

Exploring asthma prevalence and sociodemographic factors in an urban community

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Today's Presentation

- Pediatric Asthma: Brief Description of the Problem
- Spatial Analysis of Pediatric Asthma: Rationale and Data
- Analysis Objective and Goal
- Methods
- Results: Asthma Survey and Census Variables
- Results: Representative Sample
- Limitations
- Conclusions and Future Plans

Pediatric Asthma: Brief Description

- Chronic respiratory disease characterized by inflammation of the airways (NHLBI 1995)
- Most common chronic disease in the United States; affects approximately 7% of all children (Adams *et al.* 1999; Akinbami and Schoendorf 2003).
- Primary reason for missed school days, non-injury hospitalization and is the single most prevalent cause of childhood disability (Kozak *et al.* 2005; Newacheck and Taylor 2000; Akinbami *et al.* 2002)
- Several competing hypotheses with regard to asthma etiology

Research Focus: Asthma Morbidity

- Asthma incidence is a result of the complex interplay between genetics, environment and behavior
- Asthma prevalence data are used to:
 - estimate the burden of disease in a community
 - understand cross-community differences in asthma incidence and prevalence
 - plan for remedial services
 - function as surveillance tools to understand the changing dynamics of the disease
 - identify potential exposures of importance
 - identify groups at risk for increased morbidity

Pediatric Asthma in Urban Communities

Asthma-related morbidity in urban communities is disproportionately high compared to other types of communities, predominantly among impoverished, non-white children.

**Asthma-
Related
Morbidity** = f

Social Environment

Built Environment

Economic Environment

Political Environment

Natural Environment

Spatial Analysis and Pediatric Asthma

- Geographic analysis offers important insights into the impact of environmental and socioeconomic factors associated with childhood asthma.
- Although there has been extensive exploration of methods to minimize misclassification of asthma-related exposures (i.e. ambient air pollution), accurate classification of asthma and asthma-related morbidity has received little attention in the context of spatial analysis.

Data for Spatial Analysis

	Advantages	Drawbacks
Medical Utilization (ED Visits/ Hospitalizations)	<ul style="list-style-type: none">• Regional Level• Routinely Collected	<ul style="list-style-type: none">• Hospitalizations/ED Visits are rare events• Unable to discern between severe cases and mismanaged cases• Does not represent the full spectrum of severity
National Survey Data (NHIS, NHANES)	<ul style="list-style-type: none">• Cover representative samples of population• Able to compare prevalence by region• Available	<ul style="list-style-type: none">• Extensive general health surveys; limited asthma questions• Regional/state scale can't be linked to individual risk factors

Data for Spatial Analysis

	Advantages	Drawbacks
School-Based Surveillance	<ul style="list-style-type: none">•Definable population•Available to conduct extensive survey measurement•Stable population and stable structure•Urban school districts have a disproportionate amount of children in need of services	<ul style="list-style-type: none">• Data collection time and labor intensive• Need cooperation from school administration• Limited age group for information if survey is designed to be self-report

High resolution data, collected from school-based surveillance programs, may provide a more complete understanding of the burden of asthma in an urban community.

Oakland Unified School District

- Serves over 50,000 students, grades K – 12.
- District Demographics: 42% of students are African American, 34% Latino, 17% Asian/Pacific Islander
- The *Stability Rate* for all OUSD schools is 37%
- One-third of all OUSD middle and high school students are English Learners
- 32% of middle and high school students are from families enrolled in calWORKS, 70% qualified for free or reduced price school lunches

Source: OUSD District Public Information Data Portal

Study Objective

A geographic information system (GIS) was utilized to evaluate the relation between the spatial distribution of population-derived pediatric asthma data and census-derived demographic and economic factors in Oakland, CA.

Study Goal

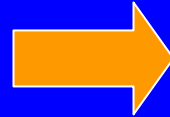
First step in understanding exposures, factors, and characteristics causally related to asthma morbidity.

Methods

- Symptom and address data were collected from 6th and 9th grade students from 16 OUSD MS and 4 OUSD HS from the years 2003 – 2005.
 - Asthma prevalence calculated as (# students defined as “positive”/# students completed survey) for each census tract
- All legible addresses were coded using the California DHS EHIP Tables Address Geocoder.
 - Valid addresses were considered =>80%
 - Addresses were matched to census tract
- Census level variables were collected from SF3 2000
- Correlations (Pearson R) were calculated between census variables and asthma prevalence

Study Population

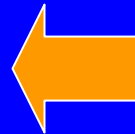
8,674 surveys
collected,
2003 - 2005



7,613 valid addresses
geocoded
(87.7%)

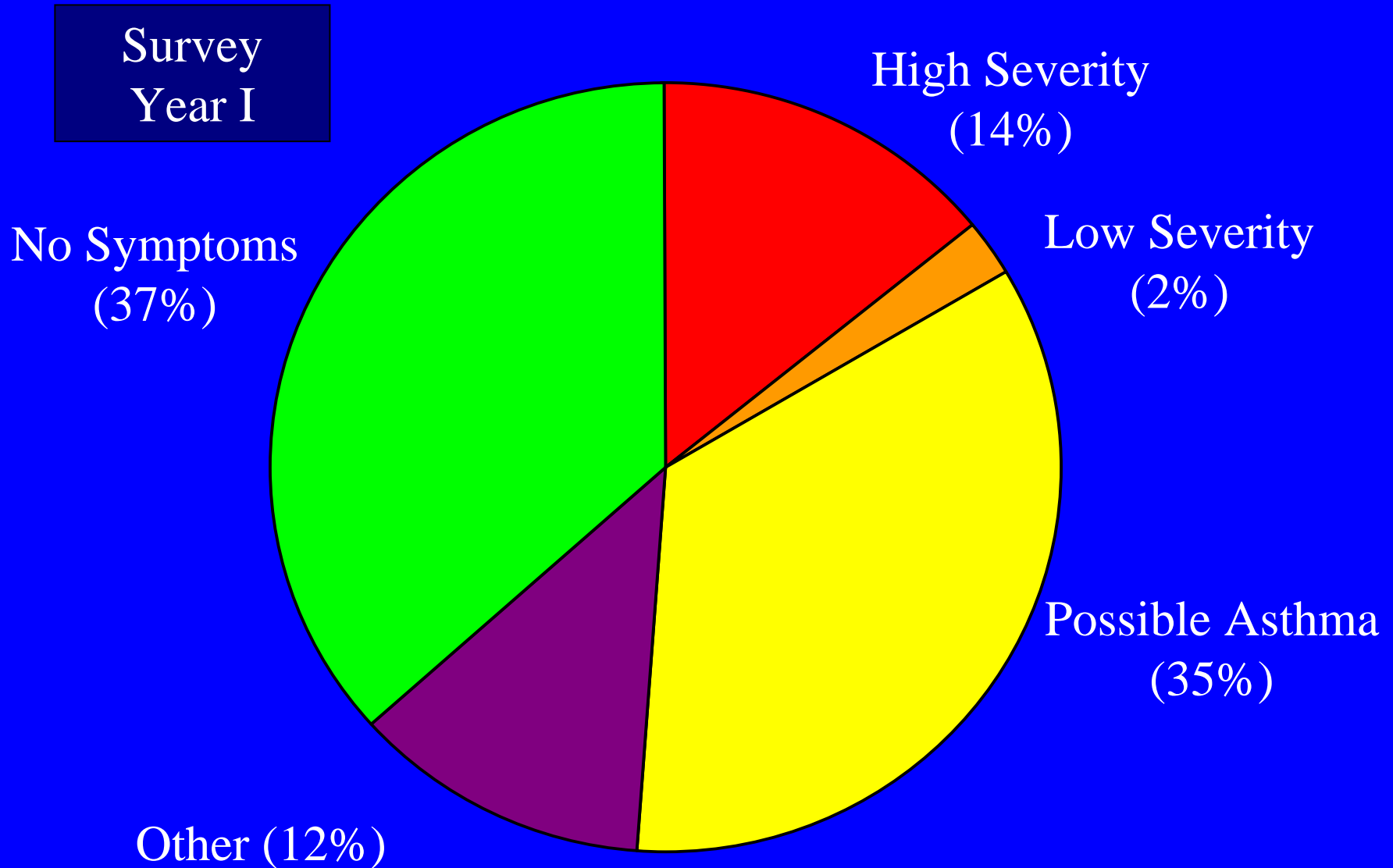


Remove non-Oakland
addresses (n=38) and
duplicates (n=49)

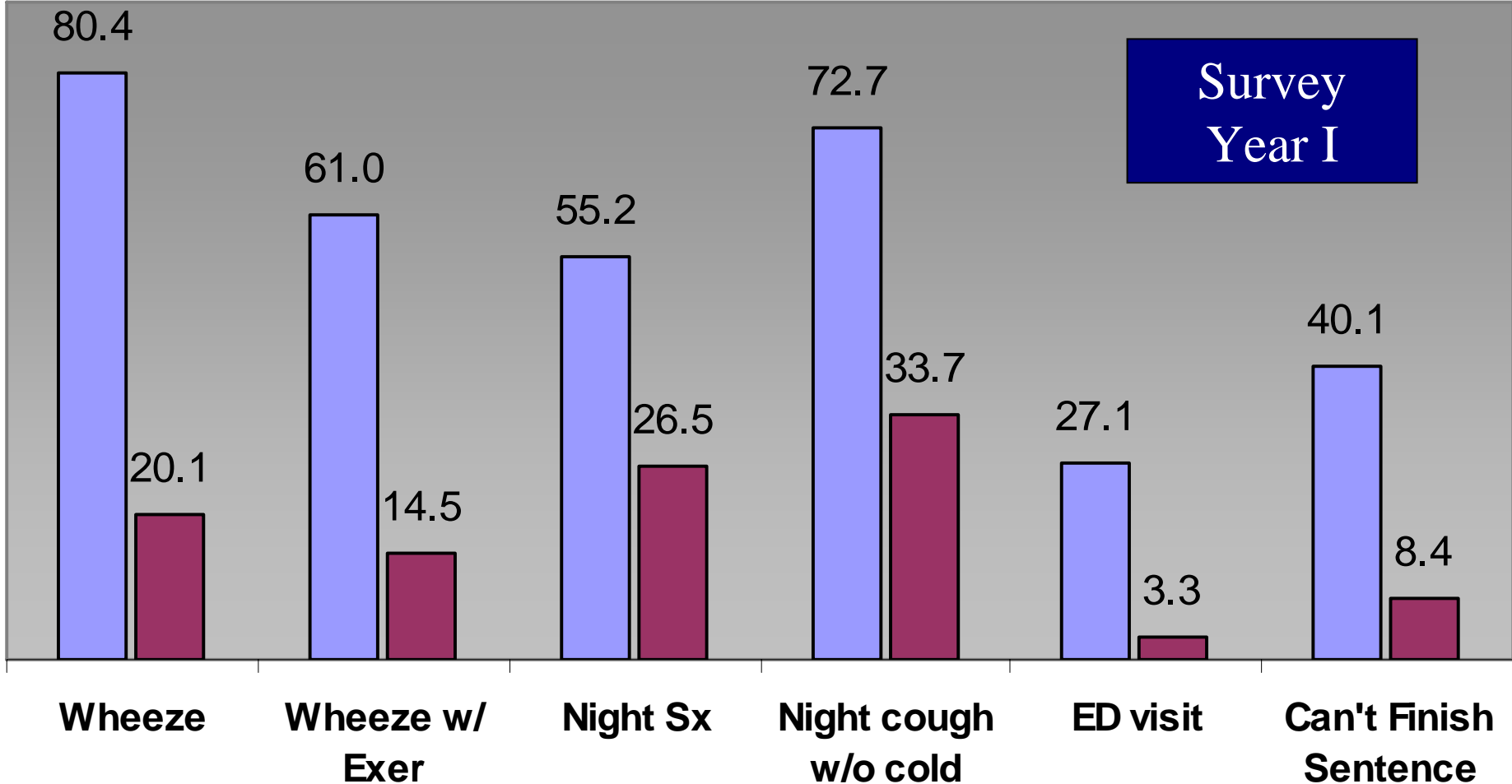


Study Pop: 7,526
Asthma: 16.6%
(n=1,251)
No Asthma: 83.4%
(n=6,275)

Results: Classification



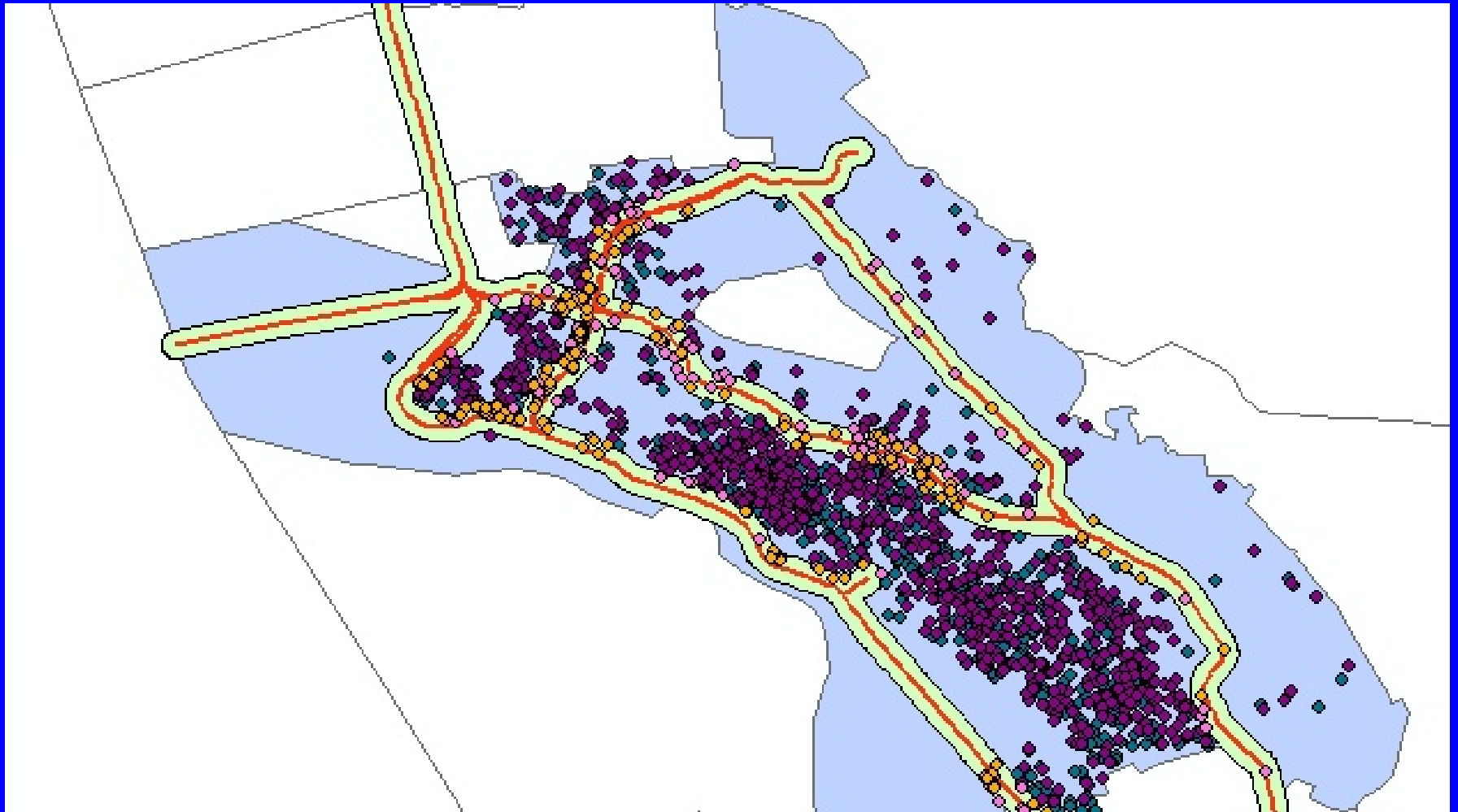
Results: Students with Probable Asthma



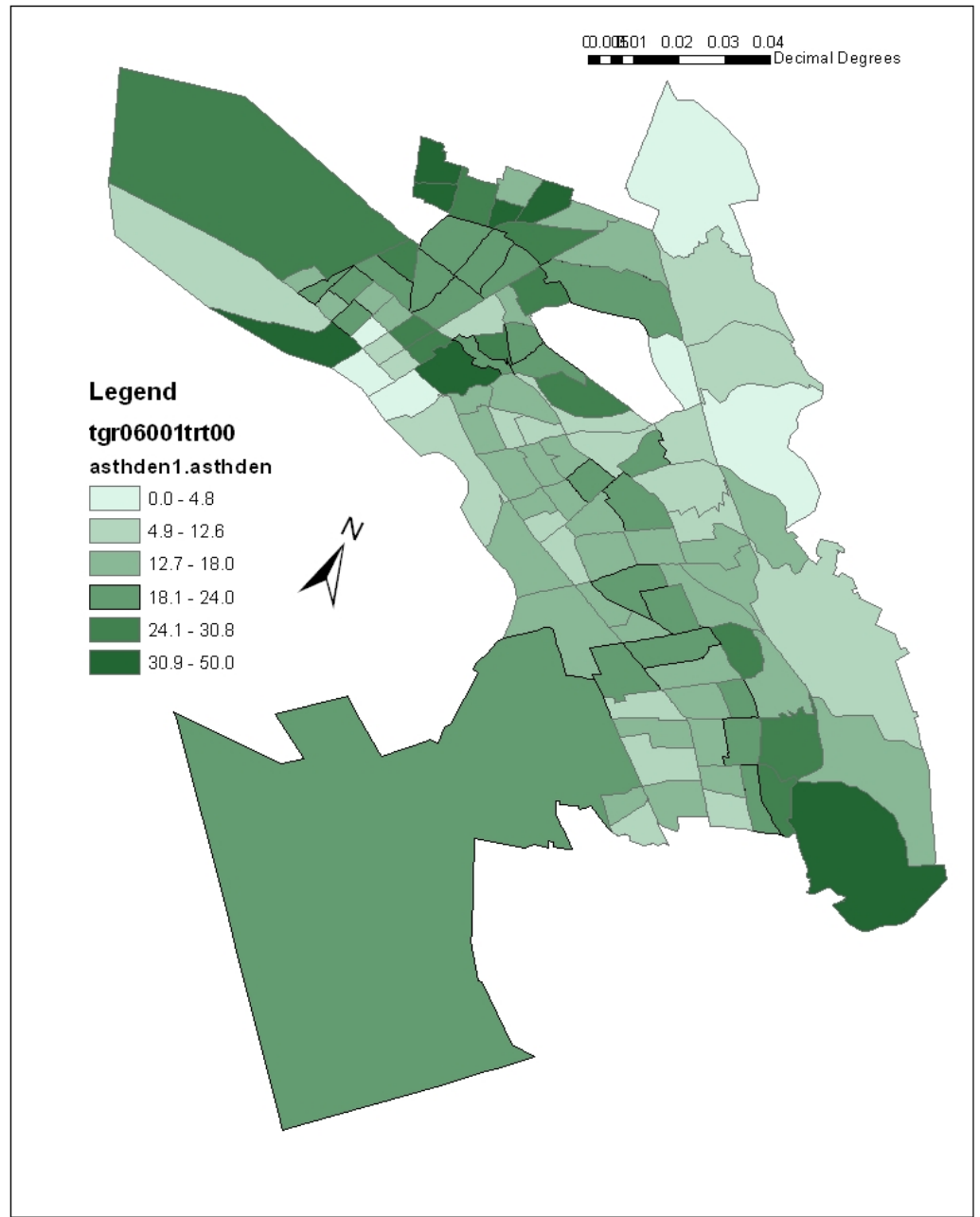
Probable (n=387)

Not Probable (n=1,965)

Spatial Analysis: Distribution of Cases



OUSD catchment area, limited access highways and buffer, and identified asthma cases



Number Census
Tracts, Oakland: 106

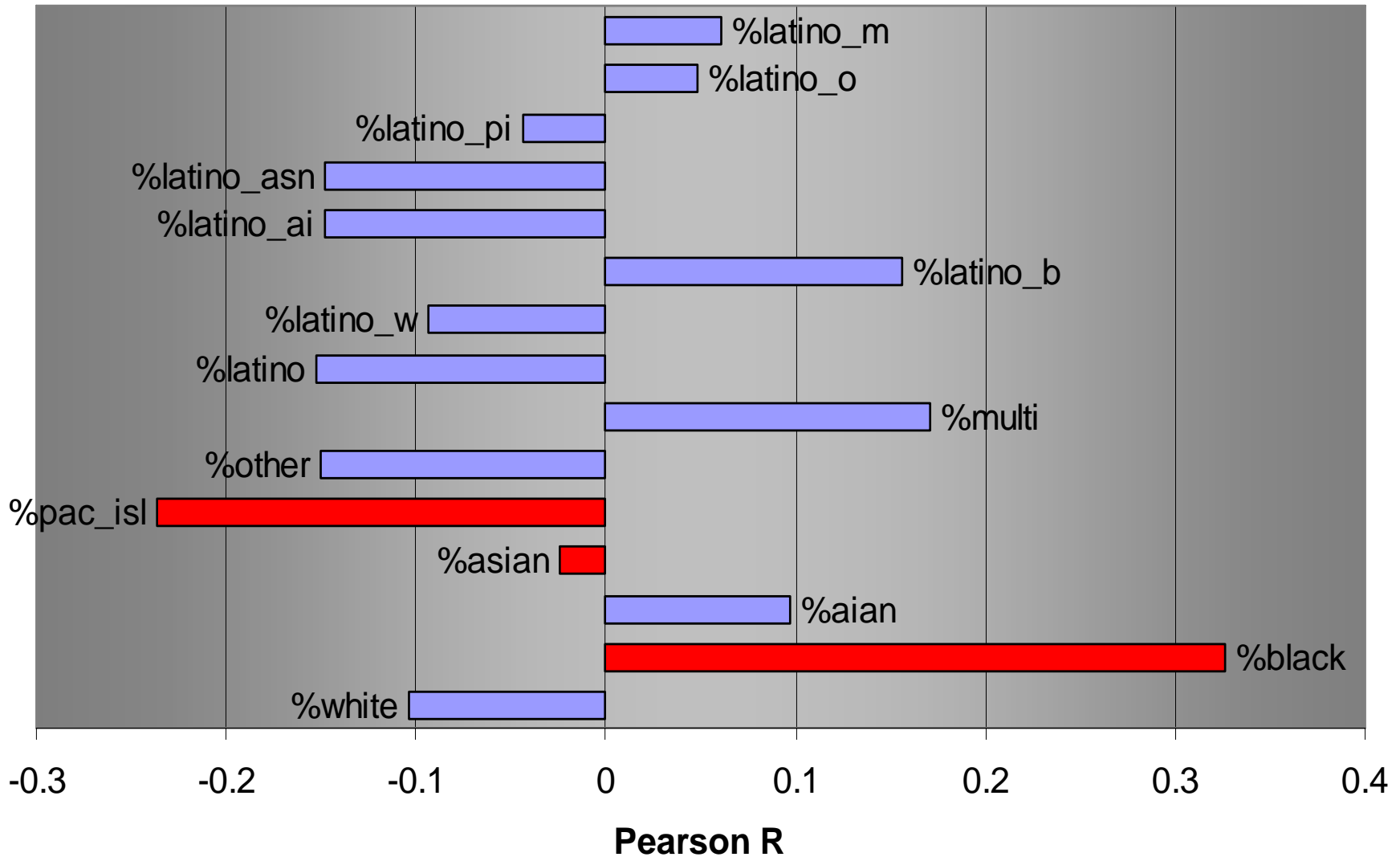
Mean Asthma
Prevalence: 17.9%
(SD: 8.8)

Median Asthma
Prevalence: 16.3%

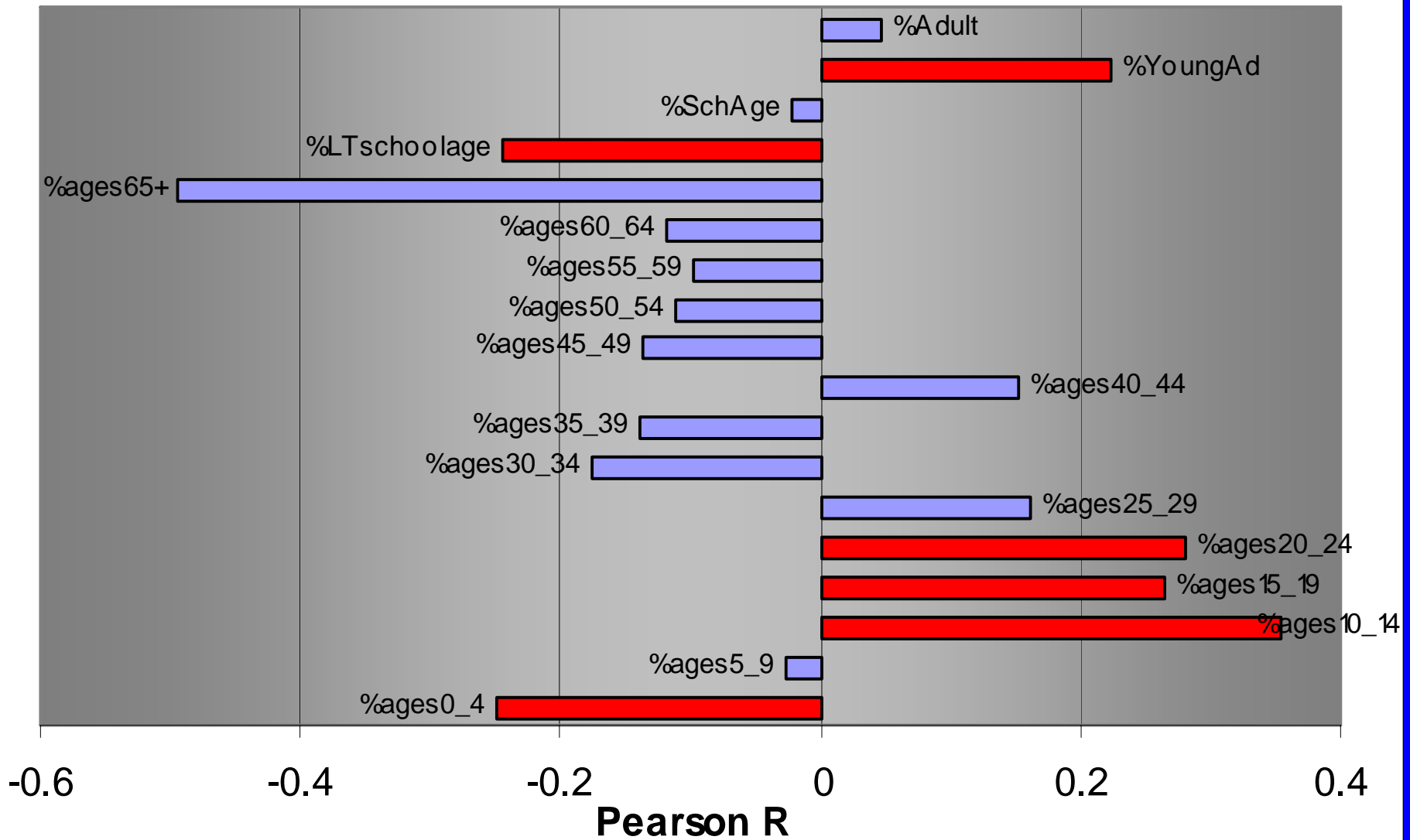
Asthma Prevalence
Range: 0.0 – 50.0%

Interquartile Range:
12.6 – 22.4%

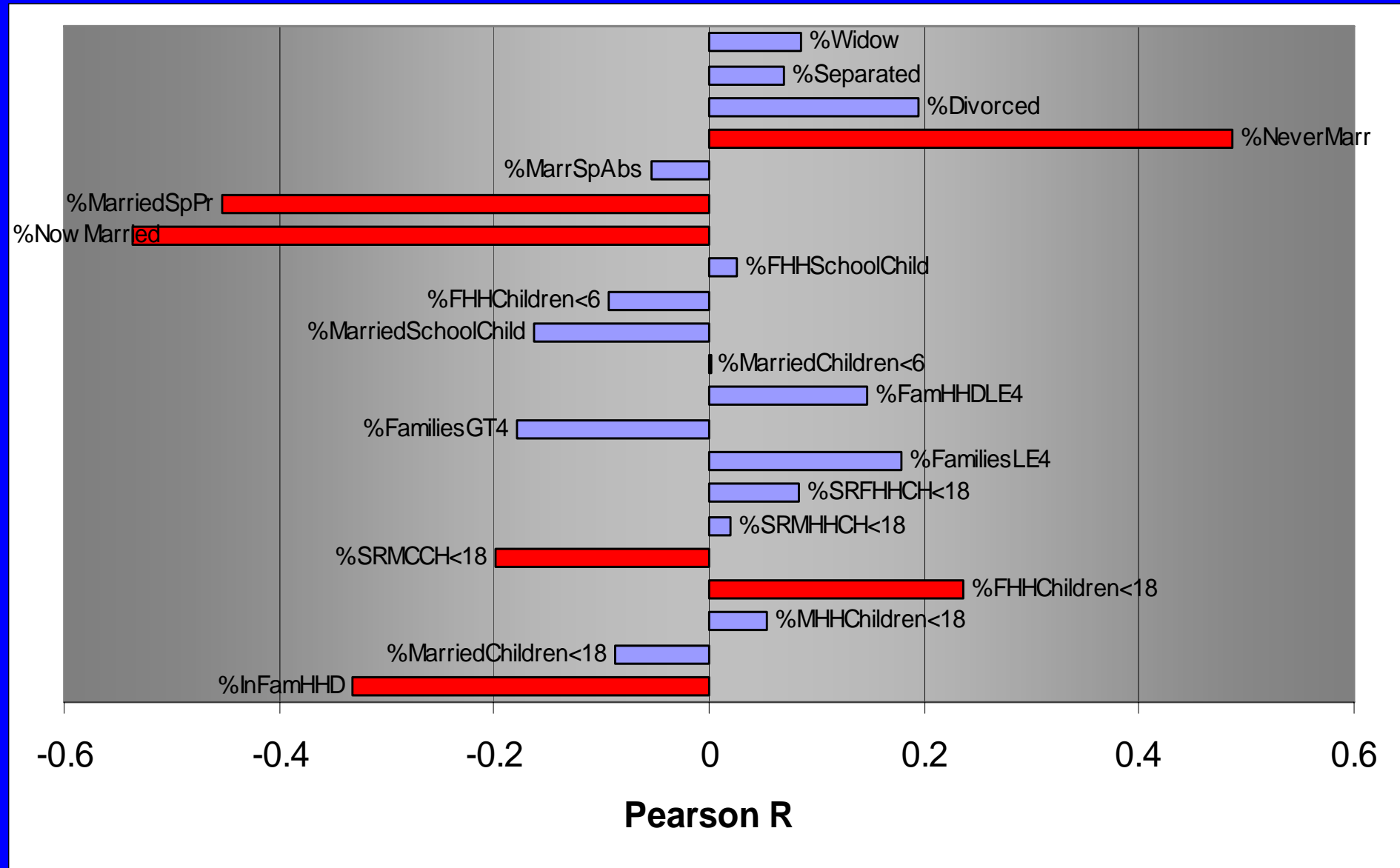
Results: Correlation with Race/Ethnicity



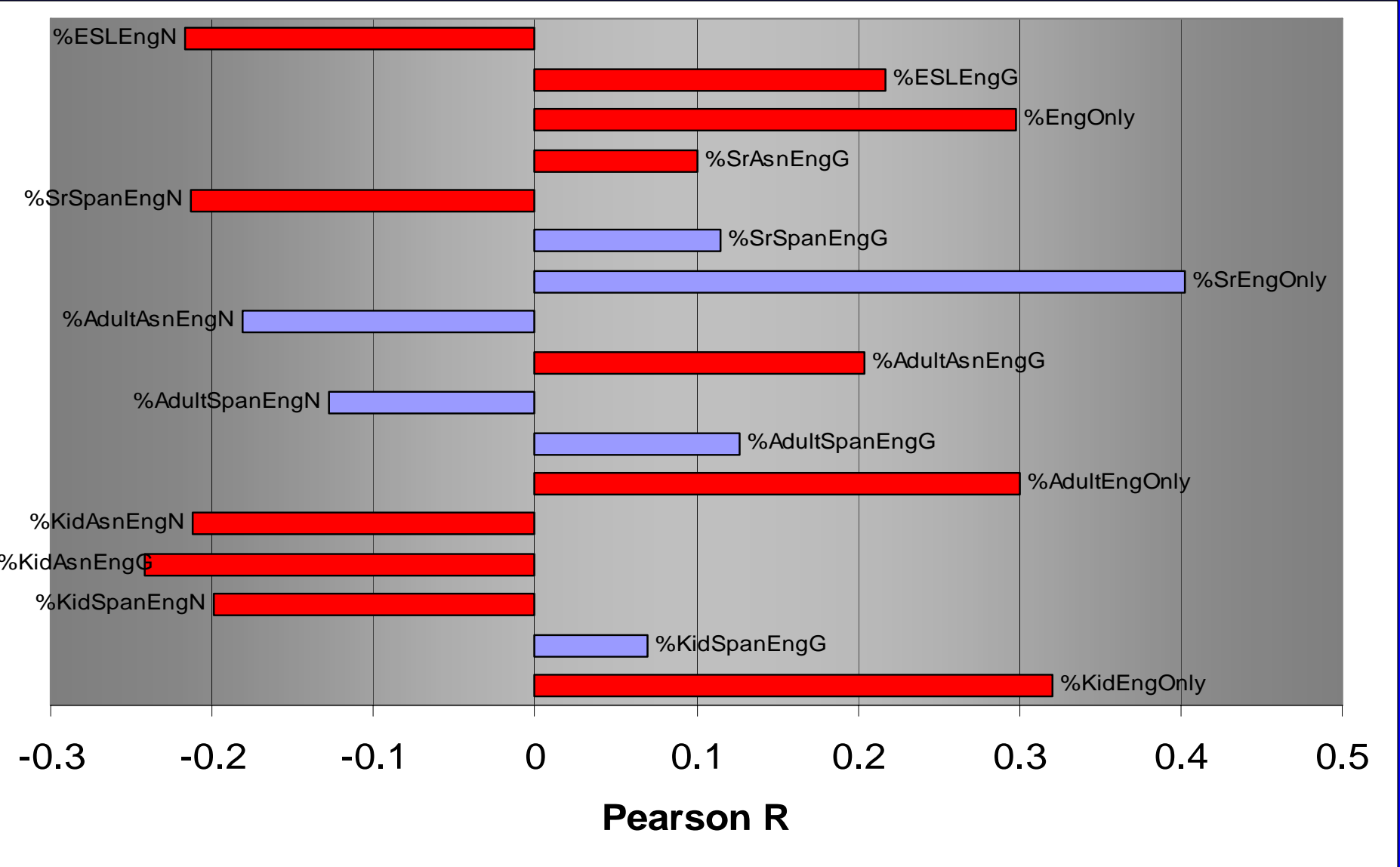
Results: Age Strata



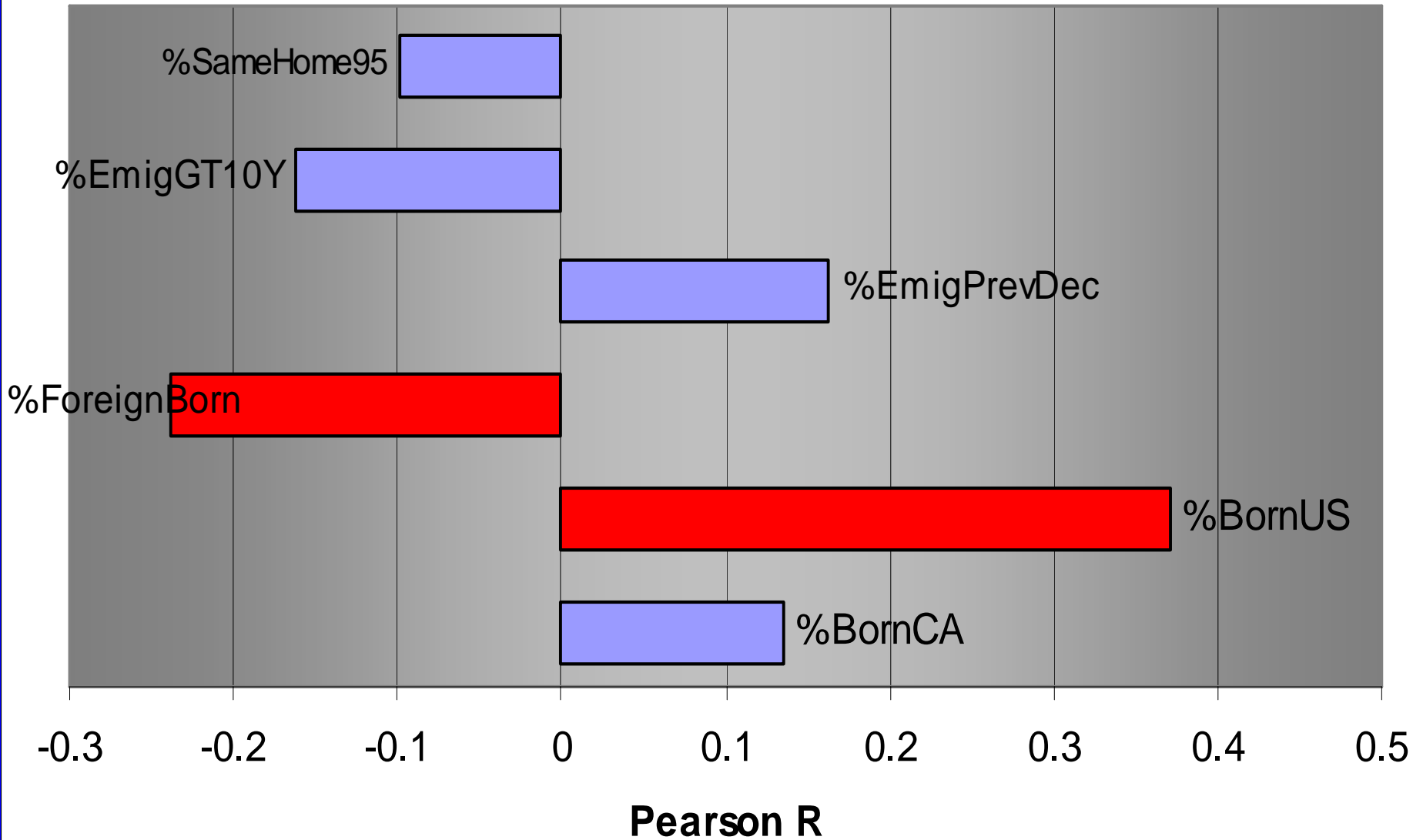
Results: Correlation with Family Structure



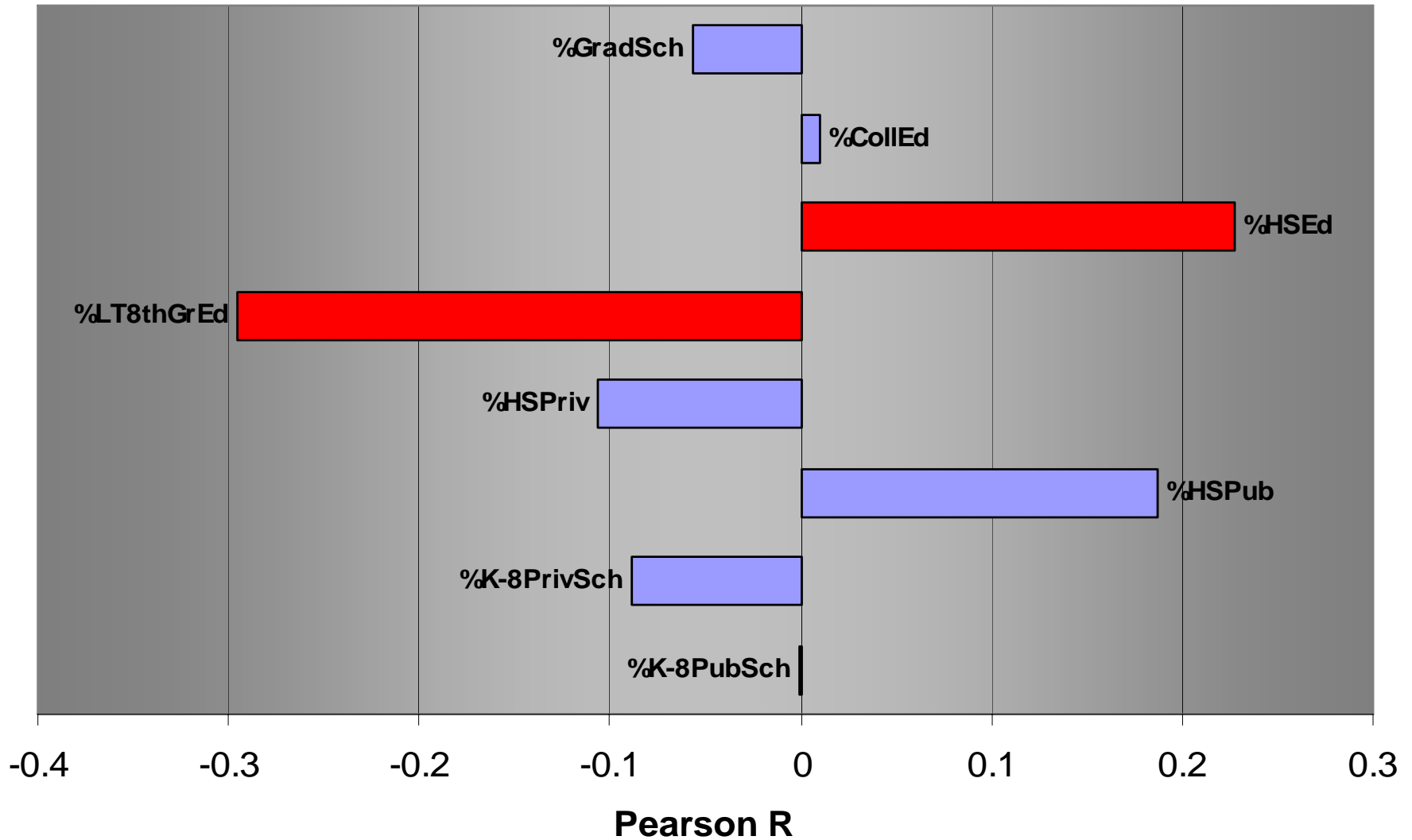
Results: Correlation with Language



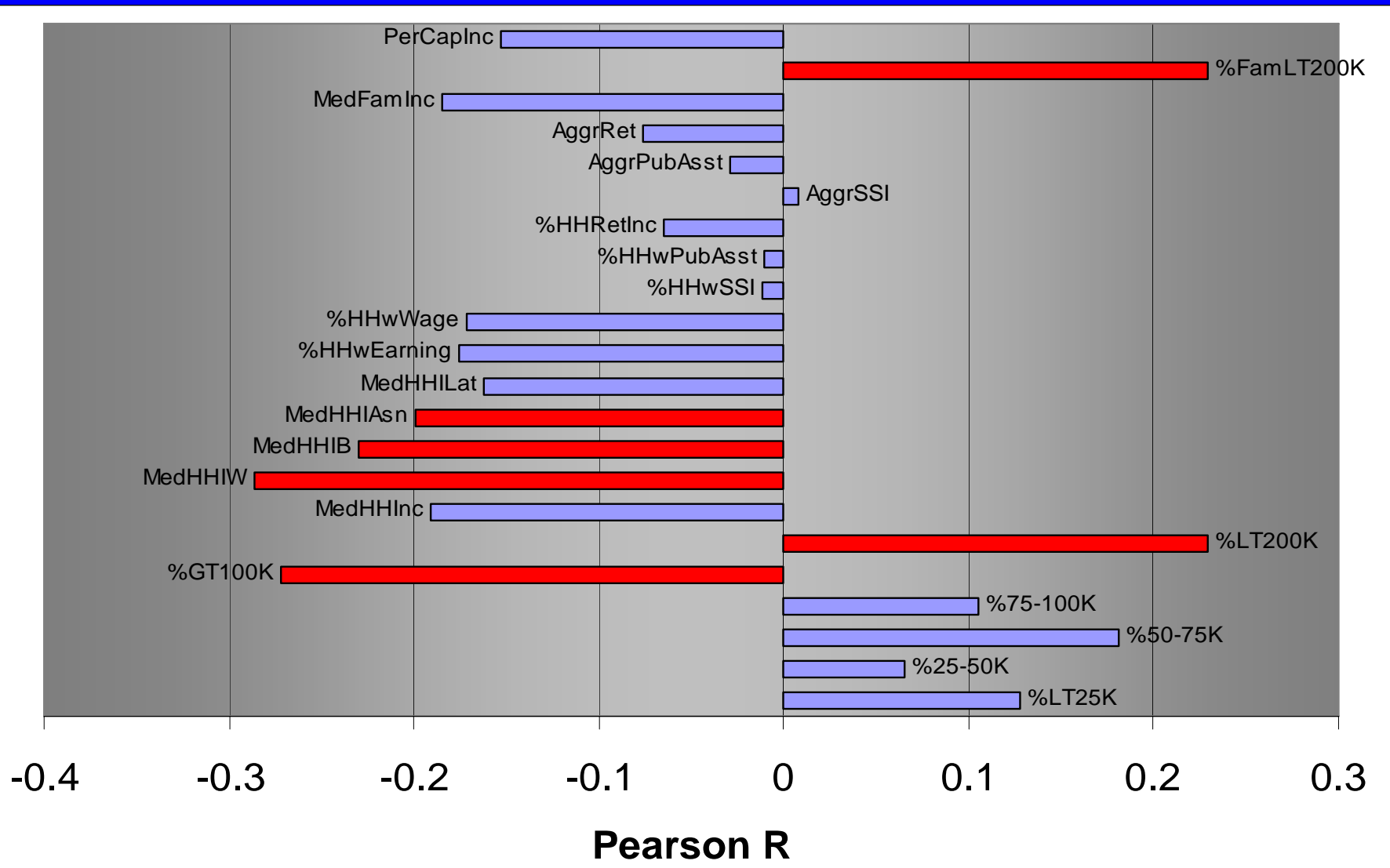
Results: Place of Birth



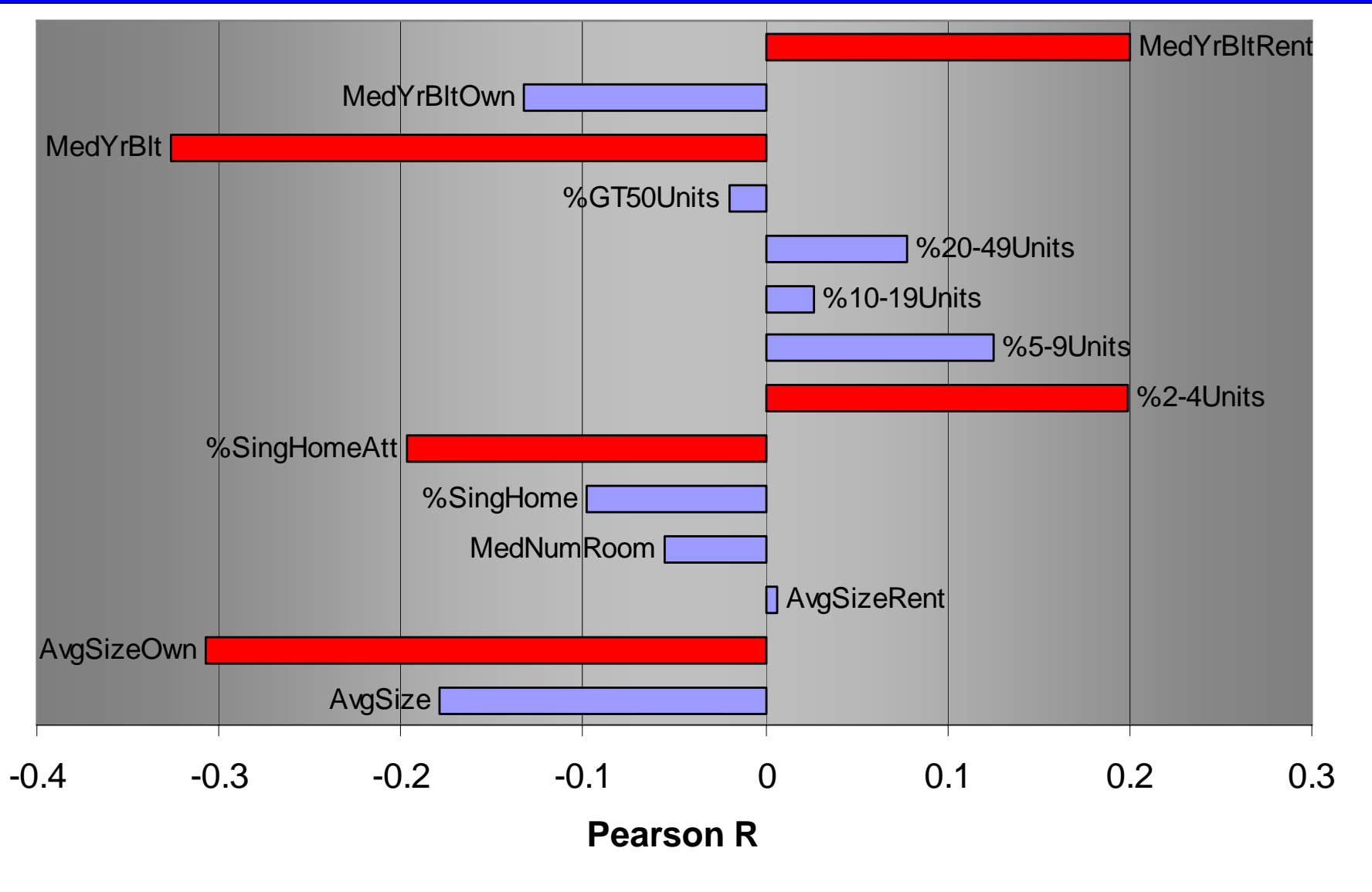
Results: Education



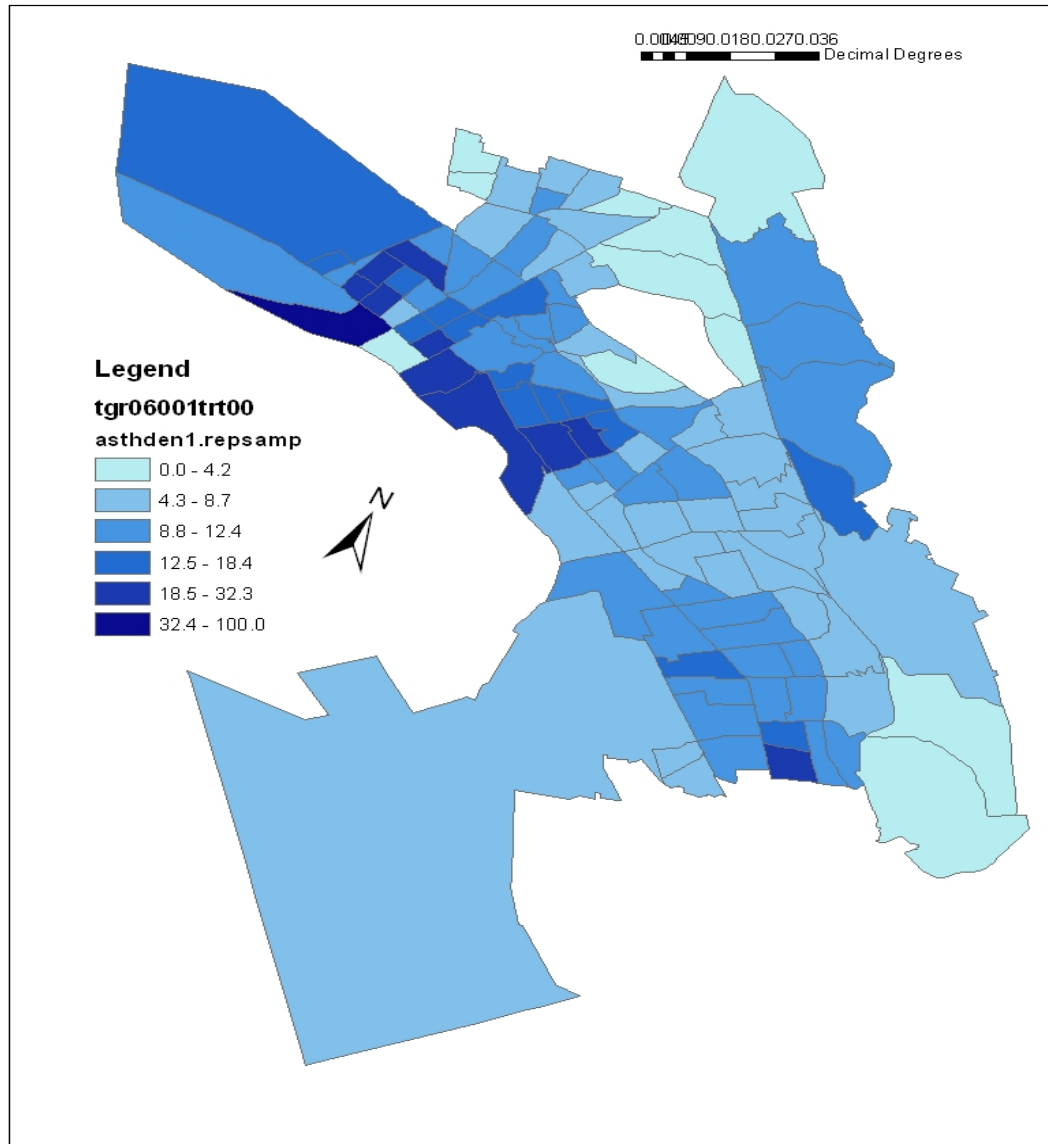
Results: HHD/Family Income



Results: Housing Characteristics



Does the school-based survey provide a representative sample of the school-aged population in Oakland?



“Representative Sample” was calculated by dividing the number of students in each census tract who completed the survey by the number of school-aged children in each census tract (ages 5 – 17) derived from the census.

Factors Associated with Representative Sample

Positive Correlations (p<0.05)			Negative Correlations (p<0.05)		
%AIAN	0.21786	0.0294	%White	-0.40421	<.0001
%Asian	0.38866	<0.0001	%Lat White	-0.35145	0.0003
%Young Adult	0.41812	<0.0001	% MCFCU6	-0.37046	0.0001
%Marr Sp Pr	0.33976	0.0005	%PMCFSCHK	-0.28255	0.0396
%NEVMARR	0.30878	0.0018	%PFHHSCHK	-0.42170	<0.0001
%Kid Asn Eng N	0.21926	0.0284	%PNOWMARR	-0.32079	0.0011
% HS Pub	0.30624	0.0019	%Kid Eng Only	-0.32149	0.0011
% HS	0.42424	0.0001	%Kid Span Eng G	-0.45165	<0.0001
			%Adult Eng Only	-0.26265	0.0083
			%Sr Span Eng G	-0.09348	0.0029
			%Sr Asn Eng G	-0.22218	0.0263
			%Eng Only	-0.29823	0.0026
			%ESL Eng G	-0.25119	0.0117
			% Foreign Born	-0.23531	0.0184
			%Same Home 95	-0.28374	0.0042
			% College	-0.33685	0.0006
			% Grad School	-0.33525	0.0007
			% K-8 Private	-0.36743	0.0002

Spatial Analysis: Limitations

- Census Data: ecological level data, joint probabilities not available, may not reflect current population demographics
- Survey Data: relies on student's report of symptoms, frequency, diagnosis; difficult to validate
- Address validation difficult with self-report student data
- Working with a transient population who may enter or leave school system at different points during the school year

Conclusions

- Local surveillance provides high resolution asthma-related morbidity information specific to a community
- Spatial analysis via survey data and analysis of these data in a GIS framework may provide more accurate estimates of asthma-related risk factors compared to health care utilization data
- GIS analysis can inform targeted interventions to address asthma disparities in urban communities
- Survey data obtained from a public school population may not reflect all demographic and economic groups of the school-aged population

Future Plans

- Inclusion of individual level variables collected from surveillance data
- Inclusion of school-level ecological characteristics
- Regression with additional community level variables, including land use and presence of public and assisted housing
- Inclusion of exposure assessment of vehicular pollution: measurement of distance to freeway

Thank You

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