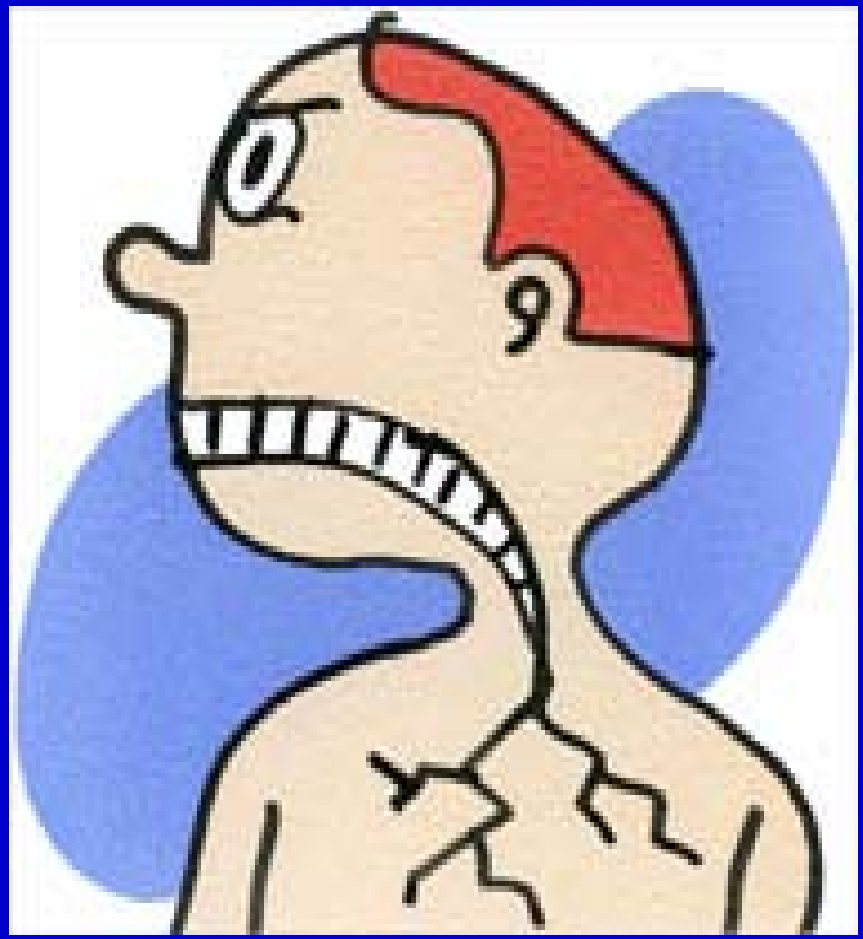
Beyond Bruising: How Violence and Hostility May Impact Lung Disease



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HARVARD MEDICAL SCHOOL

Hostility – Medical Morbidity

- Large body of research in this general domain (hostility, Type A)

- Hostility and anger co-occur with (?risk factors) for many health problems in older adults
  - CVD, all-cause mortality, altered immune function

(*Miller et al, Health Psychol 1999; 18:562; Everson et al, Am J Epidemiol 1997; 146:142)*

Historical Framework

"The influence of emotion upon the respiratory function is well known from everyday life. Sudden cessation of breathing in anxiety is referred to in such expressions as 'breathtaking'… Sighing is a common expression of despair. Crying is another complex expressive phenomenon in which the expiratory phase of respiration is involved… Because of this close correlation between emotional tension and the respiratory functions, it is probable that in most diseases of the respiratory organs, psychological factors play an important role."

Alexander F. *Psychosomatic Medicine: Its Principles and Applications*. New York, W.W. Norton & Company, 1950.

Hostility – Medical Morbidity

- Beginning evidence for emotion - PF link
- Plausible that Hostility & PF are related
- More than replication of CVD effects, a social epidemiological approach
  - Put hostility & poor health in social context

Pulmonary Function

- Variability in pulmonary function (PF) with aging
  - Development of healthy lung function
  - Rate of decline

- Accelerated rate of decline
  - Associated with maximally attained lung function in earlier life
  - Associated with risk of increased mortality
  - CVD & PF are inversely related
    - PF as a marker of CVD?

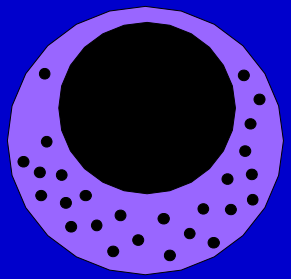
Epidemiology of COPD

- Afflicts more than 14 million in the US
- In the US, COPD is the fourth leading cause of death and the third leading cause of morbidity
- Accounts for 13% of US hospital admissions
- Projected to be the fourth leading cause of death worldwide in 2020
- Incidence is rising, particularly in women

Pathophysiology of COPD

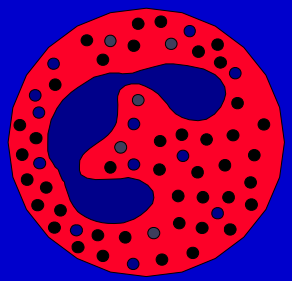
- Airway inflammation is now recognized as a central process in the pathogenesis of COPD
  - Inflammatory cell infiltration in airway walls related to clinical airflow reduction in patients with COPD (O'Shaughness TC, et al. *Am J Respir Crit Care Med* 1997; 155:852)
  - Pro-inflammatory cytokines demonstrated in induced sputum in COPD patients (Keatings VM, et al. *Am J Respir Crit Care Med* 1997; 155:542)

1990s—The Age of Airway Inflammation



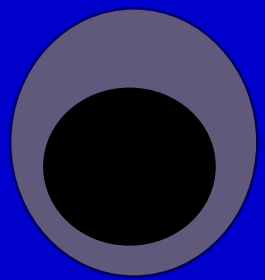
Mast cells

Mediators



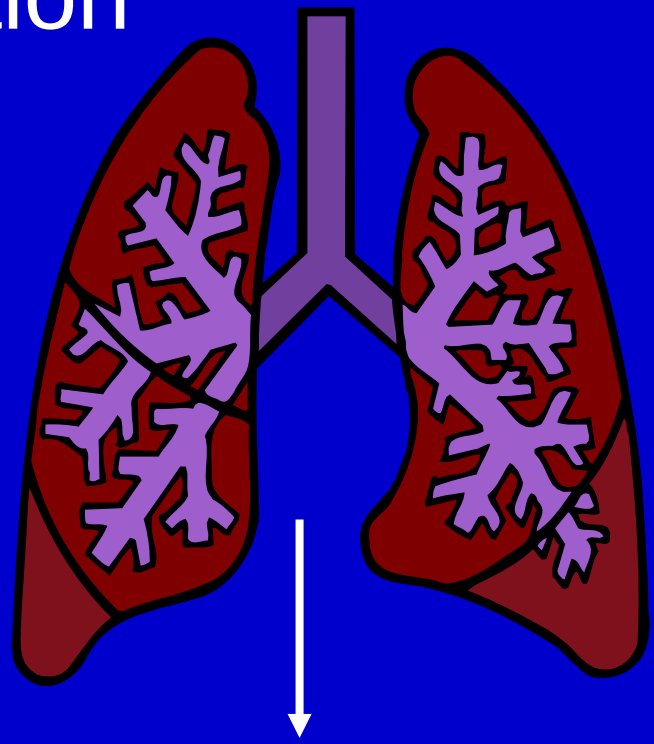
Eosinophils

Granule proteins



Lymphocytes

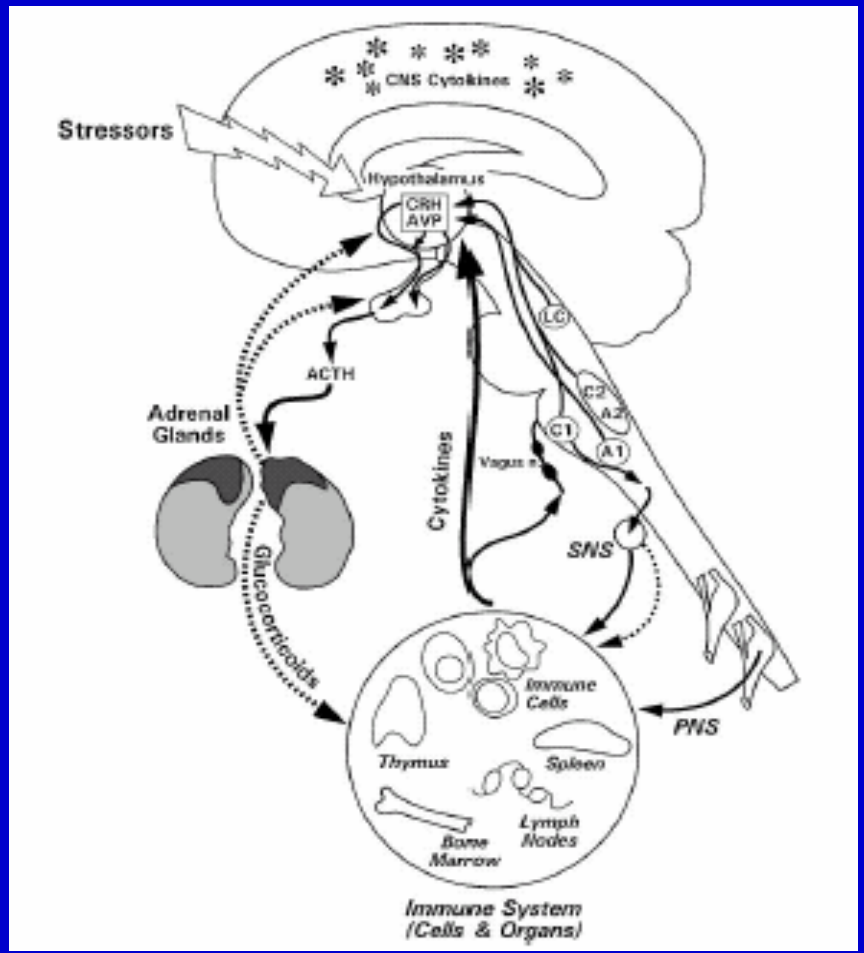
Cytokines

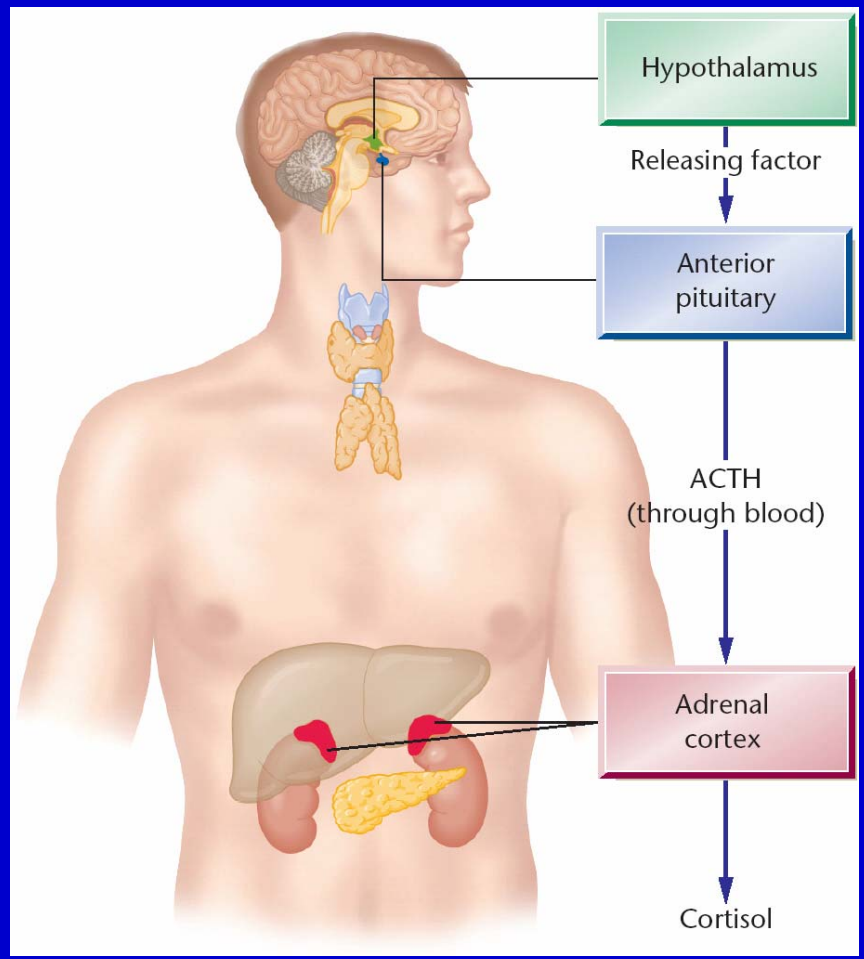


Bronchoconstriction
Inflammation
Airway hyperresponsiveness

Clinical asthma/COPD

Psychoneuroimmunology: Mind-Body Connections





Webster, Tonnelli and Sternberg 2002

Early Life Risk Factors

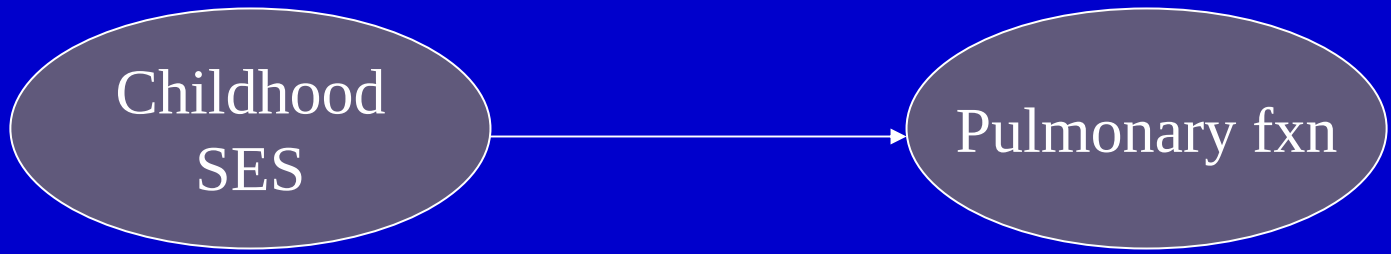
- Nutrition
- Birthweight
- Respiratory infections
- Asthma
- Toxicants (e.g., cigarette smoke, air pollutants)

Wright, Cohen, Cohen. Curr Opin Allergy & Clin Immunol 2005; 5:23.

Background Motivation

- Two motivations for current research
  - Hostility - CVD link
  - SES - pulmonary function (PF) link

Research question



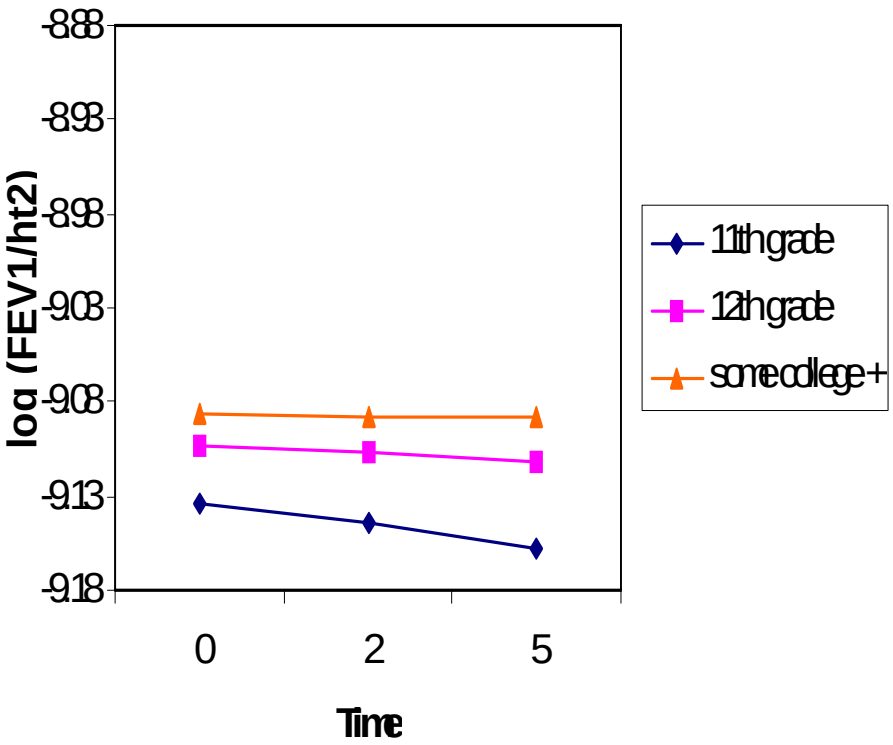
(Jackson, Kubzansky, Cohen,Weiss, Wright. Int J Epidemiol. 2004;33:271)

Sample

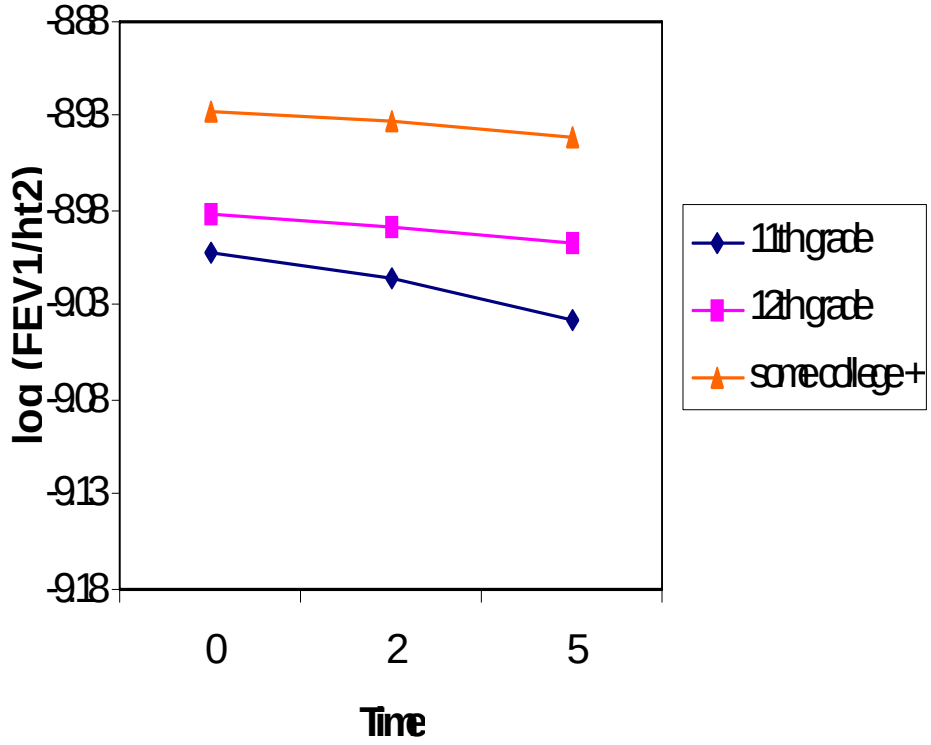
- CARDIA (Coronary Artery Risk Development in Young Adults) Study
- Sponsored by NHLBI
- Community-based, 4 US sites
- Race, gender, class variation
- Started in 1985, ages 18-30 at baseline
- PF years 0, 2, & 5
- n ~ 5,000

	Mean (SD) or Percentage	Range	N
Covariates			
Height (SD), in cm	170.35 (9.27)	149.50-193.00	5100
Age (SD), in years	24.76 (3.63)	18 -30	5113
Females (%)	54.47%	Female (ref), Male	5113
Blacks (%)	51.72%	Black (ref), White	5099
Current SES (SD), in years of education	13.59 (1.85)	10-16	5110
Asthma, unconfirmed (%)	5.48%	Yes (ref), No	5113
Asthma, confirmed by a doctor (%)		Yes (ref), No	
Maternal smoking (%)	48.21%	Yes (ref), No	5096
Paternal smoking (%)	58.16%	Yes (ref), No	5086
Former smokers (%)	13.31%	Yes (ref), No	5077
Current smokers (%)	30.41%	Yes (ref), No	5077

PF by childhood SES over time: CARDIA



WOMEN



MEN

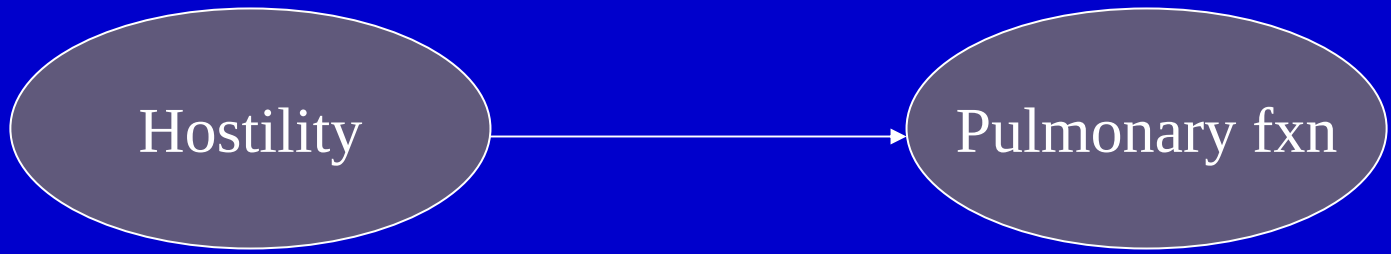
Questions

- Does rate of change of pulmonary function differ by hostility?
- Is this relationship influenced by group membership (childhood SES, race/ethnicity, gender)?
  - Mediated
  - Moderated

Vulnerability/Resiliency Factors

- Genetics
- Behavioral/personality factors
  - **Stress Vulnerable**
    - Low threshold for perceiving threat, sensitive to “danger cues”, ruminate/worry, defensive, hositlity, defeatist
  - **Stress Resilient**
    - High threshold for perceiving threat, sensitive to “safety cues”, optimistic, problem solvers, confident
- External buffers
  - Social networks

Research question

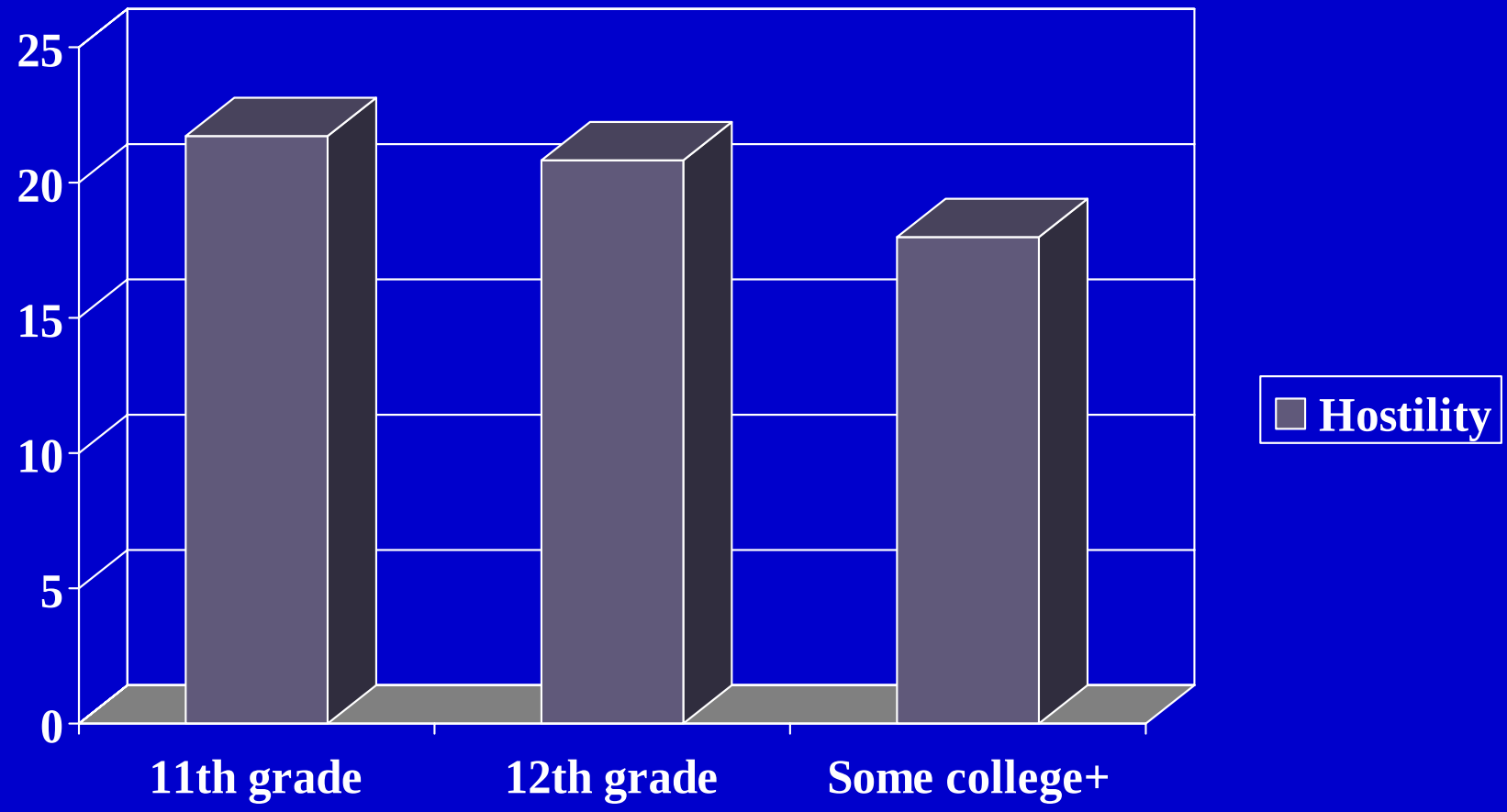


(Jackson, Kubzansky, Cohen, Jacobs, Weiss, Wright. Health Psychol 2006, in press)

Preliminary analyses

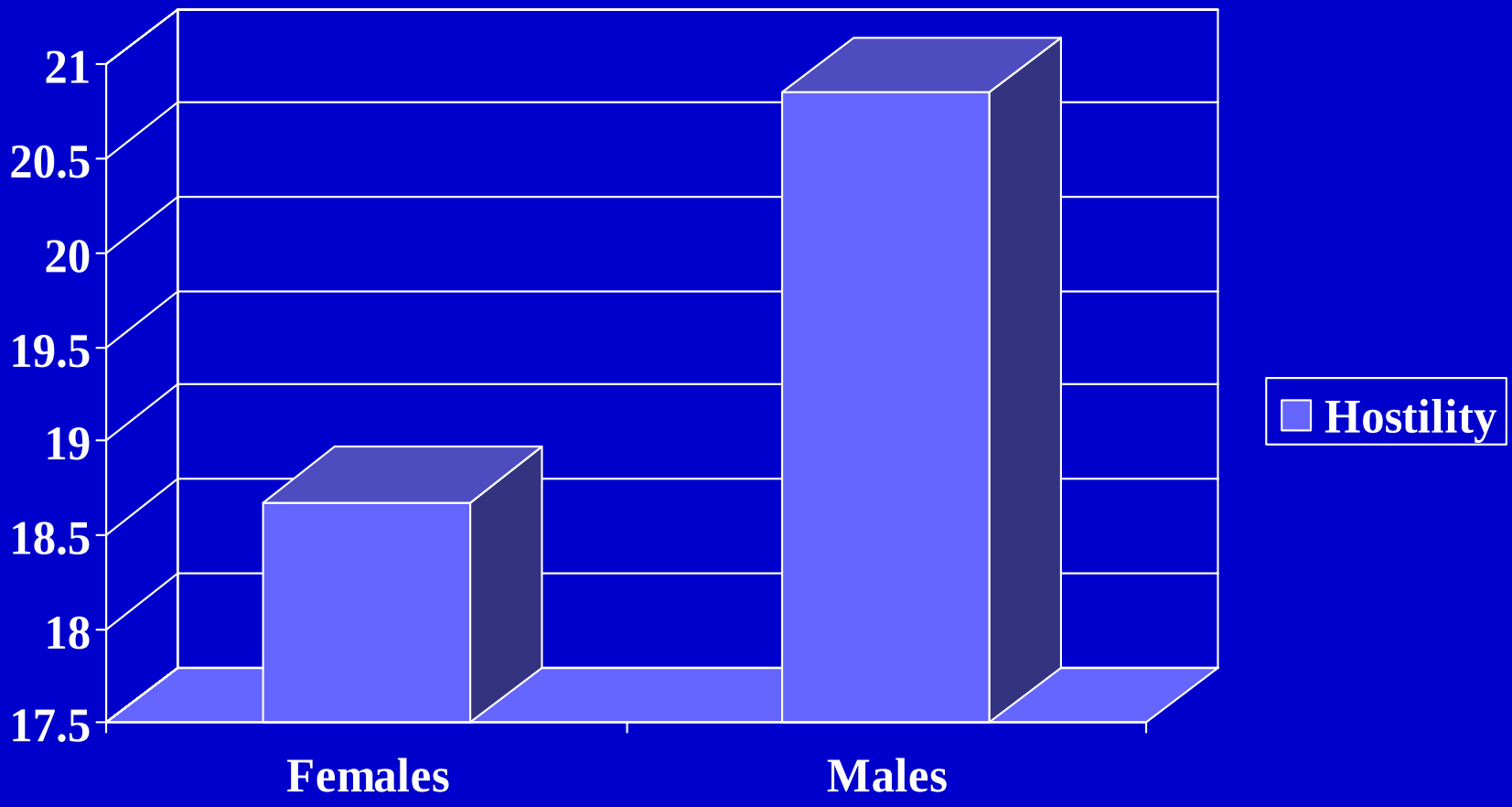
- Sample descriptives
- Hostility & pulmonary function
  - Gender
  - Race
  - Childhood SES
- Hostility predicting ΔPF

Hostility by childhood SES



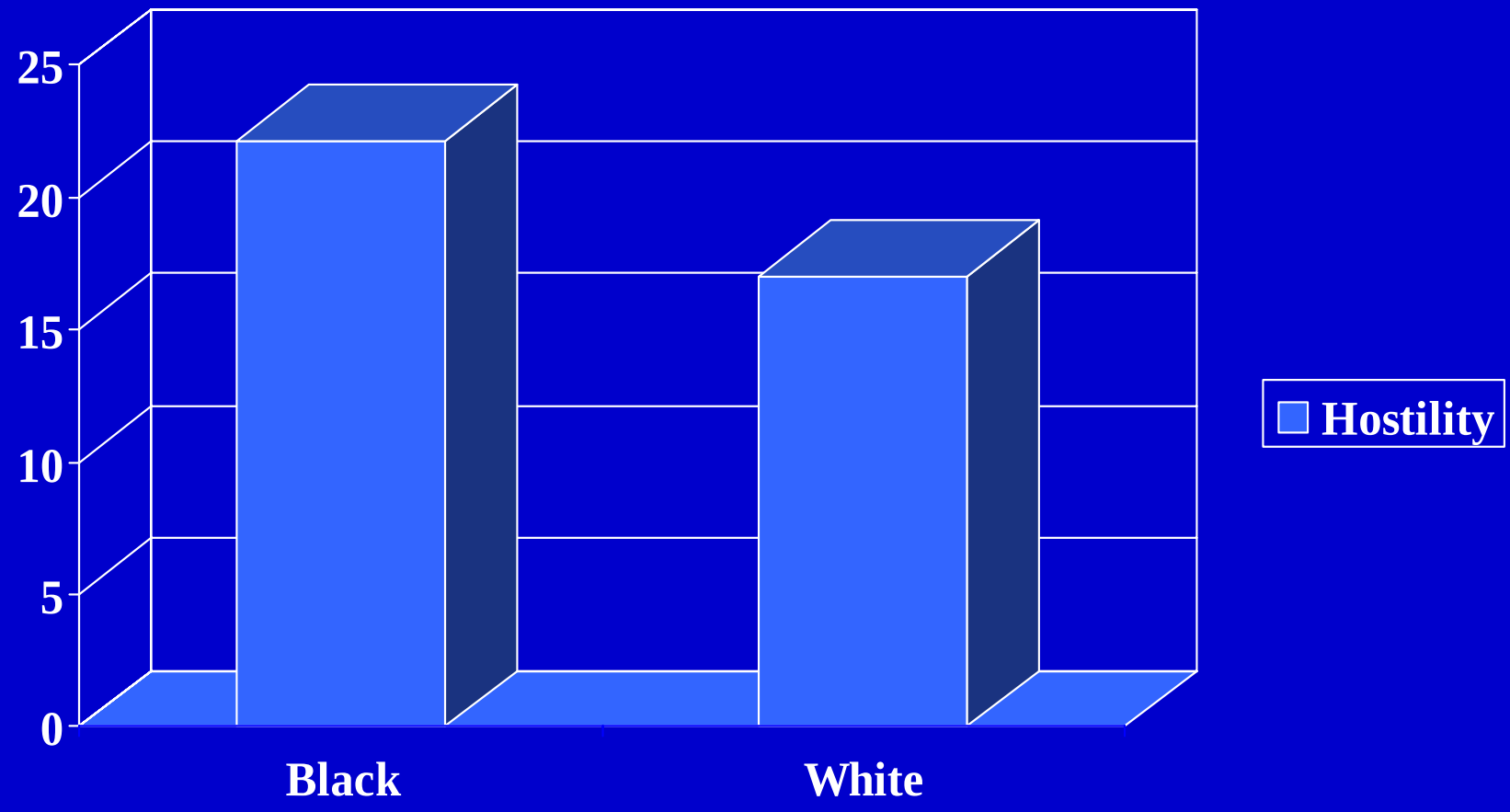
Note. Each levels is significantly different from each other.

Hostility by gender



Note. Groups significantly differ.

Hostility by race



Note. Groups significantly differ.

Analysis

- Hierarchical linear modeling (HLM, PROC MIXED in SAS) using repeated measures

- Mixed models method
  - Considers correlation in repeated measures of pulmonary function
  - Controls for baseline levels of pulmonary function
  - Includes interaction term to assess effects over time

Multivariate-adjusted effects of a one-unit increase in hostility on FEV_1

Hostility * -.002 (.0008)

Hostility x Time *.0003 (.000009)

Time * (-)

Childhood SES

Childhood SES x Time * (-)

Female * (Females, lower FEV_1)

Black * (Blacks, lower FEV_1)

Height * (+)

Age * (-)

Current SES + (+)

Self-rep asthma symptoms * (-)

Dr. dx asthma * (-)

Mother smoked

Father smoked

Current smoker + (-)

Former smoker * (+)

Next steps

- Focus of paper?
  - Hostility & PF, with/out social context variables
  - With social context variables
    - Choose to focus on e.g., race, controlling for childhood SES
    - Mediator/moderator
- Examine ΔPF interactions with gender, race, childhood SES
  - Power issue
    - Differences in cell sizes
    - e.g., relatively few with low childhood SES, esp. whites

Hostility – PF Prospectively

To examine prospectively the effects of hostility on pulmonary function over time in the Normative Aging Study (NAS), a longitudinal study of 2280 community-dwelling men.

Hypothesis

Increased levels of hostility would be associated with lower levels of pulmonary function at baseline and an accelerated rate of decline in lung function over time.

- The MMPI-2 was administered by mail to all active cohort members (n = 1881) in 1986.
- 1550 men responded (82.4% response rate), in whom complete and valid questionnaire data were available in 95% (n = 1472).
- To be included in the present study, men had to have had a pulmonary exam within one year of completing the MMPI-2. This resulted in a study population of 670 men.

Study Description

- Assessment of hostility 1986
- Physical exam every 3-5 years
- Average follow-up time 8.22 years
- Average number of spirometric tests 3.5
- n 670

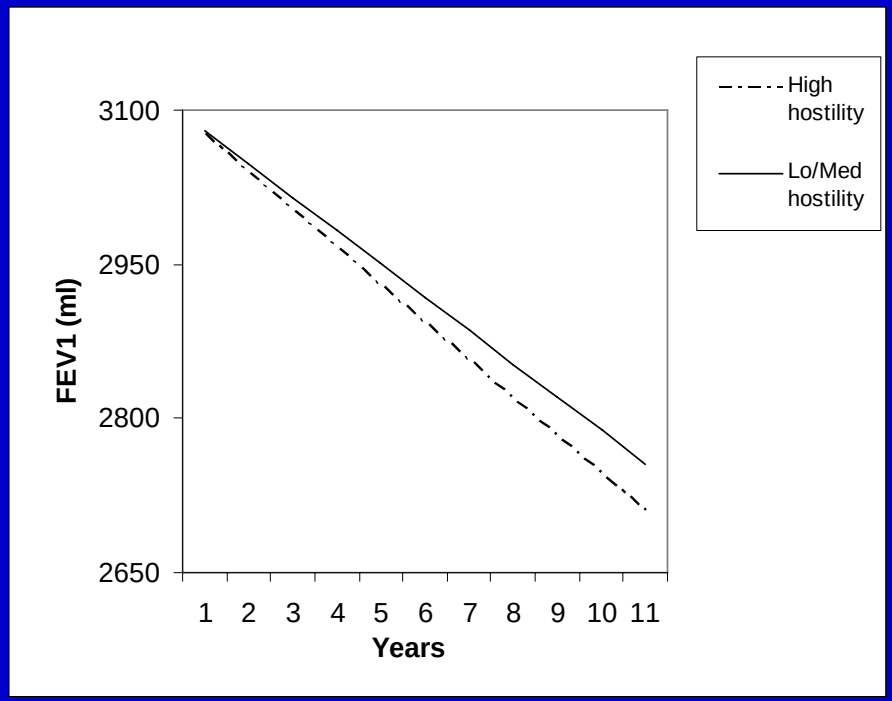
Assessment of Pulmonary Function

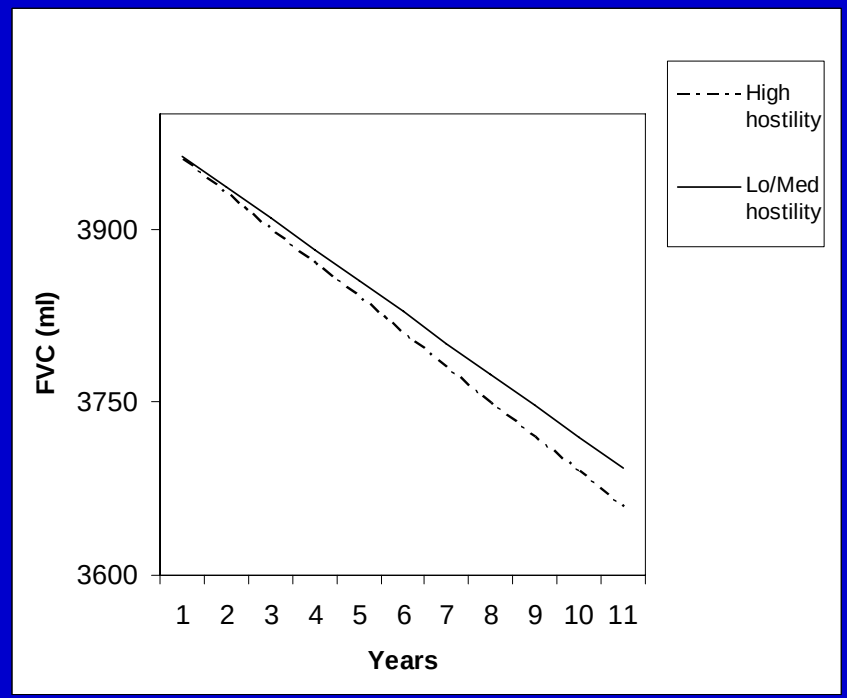
- Measures of FEV_1 and FVC obtained

- Spirometric tests administered at each physical exam
  - Spirometry was repeated up to a maximum of eight spirograms
  - at least 3 acceptable tests obtained from each subject
  - at least 2 tests were reproducible

- Acceptability of spirograms judged according to American Thoracic Society standards

Hostility and Lung Function Decline: NAS



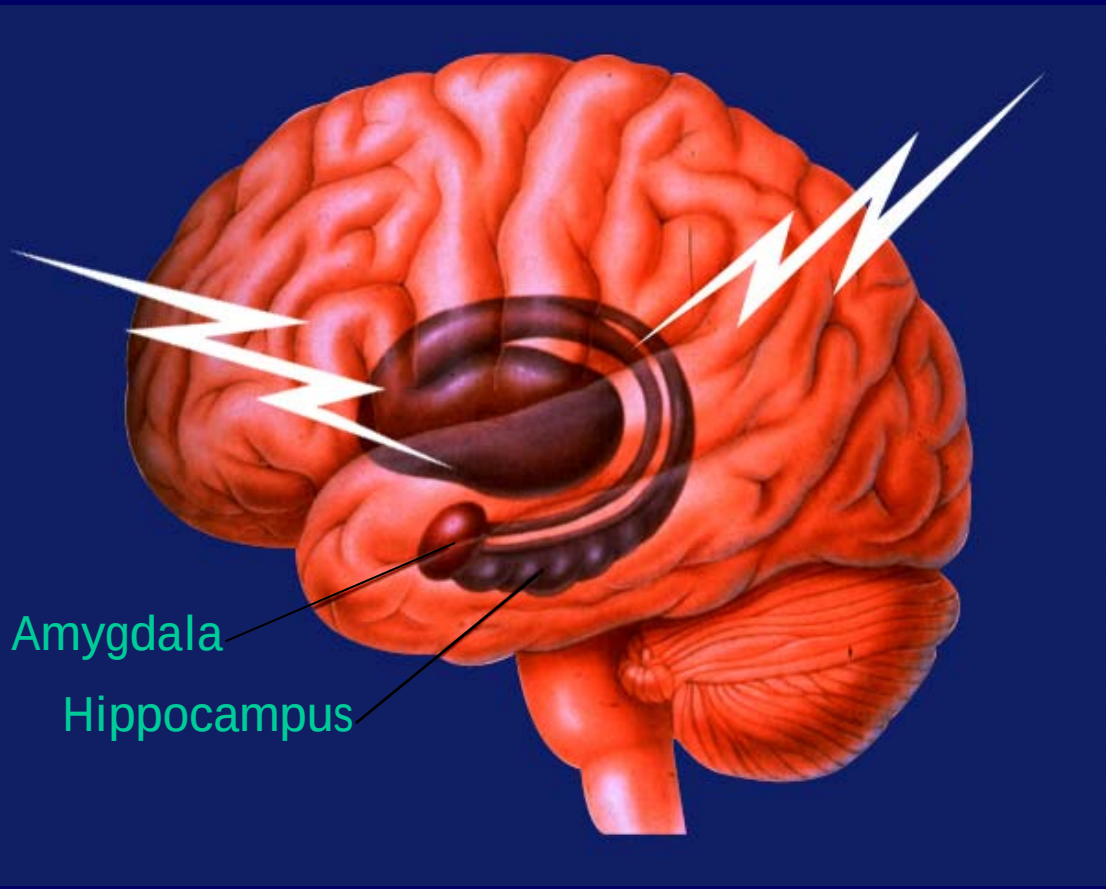


(*Kubzansky, Sparrow, Jackson, Cohen, Weiss, Wright. Thorax 2006; 61:863*)

Violence and Childhood Lung Function

Franco Suglia S, Laden F, Ryan L, Dockery D, Wright RJ. Submitted manuscript

Memory - Strong Emotions



More facts of nature: All forest animals, to this very day, remember exactly where they were and what they were doing when they heard that Bambi's mother had been shot.

MISSEB

- **Study Population**
  - Maternal-Infant Smoking Study of East Boston (MISSEB)
  - prospective cohort of women and children enrolled before 20 weeks gestation.
- **Environmental Health Measures**
  - Maternal prenatal smoking assessed by standardized questionnaires and urinary cotinine
  - postnatal environmental tobacco smoke (ETS) assessed through standardized questionnaires

Measures of Violence Exposure

- Mother's reported on child's lifetime exposure to interparental conflict using the Conflict Tactics Scale
  - Verbal Aggression, Minor and Severe Physical
- Mother's reported on child's community violence exposure using the My Exposure to Violence (ETV) scale
  - Rasch modeling, a form of latent variable analysis, used to create a continuous ETV scale

Outcome Measures

- At age 6 years, children completed Spirometry testing
  - Forced expiratory volume in one second (FEV1), forced vital capacity (FVC), ratio of FEV1 to FVC (FEV1/FVC) and forced mid-expiratory flow rate (FEF25-75%) were measured from the best acceptable blow as defined by the American Thoracic Society Standards.

Data Analysis

- Rasch models, a form of latent variable analysis to obtain a continuous scale of ETV from dichotomous responses in the questionnaire
- Model can accommodate unrestricted and conditional responses from the ETV survey and incorporate multiple informant information
- Associations between violence measures and pulmonary function adjusted for race, maternal education, child's gender, age, birth-weight, height, maternal prenatal smoking and ETS were examined using linear regression.

MISSEB Cohort (N=330)

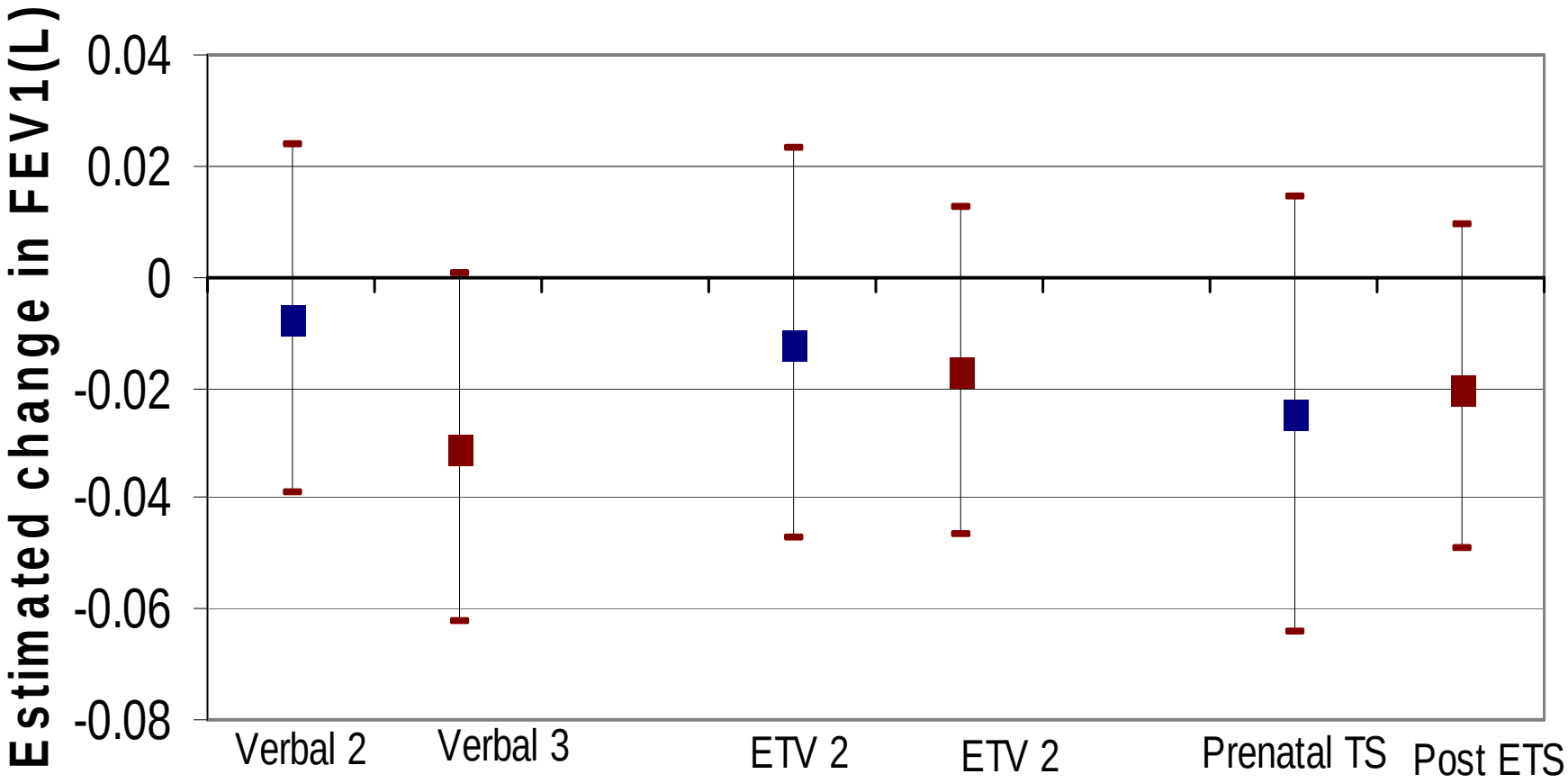
- 50% boys
- 55% Hispanic
- 66% less than six years of age
- 40% maternal education <high school.

- Mean and standard deviation (SD) PFT indicators
  - FEV1 1.28 ± .21
  - FVC 1.39 ± .23
  - FEV1/FVC 0.92 ± .06
  - FEF25-75% 1.35 ± .29

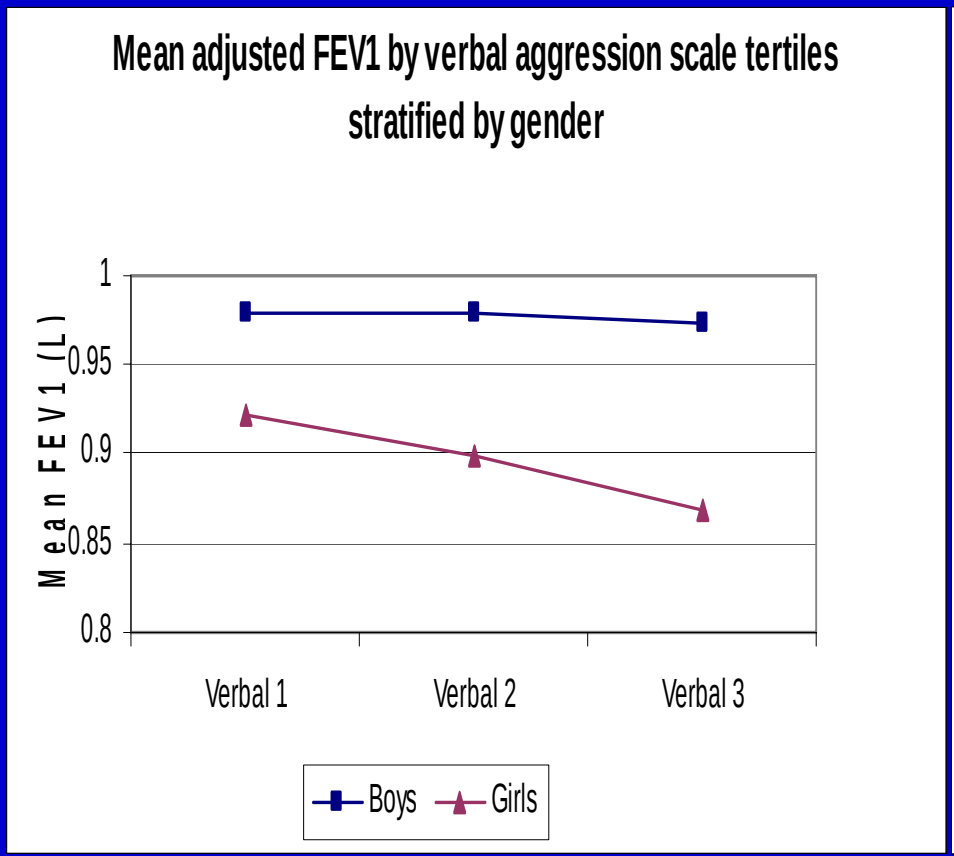
MISSEB Cohort (N=330)

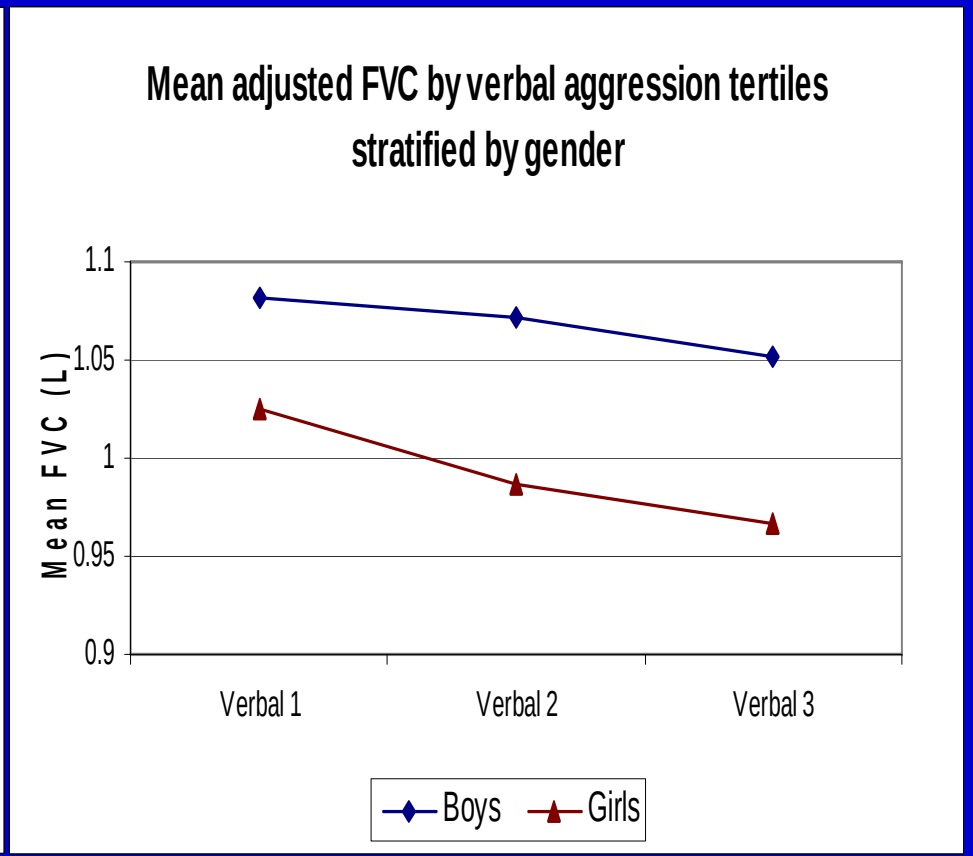
	N	%
Medical History		
Birth-weight < 2500 g	26	8.1
Gestational Age < 37 wks	116	35.3
Physician Dx Asthma	61	18.5
Environmental Exposures		
Smoking during pregnancy	69	21.0
Postnatal ETS	113	34.2
Community Violence Exposures		
Seen shoving/pushing		
Heard gunshots		
Witnessed verbal abuse		
Witnessed Knife attacks		
Witnessed Shooting		

Estimated change in mean FEV_1 and 95% CI by verbal aggression scale tertiles, ETV tertiles and pre and post natal tobacco exposure

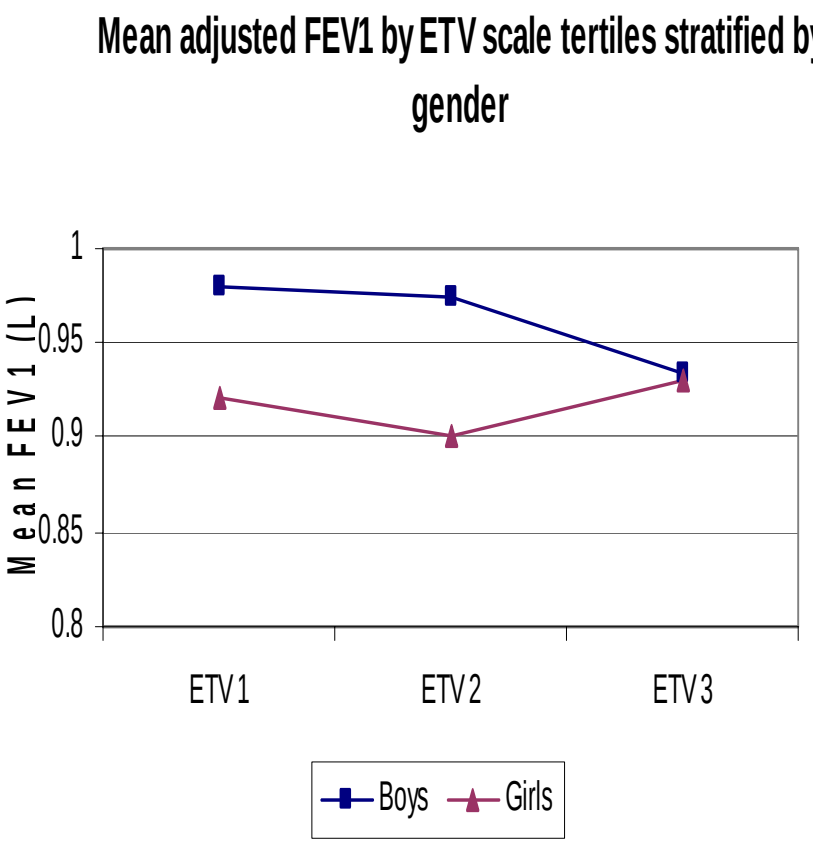


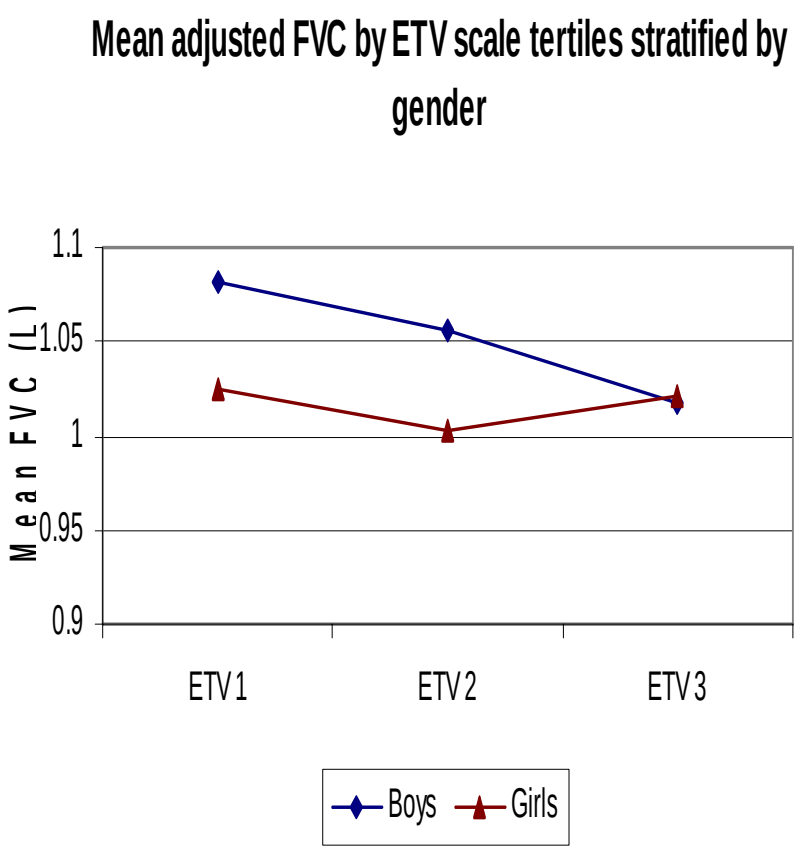
Verbal Abuse and Lung Function: Gender Effects





Community Violence and Lung Function: Gender Effects





Follow-up research question

Childhood SES → Violence → Hostility → Pulmonary fxn

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- Co-Investigators
  - Sheldon Cohen
  - Laura Kubzansky
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  - Shakira Franco Suglia
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  - David Jacobs (CARDIA)