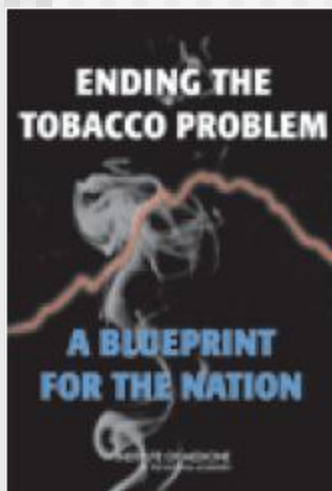


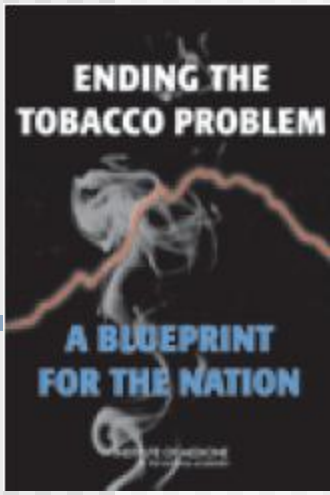
Why Are We Here?

The Science



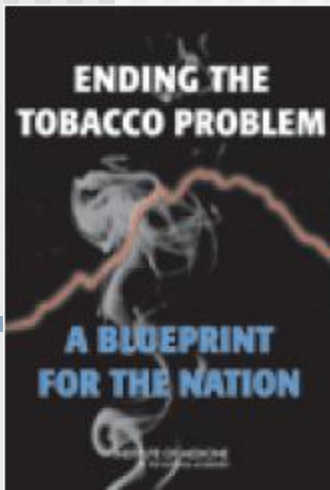
Institute of Medicine

Grassroots advocacy for clean air laws was the first major achievement of contemporary tobacco control efforts.



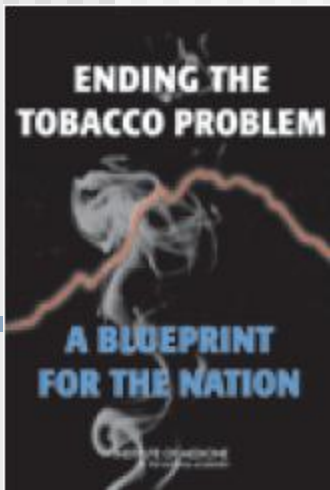
Smoking restrictions serve three purposes:

- They protect nonsmokers from the health effects and the noxious odors of secondhand smoke;
- They help smokers quit, cut down on their smoking, and avoid relapses;
- They reinforce a nonsmoking social norm.
- Clean air laws, in fact, have done more to reduce consumption than any intervention other than price increases for cigarettes.



Smokefree Laws

- States and localities should enact complete bans on smoking in all nonresidential indoor locations, including workplaces, malls, restaurants, and bars.
- States should not preempt local governments from enacting bans more restrictive than the state ban.



Multiunit Housing

- States should enact legislation requiring leases for multiunit apartment buildings and condominium sales agreements to include the terms governing smoking in common areas and residential units. States and localities should also encourage the owners of multiunit apartment buildings and condominium developers to include nonsmoking clauses in these leases and sales agreements and to enforce them.

US Surgeon General (1986)

- Involuntary smoking is a cause of disease, including lung cancer, in healthy non-smokers.
- The children of parents who smoke compared with the children of nonsmoking parents have an increased frequency of respiratory infections, increased respiratory symptoms, and slightly smaller rates of lung function as the lung matures.
- The simple separation of smokers and nonsmokers within the same airspace may reduce, but will not eliminate, exposure to environmental tobacco smoke.

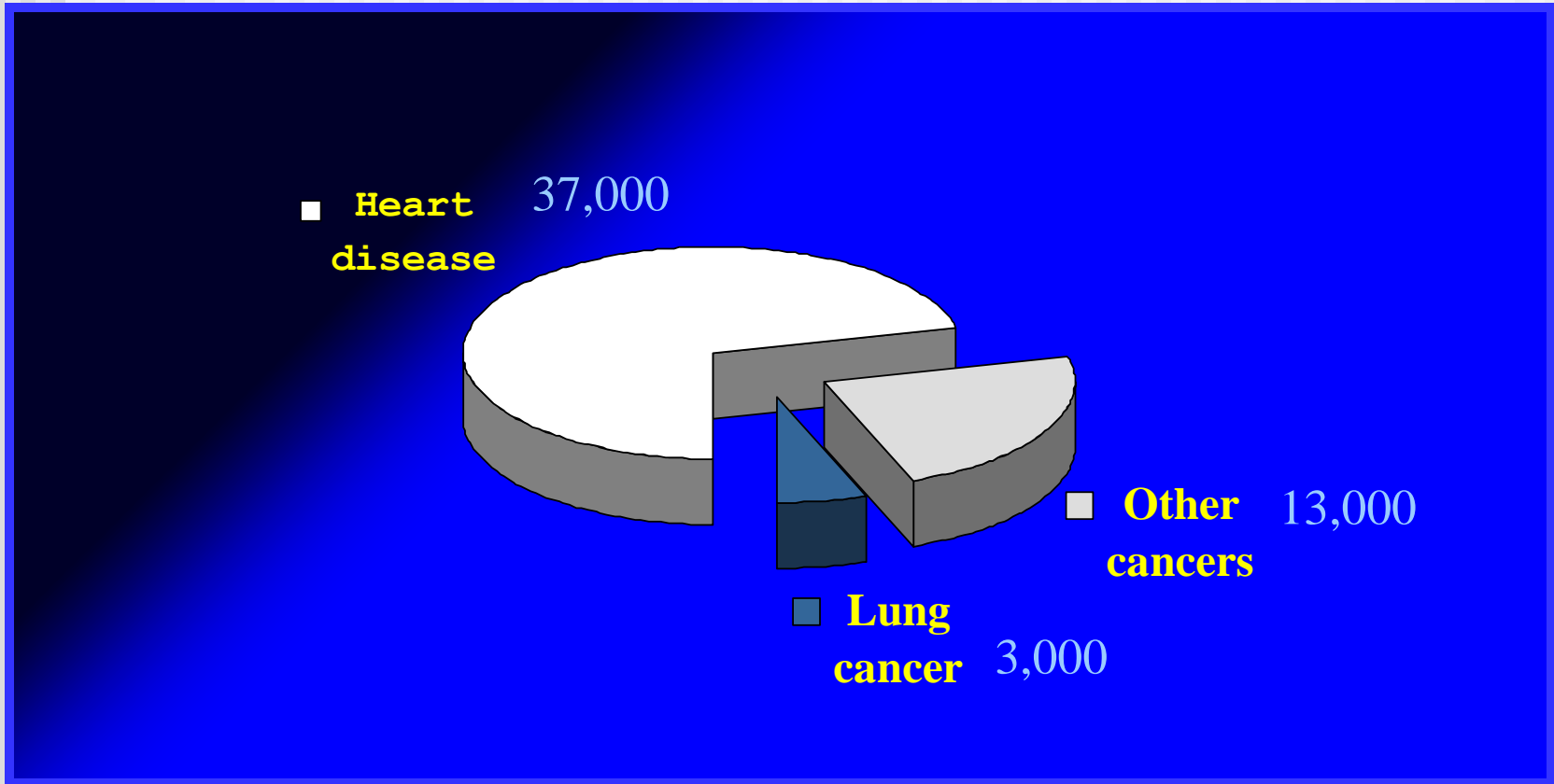
Secondhand Smoke Causes (Cal EPA/NCI, 1997)

- Fetal growth retardation
- SIDS
- Respiratory problems in kids
- Asthma in kids
- Eye and nasal irritation
- Middle ear infections in kids
- Lung cancer
- Nasal sinus cancer
- Heart disease mortality and morbidity
- About 53,000 deaths

Secondhand Smoke Causes (Cal EPA, 2006)

- Pre-term delivery
- Asthma induction in adults
- Breast cancer in younger (primarily premenopausal) women
- Acute and chronic heart disease morbidity
- Altered vascular properties
- About 50,000 deaths (not including breast cancer)

Annual deaths due to SHS



Source: Wells, 1998

Heart Disease: Epidemiology

- About 30% increase in risk if married to smoker or work in smoking workplace

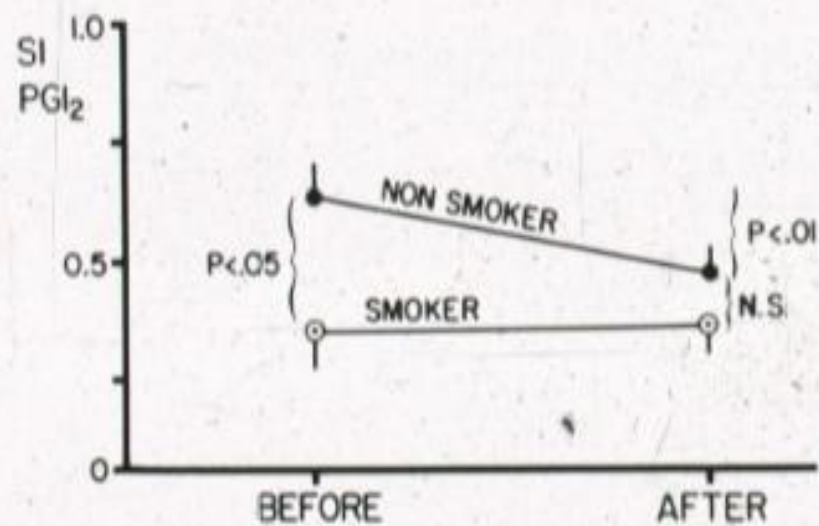


FIGURE 3. Sensitivity index of PGI₂ (SI_{PGI₂}) before and after smoking 2 cigarettes in smokers and non-smokers.

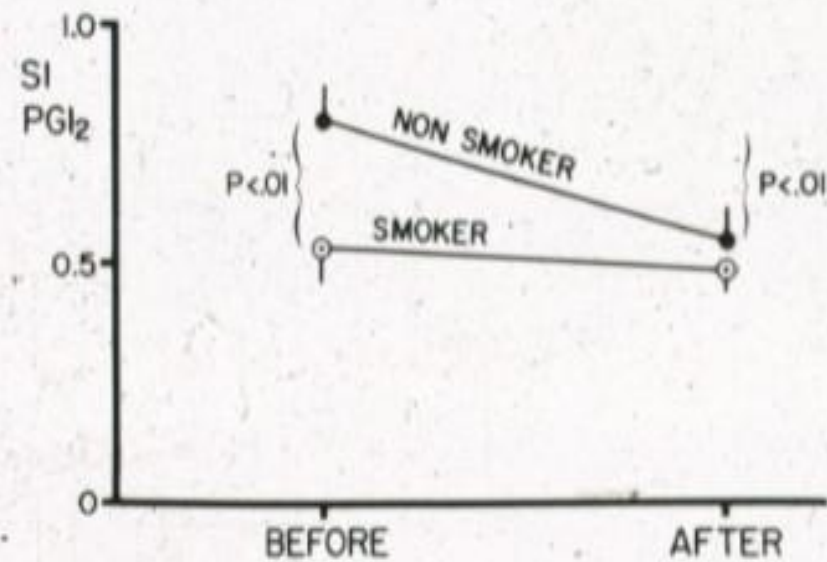
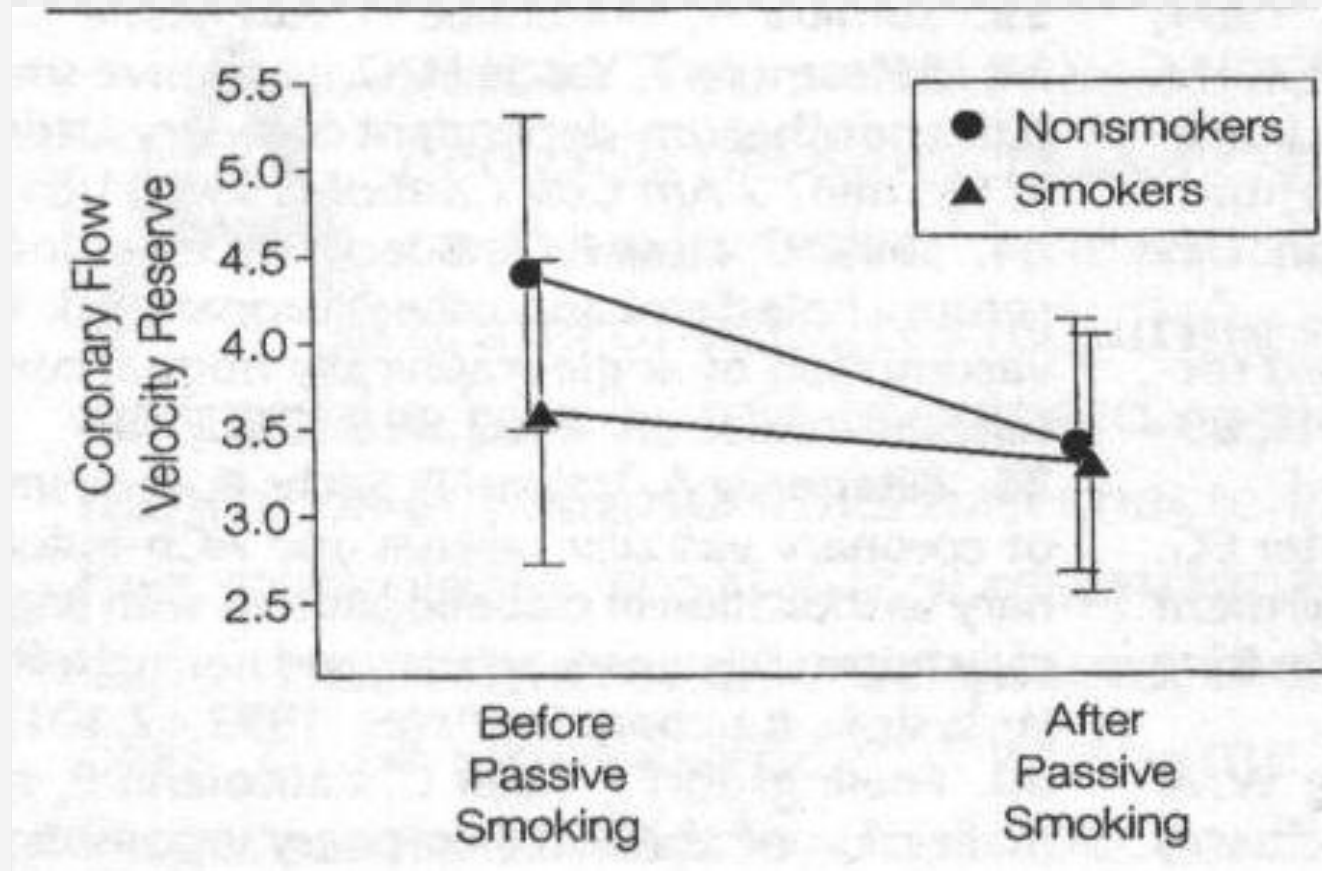
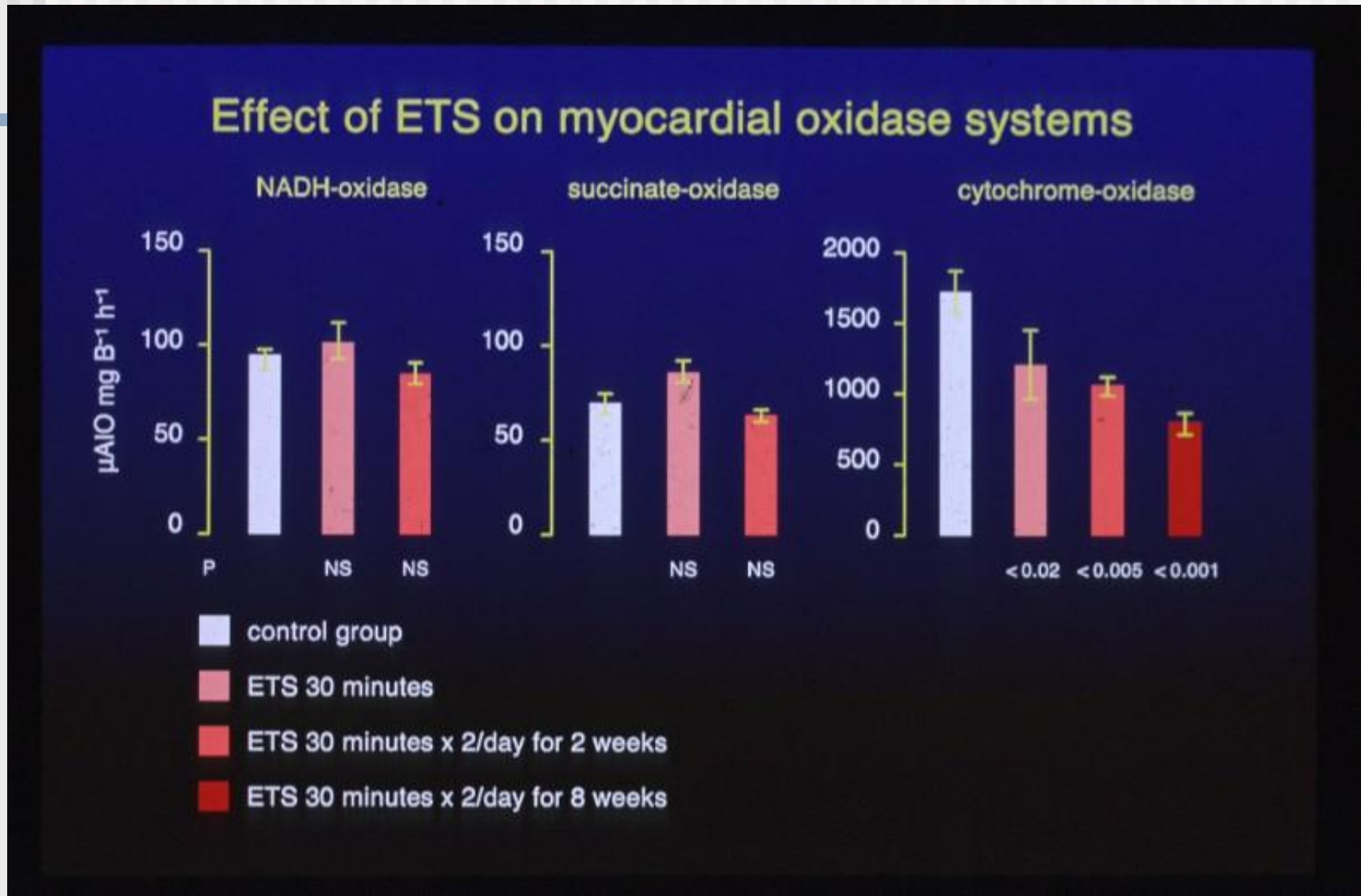


FIGURE 4. Sensitivity index of PGI₂ (SI_{PGI₂}) before and after passive smoking in smokers and non-smokers.

Coronary flow velocity reserve in smokers and non-smokers.



Effects of SHS on cardiac enzymes.

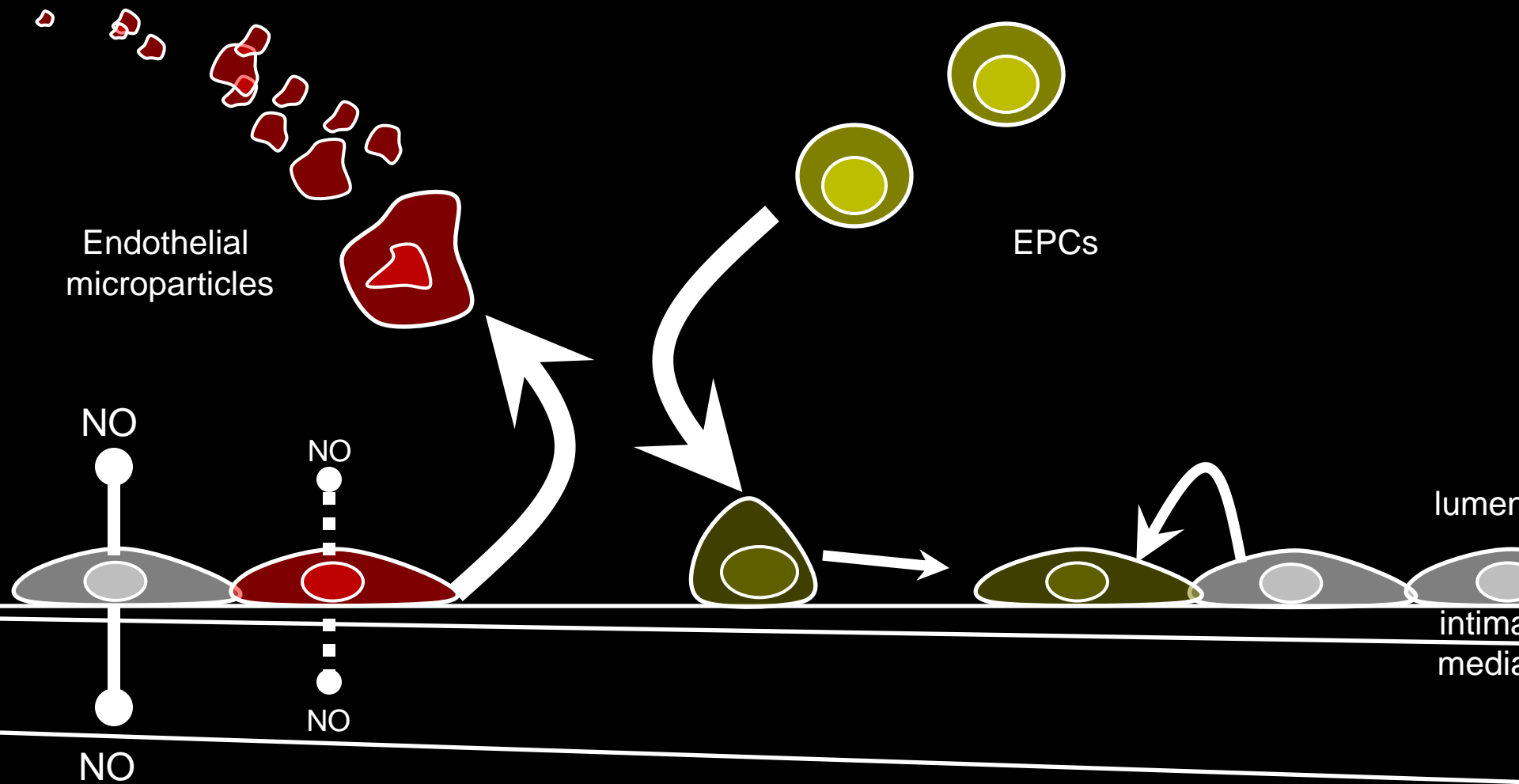


Maintenance of Vascular Endothelium

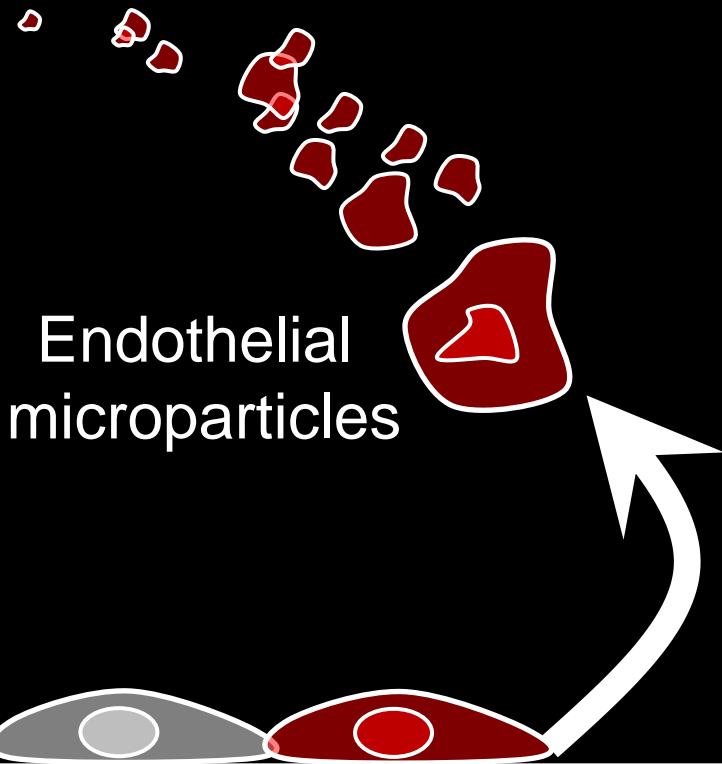
Injury



Repair



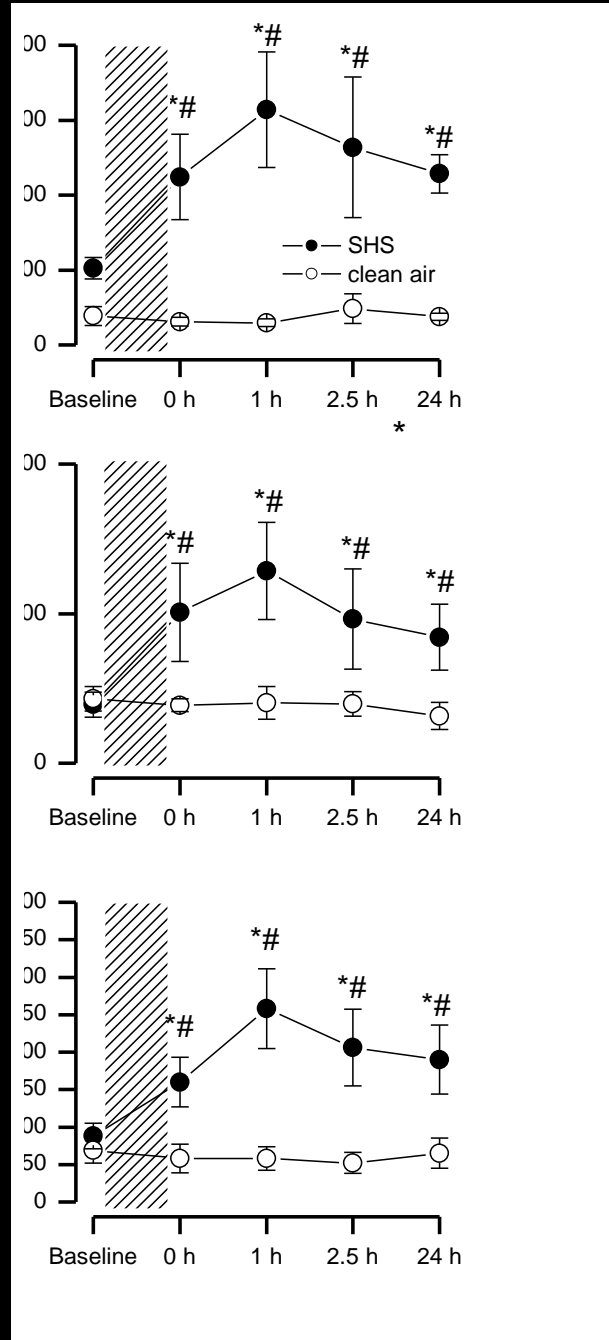
Physical evidence for endothelial damage



CD31⁺/CD41⁻
(PECAM/Gp IIb)

CD144⁺ (VE-Cadherin)
“Structural damage”

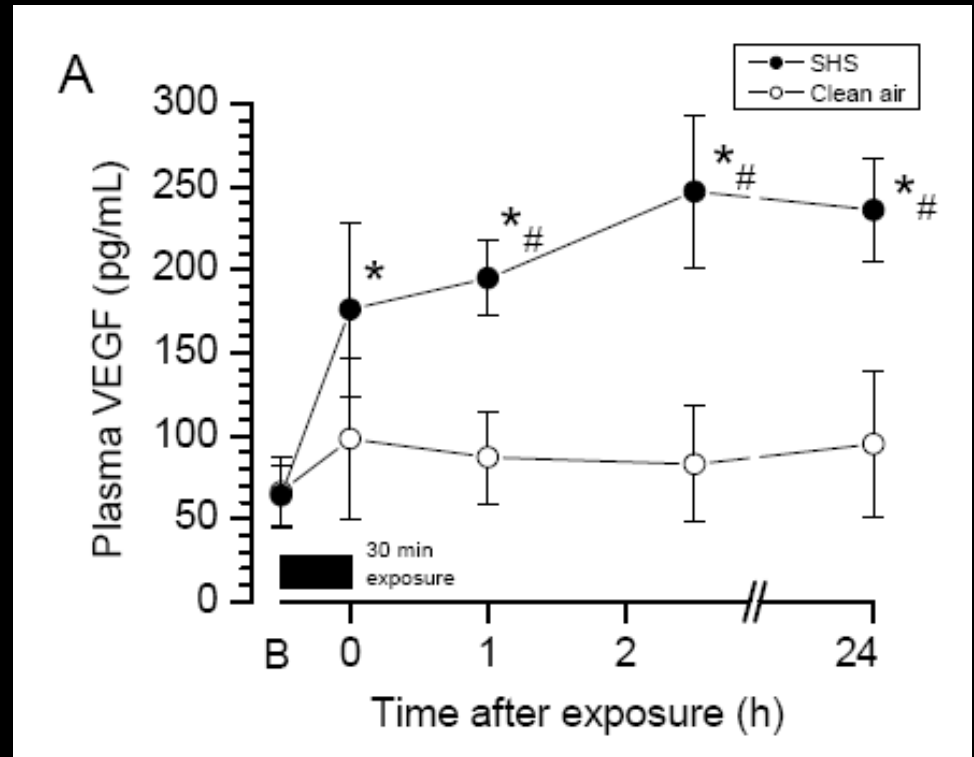
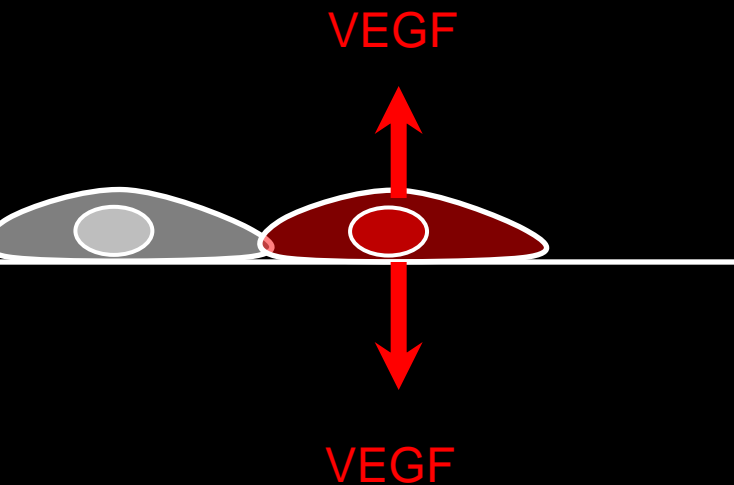
CD62e⁺ (E-Selectin)
“Activation”



* p<0.05 vs baseline

p<0.05 vs respective time point on control day

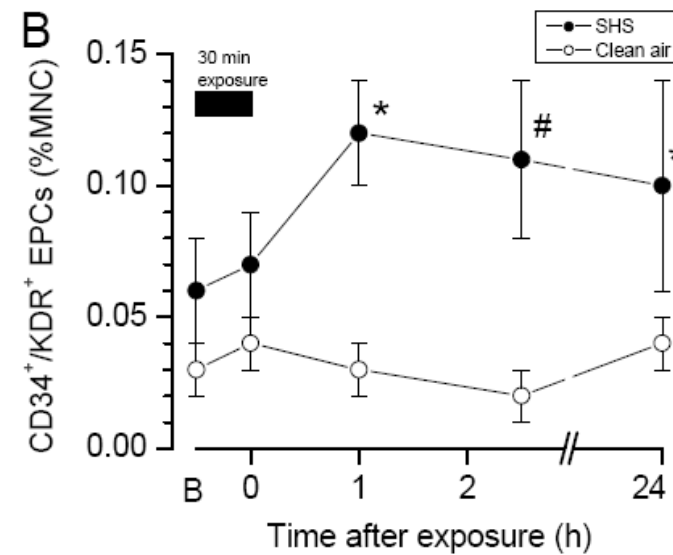
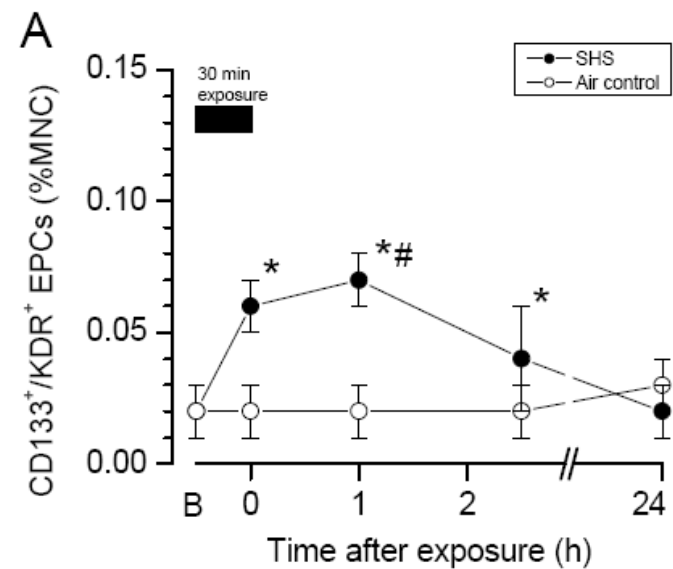
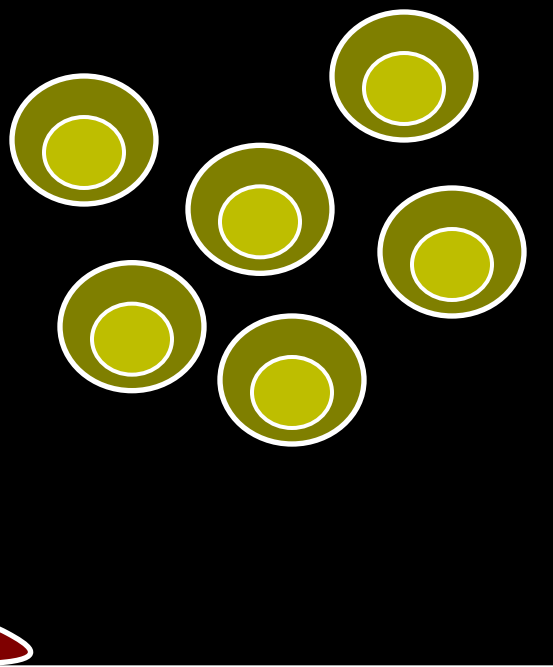
Endothelial function is acutely decreased to smokers levels



* $p < 0.05$ vs baseline

$p < 0.05$ vs respective time point on control day

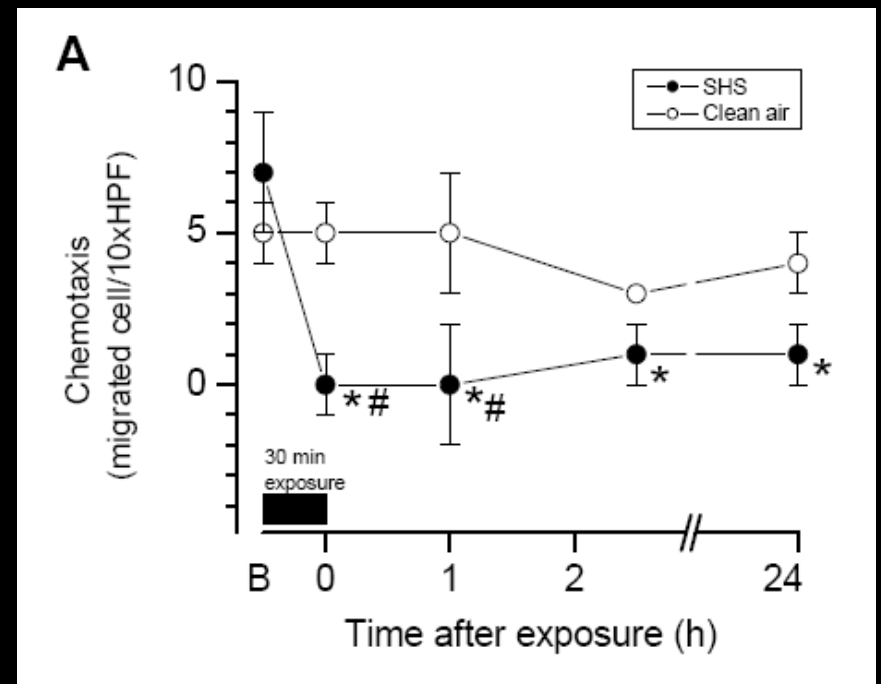
Increased EPC number in blood



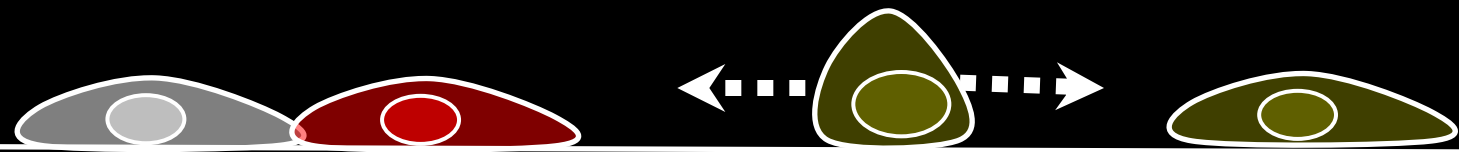
* p < 0.05 vs baseline

p < 0.05 vs respective time point on control day

Sustained inhibition of EPC chemotaxis to VEGF



* $p < 0.05$ vs baseline, # $p < 0.05$ vs respective time point on control day



Disturbed Maintenance of Vascular Endothelium

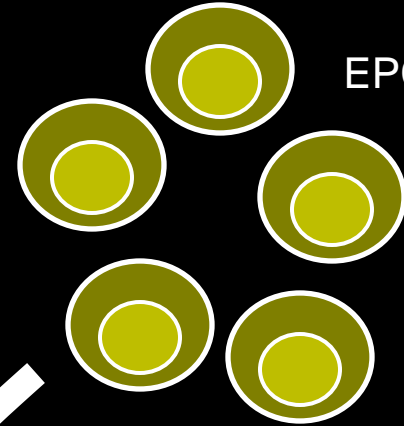
Injury ↑

Repair ↓

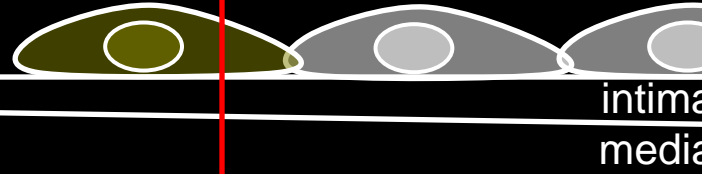
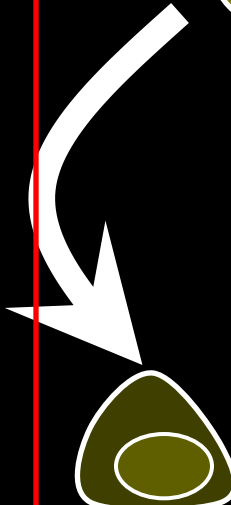
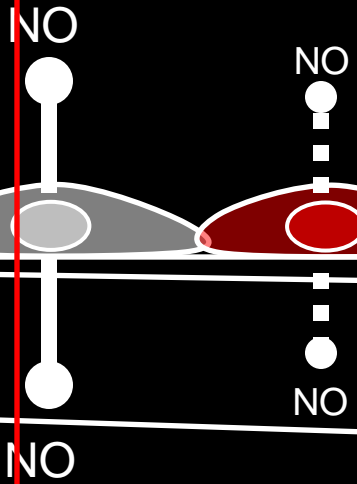
balance



Endothelial microparticles



EPCs



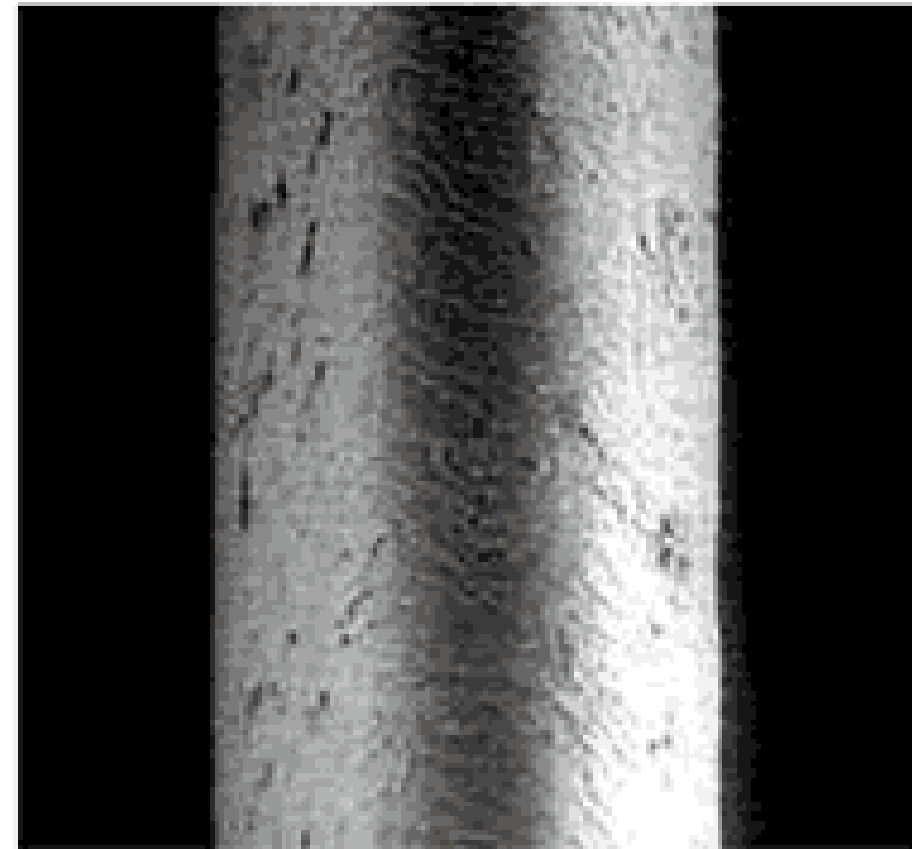
lumen
intima
media

Effects of secondhand smoke are around 80% that of smoking

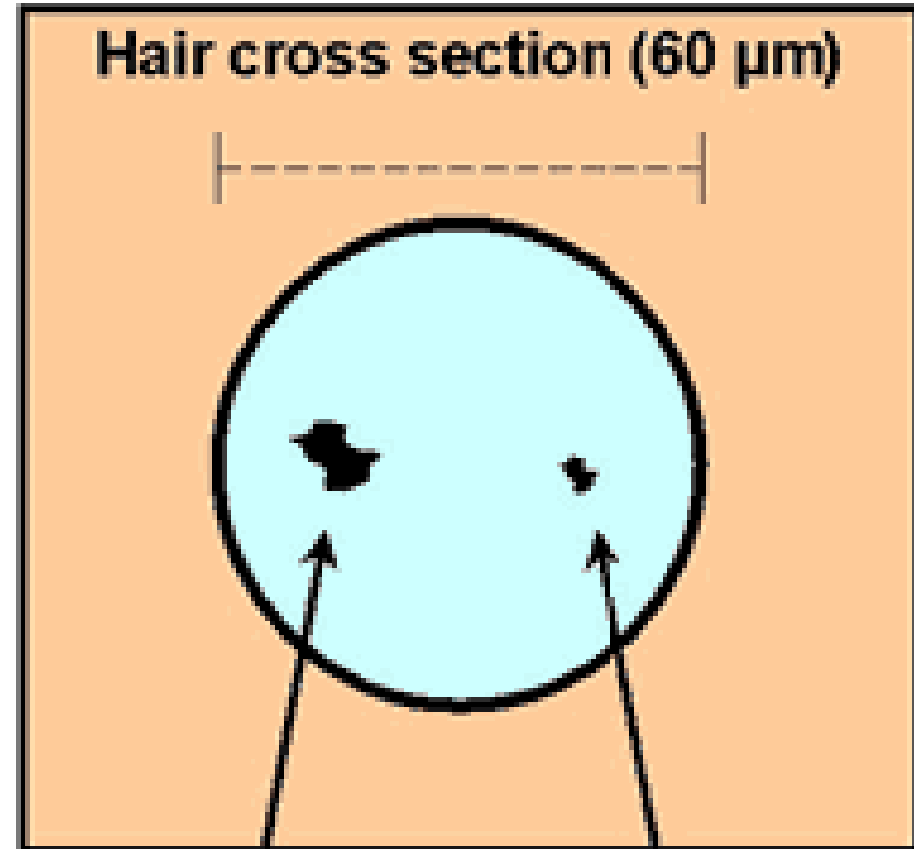
- Platelet function
 - Activation (96%)
 - Aggregate ratio (60%)
 - Fibrinogen (75%)
 - Thromboxane (114%)
- Endothelial function
 - Anuclear cell carcasses (45%)
 - Coronary flow velocity reserve (91%)
- HDL (73%)
- Inflammation
 - WBC (100%)
 - CRP (80%)
 - Homocysteine (80%)
 - Oxidized LDL (85%)
- Antioxidants
 - Vitamin C (57%)
 - Hypovitaminosis (50%)
 - Beta-carotene (174%)
 - RBC folate (58%)

What pollutants are most implicated?

Fine, combustion-related particulate matter/related co-pollutants.



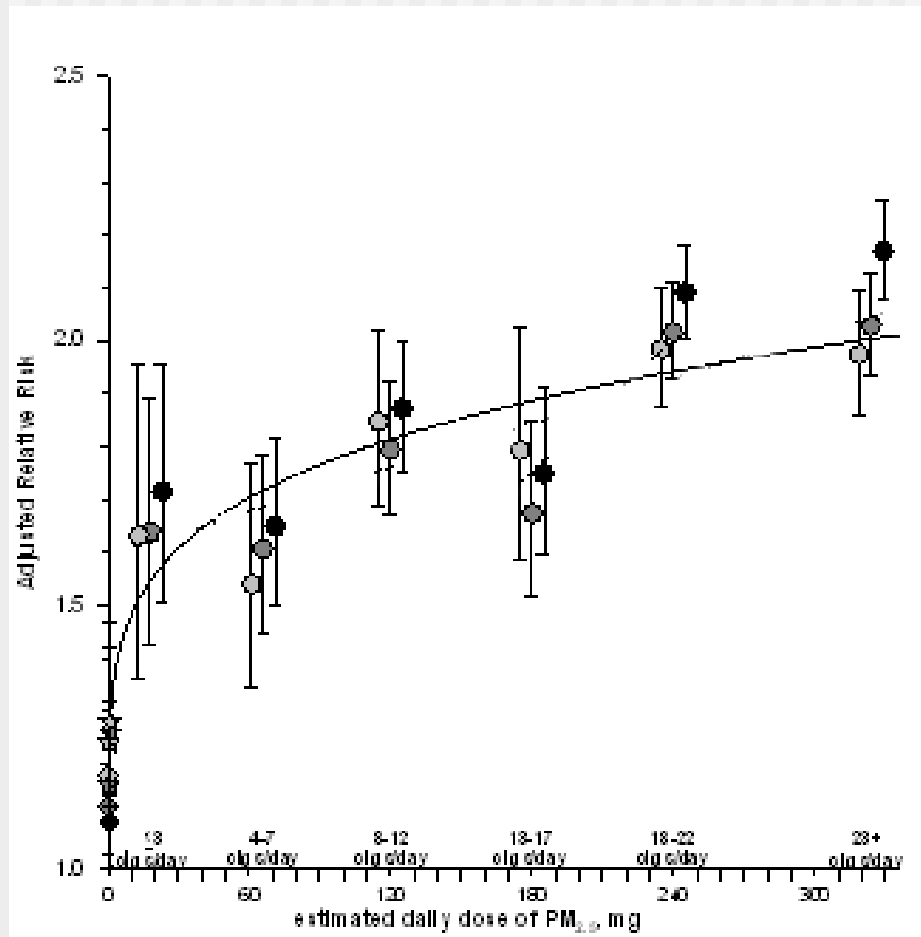
Human Hair
(60 μm diameter)



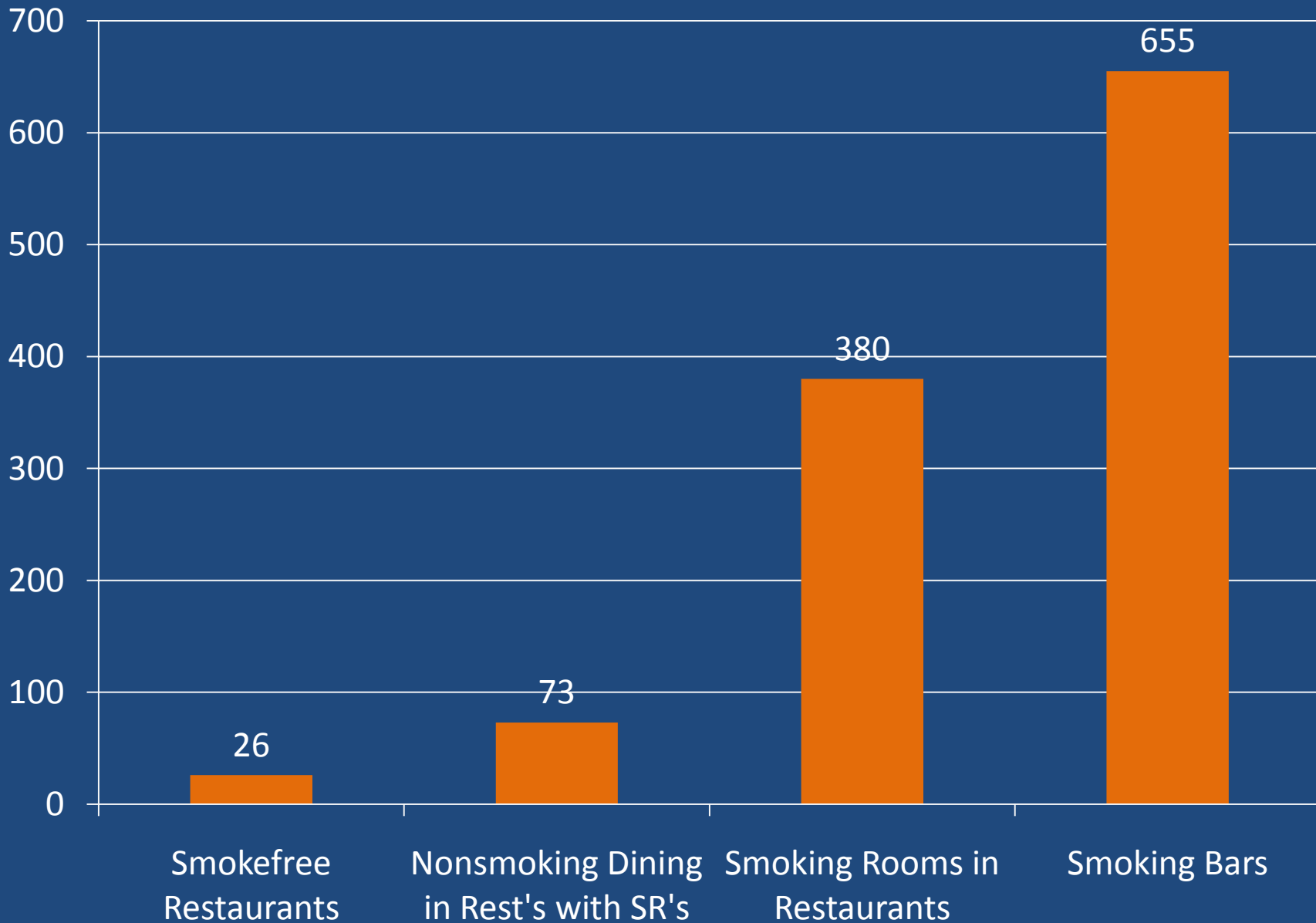
PM₁₀
(10 μm)

PM_{2.5}
(2.5 μm)

Nonlinear Dose-Response



Average PM-2.5 Pollution (micrograms per cubic meter)

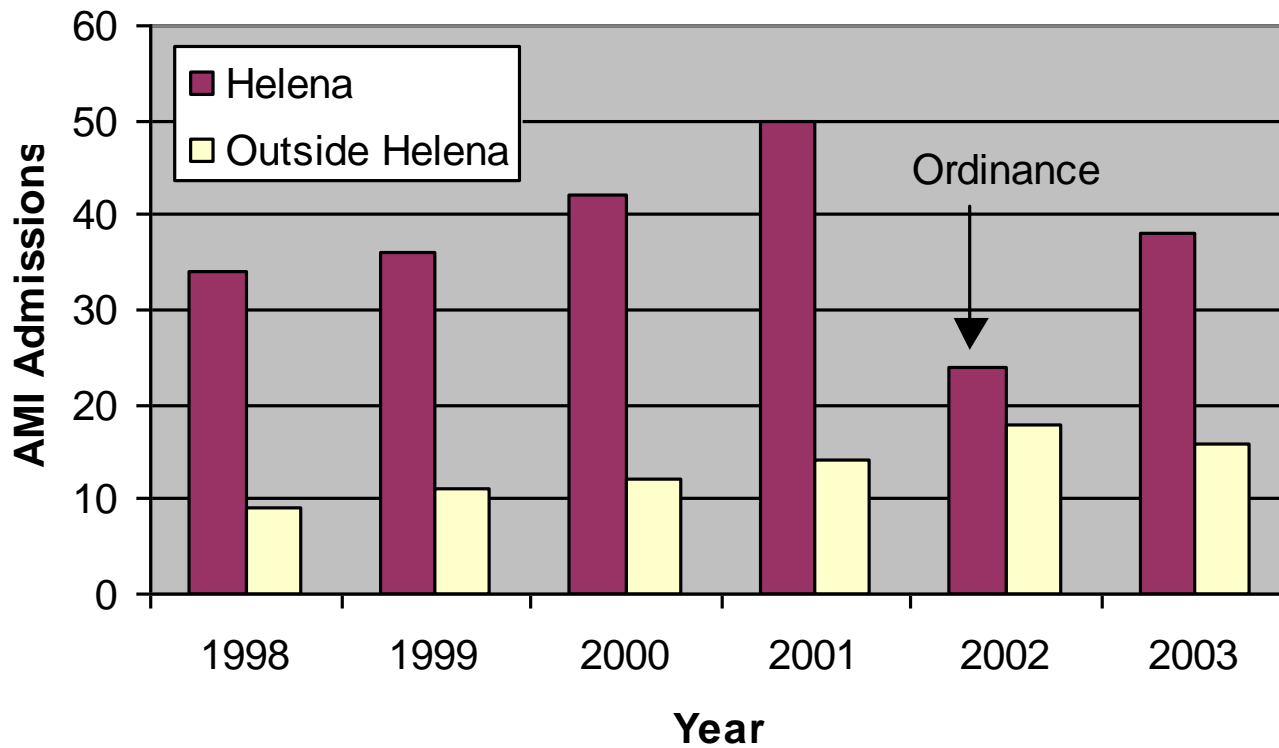


US EPA Air Quality Index

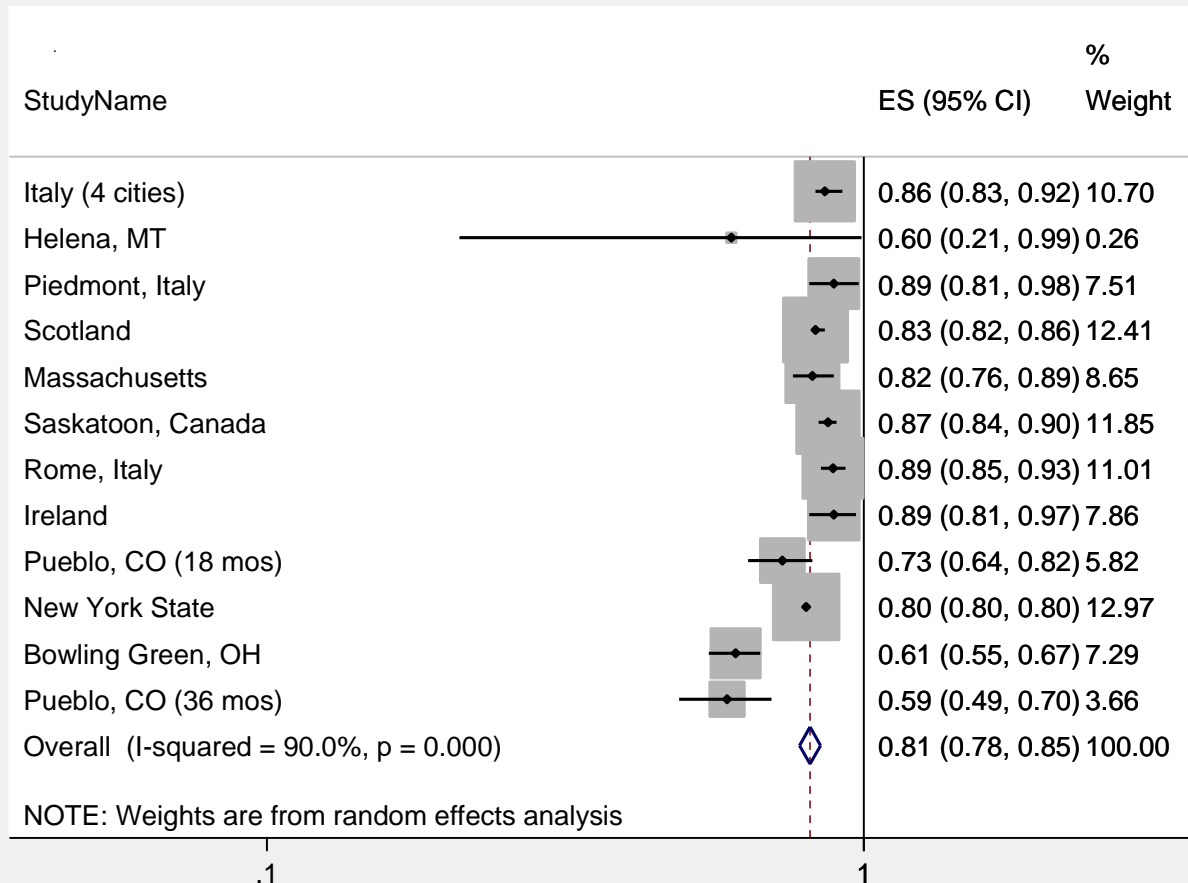
Air Quality	PM _{2.5} ($\mu\text{g}/\text{m}^3$)	Health Advisory
Good	≤ 15	None.
Moderate	16-40	Unusually sensitive people should consider reducing prolonged or heavy exertion.
Unhealthy for Sensitive Groups	41-65	People with heart or lung disease, older adults, and children should reduce prolonged or heavy exertion.
Unhealthy	66-150	People with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion. Everyone else should reduce prolonged or heavy exertion.
Very Unhealthy	151-250	People with heart or lung disease, older adults, and children should avoid all physical activity outdoors. Everyone else should avoid prolonged or heavy exertion.
Hazardous	≥ 251	People with heart or lung disease, older adults, and children should remain indoors and keep activity levels low. Everyone else should avoid all physical activity outdoors.

Gala Event

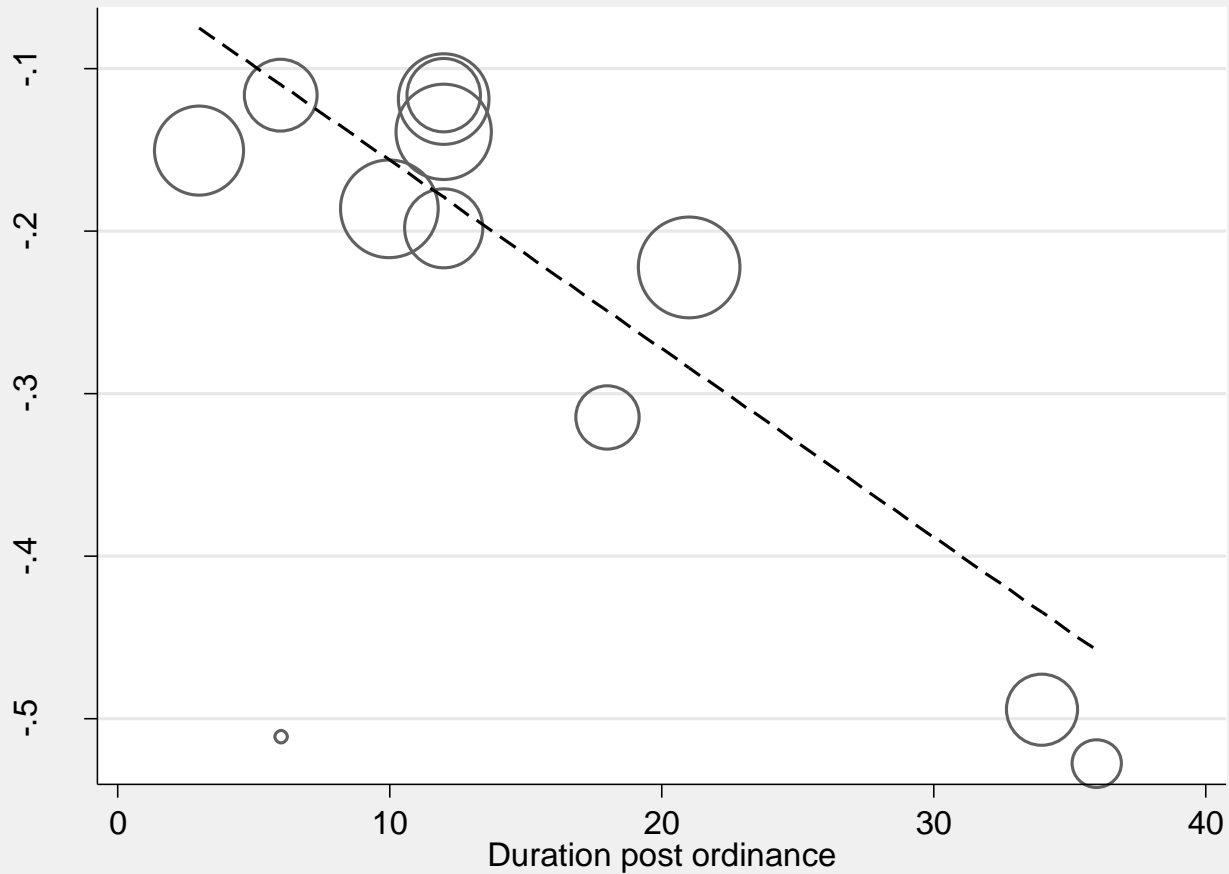
Significant Drop in AMI Admissions while Ordinance in Effect



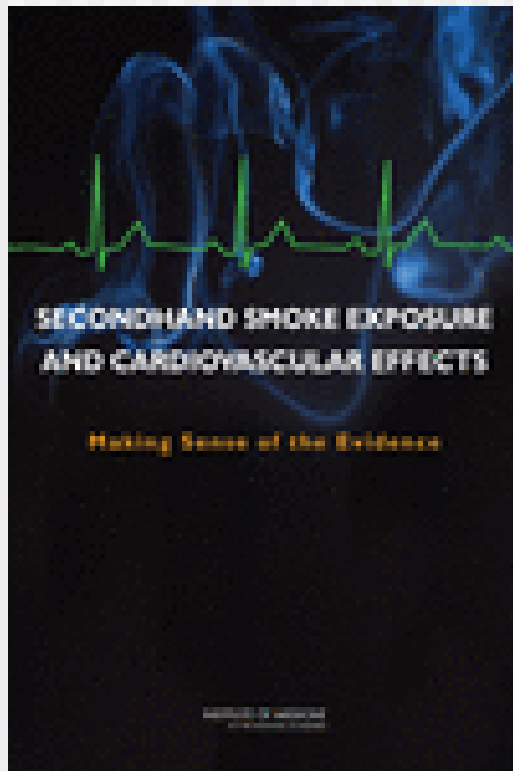
Replicated 12 times



Study length matters

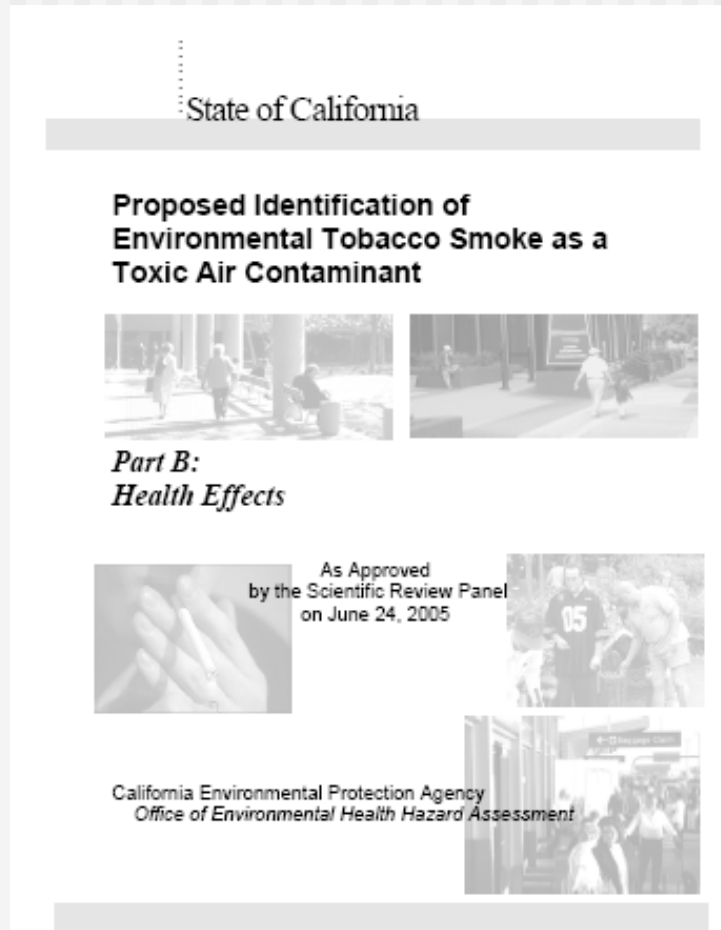


Institute of Medicine



... secondhand-smoke exposure increases the risk of coronary heart disease and heart attacks and that smoking bans reduce this risk. ... smoking bans can have a substantial impact on public health.

CalEPA report and Breast Cancer



<http://www.arb.ca.gov/regact/ets2006/ets2006.htm>

Mammary Carcinogens in Tobacco Smoke

Aromatic hydrocarbons

Benzene
Benzo[a]pyrene
Dibenz[a,h]anthracene
Dibenzo[a,e]pyrene
Dibenzo[a,h]pyrene
Dibenzo[a,I]pyrene
Dibenzo[a,l]pyrene

Nitrosamines

N-nitrosodiethylamine
N-Nitrosodi-*n*-butyl-amine

Aliphatic compounds

Acrylamide
Acrylonitrile
1,3-Butadiene
Isoprene
Nitromethane
Propylene oxide
Urethane
Vinyl chloride

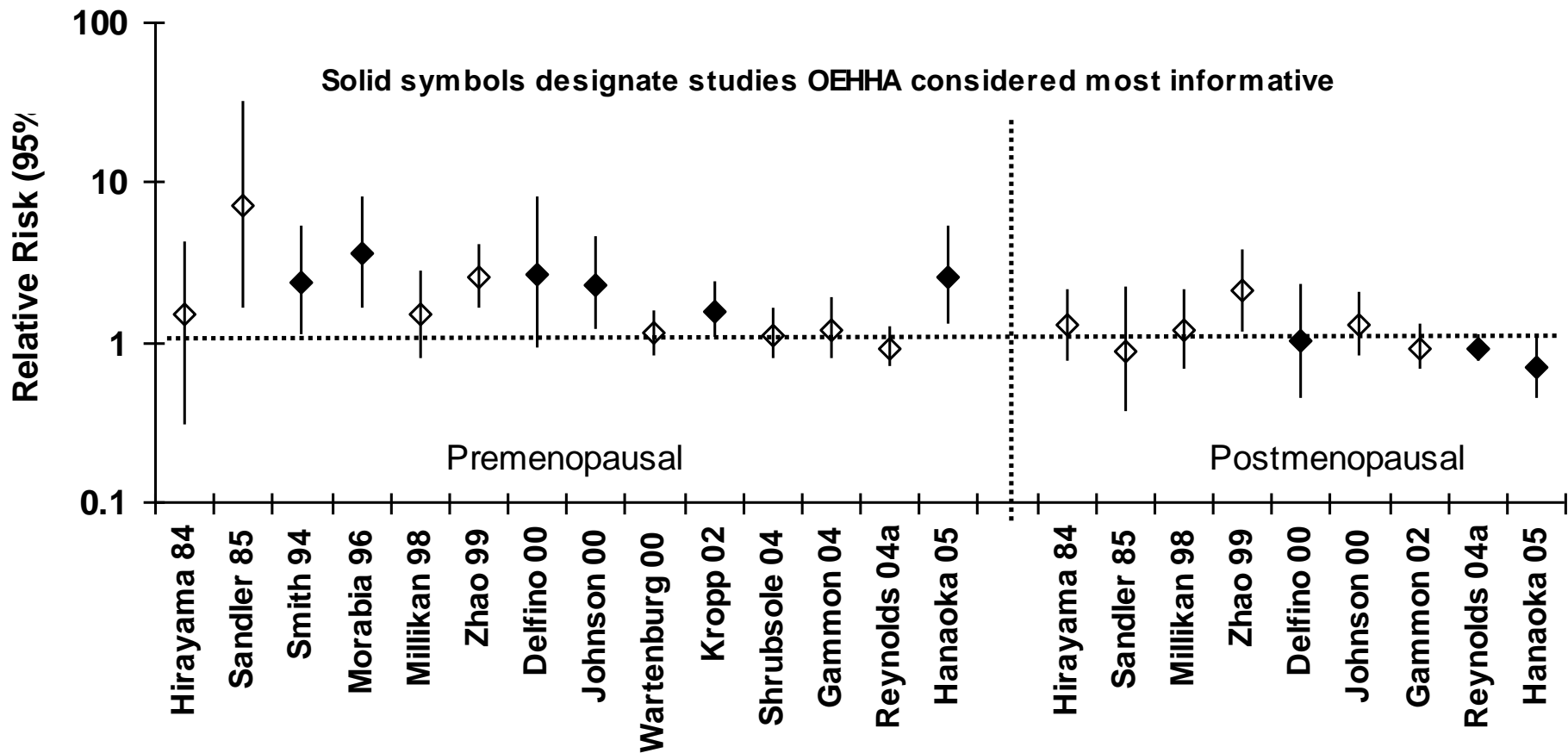
Arylamines and nitrenes

4-Aminobiphenyl
Nitrobenzene
Ortho-Toluidine

Biology

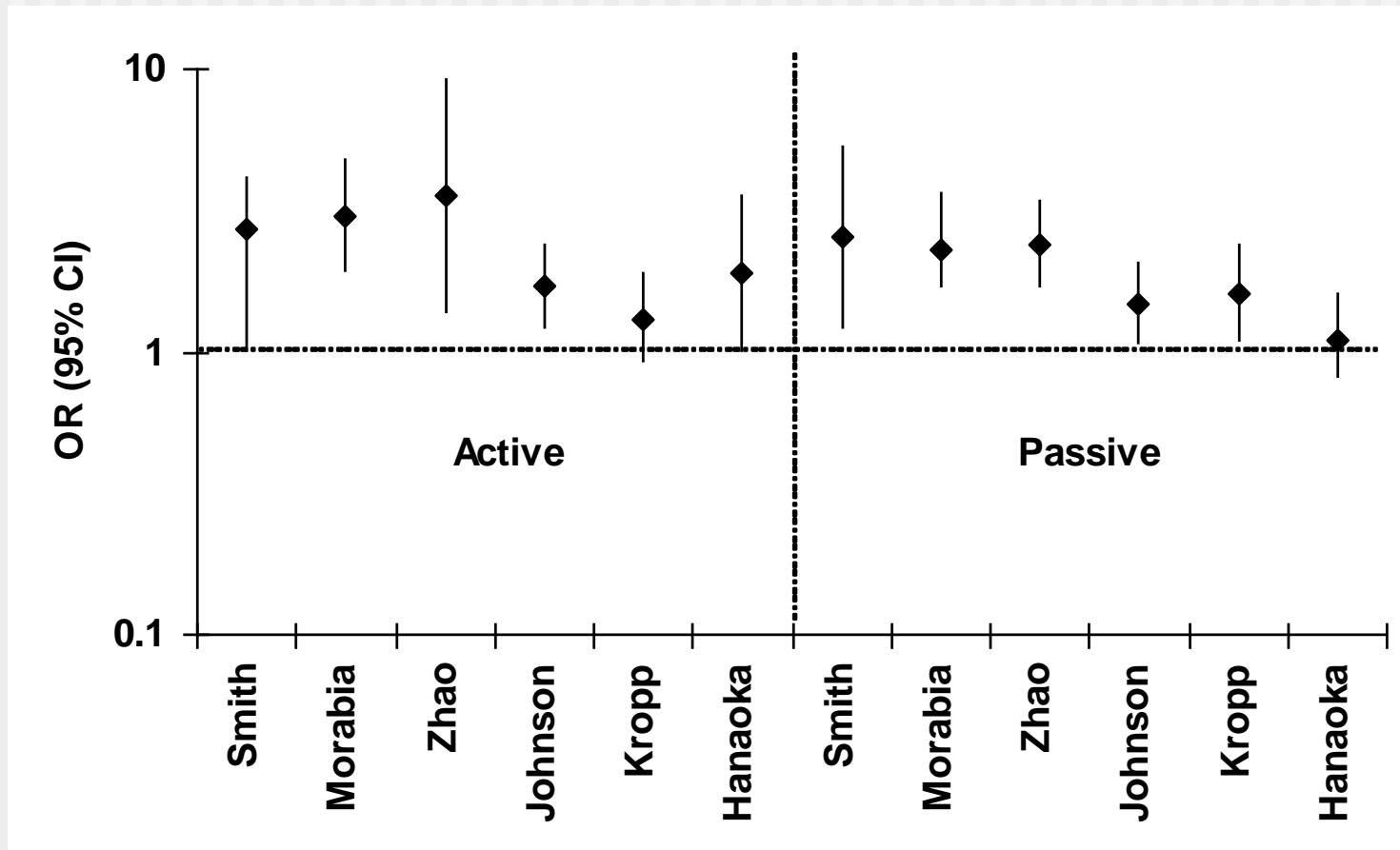
- Tobacco smoke contains multiple fat-soluble compounds known to induce mammary tumors in rodents.
- These carcinogens can be activated into electrophilic intermediates by enzymes active in the human breast epithelial cell.
- Bind to DNA and form DNA adducts in human breast epithelium.
- p53 damage in some breast tumors of smokers, but not nonsmokers

SHS Breast Cancer Risk

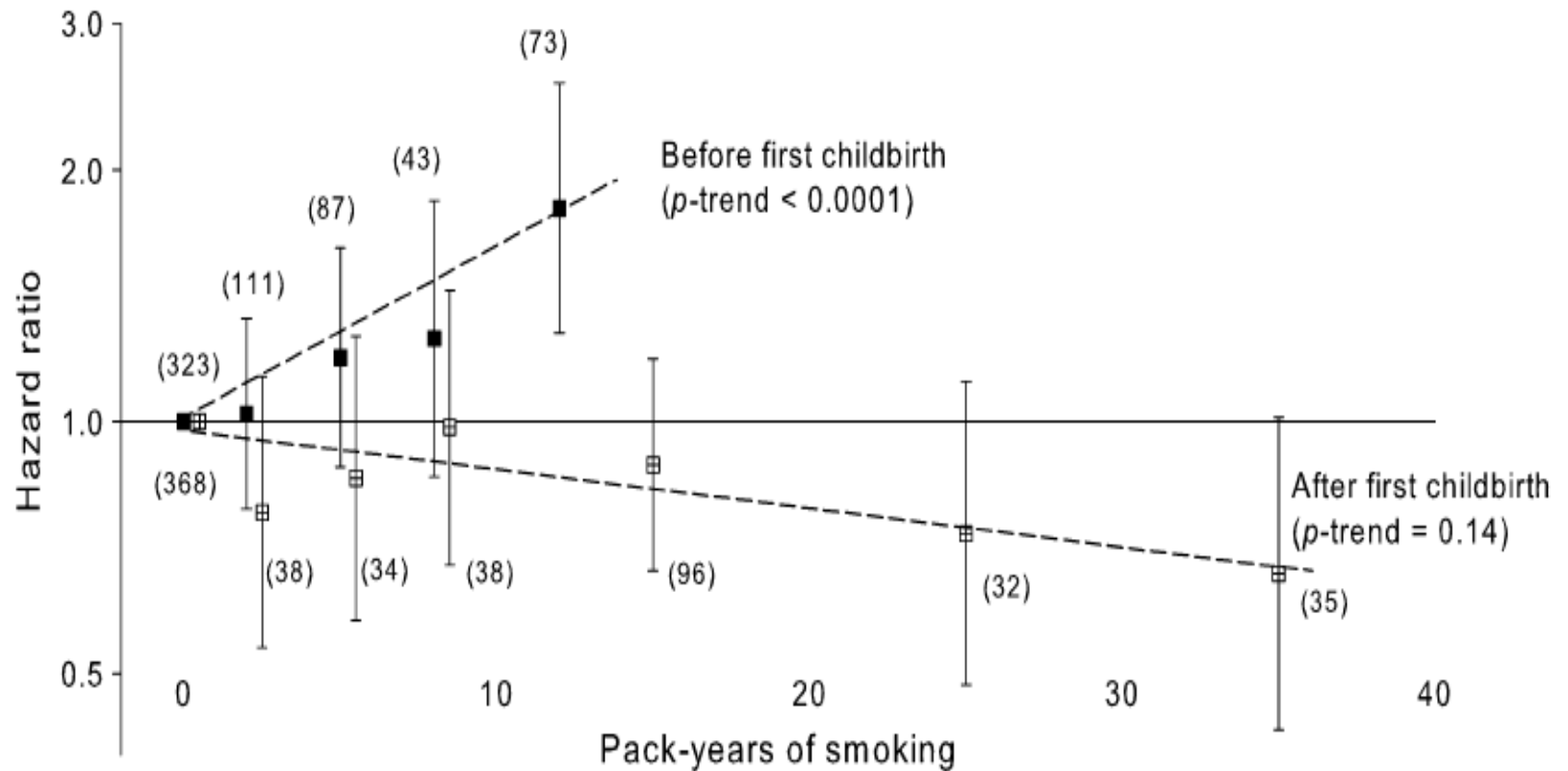


Comparison of breast cancer risk from active and passive smoke exposure in studies

CalEPA considered most informative



Effect before motherhood



BRCA1 and BRCA2

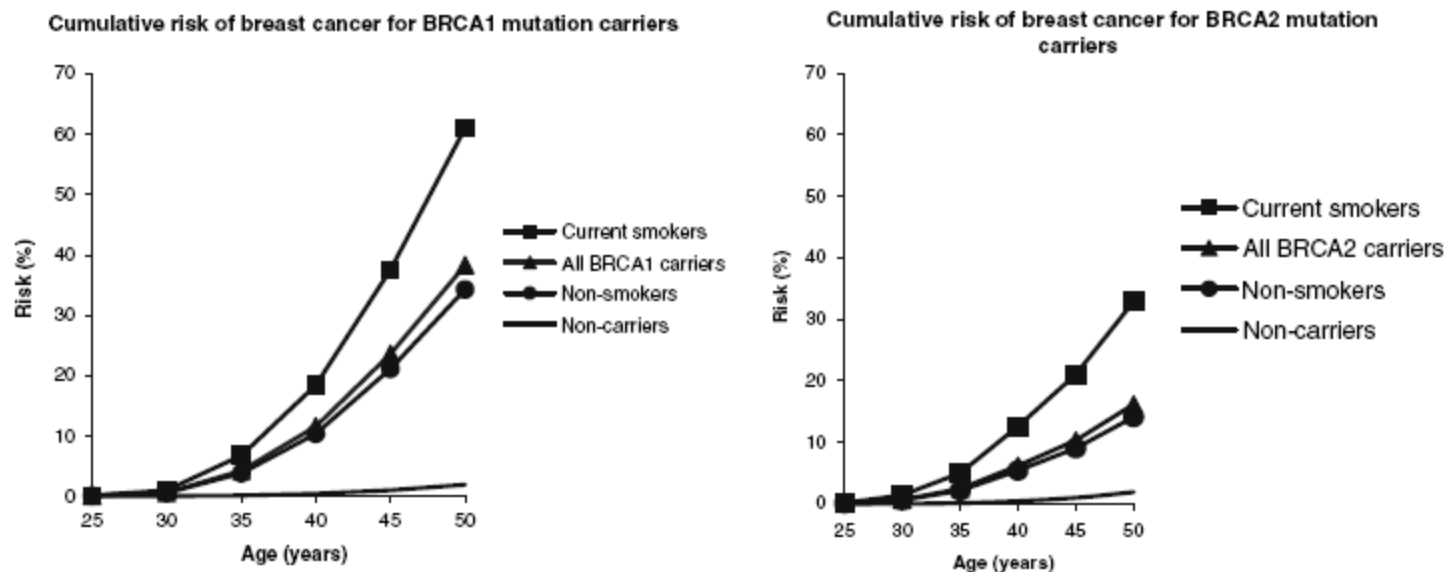


Fig. 1 Estimated cumulative incidence of breast cancer to age 50 in carriers of a *BRCA1* or *BRCA2* mutation. Cumulative incidence estimated by combining age-specific incidence data among *BRCA1*

and *BRCA2* mutation carriers (5) with the smoking prevalence among controls of Table 2 and the odds-ratio estimates of Table 3

N-acetyltransferase 2 genotypes

- Involved in metabolism of aromatic amines (tobacco smoke carcinogens)
- Meta-analysis of 13 studies
 - Ambrosone, Cancer Epi Biomarkers Prev 2008:17(1)
- Significant interaction between smoking, NAT2 genotype, and breast cancer risk
- 4 x Risk in slow acetylators that are heavy smokers
- About half of Caucasians slow

Implications for Workplace Exposure of Waitresses

- Highest occupational exposure to SHS: 72.3%
- These women tend to get exposed at the most vulnerable times
- 1.7 relative risk
- 30% of breast cancer in younger waitresses

The bottom line

- Increases in risks for smoking and passive smoking among younger women
- Exposure between puberty and lactation probably most dangerous
- Susceptible women probably get the cancers young
- Little evidence for an effect in older women