



University of California
San Francisco

Discrimination, Psycho-Social Stress and the Relationship to Non-Atopic Neutrophilic Asthma and Other Asthma Phenotypes

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Neeta Thakur, MD MPH
Neeta.Thakur@ucsf.edu

OVERVIEW

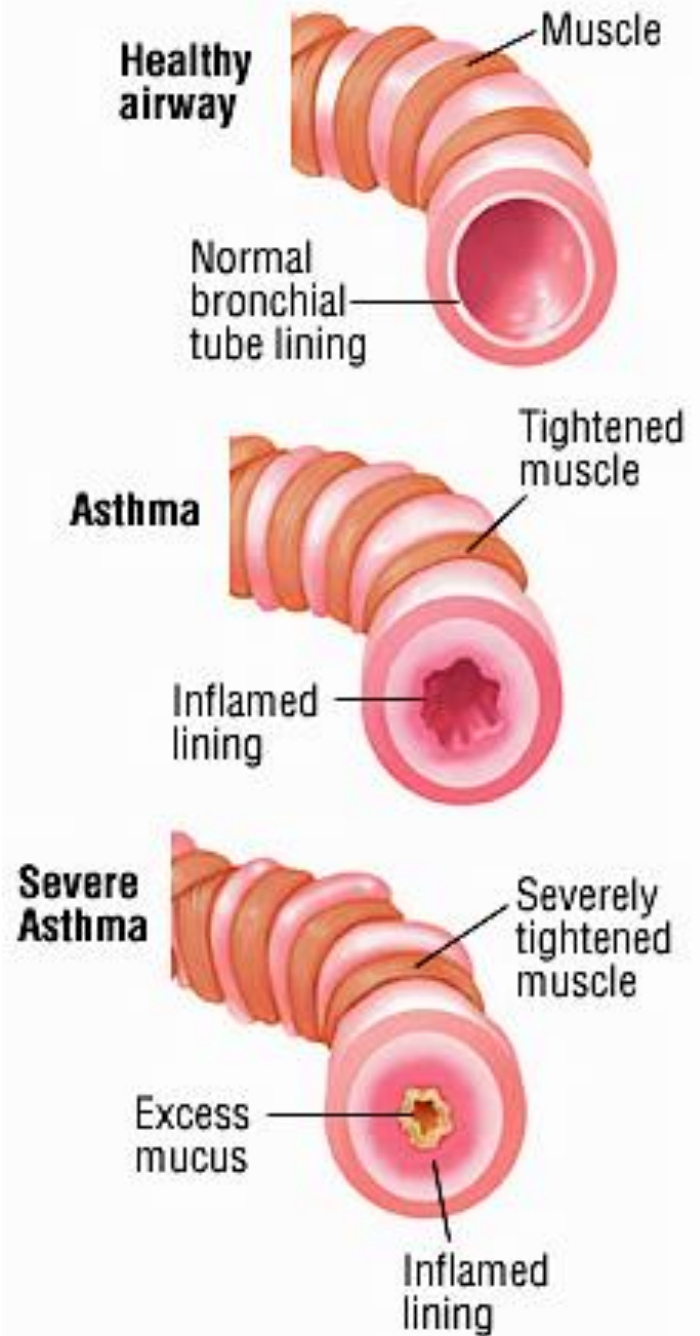


- Asthma as a heterogeneous disease
- Review the connection between social and environmental stressors and asthma
- Multilevel examination of discrimination and asthma

Living with asthma



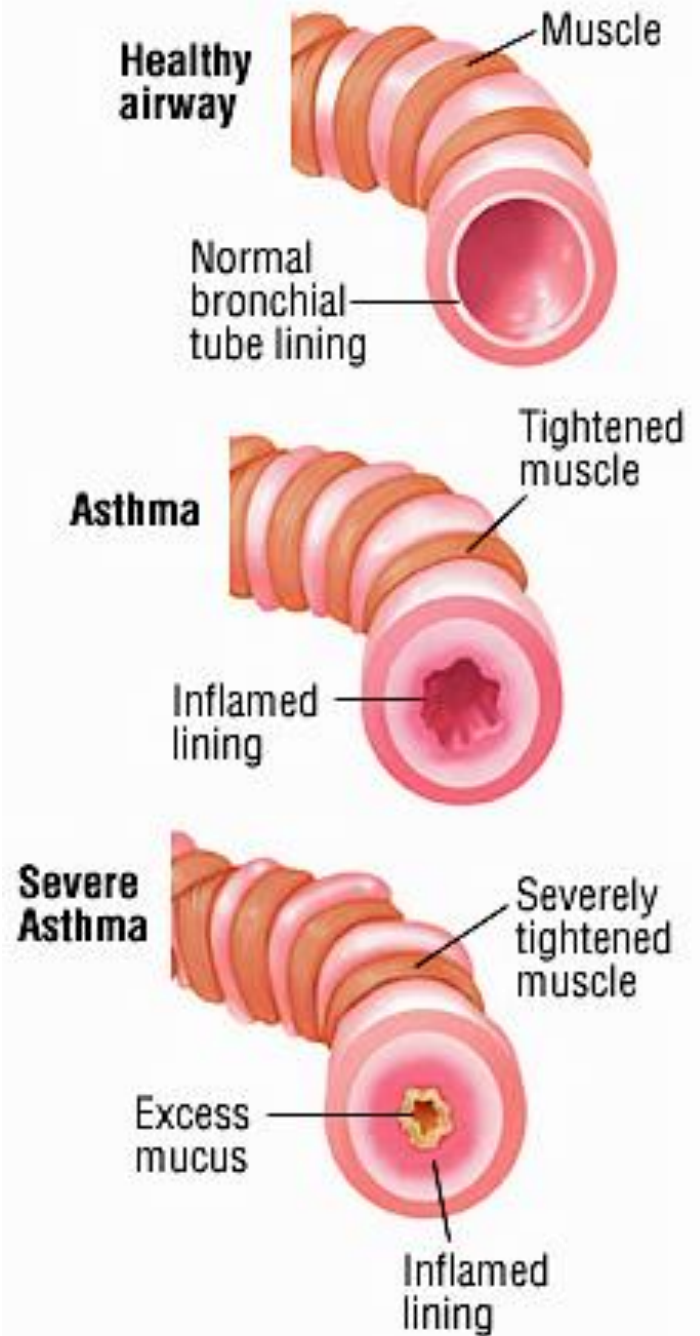
Photo Credit: Sam Oh
<https://lindseykonkel.files.wordpress.com/2012/10/the-racial-discrimination-embedded-in-modern-medicine.pdf>



Why is asthma important?

- Asthma is the most common chronic disease of childhood.
- Asthma consequences
 - Asthma affects a person's ability to sleep and learn
 - \$56 billion in lost costs due to asthma
 - Unnecessary missed days of school and work
 - Unnecessary hospitalizations

Not all asthma is the same



What is asthma?

- Tightening of Airways
- Airway Remodeling
- Thick Mucus Production
- Acute and Chronic Phases
 - Wheezing
 - Coughing
 - Shortness of Breath

What causes asthma?

The Asthma Syndrome

Symptoms of asthma, variable airflow obstruction

Asthma phenotype characteristics

Observable characteristic with no direct relationship to a disease process. Includes physiology, triggers, inflammatory parameters

Asthma Endotypes

Distinct disease entities which may be present in clusters of phenotypes, but each defined by a specific biological mechanism

Endotype 1

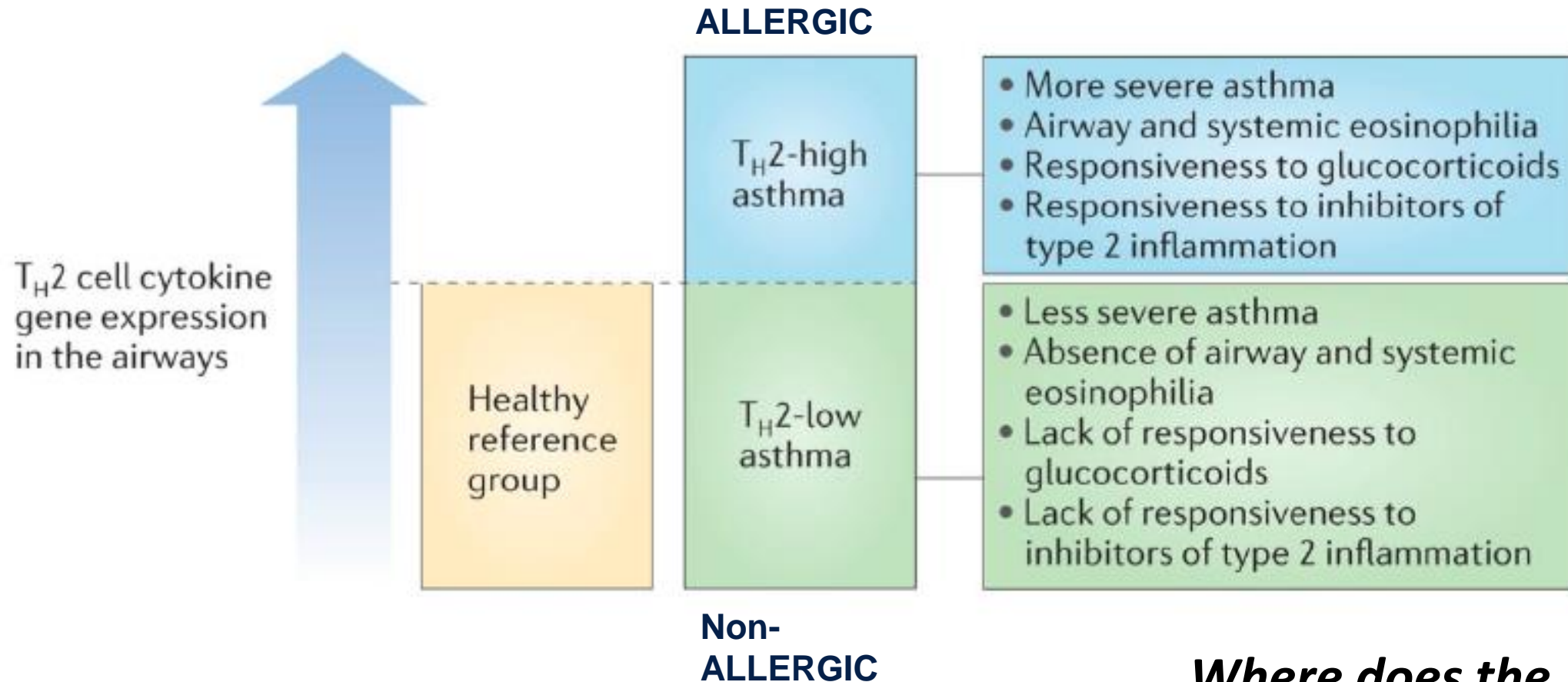
Endotype 2

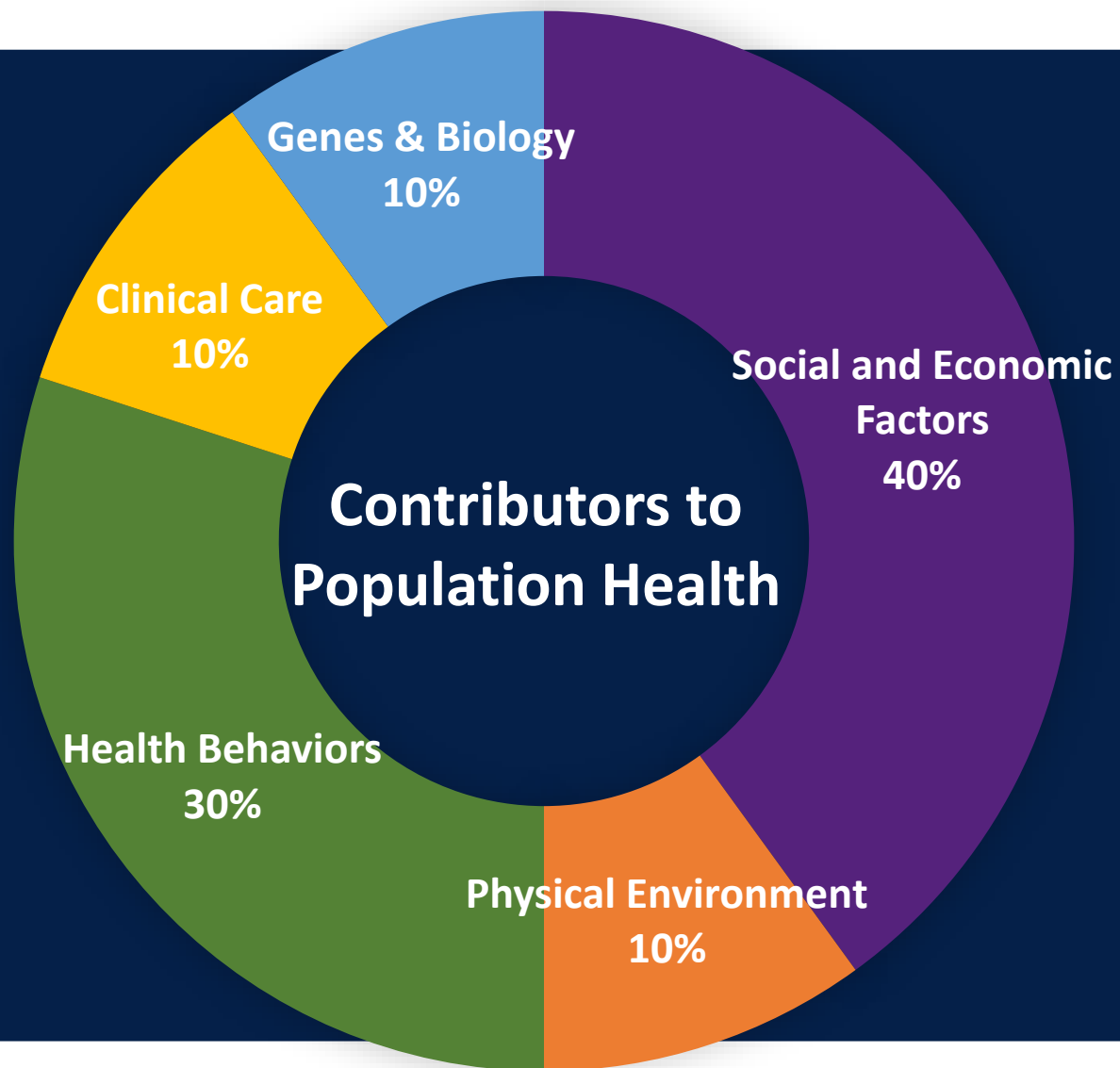
Endotype 3

Endotype 4

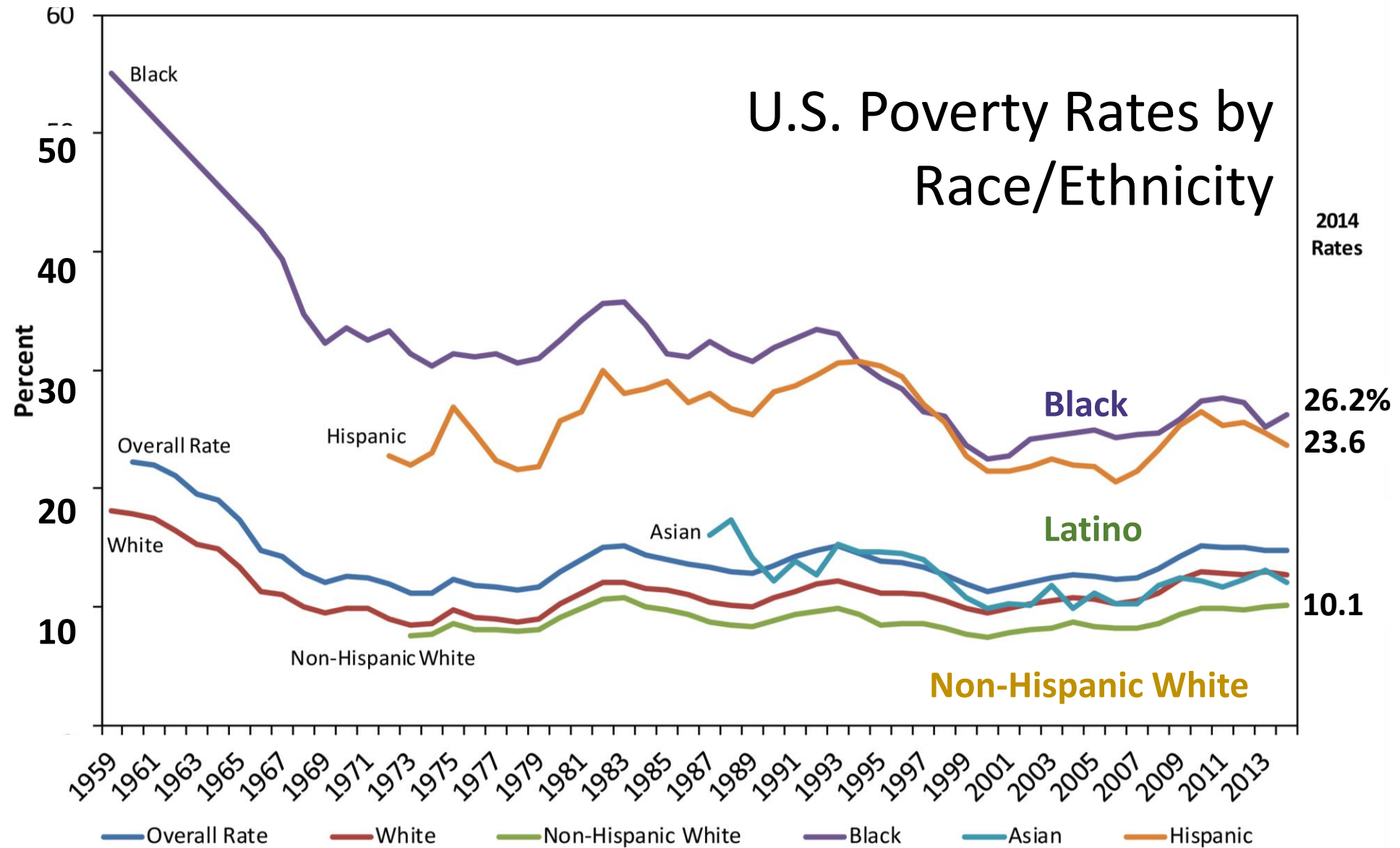
Endotype 5

Asthma Phenotypes



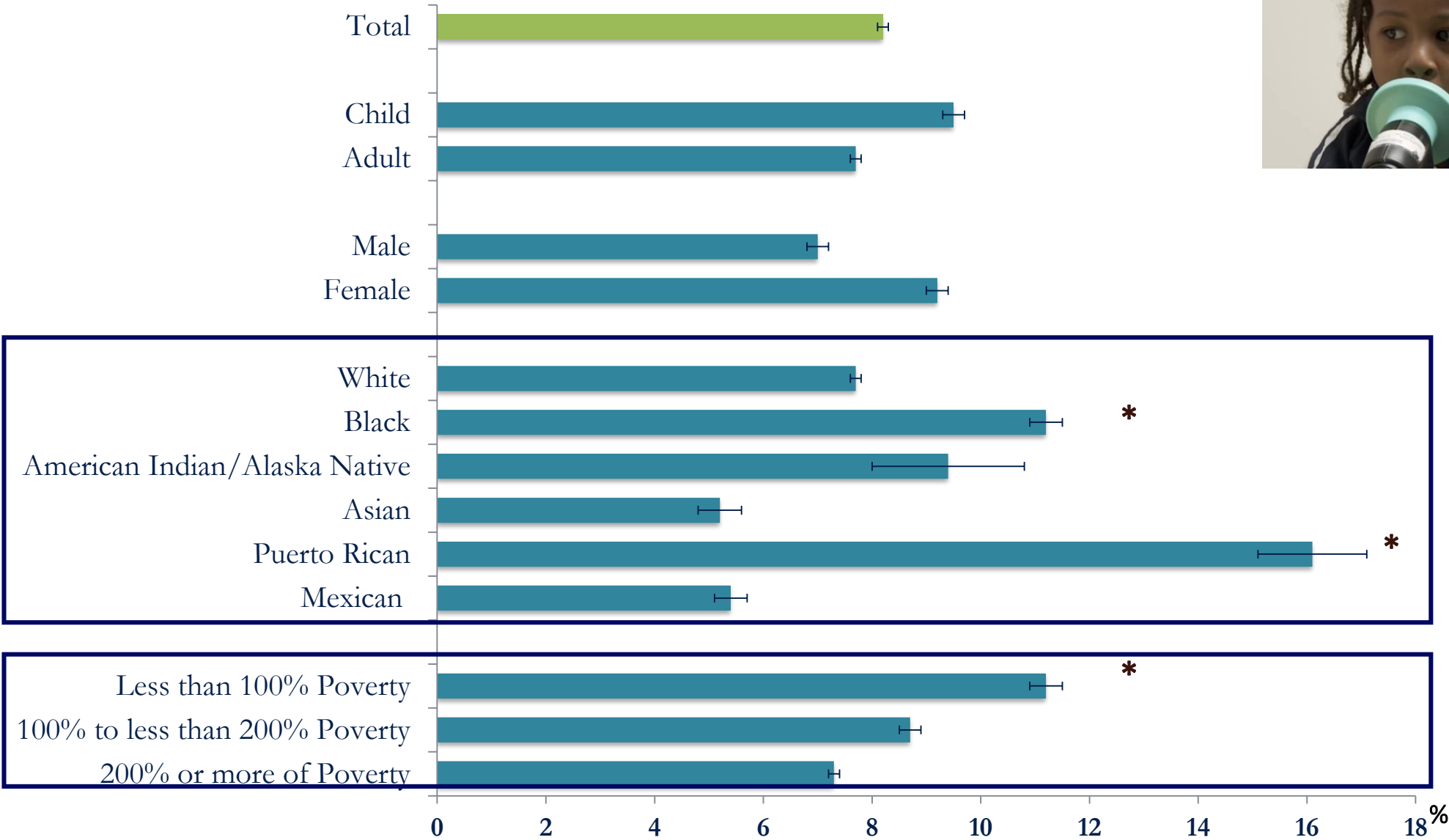


Minorities are at increased **RISK**:

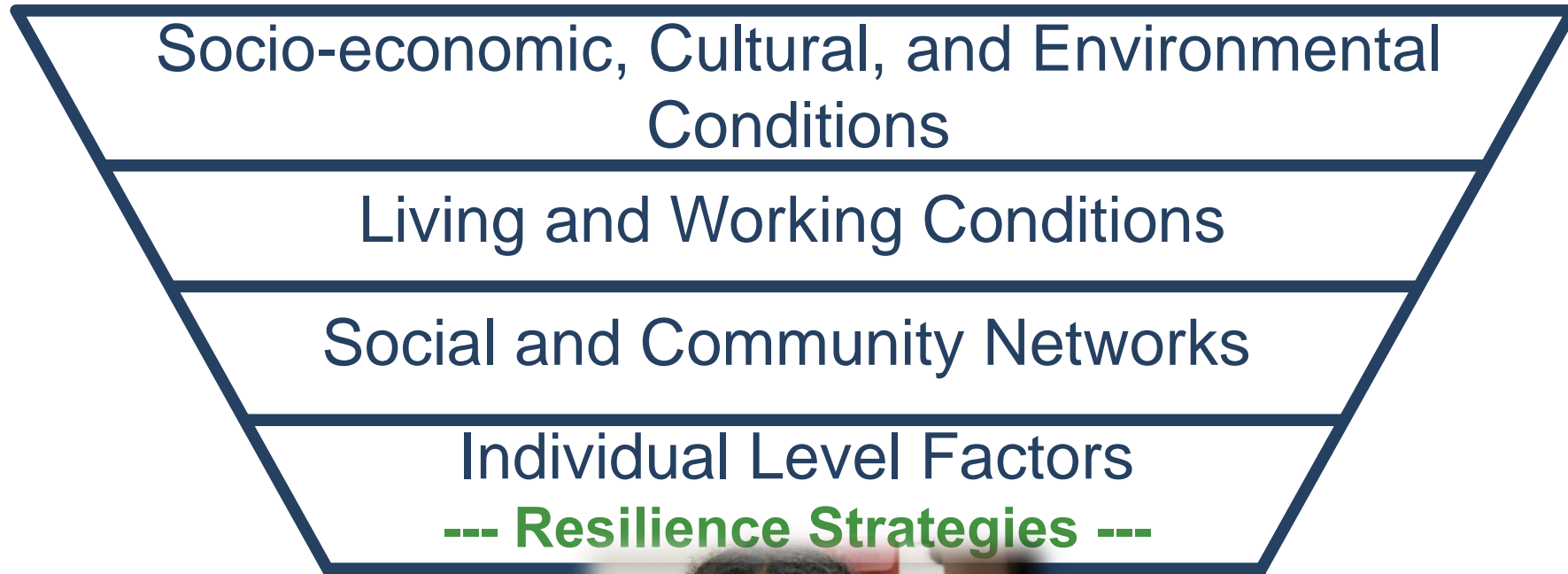


Source: U.S. Census Bureau, Current Population Survey, Annual Social and Economic Supplements.

Asthma prevalence, by selected demographic characteristics: United States, average annual 2008–2010

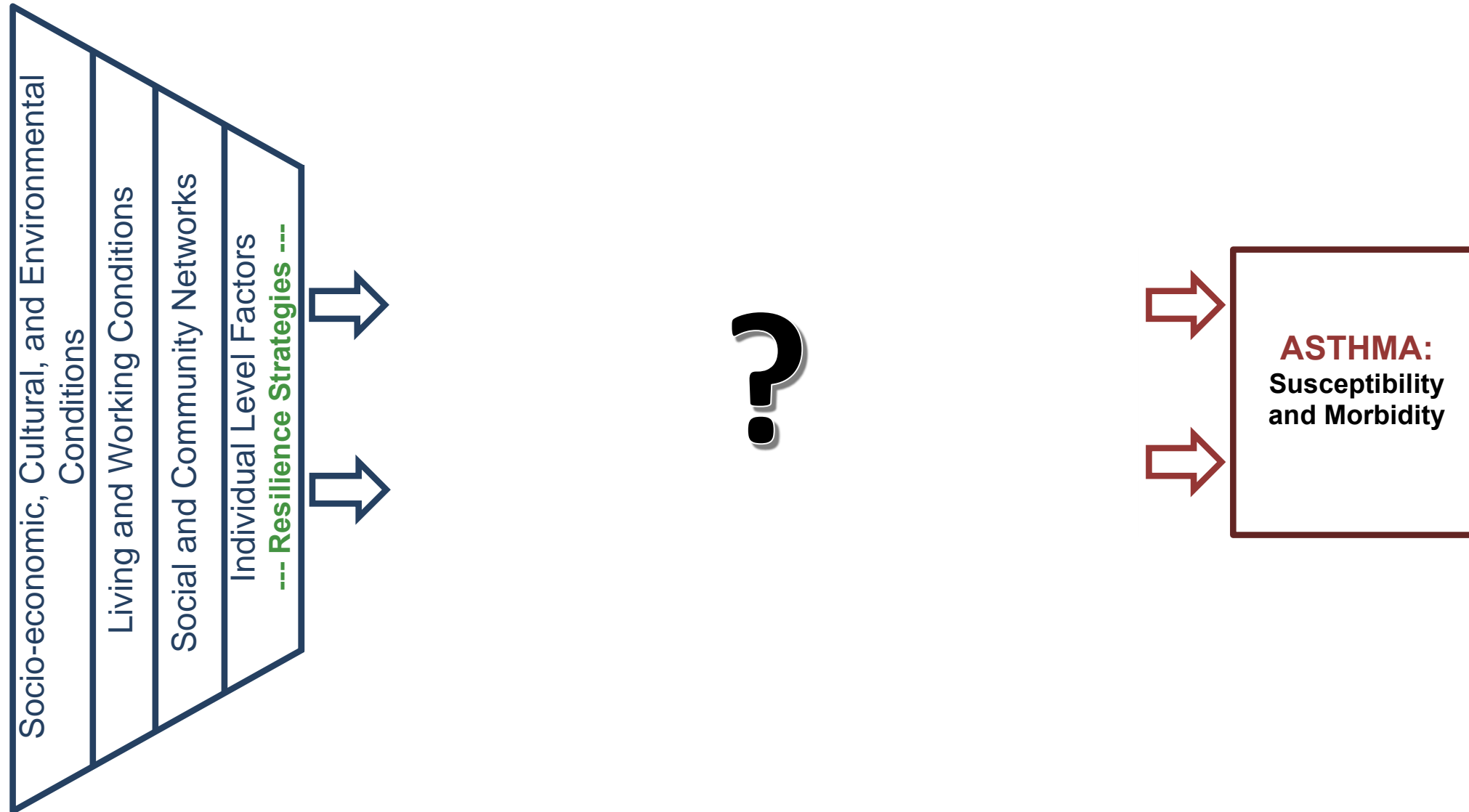


SOURCES: CDC/NCHS, Health Data Interactive and National Health Interview Survey.



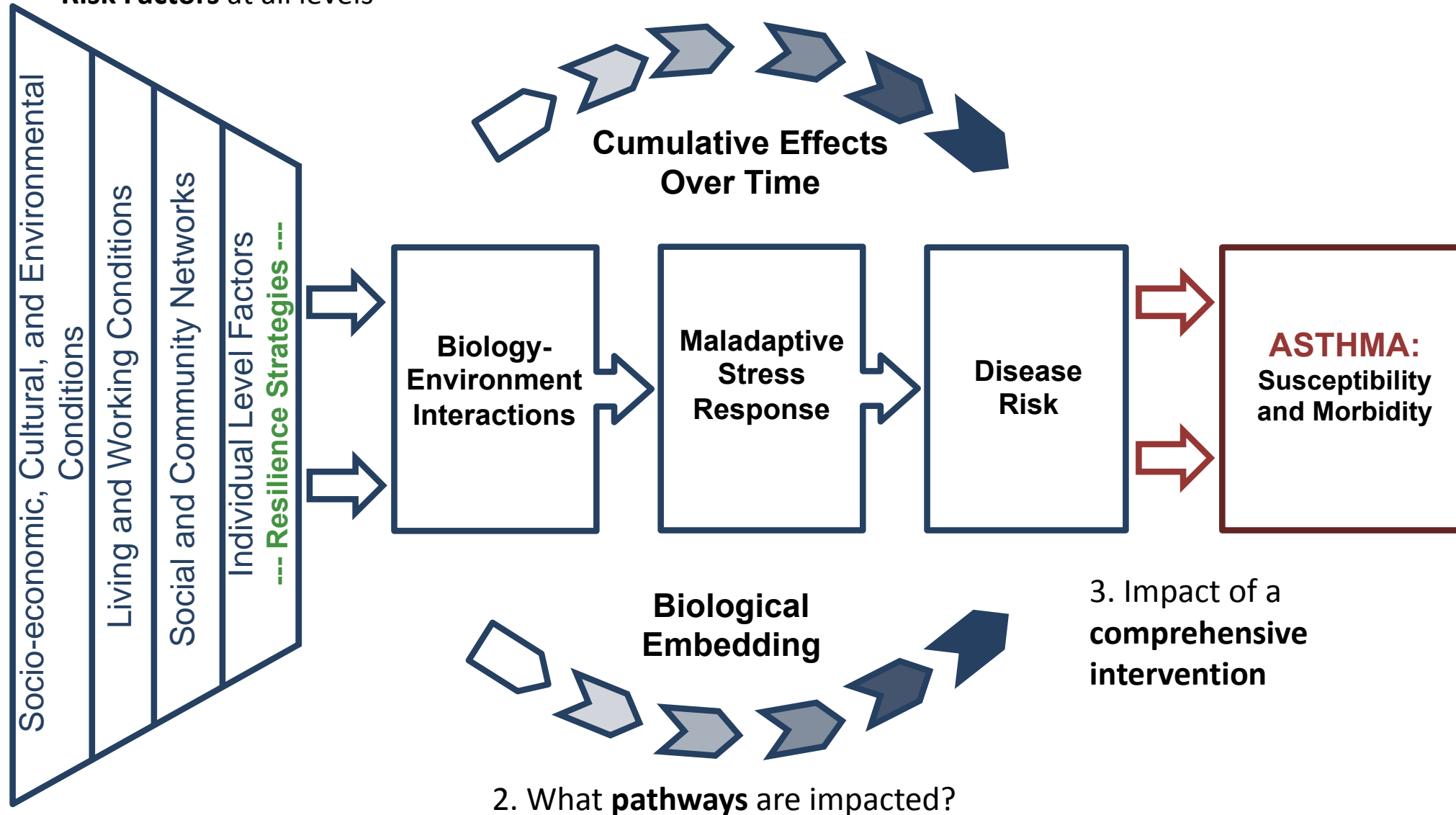
Socio-ecological Model of Health

Health Model of Asthma



Health Model of Asthma

1. Identify important
Risk Factors at all levels



GALA II & SAGE II STUDIES



> 6,500 Latino & African American children & young adults (8-21yrs)

Towards A Holistic Approach



Genomic

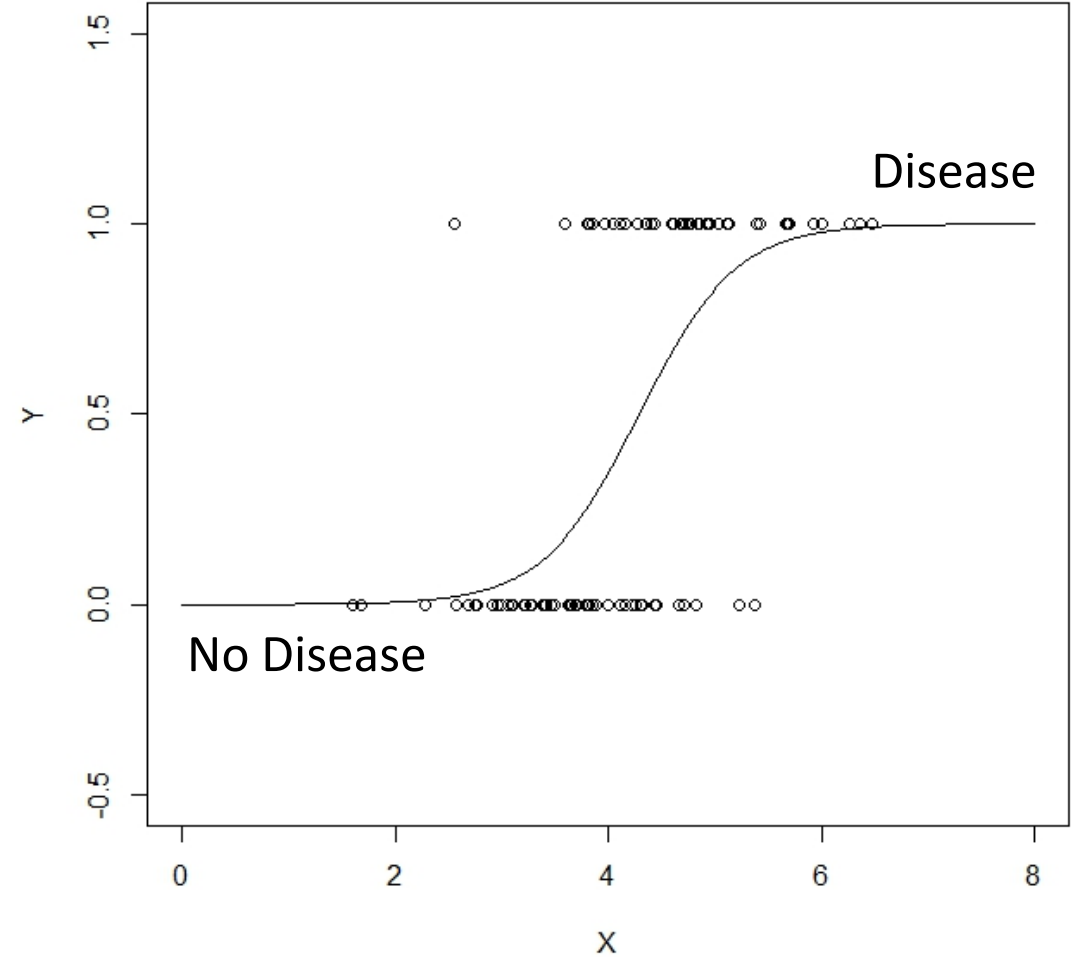
Clinical

Questionnaire

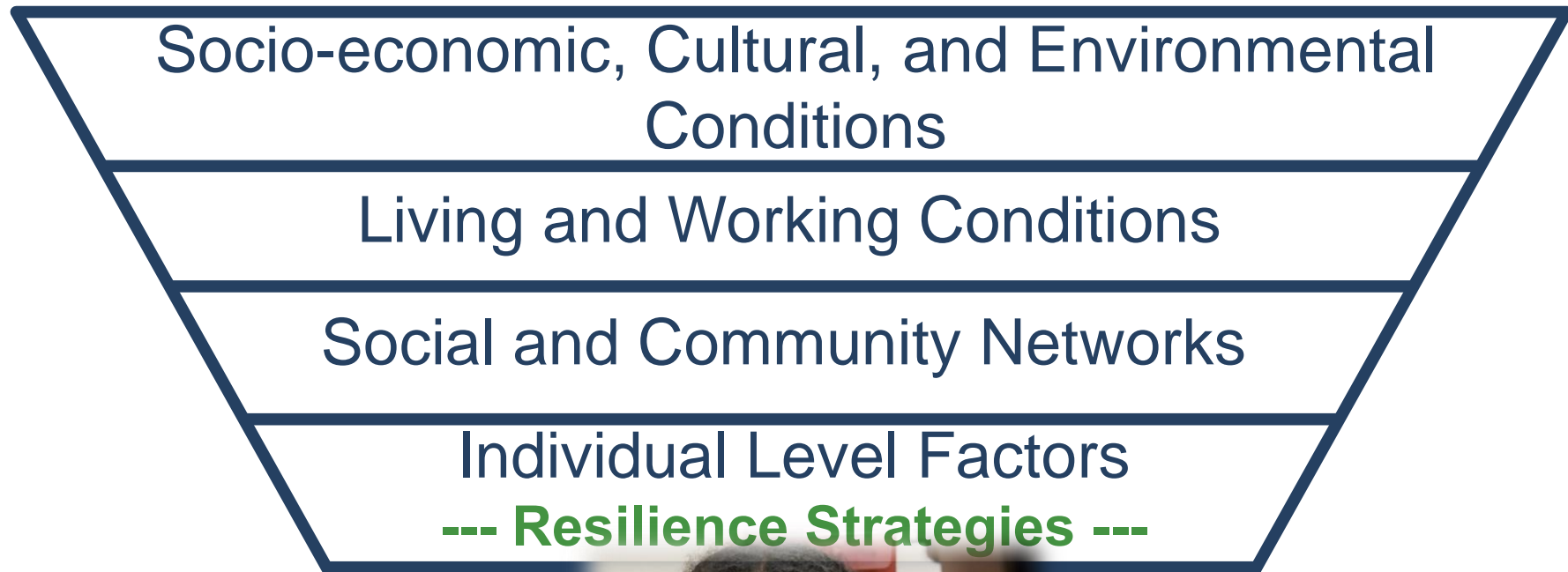
Socio-demographic

Environment

Towards A Holistic Approach



Identify which **Risk Factors** matter.



Socio-ecological Model of Health

Discrimination and Health

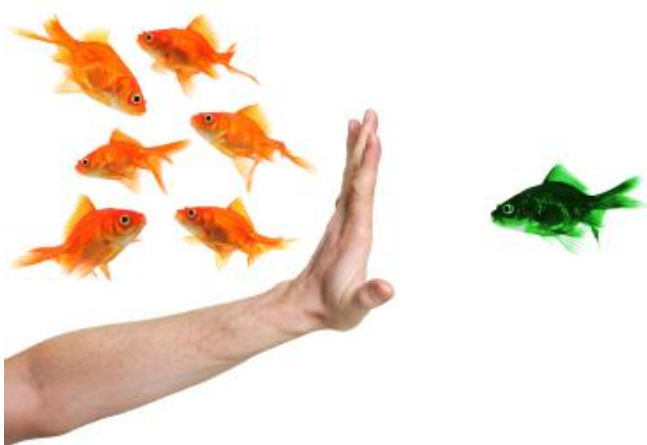
Black Women's Health Study



?
Asthma

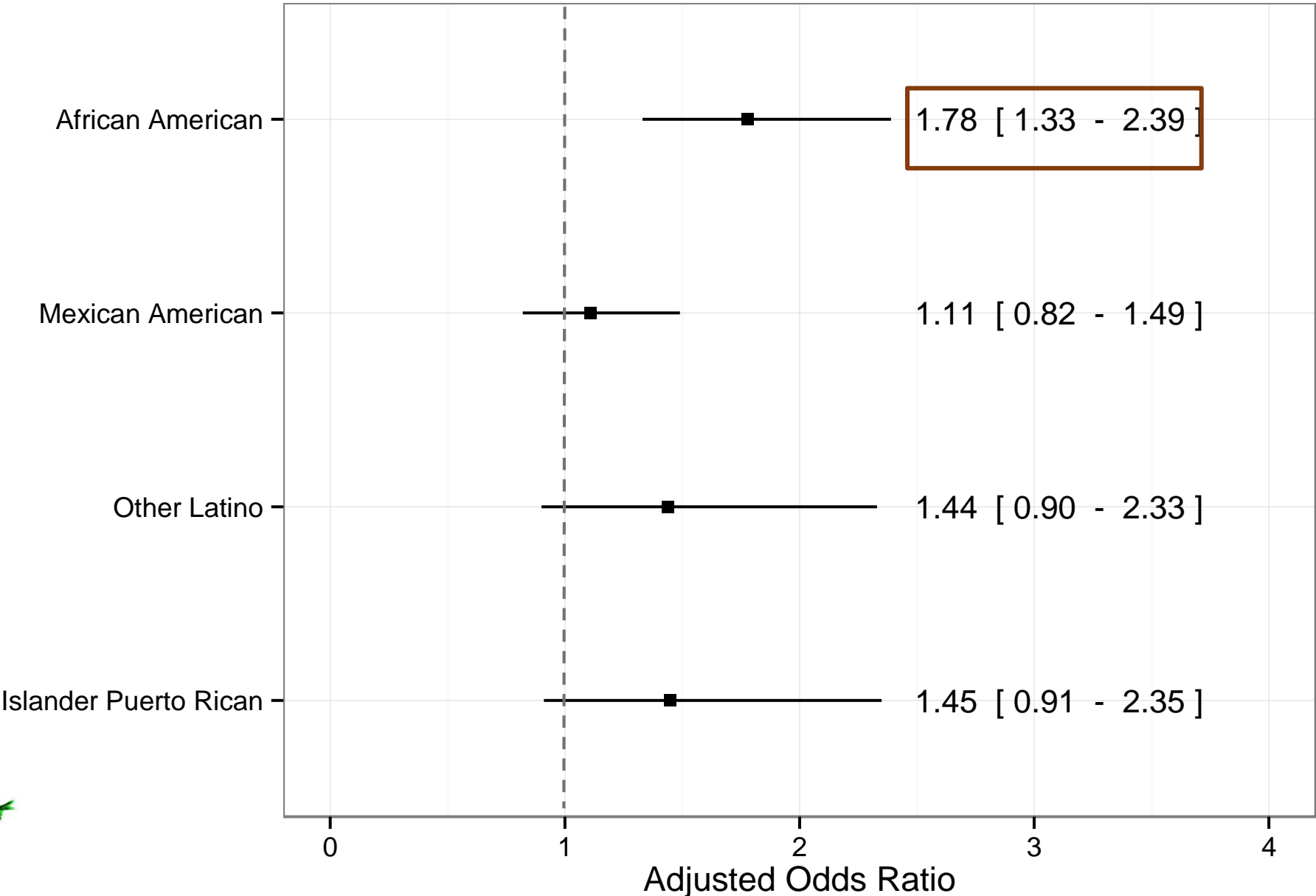
Self-Reports of Discrimination

Have you ever **experienced discrimination**, been prevented from doing something, or been hassled or made to feel inferior, in any of the following situations because of your race or color?

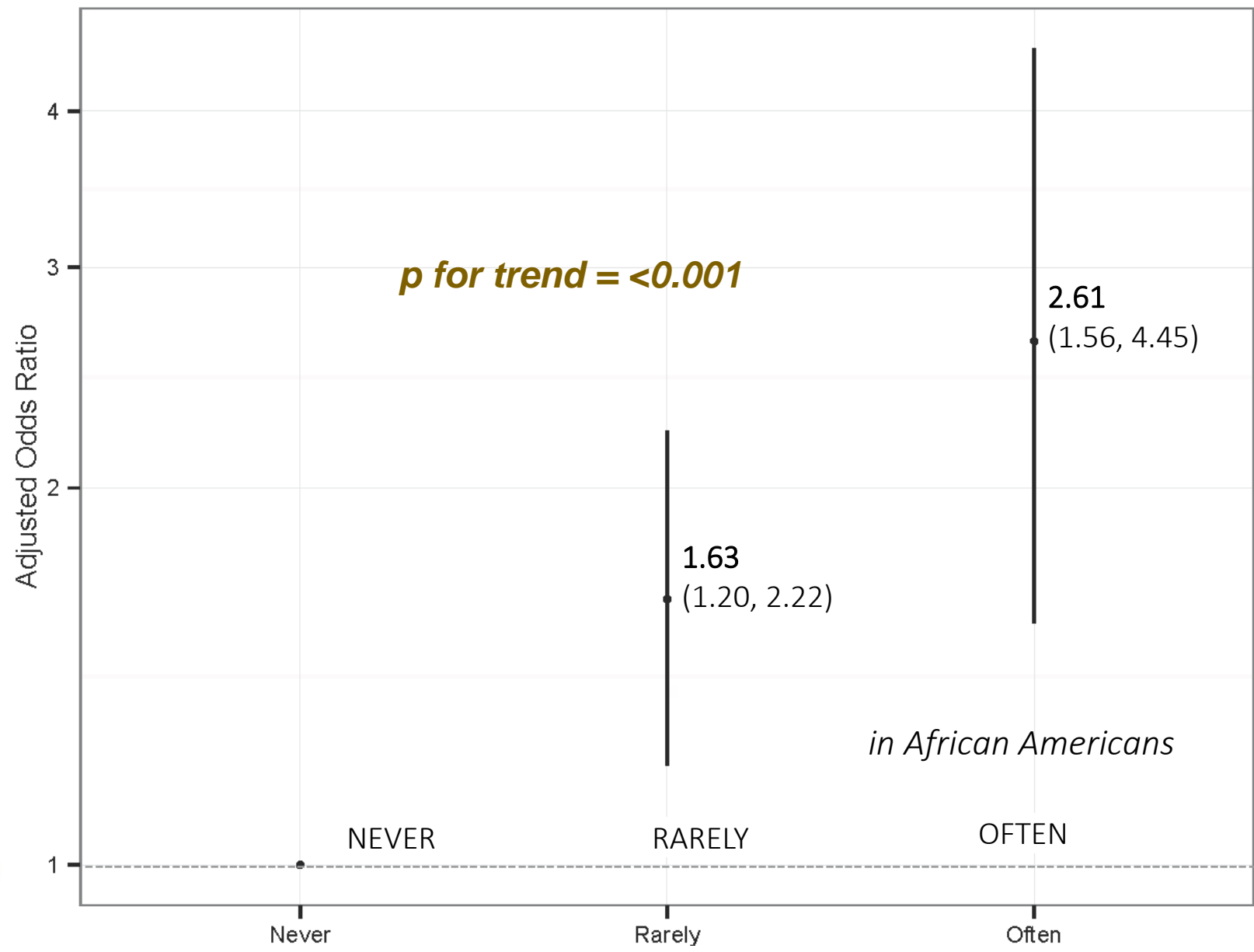


- At School
- Getting medical care
- Getting services in a store or restaurant
- On the street or in a public setting

Reports of Discrimination and having Asthma



Reports of Discrimination ‘Dose Response’



*More than
twice as
likely to get
asthma*



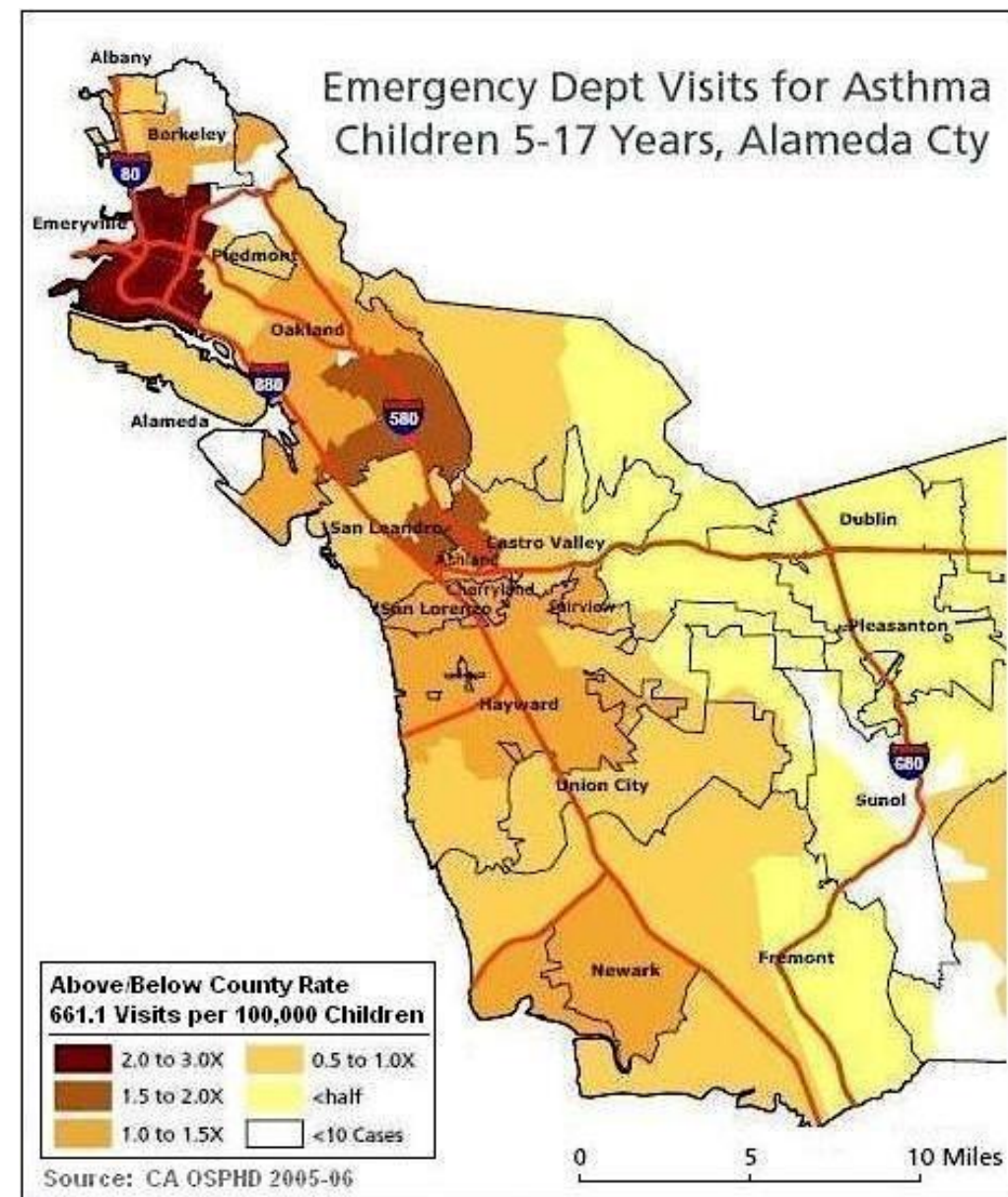
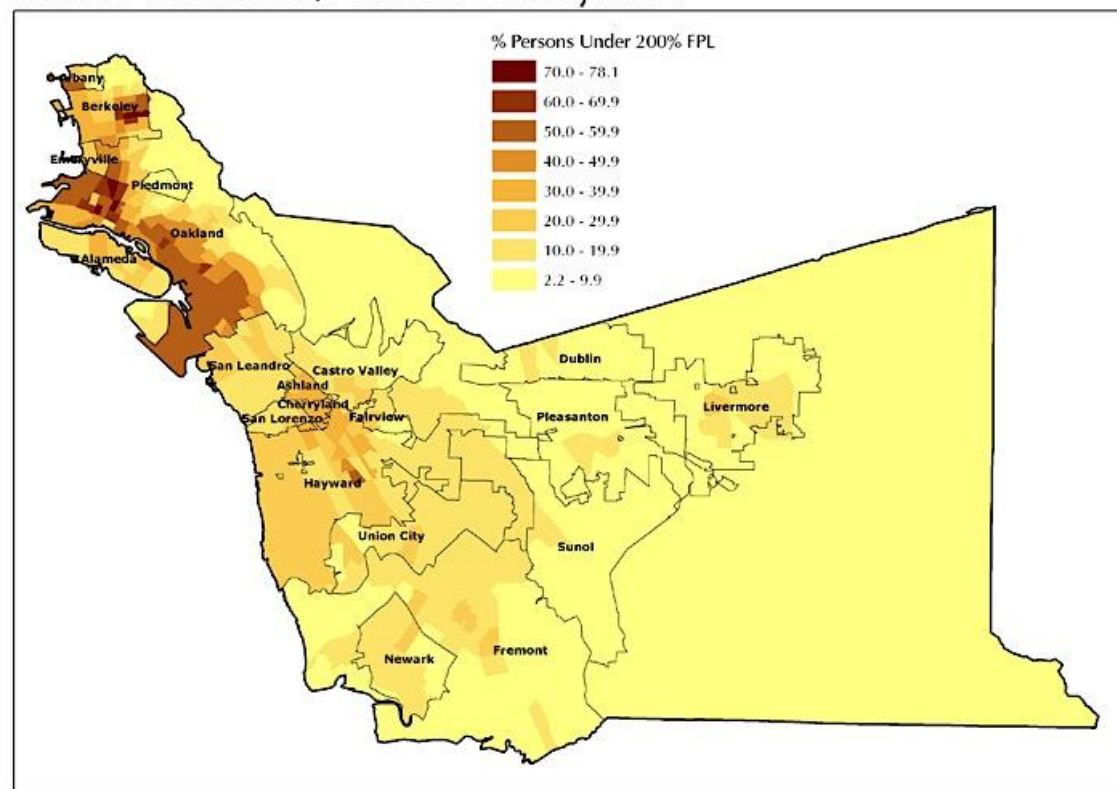
Examining **Risk** **Factors** across levels



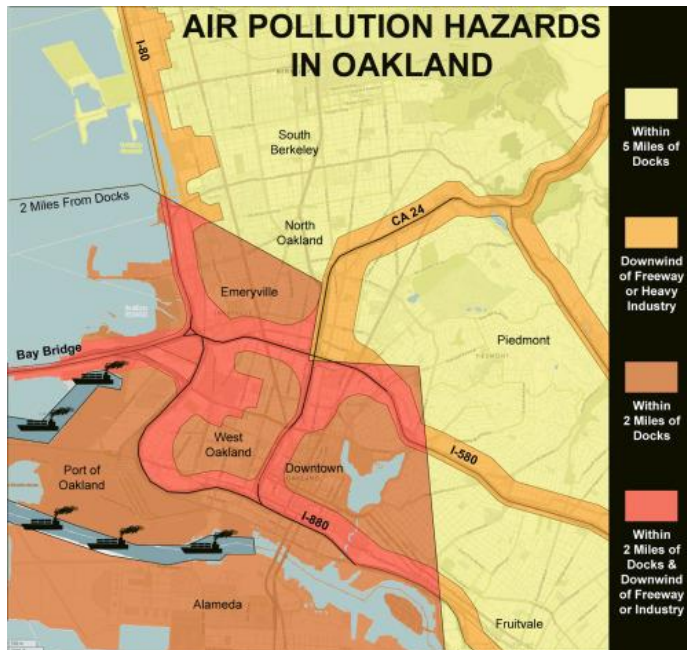
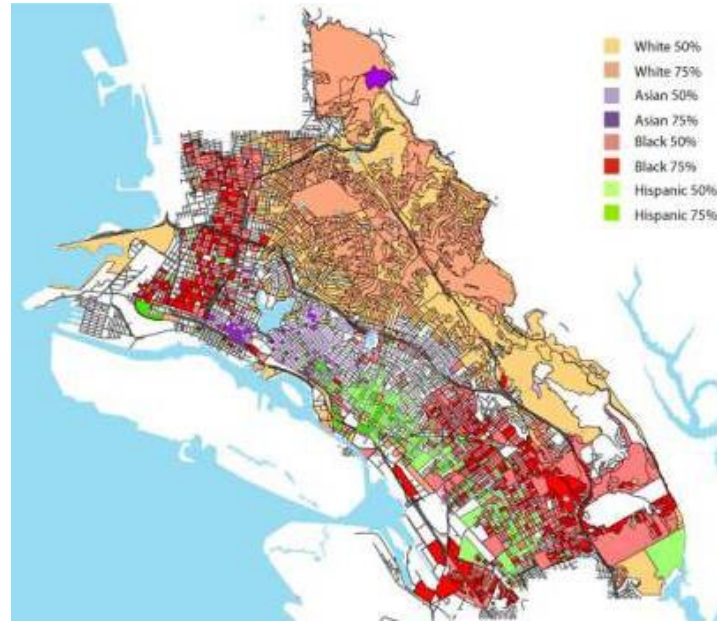
Socio-ecological Model of Health

Poverty Matters

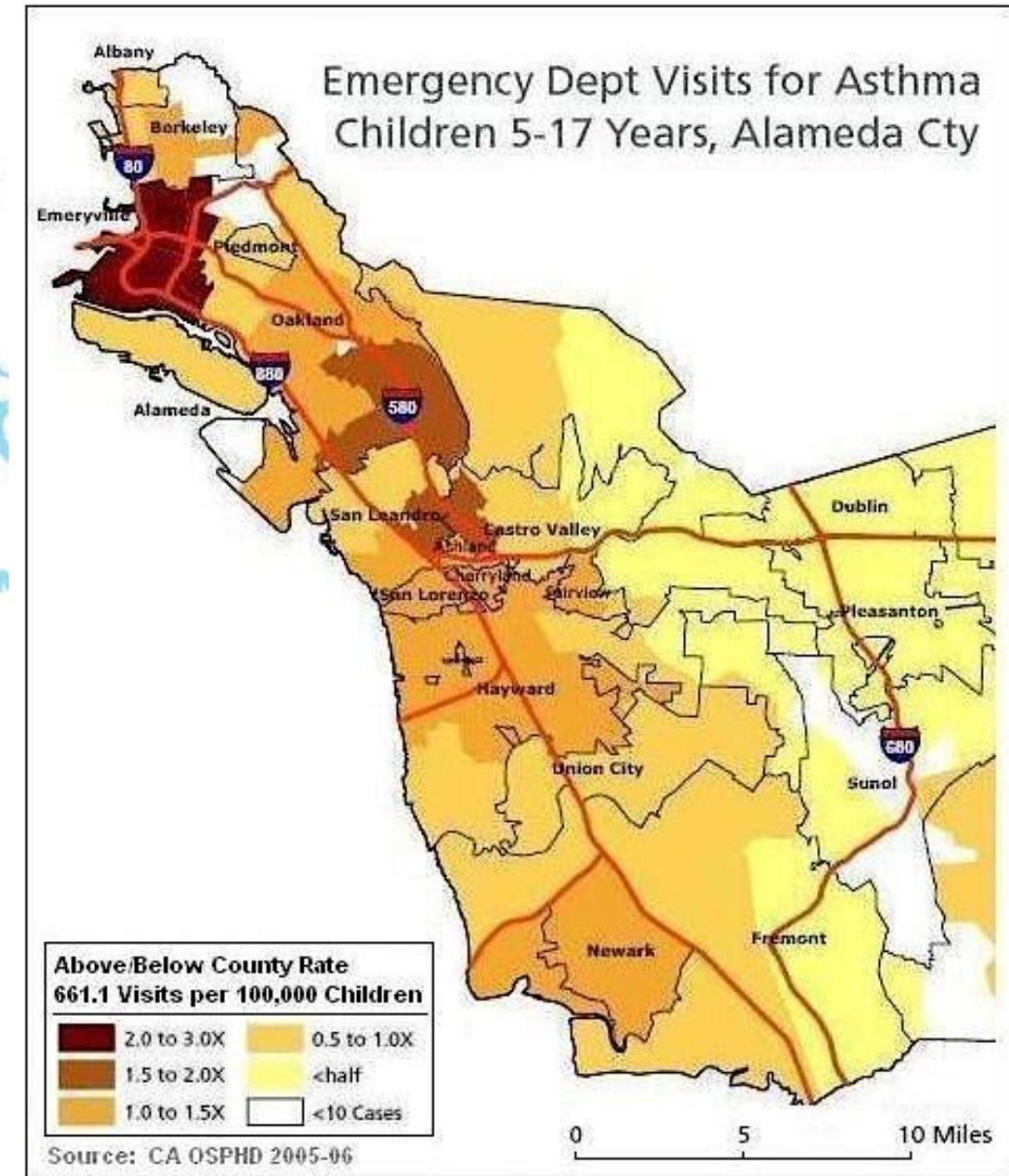
Persons Under 200% Federal Poverty Level



Place Matters



<http://itsacoop.blogspot.com/2013/09/berkeleyoakland-port-and-highway-air.html>
<https://dabrownstein.wordpress.com/tag/san-francisco-bay-area/>
 CA OSPHD 2005-2006



Air Pollution and Stress

Research

Synergistic Effects of Traffic-Related Air Pollution and Exposure to Violence on Urban Asthma Etiology

Jane E. Clougherty,¹ Jonathan I. Levy,¹ Laura D. Kubzansky,² P. Barry Ryan,³ Shakira Franco Suglia,^{1,4} Marina Jacobson Canner,⁵ and Rosalind J. Wright^{2,5}

¹Department of Environmental Health, and ²Department of Society, Human Development, and Health, Harvard School of Public Health, Boston, Massachusetts, USA; ³Department of Environmental Health, Rollins School of Public Health, Emory University, Atlanta, Georgia, USA; ⁴Department of Epidemiology, Harvard School of Public Health, Boston, Massachusetts, USA; ⁵Channing Laboratory, Department of Medicine, Brigham and Women's Hospital and Harvard Medical School, Boston, Massachusetts, USA

Parental stress increases the effect of traffic-related air pollution on childhood asthma incidence

Ketan Shankardass^a, Rob McConnell^{b,1}, Michael Jerrett^c, Joel Milam^b, Jean Richardson^b, and Kiros Berhane^b

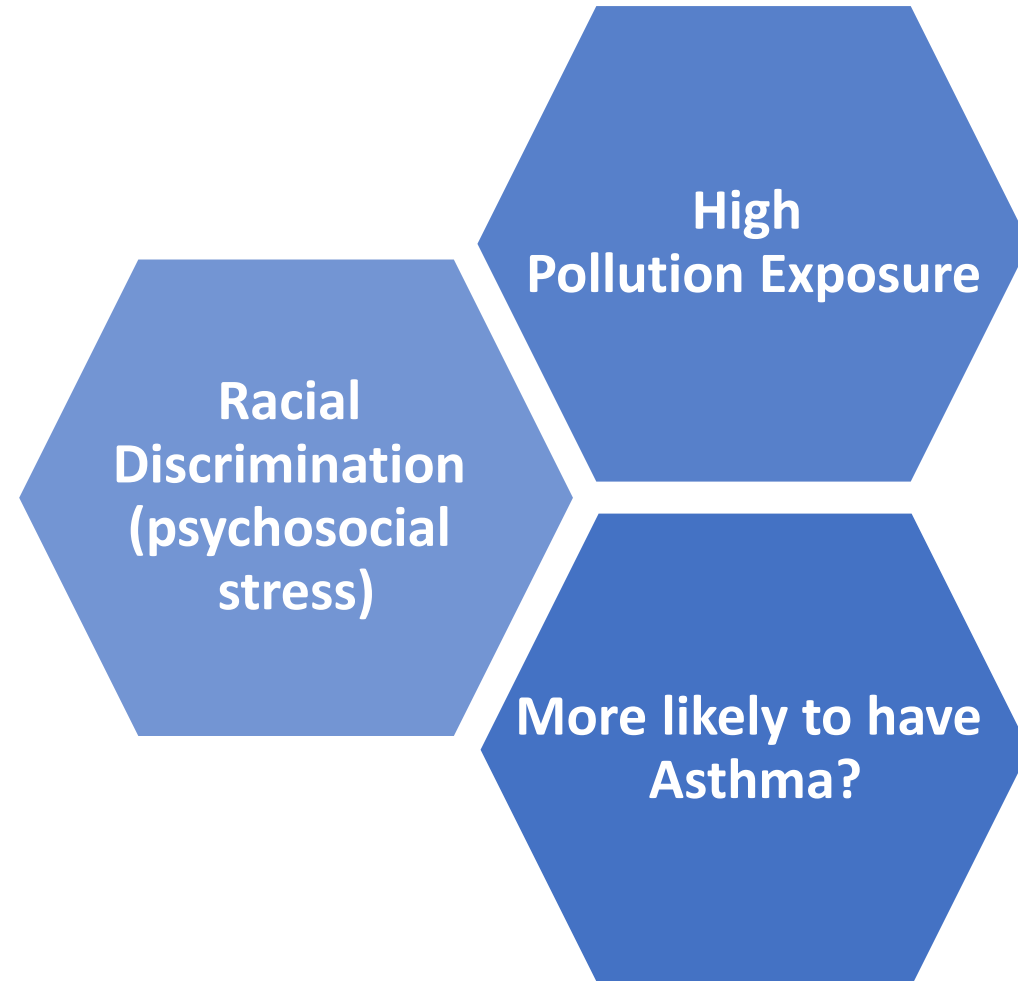
^aCentre for Research on Inner City Health, The Li Ka Shing Knowledge Institute of St. Michael's Hospital, 30 Bond Street, Toronto, ON, Canada M5B 1W8;

^bDepartment of Preventive Medicine, Keck School of Medicine, University of Southern California, 1540 Alcazar Street, Suite 236, Los Angeles, CA 90089-9013; and ^cSchool of Public Health, Division of Environmental Health Science, University of California, Berkeley, 50 University Hall #7360, Berkeley, CA 94720-7360



Research Question

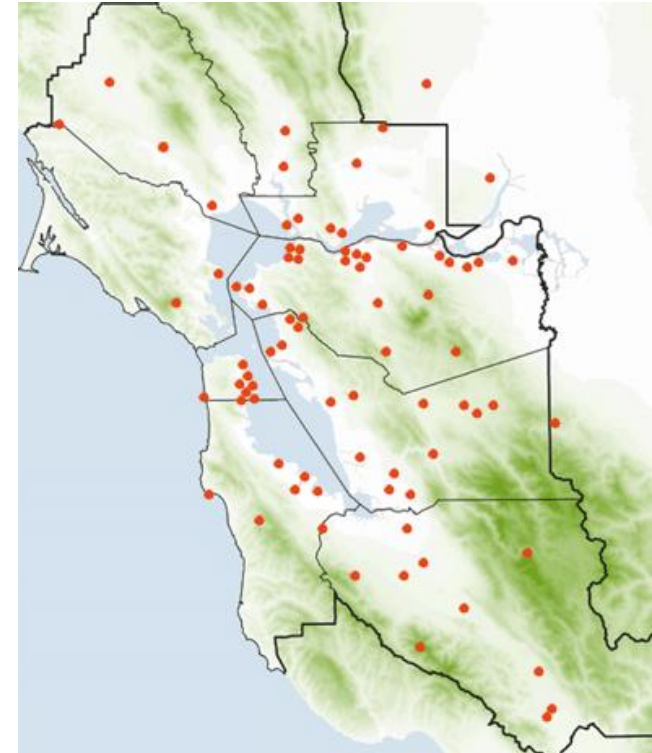
Is the association we observed with discrimination and asthma in African American youth **greater** in those with early life exposure to air pollution?



Air Pollution Assessment

1st Year of Life Exposure to NO₂

- Address Histories Obtained from Participants from birth
- Latitude and Longitude assigned using TomTom/Tele Atlas EZ-Locate software
- Ambient Air Pollution Measurements obtained from EPA Air Quality Systems



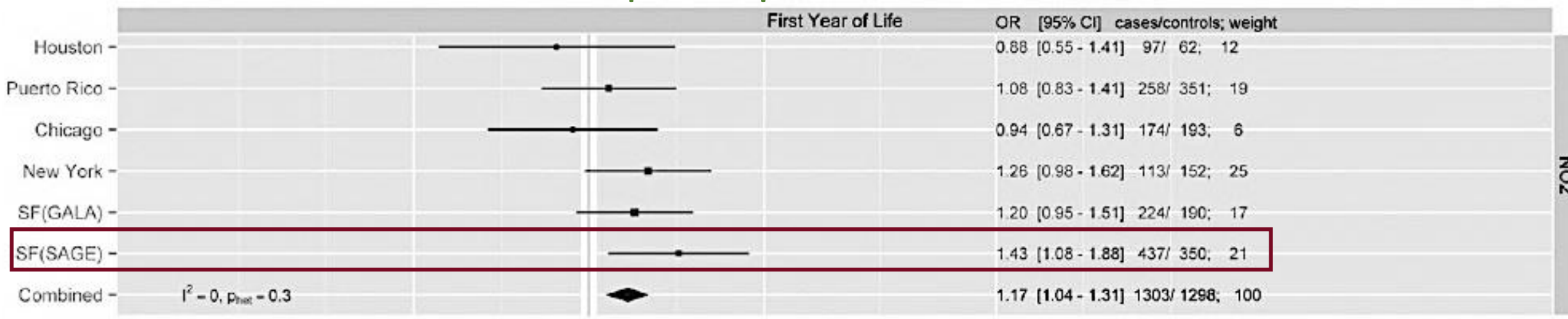
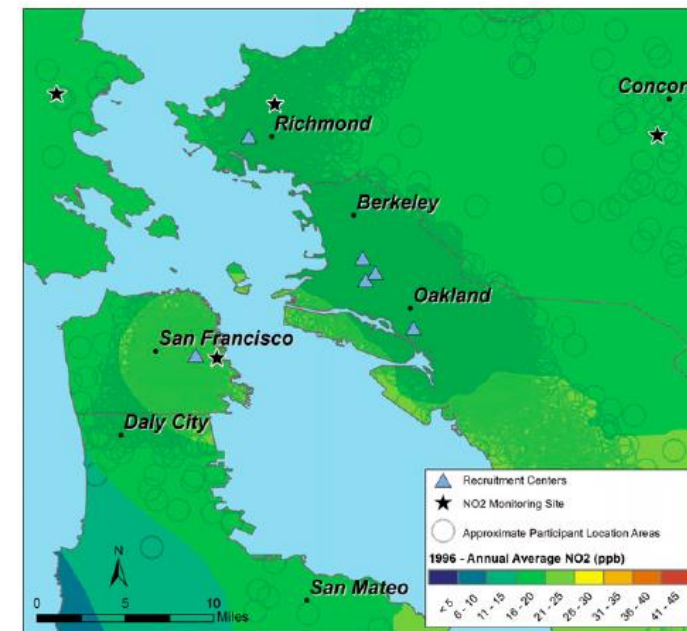
What's the role of air pollution?

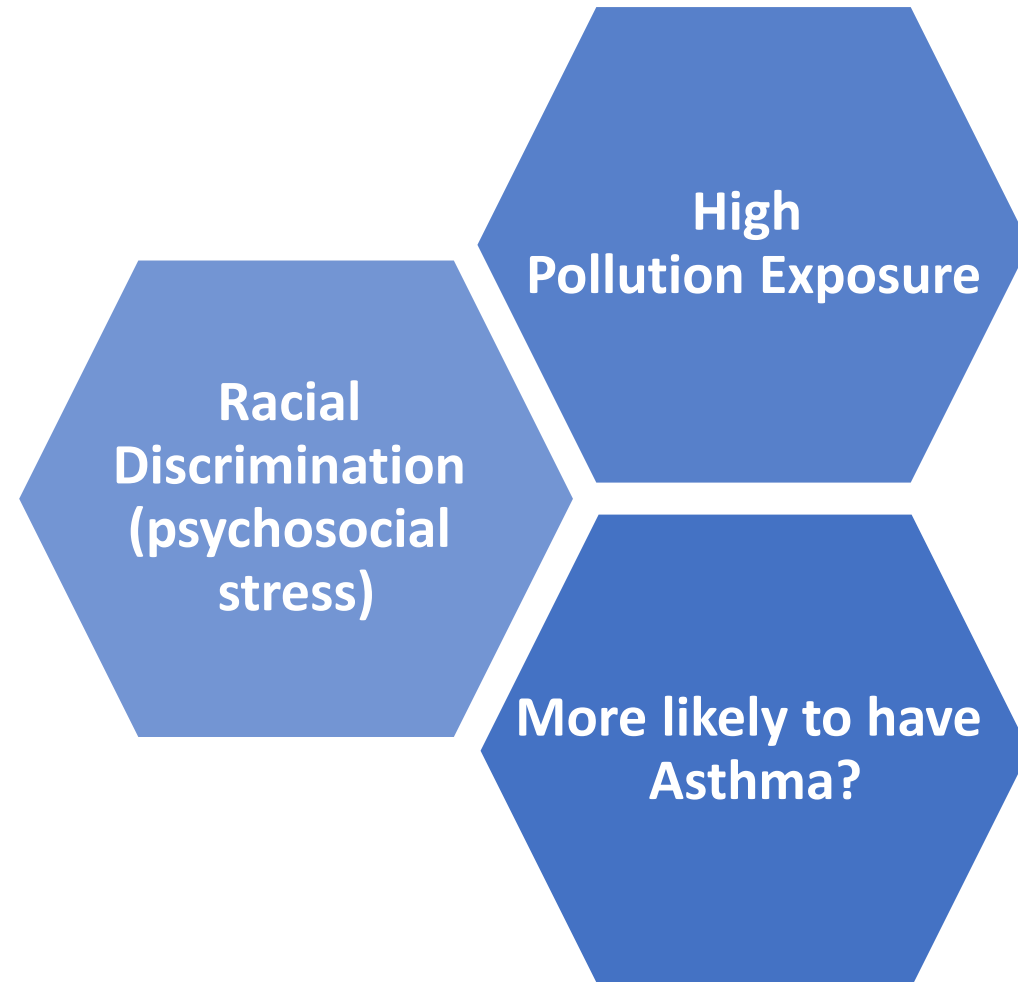
NO₂ - marker of traffic related air pollution
(how close you are to major roadways)

17% increase in the odds of asthma for
each 5 ppb increase in NO₂ exposure

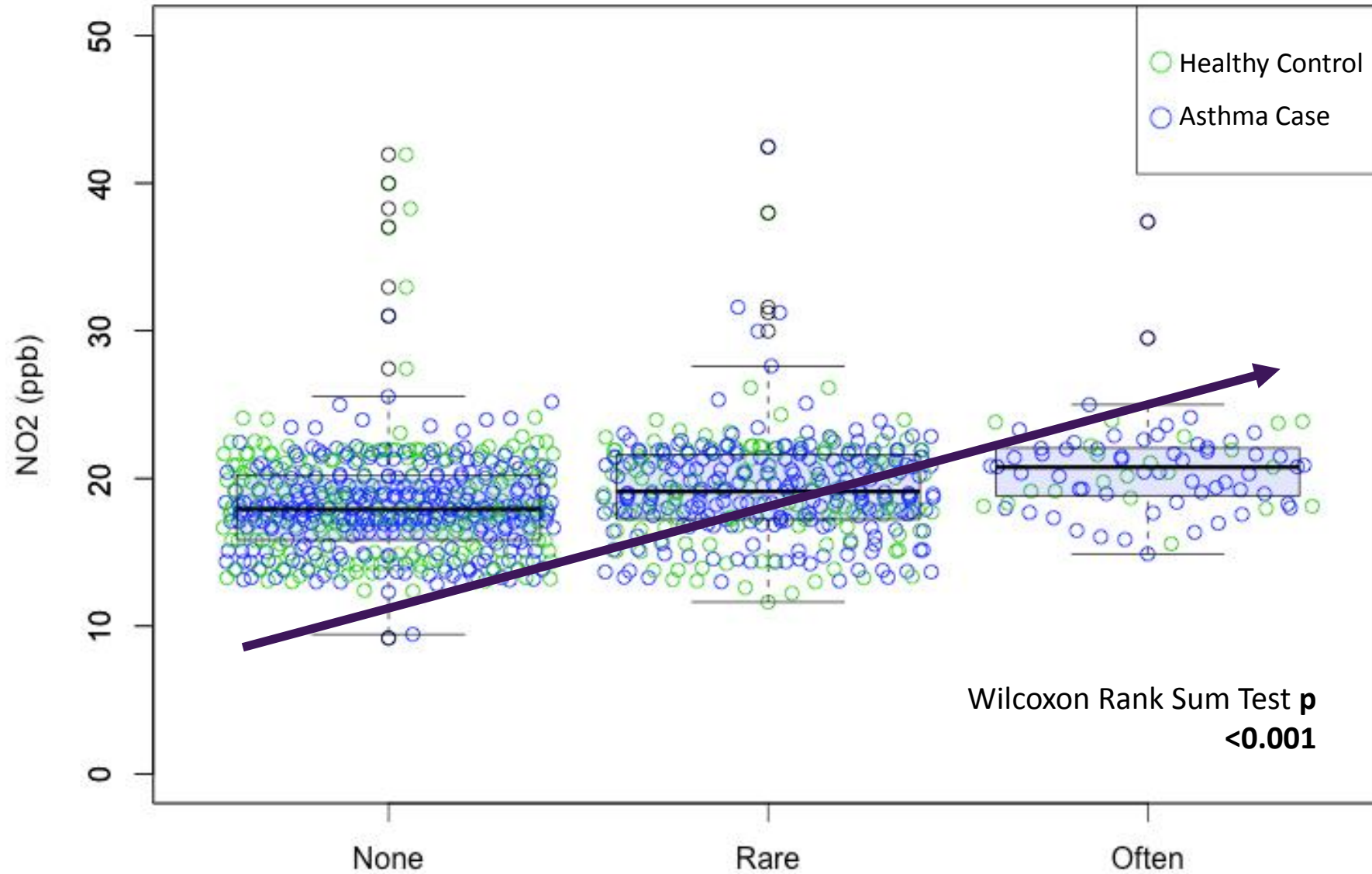
- California Standards 20ppb
- WHO Standards 50 ppb

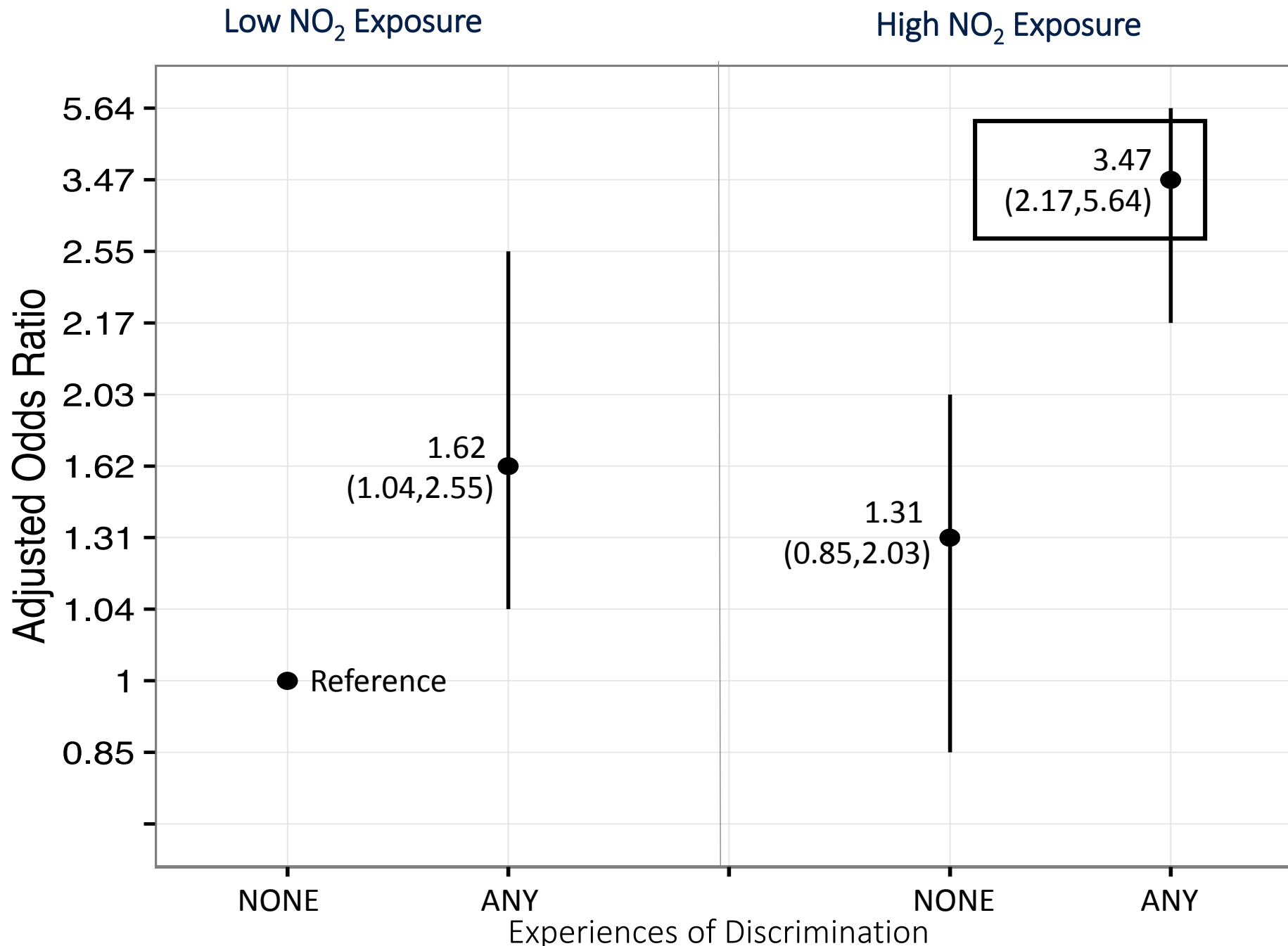
**43% increase in the odds of asthma in
African American participants**



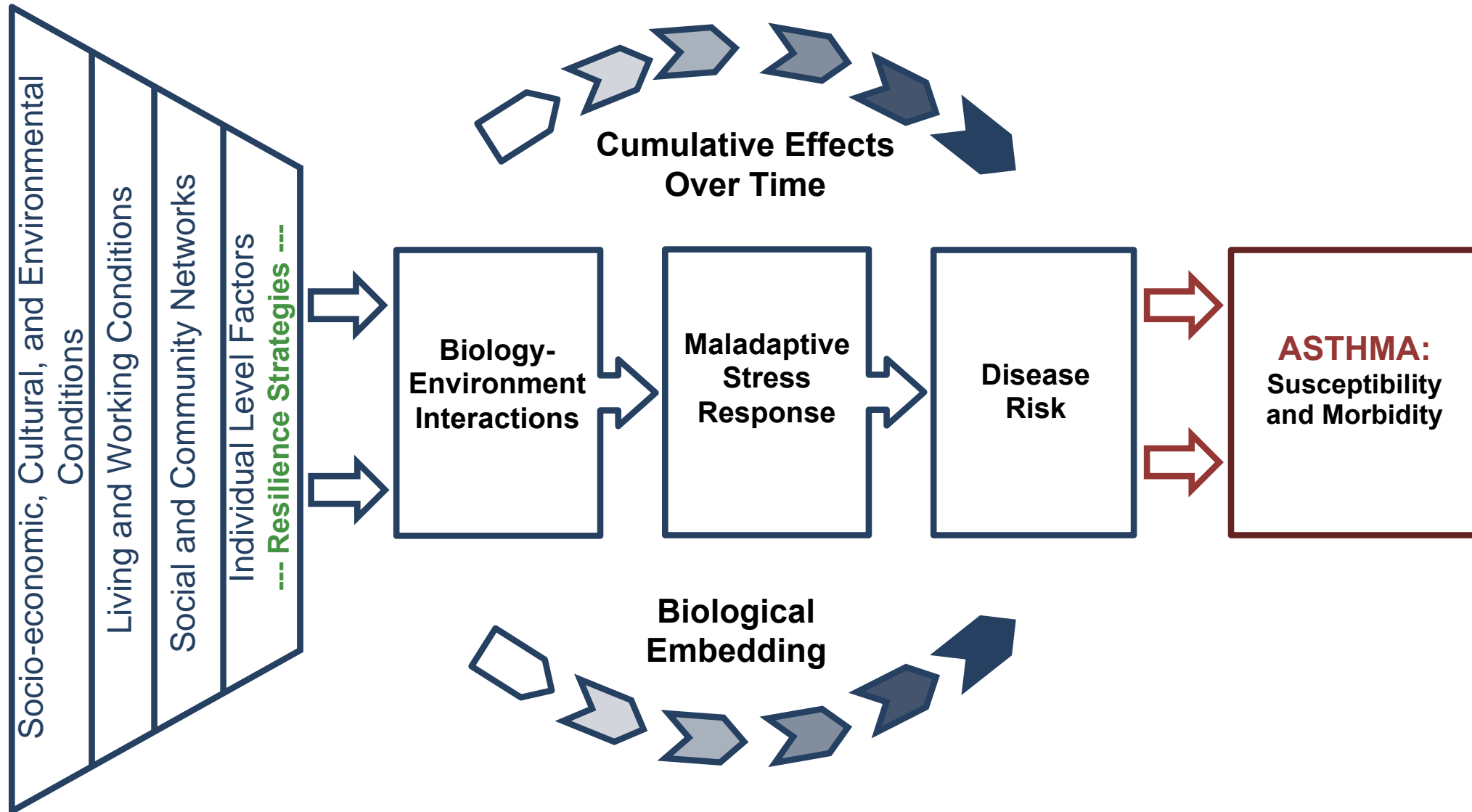


Relationship between Discrimination and NO₂ in African American Children





*More than
three times
likely to get
asthma*



2. What **pathways** are impacted?

What asthma type?



The Asthma Syndrome

Symptoms of asthma, variable airflow obstruction

Asthma phenotype characteristics

Observable characteristic with no direct relationship to a disease process. Includes physiology, triggers, inflammatory parameters

Asthma Endotypes

Distinct disease entities which may be present in clusters of phenotypes, but each defined by a specific biological mechanism

Endotype 1

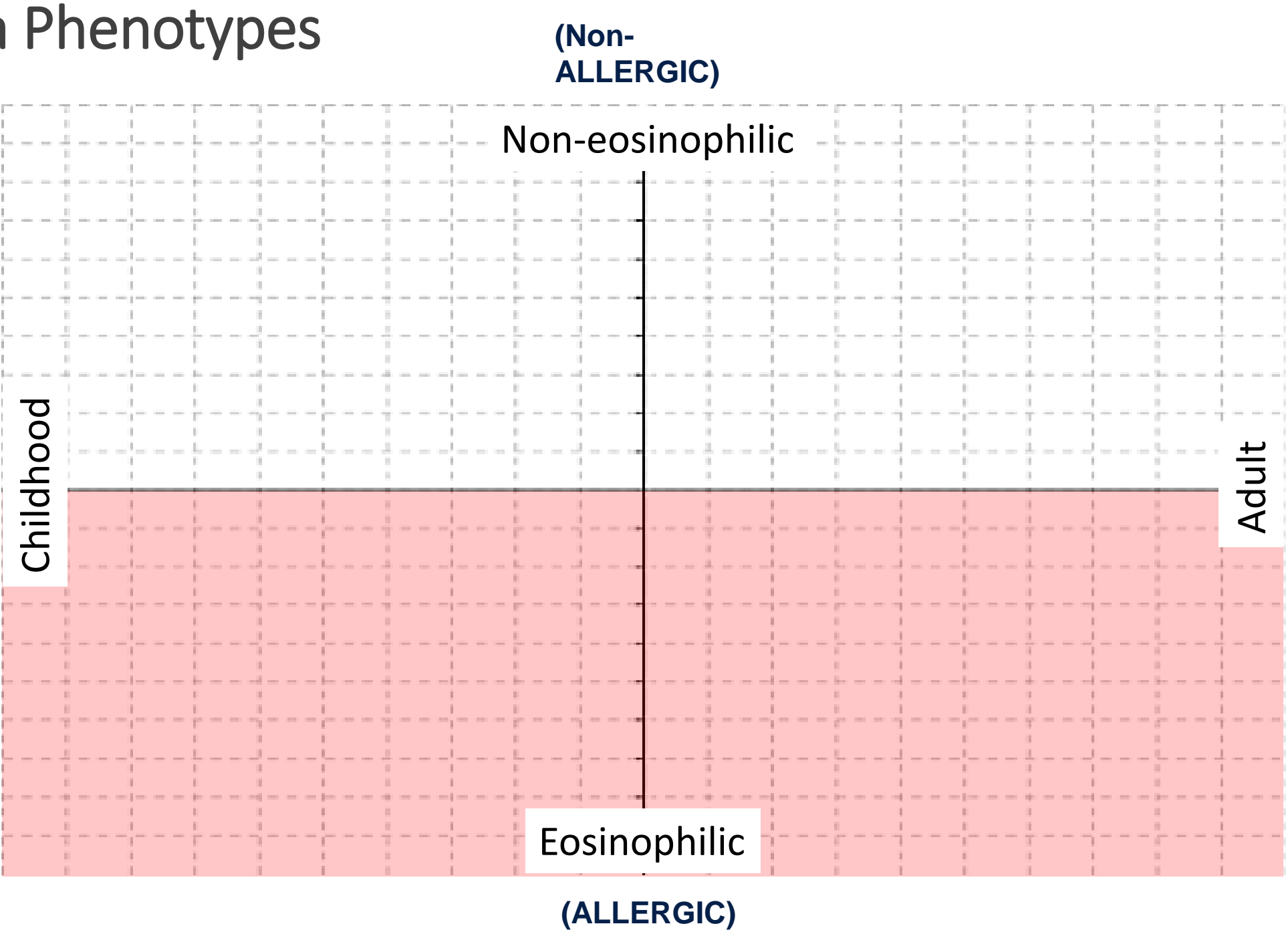
Endotype 2

Endotype 3

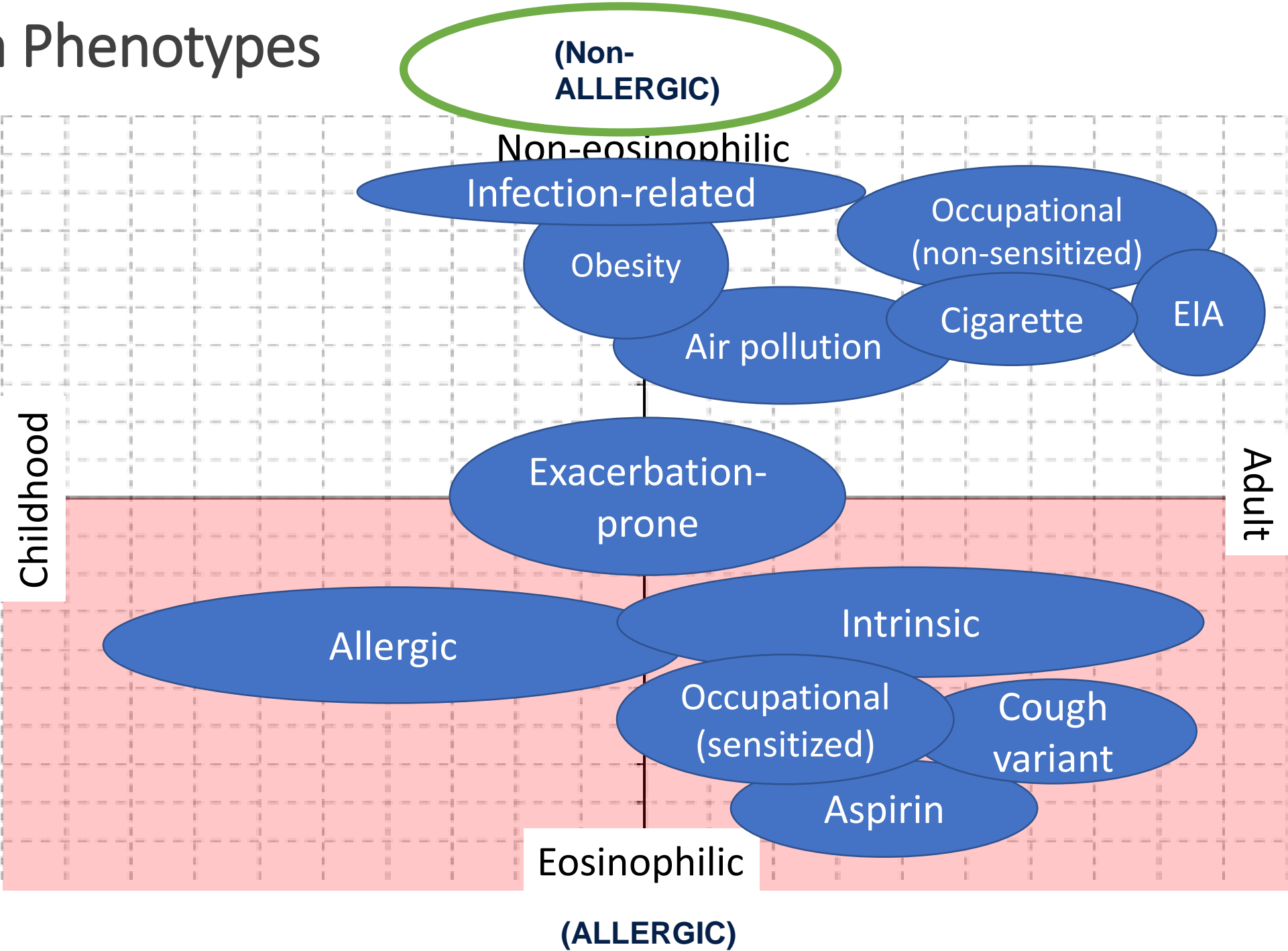
Endotype 4

Endotype 5

Asthma Phenotypes



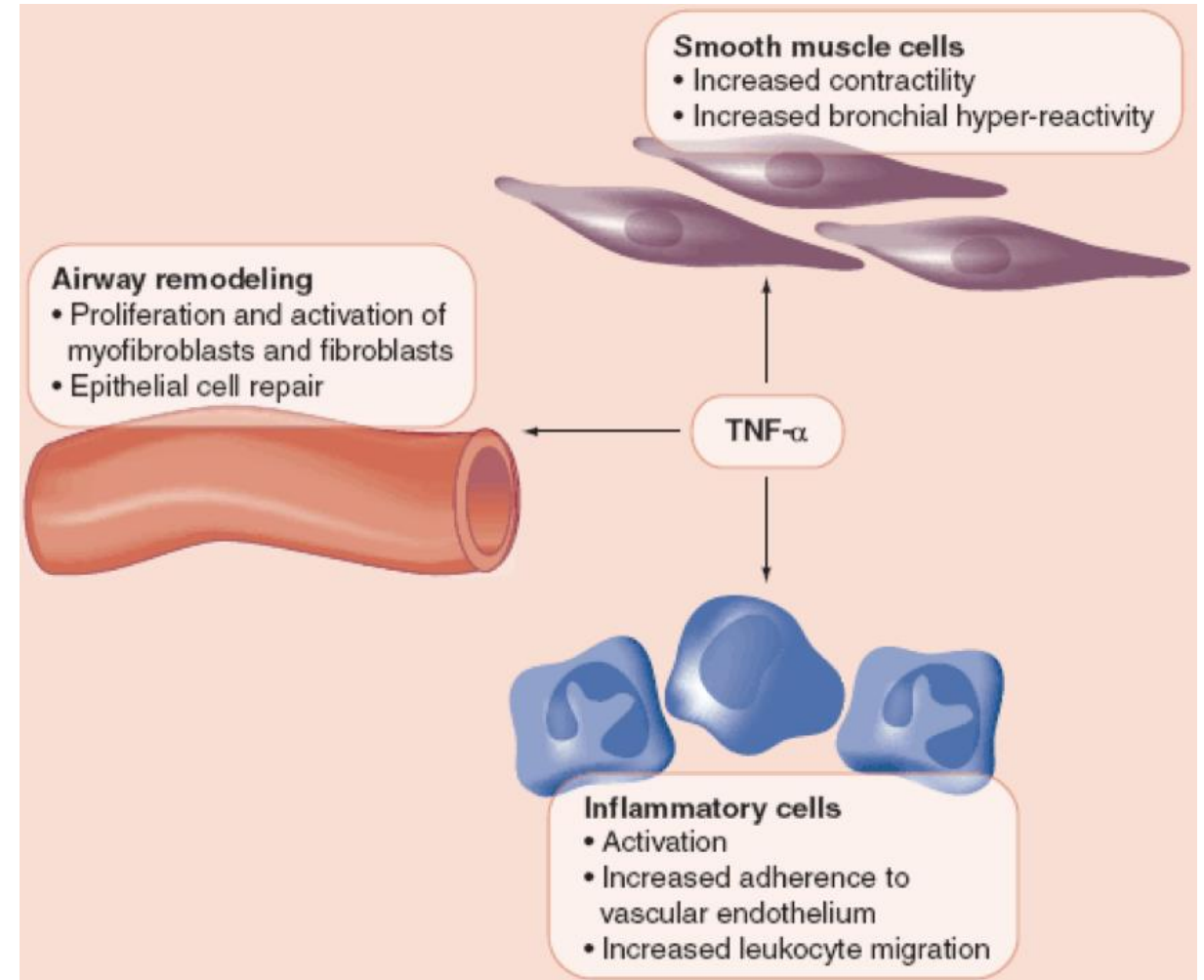
Asthma Phenotypes



TNF-alpha high asthma



- Older age of onset
- Moderate – to – severe
- Associated with:
 - Lower lung function
 - Increased air trapping
 - Thicker bronchial wall
 - Neutrophilic asthma
- Overlapping pathways?

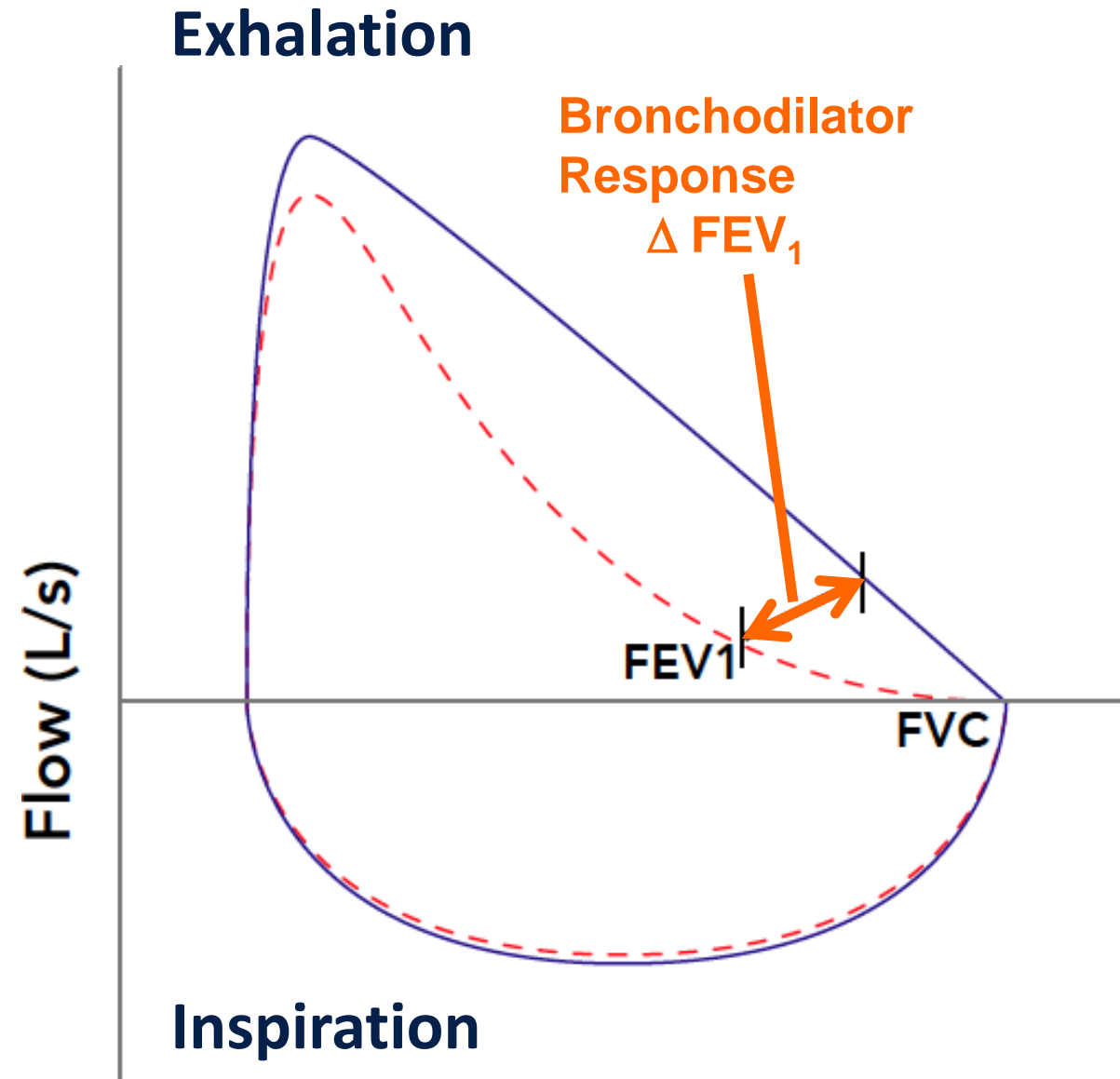




Outcome: Bronchodilator Response

- Bronchodilator (BDR) response is used to:
 - Diagnose asthma
 - Predict future lung function
 - Determine medication response
- BDR is susceptible to psychosocial stress:
 - A BDR $\geq 10\%$ is associated with poor asthma control
 - Psychosocial stress tends to worsen asthma control
 - **High levels of household stress are associated with lower BDR**

Is racial discrimination associated with bronchodilator response among African American youth and does this association vary with tumor necrosis factor alpha level?





Selected Characteristics of Participants with Asthma in SAGE II

Characteristic	NO Discrimination	ANY Discrimination	p -value
	No. (%)	No. (%)	
	295 (51.2)	281 (48.8)	
Age, median (IQR)	12.1 (4.8)	15.4 (5.5)	< 0.001
Sex, male	160 (54.2)	151 (53.7)	0.904
Tobacco Exposure			
Current	82 (28.4)	88 (31.5)	0.410
In-Utero	45 (15.3)	62 (22.1)	0.036
Asthma Control			
Controlled	110 (37.3)	59 (21.0)	< 0.001
Not well Controlled	85 (28.8)	81 (28.8)	
Very Poorly Controlled	100 (33.9)	141 (50.2)	



Mean Difference in Bronchodilator Response[^] and 95% CI for Reports of Racial Discrimination and according to TNF- α status

	Adjusted ¹
Racial Discrimination	
Never Any	Reference 1.70 (0.36, 3.03)

[^] Bronchodilator response: mean percentage change in measured FEV₁ before and after albuterol administration, using the post-albuterol spirometry with the maximal change.

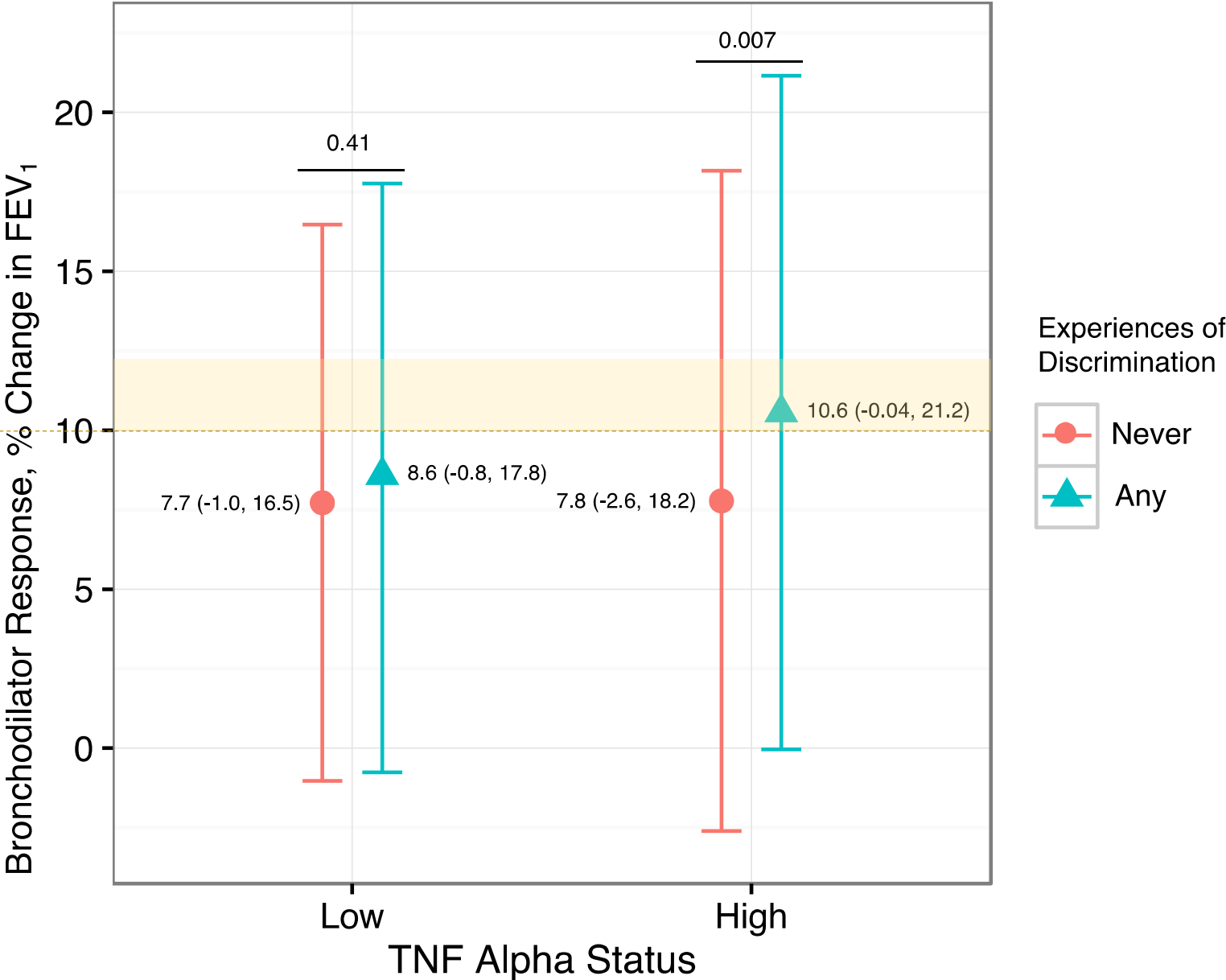
¹adjusted for sex, age, maternal education, recruitment center, in utero smoke exposure, daycare attendance, baseline lung function, controller medication use, African ancestry, TNF- α mean, and biomarker storage time.

²p-interaction = 0.04

BDR by level of discrimination (None/Any) stratified by TNF-α status



Do you respond to Albuterol? Y/N



The 'so what'?

- Suggest that there are different pathways to 'defined' asthma molecular phenotype
- Builds evidence that certain types of asthma are more susceptible to environmental and social triggers

Follow up question?

- Would screening for racial discrimination (or other psychosocial stressors) be helpful in those with moderate-severe asthma?

Maybe

“People live their lives in a holistic manner. Issues such as health care, education and economic empowerment cannot be addressed in a vacuum.”

Helene D. Gayle

CEO McKinsey Social Initiative



University of California
San Francisco

Questions?