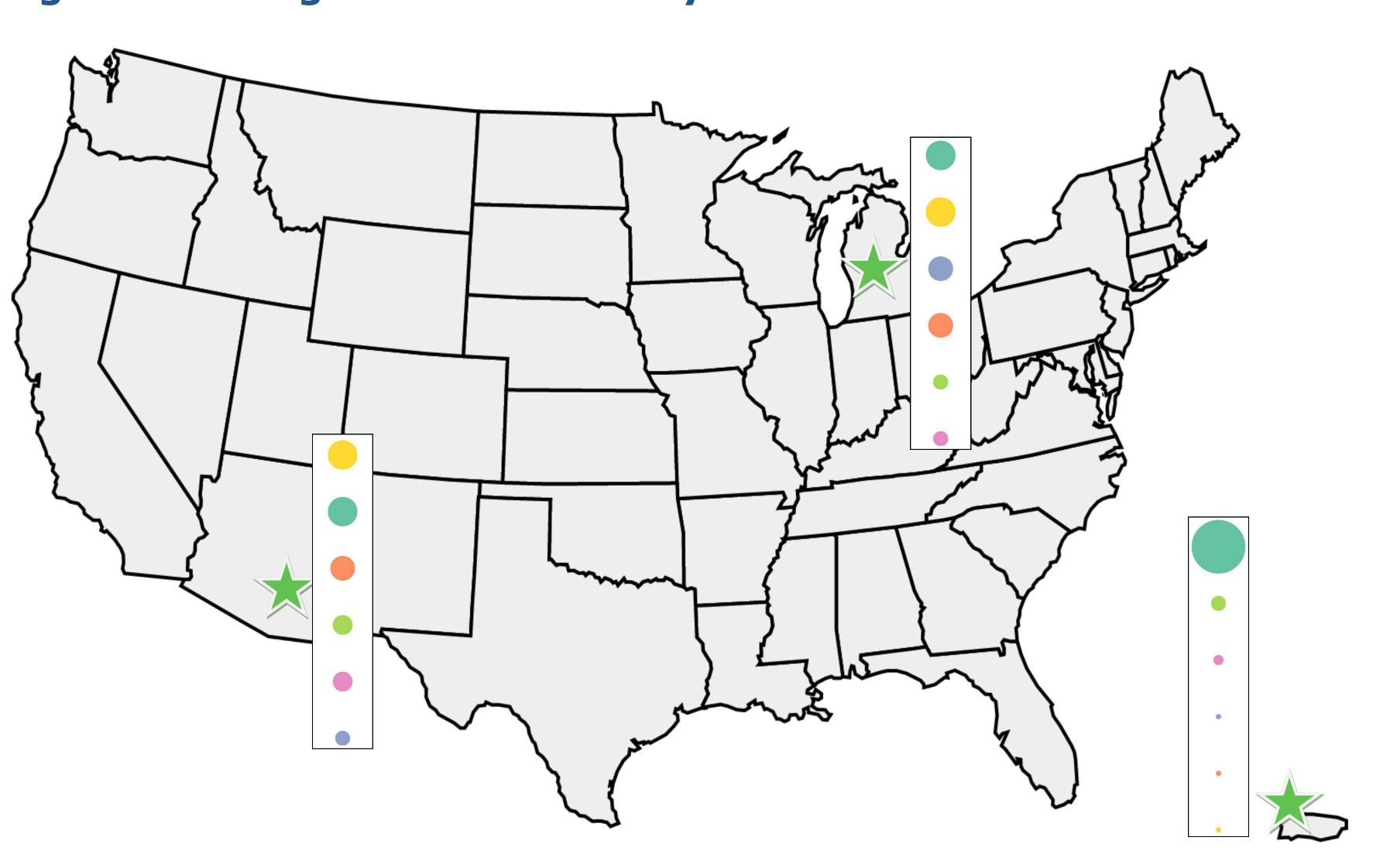
	Puerto Rico (n=106)	Arizona (n=120)	Michigan (n=90)
Gender (Male)	56%	67%	59%
Age at screening (mean years ± SD)	7.7 ± 2.1	8.0 ± 2.2	7.6 ± 2.2
Race			
Black	0%	2%	30%
Hispanic	100%	92%	50%
Other/Mixed	0%	6%	20%
Head of house completed high school	75%	66%	73%
Head of house employed	48%	87%	64%
Income < \$15,000	78%	37%	39%
Number of people living in the home	4.0 ± 1.1	5.1 ± 1.7	4.6 ± 1.4

Table 3: Baseline Asthma Symptoms by Site

	Puerto Rico (n=106)	Arizona (n=120)	Michigan (n=90)
Past 4 weeks (mean ± SD):			
Wheeze	7.5 ± 4.8	8.3 ± 6.9	10.8 ± 8.2
Slow play	2.1 ± 1.9	5.9 ± 6.3	6.2 ± 7.0
Woke during the night	3.6 ± 3.5	4.1 ± 5.1	6.8 ± 7.4
Albuterol used	6.6 ± 4.9	9.4 ± 8.9	8.5 ± 7.8
School missed (asthma)	0.5 ± 1.7	2.1 ± 2.8	2.0 ± 2.3
Past 12 months (%) for asthma:			
Overnight hospital stay	36%	12%	11%
Unscheduled visit	97%	98%	75%
Prednisone use for exacerbation*	98%	80%	59%
Prednisone use for symptoms**	89%	2%	25%
Prescribed a long-term controller	75%	100%	95%

^{*}Prednisone prescribed during hospital stay or unscheduled visit

Figure 2: Allergic Sensitization by Site*



*Bubble size is proportional to the prevalence of sensitization (Largest bubble = 77%, smallest bubble = 15%)

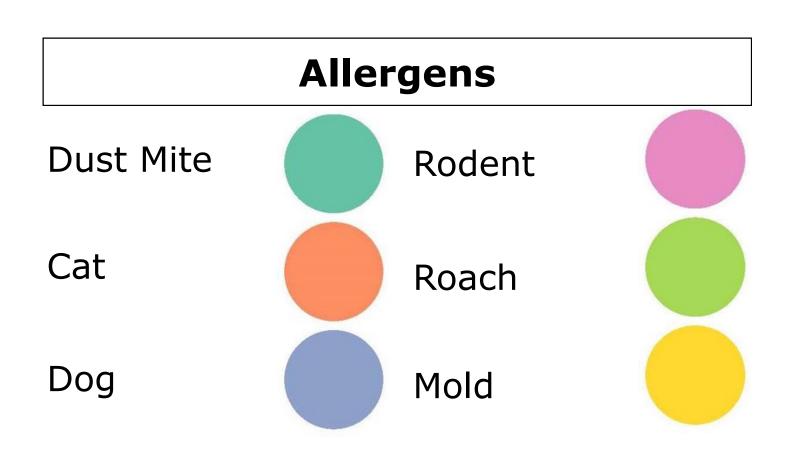
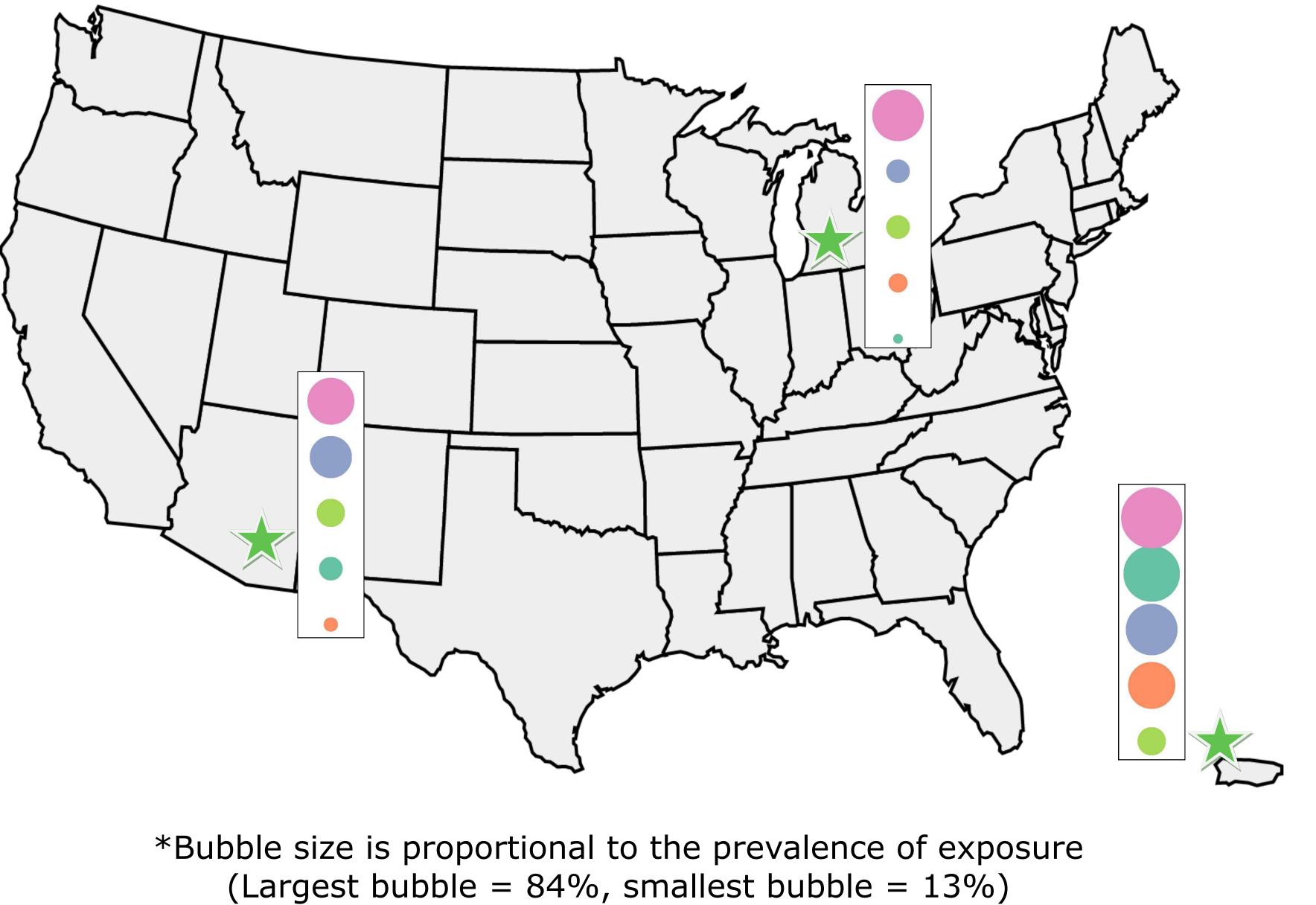


Figure 3: Environmental Exposures by Site at Baseline*



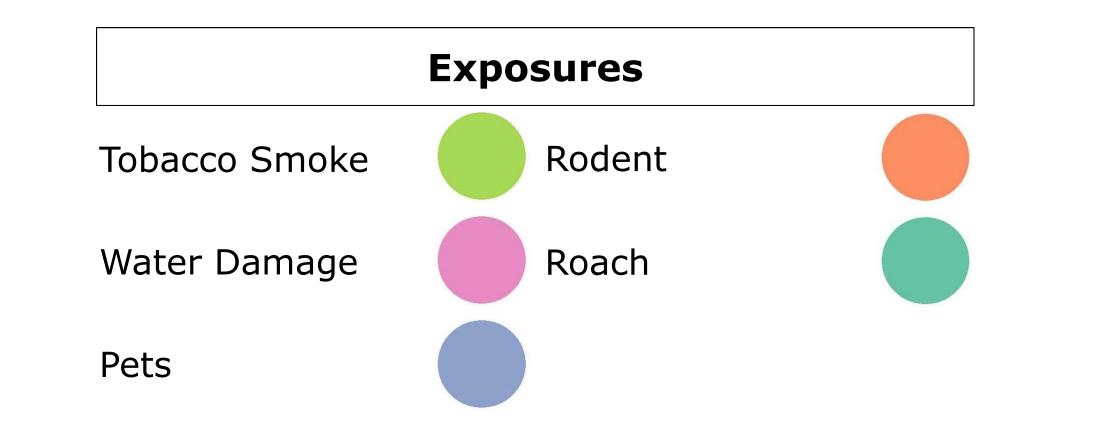
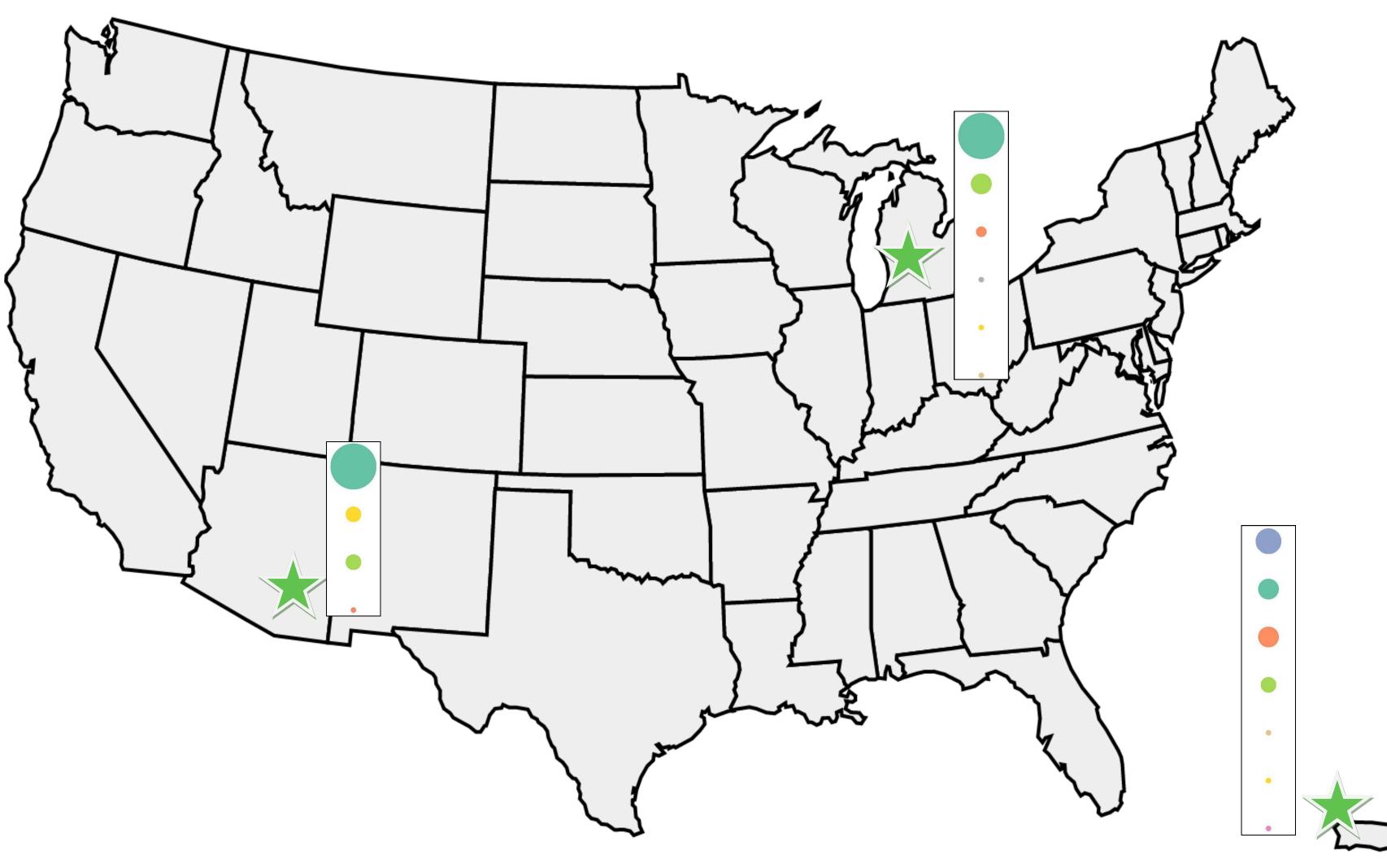


Figure 4: Housing Type by Site*



*Bubble size is proportional to the prevalence of housing type (Largest bubble = 59%, smallest bubble = 1%)



Table 4: Home Environment Characteristics by Site

	Puerto Rico (n=106)	Arizona (n=120)	Michigan (n=90)
Any carpet in the home	26%	73%	97%
Carpet in the bedroom	8%	64%	82%
Open food/dirty dishes	53%	62%	65%
Physical damage	68%	45%	75%
Mean number of people in the home (± SD)	4.0 ± 1.1	5.1 ± 1.7	4.6 ± 1.4
Mean number of children in the home (± SD)	2.2 ± 1.0	3.0 ± 1.4	2.8 ± 1.2
Mean number of rooms in the home (± SD)	4.9 ± 1.2	5.1 ± 1.3	6.1 ± 1.5

Conclusions and Recommendations

- ·Allergen sensitivities, environmental exposures and housing conditions vary by geographic location.
- Many of these sensitivities and exposures are known to influence asthma development and subsequent morbidity.
- ·Clinicians should consider local geographic and environmental influences when treating their patients with asthma in order to guide their care and target patient and family education.











^{**} Prednisone prescribed for ongoing symptoms (i.e., not prescribed during a hospital stay or unscheduled visit)