



SOCIAL VULNERABILITY, ENVIRONMENTAL INEQUALITY, AND CHILDHOOD ASTHMA IN PHOENIX, ARIZONA

A Report to the Community

By

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IGERT in Urban Ecology is a doctoral fellowship program sponsored by the National Science Foundation and facilitated by the Global Institute of Sustainability at Arizona State University. The program brings together students and faculty from the Departments of Sociology, Geography and Geology, the School of Human Evolution and Social Change, and the School of Life Sciences with the aim of preparing graduate students to address complex, socially relevant environmental problems that require the integration of disciplinary knowledges.

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COMMUNITY & UNIVERSITY PARTNERS

This study was made possible by the cooperation of the following members of the metropolitan Phoenix community:

Institute for Social Science
Research (ASU)

Antonia DeAlejandro, Translator & Student

Global Institute of
Sustainability (ASU)

Nikol Grant, Senior Research Specialist

School of Human Evolution
and Social Change (ASU)

Bob Bolin, Professor

Department of Mechanical &
Aerospace Engineering (ASU)

Yu-Jin Choi, Postdoctoral Research Associate

Roosevelt Elementary District

*Mary Chick, Head School Nurse
School Nurses*

Phoenix Elementary District

*Lynette Cook, Health School Nurse
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Kyrene School District

*Karin Crider, Director of Federal and Community Programs
Ginger Donahue, Director of Health Services
School Health Assistants*

St. John Bosco Catholic School

Anne Feeney, School Nurse

Summit School of Ahwatukee

Kathy Evans, Director

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Joe Yusin, Physician & Director

Phoenix Children's Hospital
Breathmobile

Judy Harris, Nurse Practitioner & Director

Maricopa County Asthma
Coalition

Susanne Cook, Assistant Professor of Nursing at ASU

EXECUTIVE SUMMARY

Asthma is a pressing children's environmental health issue in Arizona, the US and the world. This research project addressed racial/ethnic, socioeconomic, and spatial inequities in childhood asthma in Phoenix, Arizona. Using quantitative analysis, I investigated the relationships between socioeconomic status, race/ethnicity, indoor hazards, ambient environmental hazards and asthma hospitalization rates at the zip code level in metro Phoenix. I found distinct socio-spatial inequalities in asthma hospitalizations, with criteria pollution and race being the most important predictors. Drawing off a vulnerability framework adapted from social studies of natural hazards, I investigated the experiences of Phoenix households coping with asthma by interviewing a socially diverse group of 53 parents. Two important resources emerged as salient for coping - health care and the environment – and the ability of parents to access and control these resources varied with social class and race/ethnicity, among other characteristics. Undocumented immigrant children without health insurance emerged as extremely vulnerable to asthma-related problems. The school represented their primary source of health care. Lower-class children with private health insurance were also vulnerable because full utilization of their health plans was cost prohibitive for parents. Children on government health insurance were less vulnerable to asthma-related problems, as the programs provided free or inexpensive health care. Upper-class children with private insurance were much less vulnerable because their parents had high incomes and could afford the health care provisions offered by their insurance plans. Substandard housing represented a severe health hazard for low-income children with asthma in Phoenix, and immigrant children tended to live in the worst quality housing. Substandard housing co-located with outdoor environmental hazards in South and Central Phoenix, creating an environmental double jeopardy for children with asthma. Residing in aging, rental housing increased the vulnerability of children. Homeowners were advantaged in protecting their children as they could more easily modify their home as compared to renters. This study has policy implications for housing, school health, asthma education programs, air quality and healthcare.

BACKGROUND

Asthma is a respiratory condition resulting in coughing, wheezing, and tightness in the chest, thought to be caused by genetic factors interacting with social and environmental triggers (Halfon and Newacheck 2000). Metropolitan Phoenix is in the top 5 large US cities for asthma-related deaths (*Asthma is a problem in Phoenix and Tucson* 2003). In Phoenix, approximately 8% of the metro Phoenix population have asthma (Rimsza, Bartels, and Bannister 2006). In this study, I explored sociospatial patterns of inequality in uncontrolled asthma at the zip code level using statistical analysis for metropolitan Phoenix (i.e., Maricopa County), Arizona. I also investigated the experience of coping with asthma by interviewing 53 parents of children with asthma. I interviewed lower class, middle-class and upper class parents who were Anglo, African-American and Latino. Specific outcomes of the project included:

1. *Identification of social and urban environmental predictors of asthma for metro Phoenix including identification of groups and locations that may be disproportionately burdened by asthma or its triggers (e.g., poor air quality)*
2. *Documentation of asthma management challenges and capacities for Phoenix families*
3. *Identification of group-specific (e.g., Spanish-speaking Latinos) challenges and capacities*
4. *Production of informational brochures for participants, health care providers, local government officials, local media and others*
5. *List of policy recommendations based on findings*
6. *Publishing GIS asthma maps and research summaries on the Internet*

In this report, I will discuss the findings from a quantitative component (outcome 1), a qualitative component (outcomes 2 and 3) and then an outreach component (outcomes 4, 5 and 6).

QUANTITATIVE COMPONENT

Outcome 1: Identification of social and urban environmental predictors of asthma for Metro Phoenix including identification of groups and locations that may be disproportionately burdened by asthma or its triggers (e.g., poor air quality)

To achieve this outcome, I mapped asthma hospitalization rates and visits to the emergency room for asthma, and used statistical analysis to predict asthma hospitalization rates.

Mapping Asthma Rates

There is pronounced spatial variability in asthma hospitalization rates and rates of emergency room visits for asthma in metropolitan Phoenix. Zip codes with the highest rates of both hospitalizations and emergency room visits have rates that are 15 to 18 times higher than the zip codes with the lowest rates. For emergency room visits, the highest rates are located downtown and in the western reaches of Maricopa County (see blue shading in Figure 1), while the lowest rates occur on the north, south and east fringes of County. For asthma hospitalization rates, the highest rates are found in the western extent of the County and along the northern stretches of Interstate 17 (see blue shading in Figure 2), while the lowest rates occur in the northeastern part of the County.

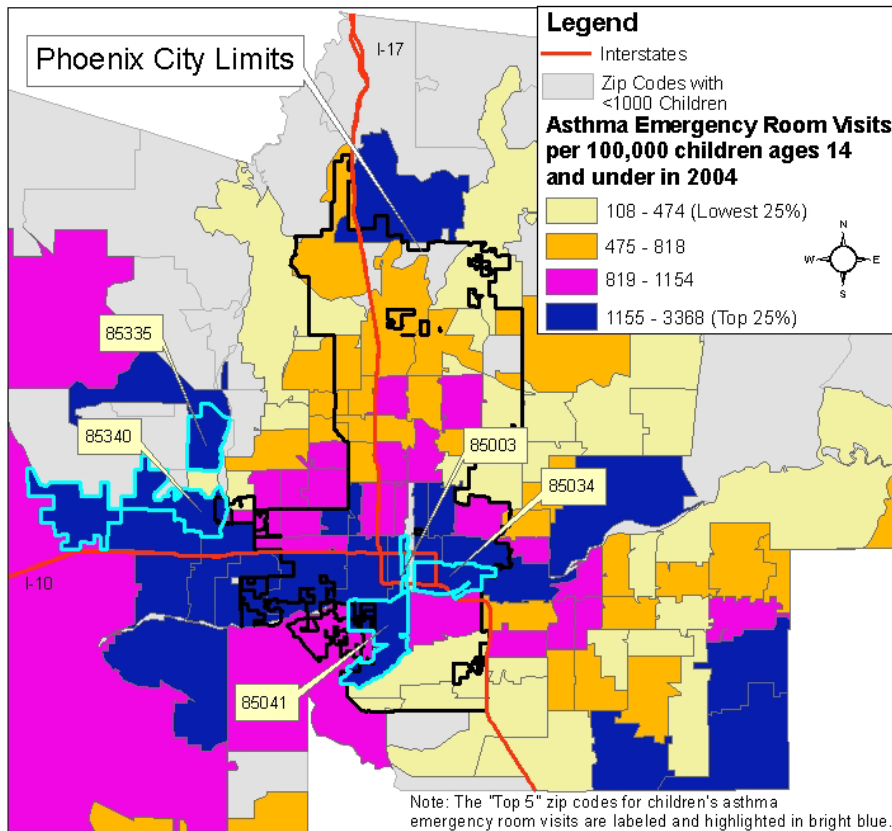


Figure 1. Emergency room visits for children ages 14 and under in 2004 (per 100,000 children per zip code)
 Source: Arizona Department of Health Services

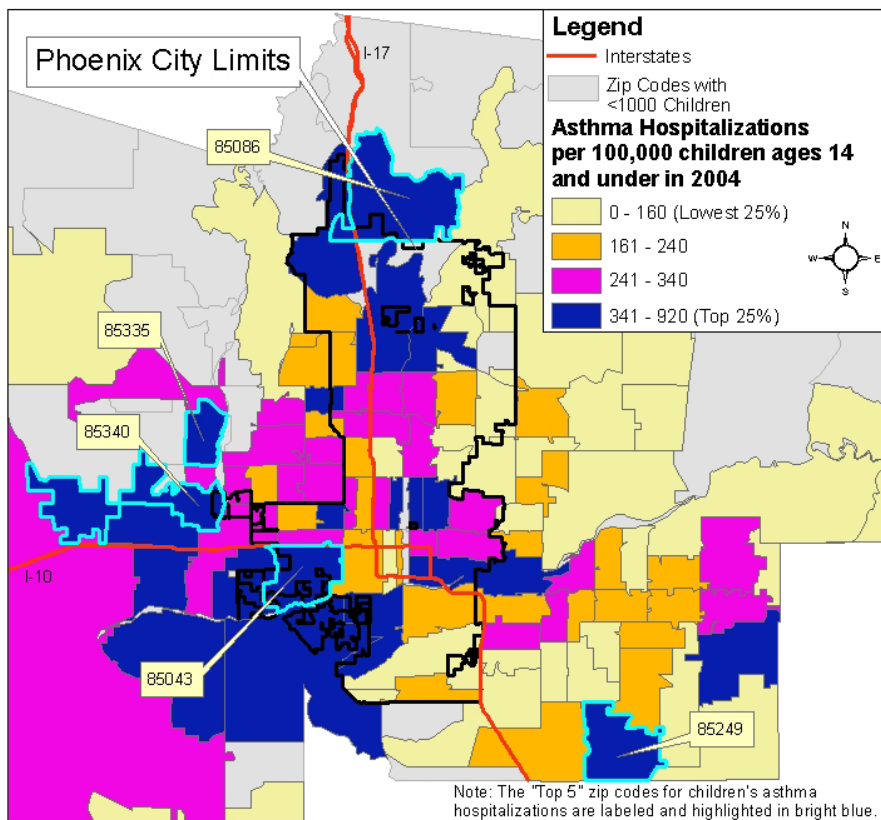


Figure 2. Asthma hospitalizations for children ages 14 and under in 2004 (per 100,000 children per zip code)
 Source: Arizona Department of Health Services

Statistical analysis

To determine social and environmental predictors of asthma in metro Phoenix, I combined several data types, including asthma hospitalizations, industrial pollution, criteria pollution and socio-demographics.

Data

Asthma Hospitalizations: I used the count of children ages 0 to 14 that spent at least one night in the hospital for asthma in each zip code in 1999 (Figure 3).

Industrial Pollution: I used data on industrial air emissions from the Environmental Protection Agency's Toxic Release Inventory (TRI). In 2000, there were 127 industrial sites in metro Phoenix that reported air emissions to the TRI; collectively, they emitted approximately 1,800,000 pounds of chemicals. I allocated the industrial emissions to the zip code level using Geographic Information Systems (GIS) (Figure 4).

Criteria Pollution Model: I used modeled pollution surfaces for nitrous oxides, carbon monoxide and ozone created by an environmental engineer at Arizona State University using Environmental Protection Agency National Emissions Inventory data. The three pollutants were highly correlated so I created a composite pollution measure for the analysis (Figure 5).

Socio-Demographics: I used items from the 2000 US Census to create 4 variables: (1) Social Class Factor combines median household income, median value of owner occupied homes and median sale price of homes; (2) Latino Immigrant Factor combines proportion Latino, proportion foreign-born, proportion living in crowded conditions (over one person/room), and proportion speaking Spanish only; (3) Race Factor is the proportion African-American; and (4) Indoor Hazards Factor combines proportion of households that rent and median age of housing stock (Figure 6).

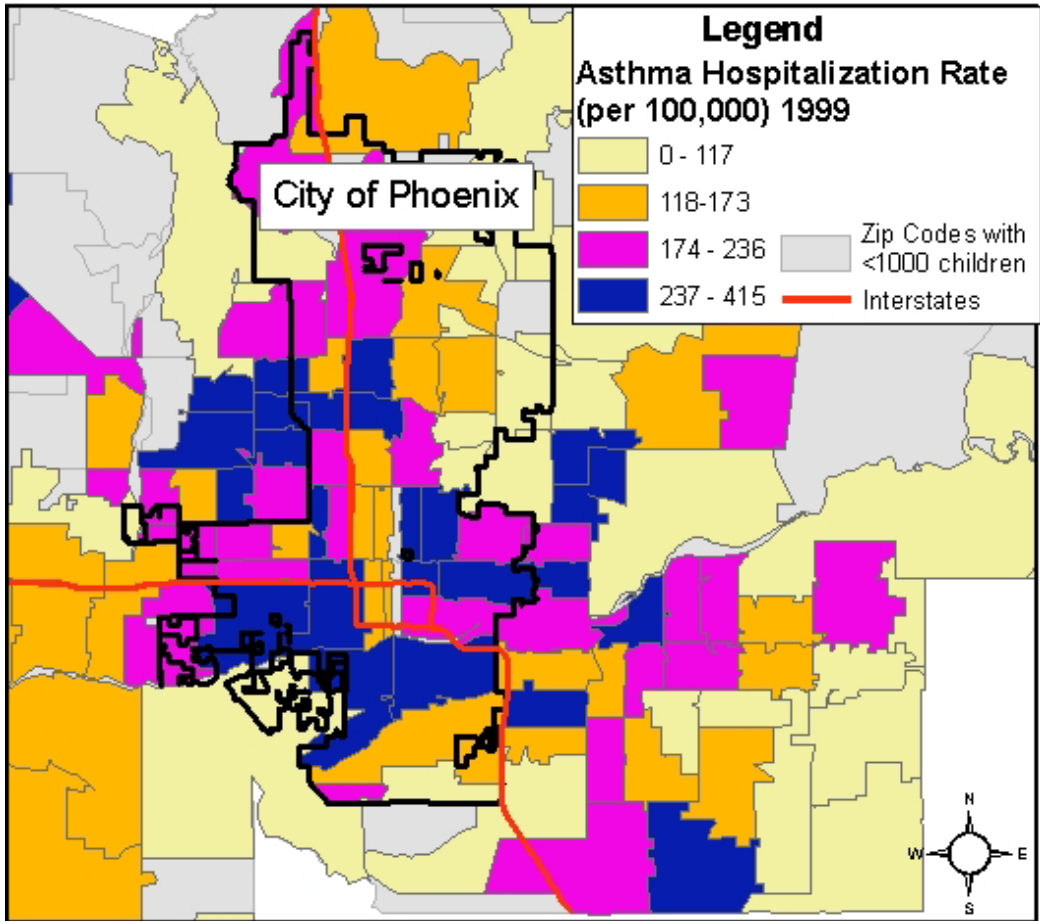


Figure 3. Children’s asthma hospitalizations in metropolitan Phoenix by zip code, 1999

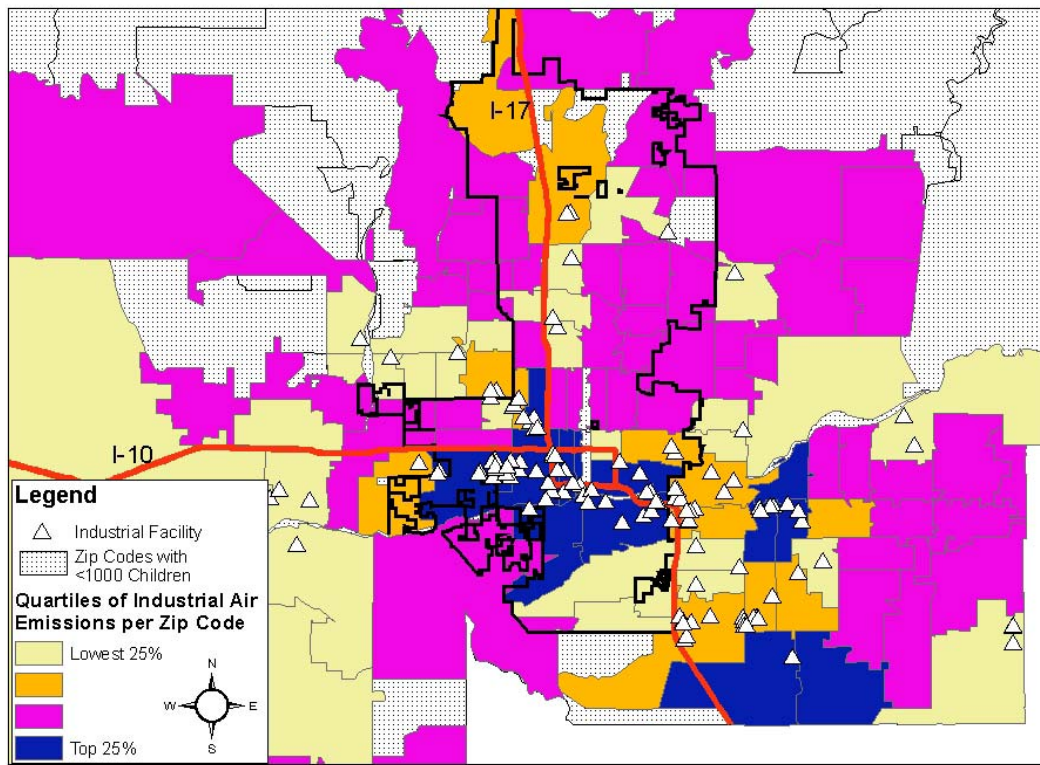


Figure 4. Industrial air emissions per zip code and the location of industrial polluters in metropolitan Phoenix, 2000

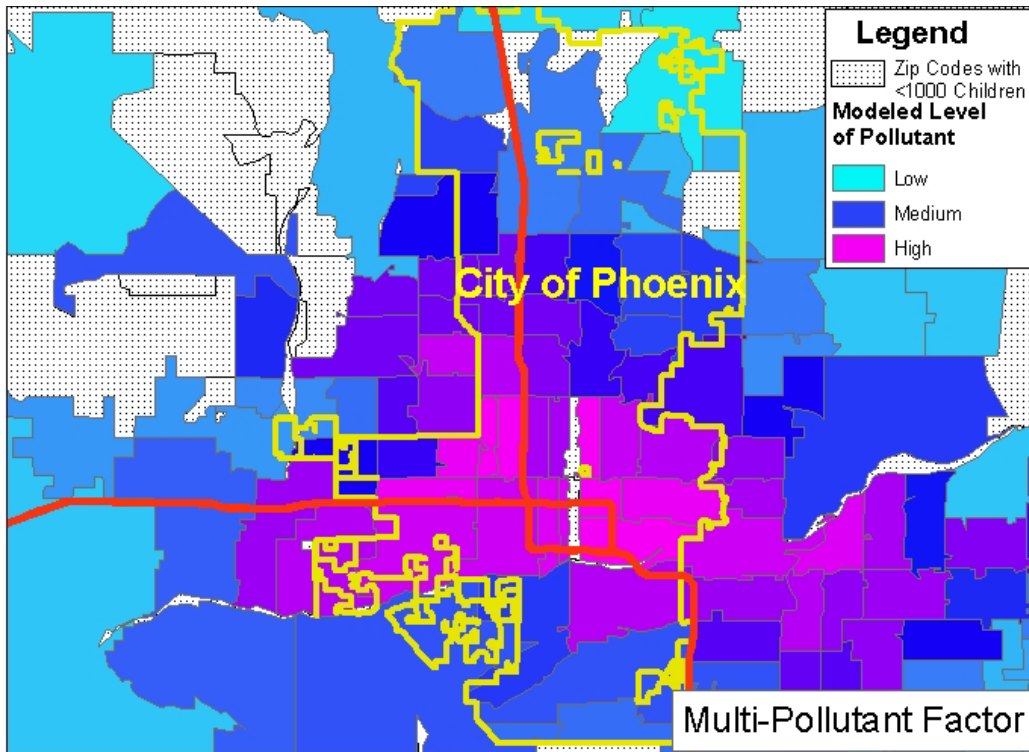


Figure 5. Criteria pollution surface (Carbon Monoxide, Ozone, and Nitrous Oxides), 1999

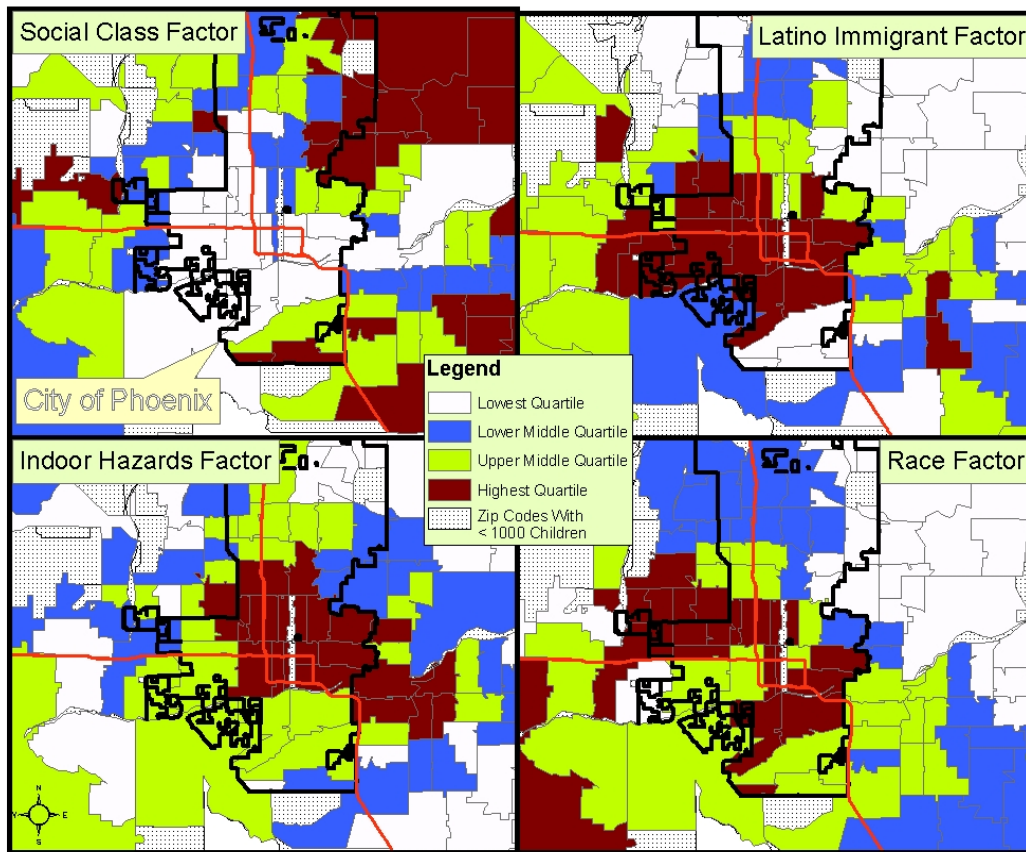


Figure 6. Spatial distribution of 4 census factors, 2000

Methods and Results

Given that the dependent variable is a count of hospitalizations per zip code, I ran Poisson regression models in SAS 9. I ran three nested models. First, I considered only the census factors representing race/ethnicity and social class as predictors of uncontrolled asthma (Model 1). Next I included the indoor hazards variable (Model 2), before combining race/ethnicity, social class, and indoor hazards with the two measures of outdoor environment (Model 3). Results are presented in Table 1.

Looking only at sociodemographic factors (Model 1), areas with lower Social Class and higher proportion of African Americans have significantly higher rates of uncontrolled asthma, controlling for Latino Immigrant, which is not significant. In Model 2, the Indoor Hazards factor is a significant positive predictor of asthma hospitalizations and its addition causes Social Class to become less significant. This means that Indoor Hazards account for some, but not all, of the effect of Social Class on uncontrolled asthma. In Model 3, Indoor Hazards became insignificant with the addition of the Multi-Pollution factor and TRI Total Air Emissions. Both outdoor environmental hazard variables account for all of the effect of indoor hazards and also have their own independent, and significant, effects. This finding indicates that areas with high levels of TRI Total Air Emissions and the Multi-Pollution factor also have high levels of indoor hazards, and that TRI Total Air Emissions and the Multi-Pollution factor are more important predictors of asthma hospitalization than is Indoor Hazards. This suggests that while indoor asthma interventions are important, pollution reduction strategies may be more important.

The Latino Immigrant Factor is significant ($p = 0.053$) in the negative direction, meaning that areas with more Spanish-speaking Latino immigrants have lower rates of asthma hospitalization controlling for the other factors. Explanations for this finding include the possibility that Latino immigrants are not relying on, or using, the hospital for asthma care and/or that they have lower rates, or less severe cases, of asthma. The Multi-Pollutant factor emerges as the most important predictor (largest Beta) of asthma hospitalizations.

| Model | Intercept | Social Class | Latino Imm. | Race | Indoor Hazard | Pollution Factor | TRI Total Air |
|--------------|------------------|---------------------|--------------------|-------------|----------------------|-------------------------|----------------------|
| 1 | BETA -6.343 | -0.150 | 0.037 | 0.098 | | | |
| | Sig. 0.000 | 0.005 | 0.308 | 0.000 | | | |
| 2 | BETA -6.349 | -0.092 | -0.016 | 0.104 | 0.128 | | |
| | Sig. 0.000 | 0.088 | 0.684 | 0.000 | 0.003 | | |
| 3 | BETA -6.357 | -0.098 | -0.085 | 0.065 | 0.046 | 0.161 | 0.060 |
| | Sig. 0.000 | 0.071 | 0.053 | 0.022 | 0.365 | 0.001 | 0.024 |

Table 1. Predicting asthma hospitalizations: analysis of parameter estimates

QUALITATIVE COMPONENT

Outcomes 2: Documentation of asthma management challenges and capacities for Phoenix families

Outcome 3: Identification of group-specific (e.g., Spanish-speaking Latinos) challenges and capacities

To achieve these outcomes, I conducted interviews with Phoenix parents about their experiences dealing with their children's asthma.

Methods

Parents were recruited to participate in interviews through three Phoenix school districts (i.e., Kyrene, Roosevelt, Phoenix Elementary) and two private schools (Summit School of Ahwatukee and St. John Bosco). Interviews were conducted in both Spanish and English, using the assistance of a bilingual undergraduate Arizona State University student. Interviews lasted 60 minutes on average, and ranged from 40 to 120 minutes in length. The majority of interviews were conducted in the participant's homes.

All 53 participating parents were mothers. 30% (n=16) of the households had one parent in the home and 53% (n=28) had mothers who worked outside of the home. In terms of residential tenure, 45% (n=24) of households owned their home, 38% (n=20) rented from a private landlord, and 17% (n=6) used public housing. 36% (n=19) of parents had health insurance through a job for their child, 51% (n=27) had government insurance (through AHCCCS or Kids Care) for the child, and 13% (n=7) did not have health insurance for the child. 70% (n=37) of mothers were born in the US and 26% (n=15) were born in Mexico. 64% (n=34) of the mothers spoke English only, 23% (n=12) spoke only Spanish, and 13% (n=7) spoke both English and Spanish. 51% (n=27) of the mothers were Latinas, 28% (n=15) were Anglos, and 21% (n=11) were African-Americans. The average income of participating households was between \$20,000 and \$39,999 per year, with some households making well under \$10,000 and others over \$150,000. The average educational attainment for the mothers was "part of college;" several mothers did not complete elementary school and others possessed advanced degrees. The age of the primary child with asthma ranged from 4 to 12 with a mean of 8. These children lived in households of 2 to 12 persons with a mean of approximately 5 members.

For the analysis, participants were divided into an upper income (family earned \$17,000 or more per year per household member) and a lower income (family earns less than \$17,000 per year per household member) group. The majority of the lower income groups lived in downtown Phoenix and south of downtown (in the Roosevelt and Phoenix Elementary School Districts) and was Latino or African American, while the majority of the upper income group lived in Ahwatukee and Chandler (in Kyrene Elementary District) and was white (Figure 7).

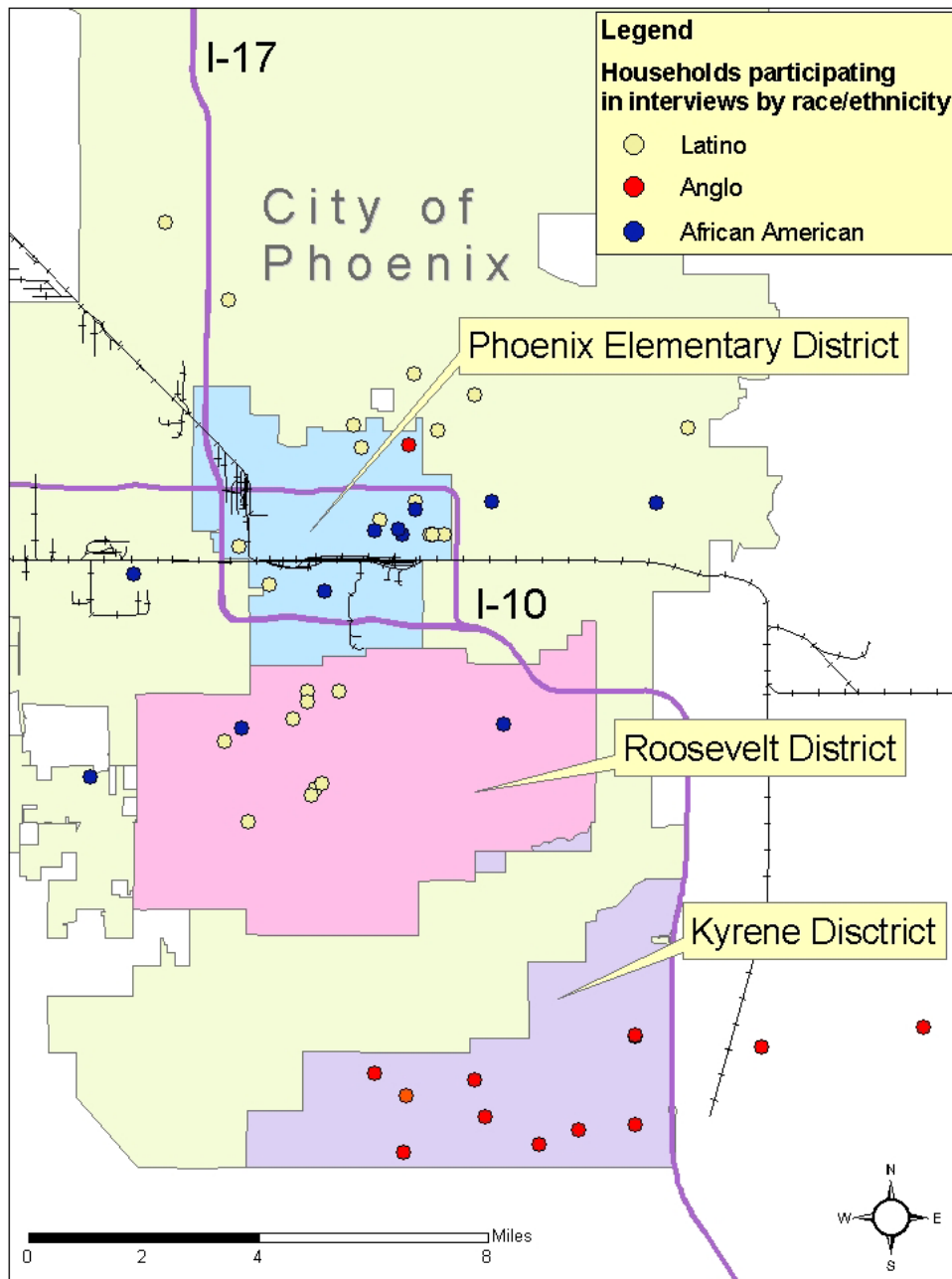


Figure 7. Location of interviewed parents by race/ethnicity

Results

Common Parental Experiences

- Most parents whose children had moderate to severe asthma expressed fear and anxiety about their child's condition.
- When a child had moderate to severe asthma, parents reported episodes of familial stress and conflict. These conflicts occurred over decisions about what to do with family pets, when the family wanted to visit extended family members who smoked or had pets, and because extra attention was given to the child with asthma and the child's siblings felt jealous.

- Women were the primary managers of children’s asthma in almost all of the households interviewed. Even when married mothers worked outside of the home, they took primary responsibility for asthma care.
- Many parents feared the impacts of steroid medications, but still gave them to their children.
- Parents listed a variety of causes for their child’s asthma, with genetics being the most common (Figure 8).

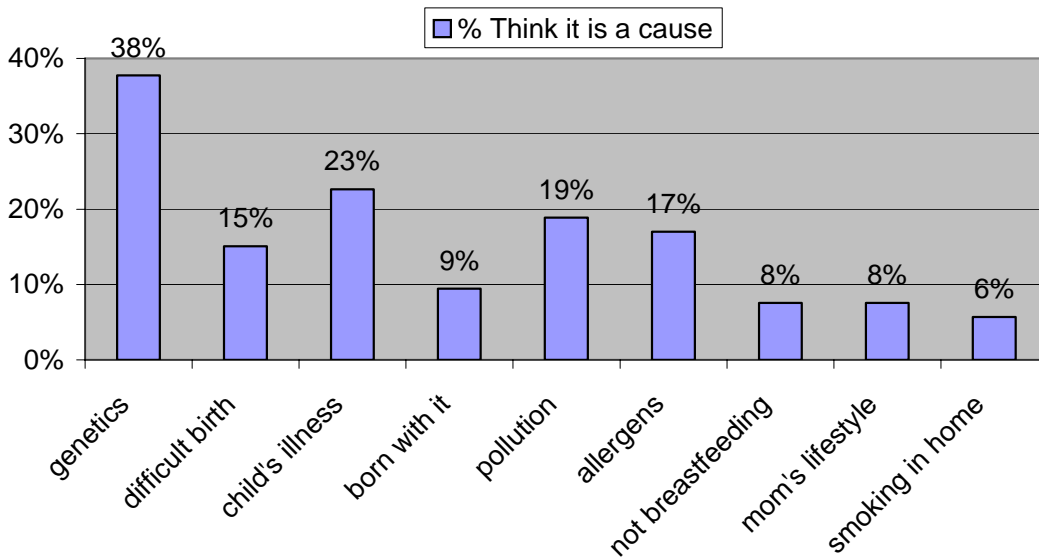


Figure 8. Parental reports of asthma cause

Differences in Experiences with Healthcare

- The families with public health insurance, that is AHCCCS and Kids Care (n=27), were generally satisfied with their insurance plans. Main complaints were difficulties getting approval for expensive preventative asthma and allergy medications (e.g., Zyrtec) and allergy testing, and not being able to use the free taxi service for same-day appointments.
- Lower income families with job-based insurance (n=6) struggled with rising costs. High costs had primary impacts on children’s health. For example, parents were forced to give their children partial doses of asthma medications, because they could not afford to refill the prescriptions and then their children struggled with breathing. Cost also had secondary impacts on children’s asthma. For example, some parents had to move into less expensive (lower quality) housing because of rising health care costs.
- Rising healthcare costs had a minor impact on upper income families (n=13) and those interviewed were generally satisfied with their health insurance. Many parents spoke about the costs of healthcare in relative, not absolute, terms: what was ‘expensive’ was determined, not by an upper limit of what they could pay, but in relation to a generalized knowledge about what others paid.
- Upper income families (n=13) were generally satisfied with their health insurance plans. No parent reported that the insurance company would not cover asthma-related medications.

- All upper income children had a particular primary care doctor, which was not case for the lower income children, who did not always see the same doctors because of frequent moves, gaps in insurance coverage, and health plans that did not assign them to one physician. The importance of seeing the same physician (i.e., continuity of care) has been affirmed by researchers who find that continuity reduces children's emergency room visits and hospitalizations (Christakis et al. 2001). Generally, upper class children were able to visit 'their doctor' when they went to the clinic, except for last minute appointments, whereas lower income children often saw a variety of physicians.
- Not having health insurance represented a serious constraint for families of children with asthma (n=7). Recent research estimated that approximately 13% of Phoenixians are uninsured (Hurley, Pham, and Claxton 2005). Parents without health insurance for their children in this study were either working poor or undocumented immigrants. Several of these families reported being turned away from a clinic because they did not have money to pay for services.
- My findings show that instead of relying on the emergency room and hospital for treatment, undocumented immigrants use them as a last resort and rely on protections offered by schools, including the Phoenix Children's Hospital Breathmobile. Of the 8 families with undocumented parents, none had hospitalized a child, only 2 had taken children to the emergency room, and 5 had children who saw the Breathmobile. The healthcare utilization behaviors of these 8 families were mediated by social, cultural, and economic factors such as lack of money, transportation difficulties, beliefs about doctors, and fears of deportation.
- The school played an important role in the healthcare of uninsured children. Most parents of uninsured children reported that the school was their child's primary source of health care. Assistance from the school helped undocumented immigrant children, and secondarily US-born children of undocumented immigrants, to overcome multiple and compounding asthma management challenges related to their parents' immigration status, fear, education levels, and limited English proficiency.
- The majority of upper income children whose parents participated in the study did not have a credentialed nurse in the school (n=10/13). These children attended public schools in the Kyrene School District where health assistants cared for children, or they attended private schools, where secretaries handled school health issues. Parents reported a range of feelings regarding the health assistants and secretaries, from anger to praise. Only the upper income children that went to St. John Bosco Catholic School and schools in the Phoenix Elementary District were under the daily care of a credentialed nurse. These parents reported that the nurse played an important role in their child's asthma treatment.
- The Phoenix Children's Hospital Breathmobile provides asthma care for children without health insurance, and those who are underinsured. Children using the Breathmobile (n=9) were prescribed

preventative medications and received frequent asthma care. The Breathmobile assisted families by teaching parents and children about asthma, its triggers, and in-home modifications, and providing medications. Parents using the Breathmobile were appreciative of the services provided and many reported that their children would not have medications without it.

- Spanish-speaking parents reported a lack of translation services at some local hospital emergency rooms, despite the fact that Title VI of the Civil Rights Act of 1964 prohibits discrimination based on national origin, which includes language. Families coped with the lack of translation by having the child translate, and reported concern about communication difficulties. Several parents were learning English and reported that their child’s asthma was a motivating factor for them.
- Children with job-based health insurance, white race and upper income saw specialists for asthma at higher rates than other children (Figure 9).

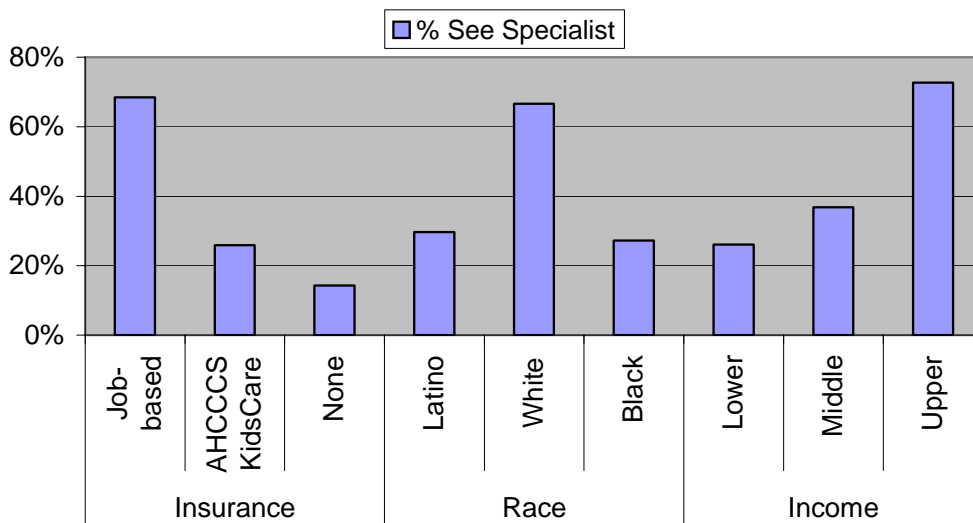


Figure 9. Percent of families in insurance, race and income categories with children who see asthma specialists

- Many lower income households faced transportation-related challenges in accessing health care, especially those without access to the AHCCCS/Kids Care taxi service. Even when two-parent households had a car, the husband usually took it to work, leaving the wife at home without a car. This made picking a sick child up from school quite difficult. Mothers relied on friends, family, and the city bus (although some explained that the school nurse did not want them to take the sick child home on the bus, which made getting the child home difficult).
- Research studies have demonstrated that African American children consistently suffer from higher rates and more severe cases of asthma than white children (Ortega and Calderon 2000; Akinbami, Rhodes, and Lara 2005). Asthma management challenges for the 11 African America families in this study stemmed from a variety of sources including discrimination in health care, family characteristics (i.e., elderly relatives with health problems adopting children with asthma), and children’s multiple health problems (e.g., learning disabilities, hyperactivity, and complications from parental drug use).

Differences in experiences managing environmental exposures.

- Because I recruited participants from Roosevelt and Phoenix Elementary Schools, the lower income families who participated in the interviews lived in “South Phoenix” (demarcated in Figure 10), which includes downtown Phoenix and the neighborhoods south of downtown. South Phoenix is the city’s zone of environmental degradation inhabited by poor and minority residents (Bolin, Grineski, and Collins 2005). South Phoenix families interviewed reported experiencing a variety of hazards, including waste sites (e.g., 7th Avenue Landfill), industrial facilities, and diesel trucks, on a daily basis. Environmental degradation combined with social stresses as parents reported fears of crime and fears that outdoor environmental conditions would make children sicker.
- Lower income families (n=40) lived in conditions that made it more difficult to manage asthma. I interviewed families living in homes with a tar paper roof or holes in roof; rodent and insect infestations; feral cats living under home; no heat or air conditioning; gaps under door, no door or door off hinges; boarded up windows or broken windows; and wood slat floor.
- Of the 40 lower income families, immigrant families tended to live in the poorest quality environments (e.g., poor quality housing, dusty yards, near freeways and industrial facilities). This follows a national trend in the US whereby counties with higher percentages of immigrants and non-English speaking families have greater numbers of large quantity hazardous waste generators and proposed Superfund sites (Hunter 2000). These families were aware of the indoor hazards they faced, but did not feel like they had the money to move or rent a better quality dwelling.
- South Phoenix is where families find the least expensive monthly rents (Figure 10) and the City’s five conventional public housing complexes. These public housing projects are located near sources of air pollution, like freeways and industrial land uses (Figure 11).

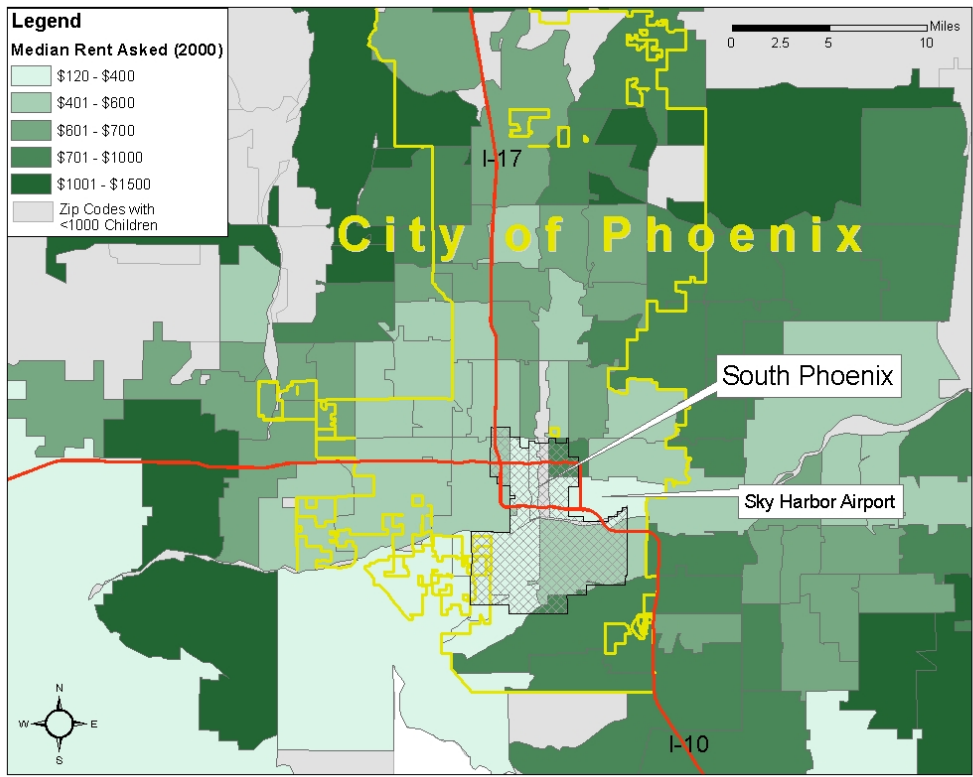


Figure 10. Median rent asked, 2000

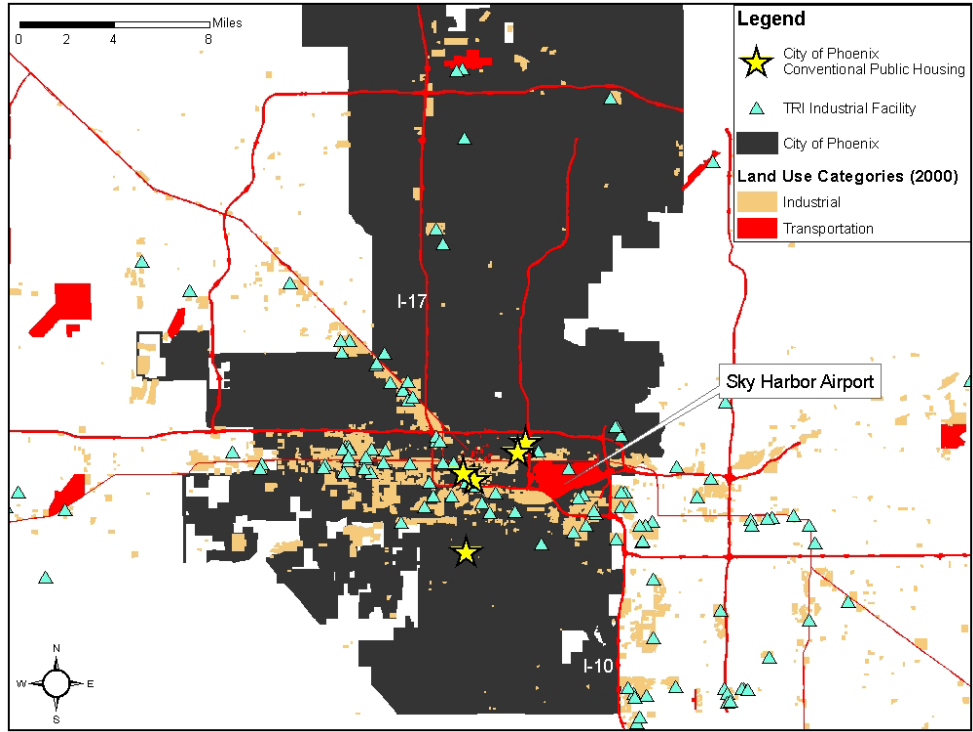
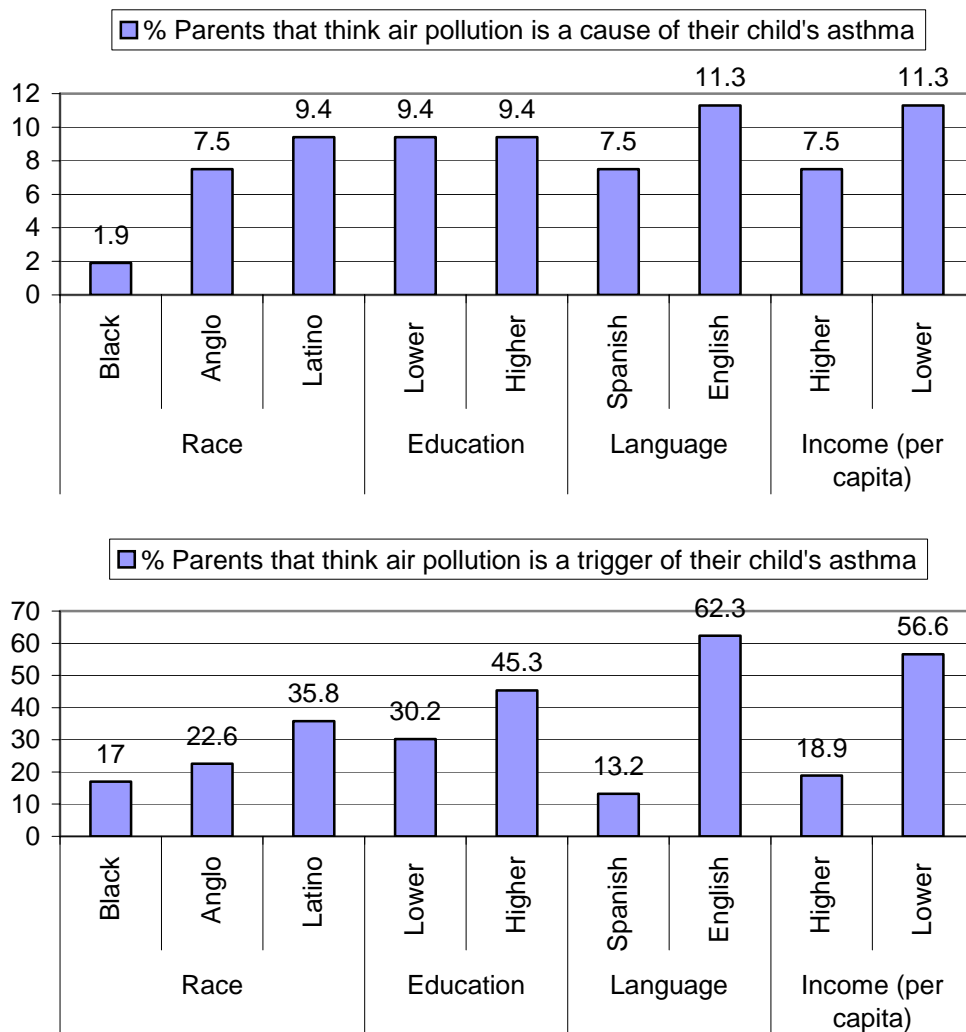


Figure 11. Map of public housing and land use in Phoenix, 2000

- 76% of parents reported that air pollution was a trigger for their child. These parents reported several methods they used for controlling exposure to air pollution, although all felt there was little they could do to remediate air pollution. Parents kept children inside of bad air days, and some upper income parents ran air filtration systems, which have been shown to reduce particulates and mold spores (Cheong et al.

2004). Only 1 of the lower income families had an air filtration machine in the home and several mentioned they desired an air machine, but were unable to afford it.

- Whether parents thought air pollution was cause and/or trigger of their child’s asthma varied by socio-demographics (Figure 12).



Note: “Lower Education” is a high school degree or less. “Higher Education” is more than a high school degree. “English Language” includes parents who speak both Spanish and English. “Lower Income” is families who earn less than \$17,000 per household member per year. “Higher Income” is families who earn \$17,000 per household member per year or more.

Figure 12. Percent of families in race, education, language and income categories who think pollution is a cause or trigger of their child’s asthma.

- Lower income families had more difficulties controlling indoor hazards than did upper income families. For lower income families living in South Phoenix’s aging housing stock, managing pests, like mice, rats and cockroaches, which are associated with the development and exacerbation of asthma, was difficult (Salam et al. 2004; Lanphear et al. 2001).
- Rental homes tended to be in poorer condition than owner-occupied homes and the pest problems more extreme. Among the lower income participants (n = 40), the median income category of the 28 renters was between \$10,000 and \$14,999 per year, whereas the median income category of the 12 owners was

between \$20,000 and \$39,000 per year. While African American and Latino families both had median incomes of \$10,000 to \$14,999 and parental median education levels of a high school degree, African American families were less likely to own their home (18%) as compared to Latinos (30%), making asthma modifications slightly more difficult. Some of the poor Latino families in this study pooled their resources and bought a home with several other relatives, which was not the case among the African American families interviewed.

- Mold problems were surprisingly common among lower income families, as at least 11 of the interviewed families reported had them. In-home molds are linked to the development of asthma (Chung et al. 2005; Skorge et al. 2005; Stark et al. 2005; Jaakkola, Hwang, and Jaakkola 2005) and tend to be associated with cockroaches, indoor cats and in-home dampness (O'Connor et al. 2004). Respondents identified evaporative coolers and roof leaks as sources of their in-home mold. Mold was a problem more often facing families that rented, as only 2 of the 11 with mold problems owned their homes. In the rental cases, tenants complained to landlords about mold but nothing was done.
- Predatory landlords taking advantage of marginal families with little cultural or economic power (e.g., undocumented immigrant families) was a common occurrence for the lower income families and it influenced parents' abilities control children's asthma. Some undocumented immigrants families were afraid to complain to the City Landlord/Tenant Office, while others were afraid of being evicted if they complained. One undocumented immigrant family was evicted for complaining about conditions.
- In Phoenix, as in all major US urban areas, there is a shortage of public housing. Phoenix is the 5th largest city in the US, yet it ranks 59th in federal funding for public housing and the city's housing department relies almost exclusively on federal funding (Alonzo-Dunsmoor 2005). In Phoenix, 4,600 families use some type of public housing, including those 1,776 families living in the conventional public housing (City of Phoenix 2005). These families represent a fraction of those in need in Phoenix as over 74,000 families live in poverty (Bureau of the US Census 2000). In 2005, there were 44,000 families waiting for an opening in a conventional public housing apartment or a Section 8 voucher which provides subsidized rent (Alonzo-Dunsmoor 2005). In this study, 9 families used housing assistance: 4 used Section 8 housing vouchers and 5 lived in the housing projects.
- Families on Section 8 were satisfied with the program; several others were on waiting lists for vouchers. If landlords of homes occupied by Section 8 tenants neglected properties (e.g., mold) or tried to raise the rent, some Section 8 families (n=2) used the program to demand adequate housing. Section 8 status enhanced parent's ability to remedy landlord neglect and dishonestly in ways that were not possible for those renting from private landlords.

- Families in conventional public housing were protected from the most grievous of landlord abuses, but had to deal with poor environmental conditions. In addition to being located in industrial areas near freeways (Figure 12), the conventional public housing projects were deteriorating after sixty years of use and parents reported problems with leaks and mildew.
- Another negative aspect of conventional public housing projects for children with asthma was that all of the City's 1,776 public housing units were equipped with evaporative coolers, instead of air conditioning. There was a general sense among nearly all parents with evaporative coolers and some South Phoenix healthcare providers that evaporative coolers are not desirable for people with asthma. This is because improperly maintained coolers can become moldy and trigger asthma. 11 lower income parents voiced concerns about evaporative coolers triggering their child's asthma. Air conditioning is also desirable because, as research in Tucson (AZ) demonstrated, asthma inhalers are less effective when used at temperatures above the recommended temperature (i.e., 15-25 C or 59 –77 F) (Hoye, Mogallan, and Myrdal 2005). During the late summer in Phoenix, monsoon season brings humid weather, making evaporative coolers ineffective. The new HOPE VI housing project, currently under construction, will have air conditioning for the tenants.
- Higher and lower income families took a series of home modification steps after finding out that their child had asthma, including disposing of stuffed animals, encasing pillows, purchasing air filters and removing carpet (American Academy of Pediatrics 1999). Most parents were knowledgeable about these modifications, but making them was more difficult for lower income parents because of cost. Families that rented (n=28) faced difficulties removing carpet. Legally, a landlord cannot forbid a household from modifying the residence if a member of the household has a disability. However they are not legally responsible for installing new flooring (e.g., tile, wood, linoleum) and can request that carpet be re-installed before the family leaves. Families that plan to stay in their rental unit indefinitely were more likely to invest their own money in asthma-related modifications. Both lower and upper income homeowners were better able to remove carpet than were renters. Among the upper income homeowners (n=12), most were proactive with home modifications but some chose not to undertake home modifications because of aesthetic preferences for carpet.

OUTREACH COMPONENT

Outcome 4: List of policy recommendations based on findings

Outcome 5: Production of informational brochures for participants, health care providers, local government officials, local media and others (see Appendix)

Outcome 6: Publishing GIS asthma maps and research summaries on the Internet

To achieve these outcomes, I prepared a list of policy recommendations, sent out informational brochures and posted this report on a website.

Policy Recommendations

- Improve conditions for low-income renters
 - Substandard low-income housing conditions are a serious children's health concern in Phoenix. Additional public housing units and enforcement of housing codes, while protecting residents, in low-income rental housing, especially for Spanish-speaking tenants, is needed.
- Improve public transportation
 - More bus routes would help families without cars access health care.
 - More public transportation opportunities would also reduce air pollution generated by personal automobiles.
- Expand AHCCCS taxi service
 - The AHCCCS taxi provides transportation for clients to and from doctor's appointments with 24 hours notice. Expanding the service to include same day appointments, and transportation home from school when the child is sick, would help meet the needs of families without transportation.
- Carry out an education campaign about reducing air pollution
 - Parents of children with asthma viewed pollution a serious concern, something outside of their control, and something they cannot fix. Only 1 of the 53 parents interviewed said that taking the bus was something she could do to manage air pollution exposures for her son with asthma.
 - To help officials better enforce pollution laws regarding dust and illegal air emissions, more bi-lingual publicity regarding the County Environmental Complaint Phone Line would allow residents to better take action against polluters.
- Station a credentialed school nurse in every school
 - Many public, private and charter schools lack school nurses, but school nurses are essential for helping parents manage asthma and reducing risks of asthma attacks at school.
- Expanding and continued funding for school health services
 - School-based health clinics are especially important in schools serving immigrant populations. The school is the first place these families turn for health help. The Phoenix Children's Breathmobile visits schools and provides an important service for children with asthma. However, the Breathmobile receives no government support and serves only 2 school districts. Expanding mobile asthma care services in low-income school districts valley-wide would reduce asthma hospitalizations.

- Develop asthma education materials for parents who cannot read English or Spanish.
 - While there are informational materials available in Spanish and English, there are parents who cannot read, but still desire information about how to manage their child's asthma.
- Train more racial/ethnic minority physicians
 - Upper income Anglo parents had similar social backgrounds to their physicians, felt comfortable around them, and were able to communicate effectively with them. For the Latino and African American parents, their social background was generally different than their physicians and several expressed the desire to be seen by a doctor that was racially and ethnically similar to them because they felt more comfortable.

Informational Brochures

A Results Flyer has been shared with school nurses, health assistants and secretaries and the schools participating in the project. It has also been sent home (in English or Spanish) to all parents who participated in the interviews. Additionally, the Results Flyer and/or this Report has been shared with representatives from Mountain Park Health Care Center, City of Phoenix Neighborhood Services, Maricopa County Air, Arizona Department of Health Services, and Arizona Department of Environmental Quality, Phoenix Children's Hospital, St. Joe's Asthma Education Program, Don't Waste Arizona, Merck Pharmaceutical, GlaxoKlineSmith Pharmaceutical, Arizona Asthma Coalition, and Maricopa County Asthma Coalition.

In addition, I have presented the findings of this research at a number of advocacy and academic meetings and conferences. I have made a series of three presentations at meetings of the Maricopa County Asthma Coalition (December 2005, February 2006, and June 2006). I presented this research at the annual meeting (October 2005) of the Association of Pacific Coast Geographers (Phoenix, AZ), and at the annual (May 2006) International Conference in the Social Sciences (Honolulu, HI). Additionally, I gave research colloquiums at the University of Florida (January 2006), Ohio University (February 2006), San Diego State University (February 2006), University of Texas at El Paso (February 2006) and University of New Hampshire (March 2006), where I shared the results of this project with colleagues. This research will also be published in academic journals. A PDF of this report can be found at

<http://caplter.asu.edu/home/products/reports.jsp>

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Phoenix Asthma Study Results

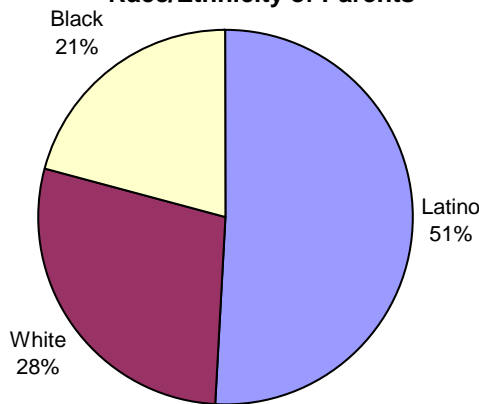


This flyer summarizes the results of the Phoenix Asthma Study conducted between May 2005 and May 2006 in metropolitan Phoenix, Arizona by Sara Grineski of Arizona State University. Asthma is a serious problem in Phoenix and recent research estimates that approximately 9% of residents have asthma, but in some neighborhoods it is more than double that. Children suffer from asthma at higher rates than adults, and were thus the focus of this study. The study involved

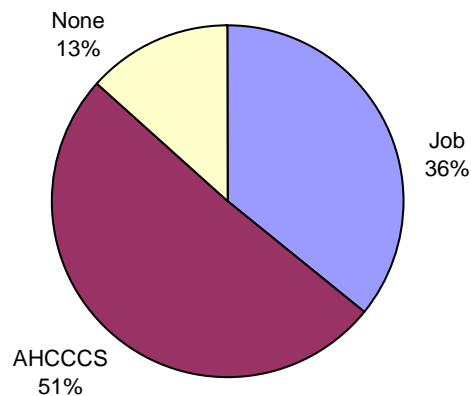
interviewing parents of children with asthma about what it is like to deal with asthma, and analyzing secondary data related to asthma, social characteristics, and air pollution.

■ I interviewed 53 parents with 71 children, ranging in age from 4 to 14, with asthma living in metro Phoenix. A summary of characteristics is provided in these 4 pie charts.

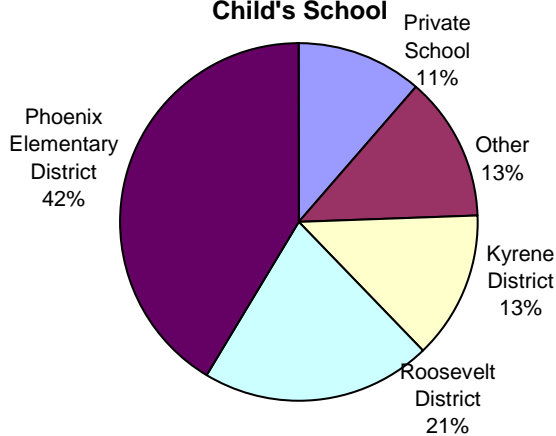
Race/Ethnicity of Parents



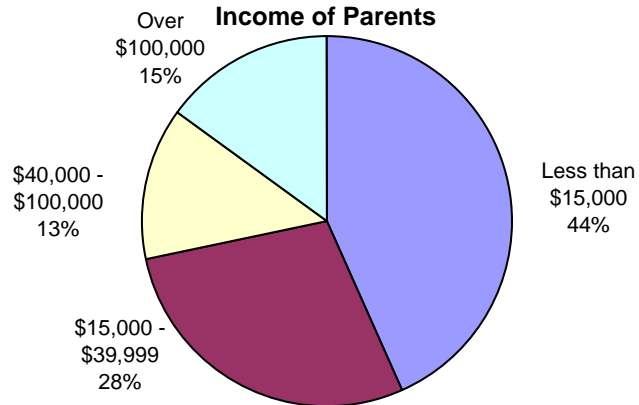
Child's Insurance



Child's School



Income of Parents



Findings from Interviews

■ Upper-income families with job-based insurance were satisfied with the health care their children received for asthma, while low-income families with job-based insurance were less satisfied because they were less able to afford co-payments for medications and doctor's visits.

■ Families who had AHCCCS and Kids Care were very satisfied with the programs. Many relied on the taxi service to get to doctor's appointments.

■ 76% of parents thought that air pollution was an asthma trigger for their child/children.

Some schools in metro Phoenix did not have school nurses, which made it more difficult for children with asthma. In schools with nurses, the nurses played an important role in helping families control asthma.

Asthma impacts the whole family by influencing relationships between spouses, extended families, siblings, employers, and landlords. When a relative smoked, it caused stress on the relationship between the parent, child and relative. Sometimes, it changed the relationships between children and their extended families in negative ways.

More polluted neighborhoods (such as those near freeways and industrial facilities) had poorer quality housing stock and dustier yards than neighborhoods farther from pollution sources, making it more difficult for parents to control asthma in these neighborhoods.

Some children were prescribed Xopenex, an albuterol-like medication with fewer side effects than albuterol. Parents were very satisfied with this medication. Some health care providers do not prescribe it because it is very expensive and some insurance companies do not cover it.

Landlords neglect of rental properties was a serious concern for low-income families in rental housing. Eleven families had mold in their homes, which triggered children’s asthma but the landlords would not remediate it.

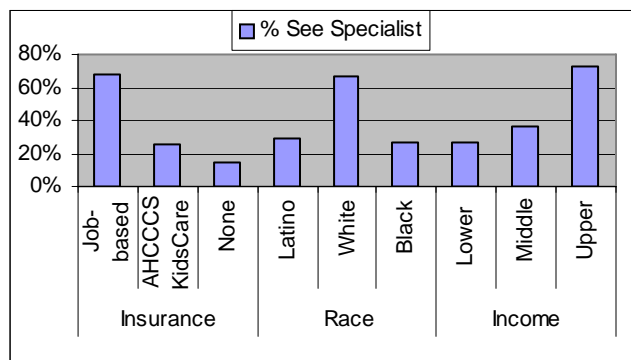
Phoenix Children’s Hospital Breathmobile (mobile asthma clinic) provides an important service for children without insurance. Without the Breathmobile, some parents would not have medications for their children, or even know their children have asthma.

Allergy testing helped parents discover allergic triggers of children’s asthma, but some insurance plans did not approve the testing.

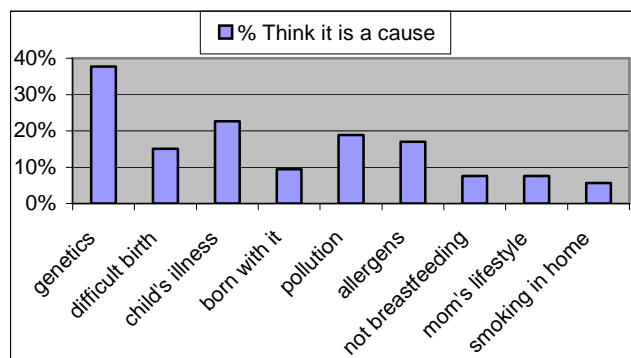
Nearly all parents who had children on inhaled steroids like Advair and Flovent felt that the medications had significantly improved their child’s asthma control.

Parents generally reported that removing carpet from their homes helped alleviate children’s symptoms. When parents did not remove the carpet, it was usually because of cost, rental status, or a preference for carpet, not because they did not know it was a suggested modification.

Children with job-based insurance, white race and upper incomes were more likely to see specialists for asthma.



Parents identified many causes for children’s asthma, with genetics most often mentioned.



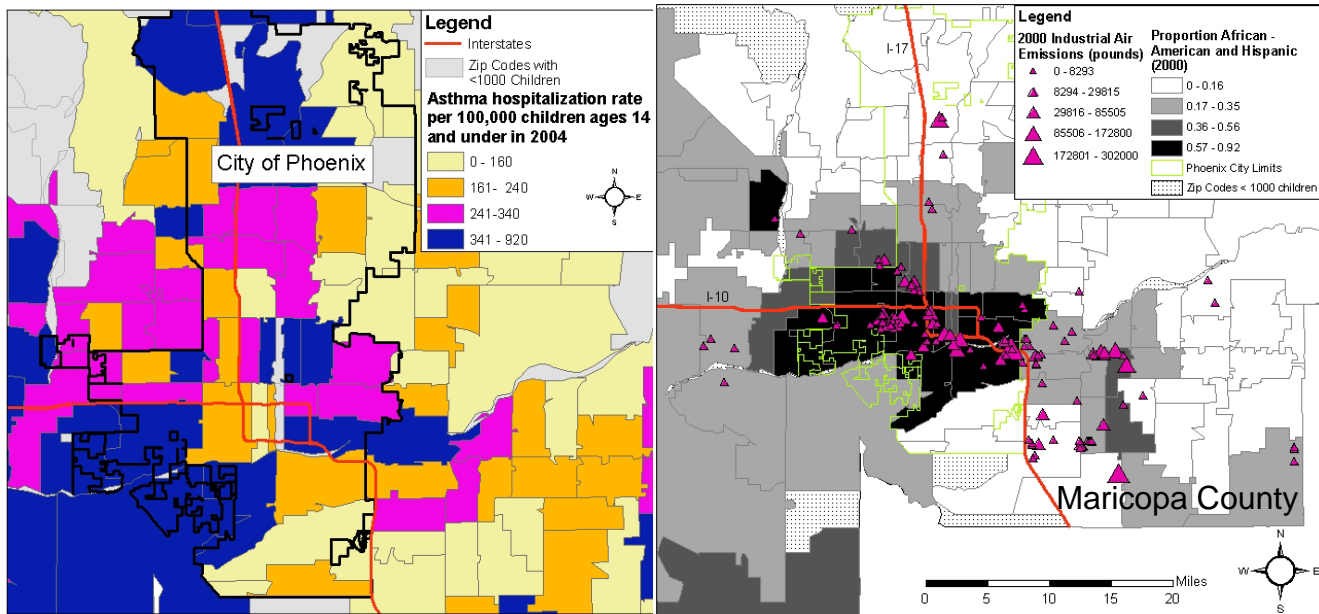
Parent Tips

When asked what helped parents better cope with their children's asthma, they said:

- ☐ “Introduce yourself to your child’s teacher at the beginning of the year and tell them about your child’s asthma.”
- ☐ “I always try to go to the same pharmacy. That way, the pharmacists learn my son’s medications and I can ask them questions because I know them.”
- ☐ “I have found that massage helps her relax. I rub her back when she has trouble breathing.”
- ☐ “I have a small portable nebulizer (breathing machine) that weights 6 ounces and runs on AA batteries. It is great for travel. I bought it on the Internet.”
- ☐ “I found the book *Asthma and Allergies for Dummies* to be really helpful.”
- ☐ “I requested her file from the doctor’s office and I just have it in a little folder ready to go. If I have to take her to the emergency room I grab my file and the doctors are really happy to see that.”
- ☐ “If you hang their clothes up, instead of putting them in a drawer, it is supposed to help with dust mites.”
- ☐ “I think by taking swimming lessons, she is learning to manage her own asthma.”
- ☐ “I have taught my daughter which hospital she goes to - so she can tell anyone where she should go - if she has a problem and I am not there.”
- ☐ “At first, I was protective and I limited her. I said, ‘You can’t do that.’ But I come to find out that the more they exercise, it opens up their lungs. I used to say, ‘Stop running.’ Now, I just let her go.”
- ☐ “I use eucalyptus oil and a humidifier when she is sick.”
- ☐ “I have found a doctor that talks directly to her - not to me - but to her. And that is really important”
- ☐ “I got rid of her stuffed animals, but she couldn’t part with her Sponge Bob, so I put it in the dryer twice a week and that helps.

Findings from Pollution Data Analysis

- ☐ I found an association between levels of traffic pollution (nitrous dioxide) and daily hospitalizations for asthma in Maricopa County between 2001 and 2003. Three days after a high pollution day, more children were hospitalized for asthma than if the pollution levels were low. I also found that on days when the temperature was below average, more children were hospitalized.
- ☐ African American and Latino residents in Maricopa County are more likely to live in hazardous neighborhoods (as measured by pounds of chemicals released from industrial facilities and levels of carbon monoxide, nitrous oxides and ozone) than white residents. This relationship is found independent of social class.
- ☐ I also found that air emissions from industrial facilities, criteria pollution (carbon monoxide, nitrous oxides and ozone) levels, percent of residents that are African American, and social class were important predictors of children’s asthma hospitalizations at a zip code level in Maricopa County.



Note: Pink triangles are industrial facilities.

Important Information

- ☐ **Air Pollution Alerts** (602-771-2367) – AZ Dept. of Air Quality records a pollution report over the phone. Also available via email, sign up at: <http://www.valleymetro.org/Rideshare3/4CAC/5HPAs/index.html>.
- ☐ **Camp-Not-A-Wheeze** (602-258-7505) – is run by American Lung Association of Arizona and is designed especially for children ages 7-14 with moderate to severe asthma. Campers learn to better manage their asthma in a safe and medically monitored environment. Scholarships available.
- ☐ **Asthma Athletics** (602-957-4948 or 602-277-5551 ext. 5064) - runs swimming and soccer programs for children with asthma that include asthma education for families (asthmaathletics@yahoo.com).
- ☐ **Arizona Asthma Coalition** (480-595-7071) - is a state-based asthma advocacy group with the mission to improve the quality of life of people with asthma (<http://www.azasthma.org/>)
- ☐ **Citizen’s Environmental Complaint Line** (602-506-6616) – call if you suspect a business or industry of violating environmental codes (between 8 AM to 5 PM Monday through Friday).
- ☐ **Southwest Fair Housing Council** (602-252-3423) - provides advice about dealing with landlords when your child has asthma.
- ☐ **City of Phoenix Landlord/Tenant Counseling Office** (602-262-7210) – can help if your landlord is neglecting the property where you live (such as not cleaning up mold).
- ☐ **Partnership for Prescription Assistance** (1-888-477-2669) - helps qualifying patients who lack prescription coverage get the medicines they need. (<https://www.pparx.org/Intro.php>).
- ☐ **City of Phoenix Neighborhood Services Department** (602-262-7344) - provides grants/loans to low-income homeowners for fixing homes; provides temporary shelter, one month's rent, security and utility deposits, food vouchers and bus tokens to tenants who are at risk of becoming homeless due to unsafe living conditions; and provides counseling/mediation for tenants and landlords.

Please contact the researcher with any questions or comments

Sara Grineski -- grineski_sara@hotmail.com

Thanks to all the parents and school health staff that participated in the project!