CDC's
National Biomonitoring Program

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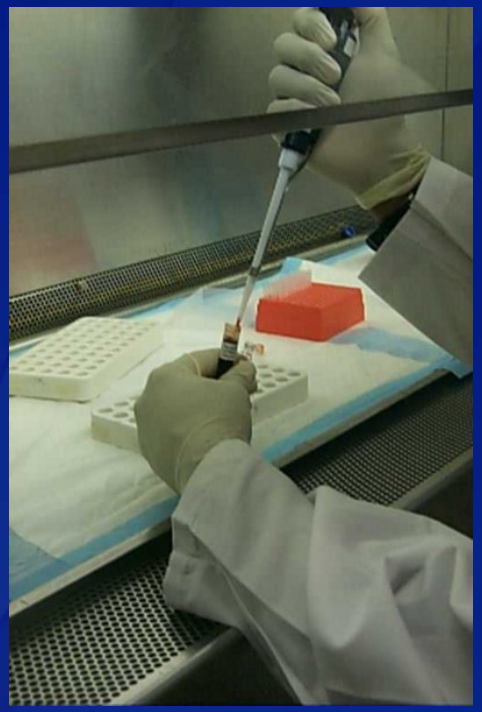
Biomonitoring

An assessment of internal dose or exposure by measuring a chemical (or its metabolite or reaction product) in human blood, urine, or other tissue



Provides information for:

- Public health response to a known or suspected excessive exposure to a toxicant
  - ➢ Identify the exposure and affected population
  - ➢ Assess health risk from the exposure
  - ➢ Treat and/or prevent exposure
- Health research to determine what toxicants and what internal dose levels cause disease

National Biomonitoring Program: Objectives

- To assess the exposure of the U.S. population to priority environmental chemicals every two years.
- Provide biomonitoring measurements for studies of exposure of vulnerable population groups and for studies investigating the relationship between human biomonitoring levels and adverse health effects.
- Develop new and improved biomonitoring methods for priority environmental chemicals.
- To provide effective laboratory support for CDC emergency responses that involve known or potential exposure to environmental chemicals.
- Provide analytical support, training and technology transfer to state and local laboratories to support investigations of known and potentially unsafe exposures.

NHANES: How we assess exposure of the U.S. population to priority environmental chemicals

- National Health and Nutrition Examination Survey
  - Began in 1971
  - Continuous survey since 1999 (survey cycle = 2 years)
  - Stratified, multistate national probability sample
  - About 10,000 participants in 30 locations every 2 years
- Methods
  - Face-to-face and computer-assisted interviews:
    - Demographics
    - Socioeconomic
    - Dietary
    - Health-related topics
  - Physical examination
  - Biological specimen collection

More at : http://www.cdc.gov/nchs/nhanes/about_nhanes.htm

National Health and Nutrition Examination Survey (NHANES) Mobile Examination Centers

NHANES: How we assess exposure of the U.S. population to priority environmental chemicals

- Biomonitoring specimens: blood
  - All consenting participants (ages 1 year and older)
  - Not all environmental chemicals measured in all participants
  - Blood metals in all participants
  - Serum cotinine in ages 3 years and older
  - Most blood/serum chemicals in ages 12 years and older
- Biomonitoring specimens: urine
  - All consenting participants, ages 6 years and older
- Most environmental chemicals use ½ or 1/3 representative subsamples (~2500)
- What chemicals are measured (http://www.cdc.gov/exposurereport/chemical_selection.html)

Data Dissemination: *National Report on Human Exposure to Environmental Chemicals*

- Results compiled in the *National Report* and *Updated Tables* are cumulative
- Results are descriptive (geometric means, percentiles, confidence intervals)
  - Demographic groups (age, sex, racial/ethnic)
  - *Fourth Report* (December 2009) and *Updated Tables* (September 2012, most recent) provide results for 246 chemicals
  - Most extensive evaluation of U.S. population exposures
  - Provides reference values for environmental chemical exposure

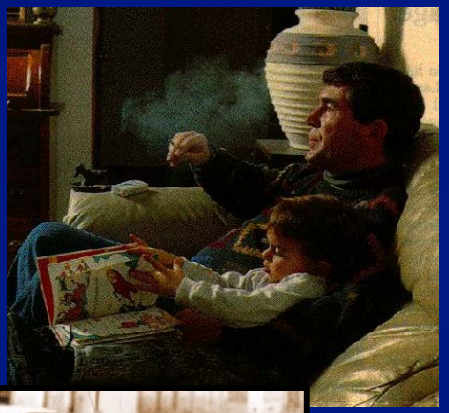
Available at: http://www. cdc.gov/exposurereport/

Data Dissemination: Publications and Posting Results Publicly

- Results for new chemicals are analyzed by CDC and presented in peer-reviewed publications.
  (http://www. cdc.gov/exposurereport)
- Datasets for all chemicals are posted on NHANES website, once a rigorous quality control process is completed. (http://www.cdc.gov/nchs/nhanes.htm)
- NHANES provides data documentation and guidance documents for researchers who wish to conduct analysis any of the NHANES data.
  (http://www.cdc.gov/nchs/nhanes/nhanes_questionnaires.htm)

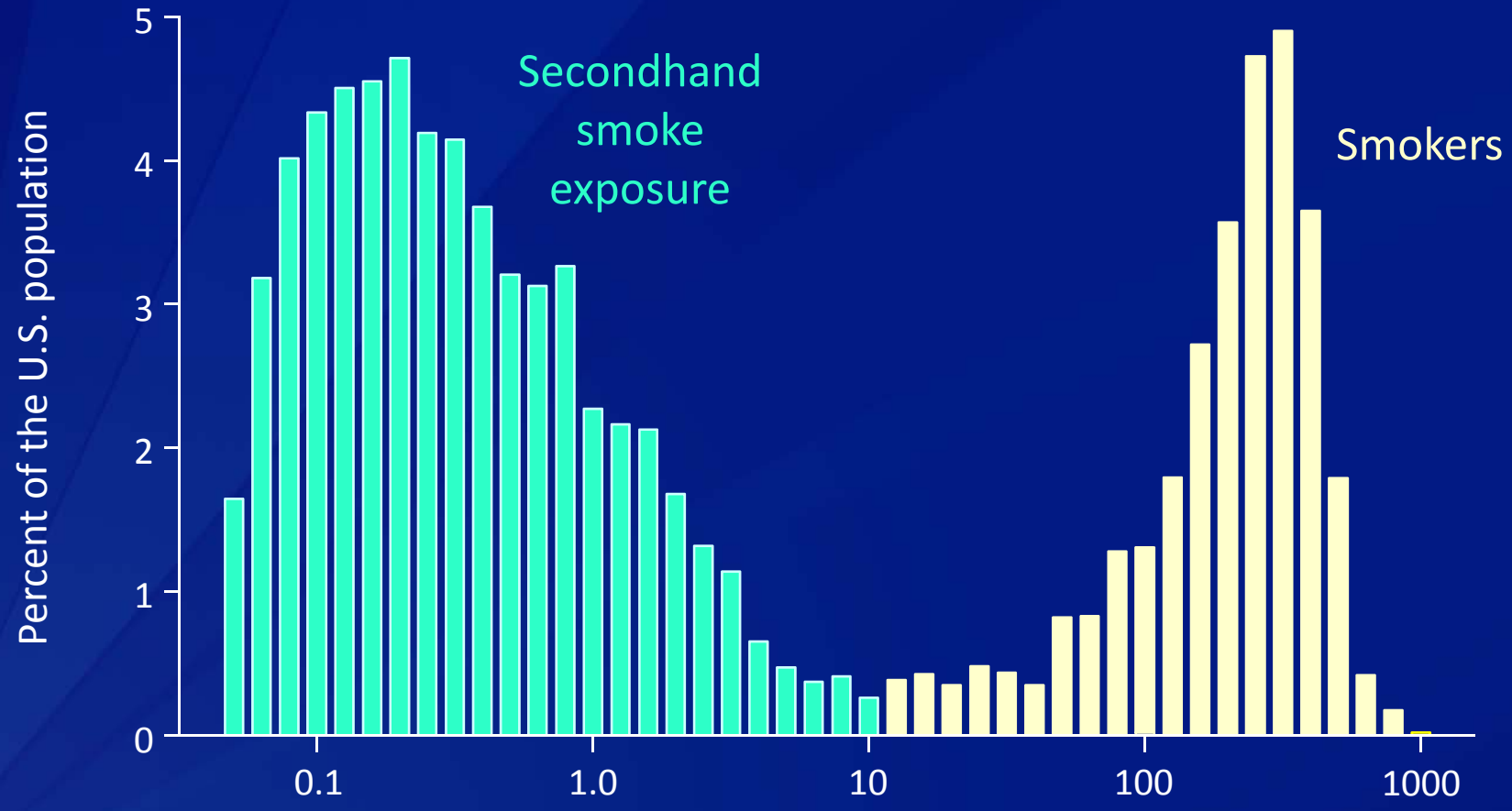
Biomonitoring Data Has Informed Public Health Policy and Regulations

- Serum cotinine and second-hand smoke (SHS) exposure
- Blood lead and gasoline, the relationship between environmental and human exposure
- Recent examples of public health policy impacts



Second Hand Smoke Exposure

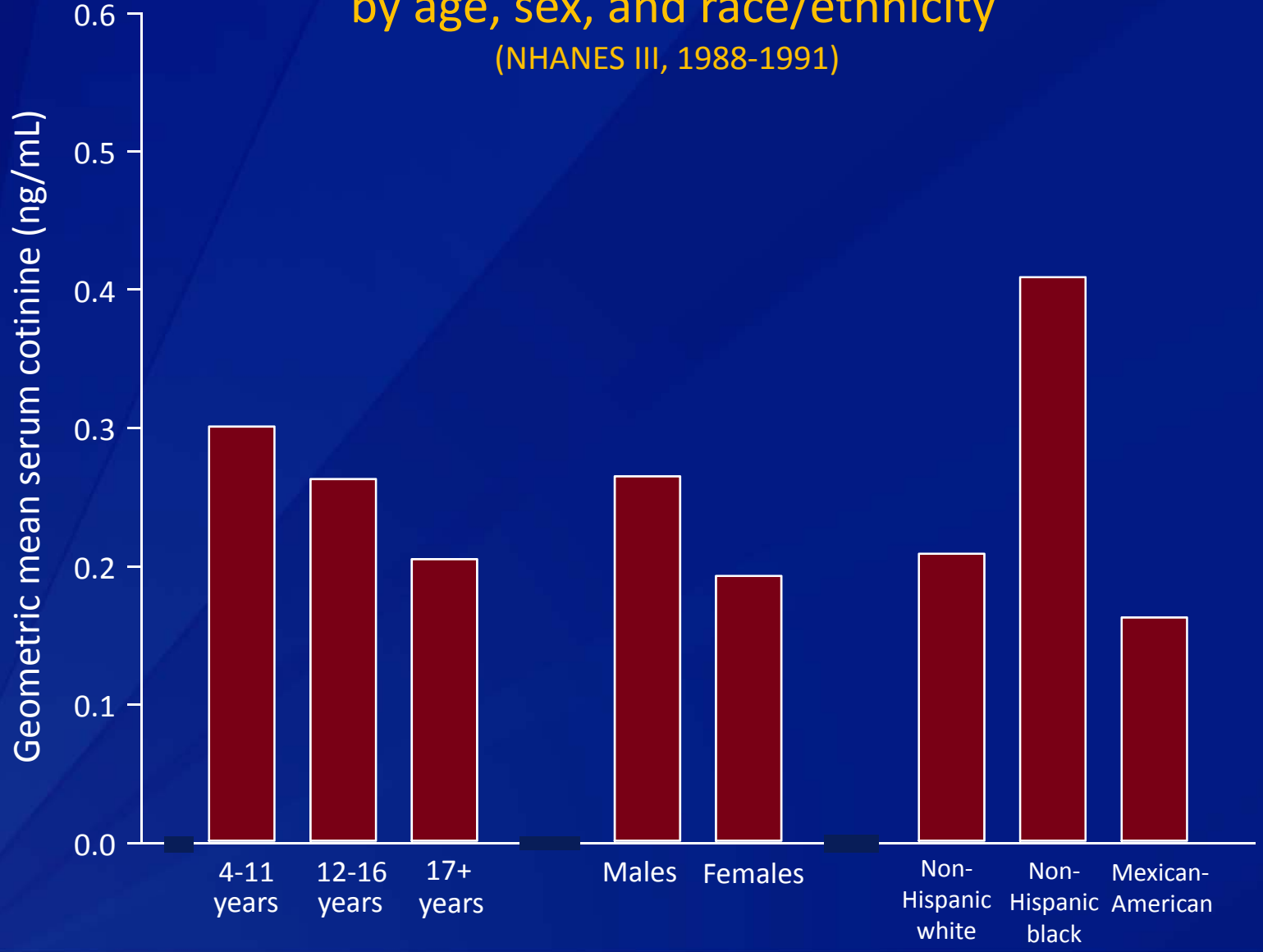
Using serum measurements, CDC assesses the number of smokers and those exposed to secondhand smoke in the U.S. every two years



Serum Cotinine Levels for Non-Tobacco Users

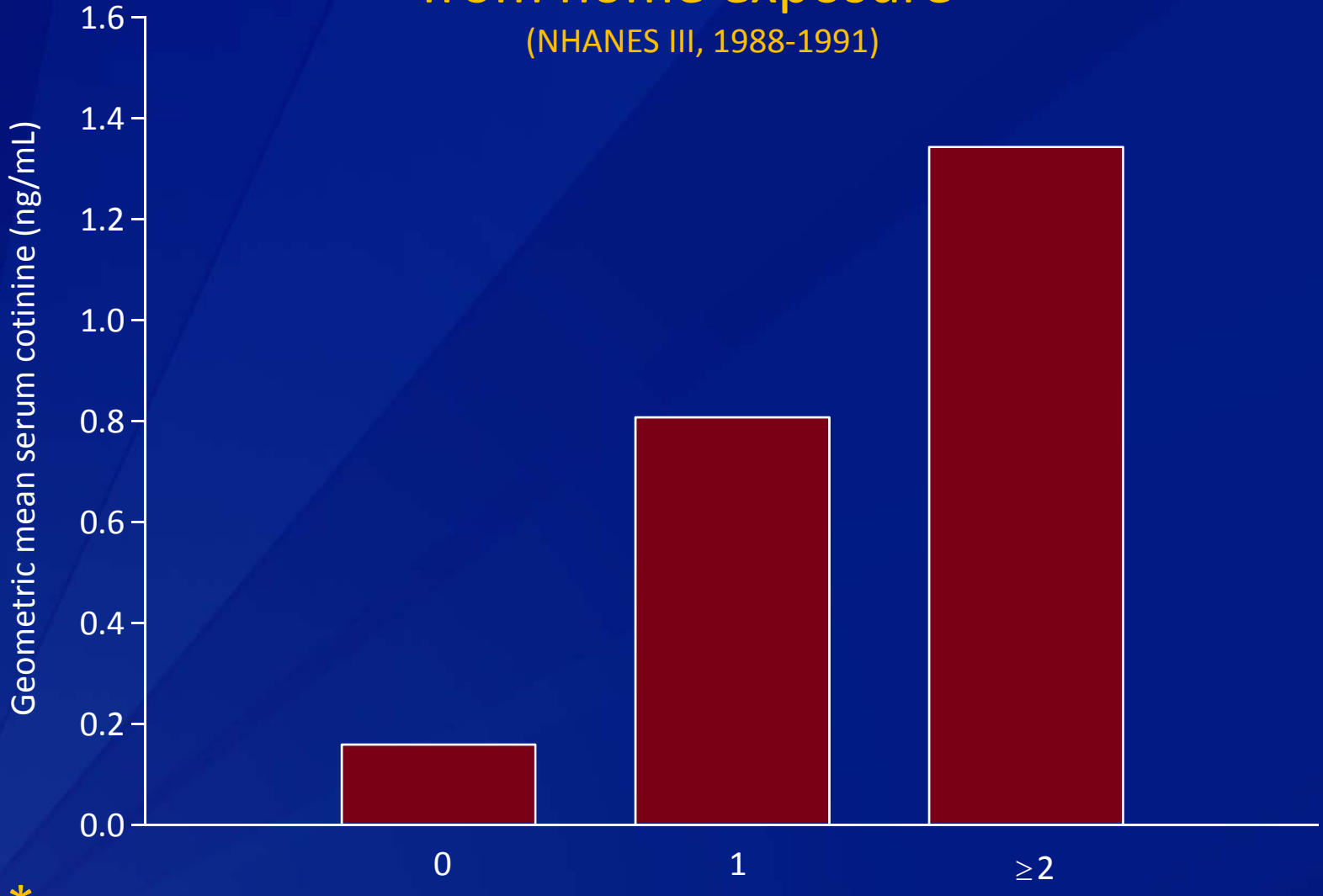
by age, sex, and race/ethnicity

(NHANES III, 1988-1991)



Serum Cotinine Levels for Non-Tobacco Users from home exposure*

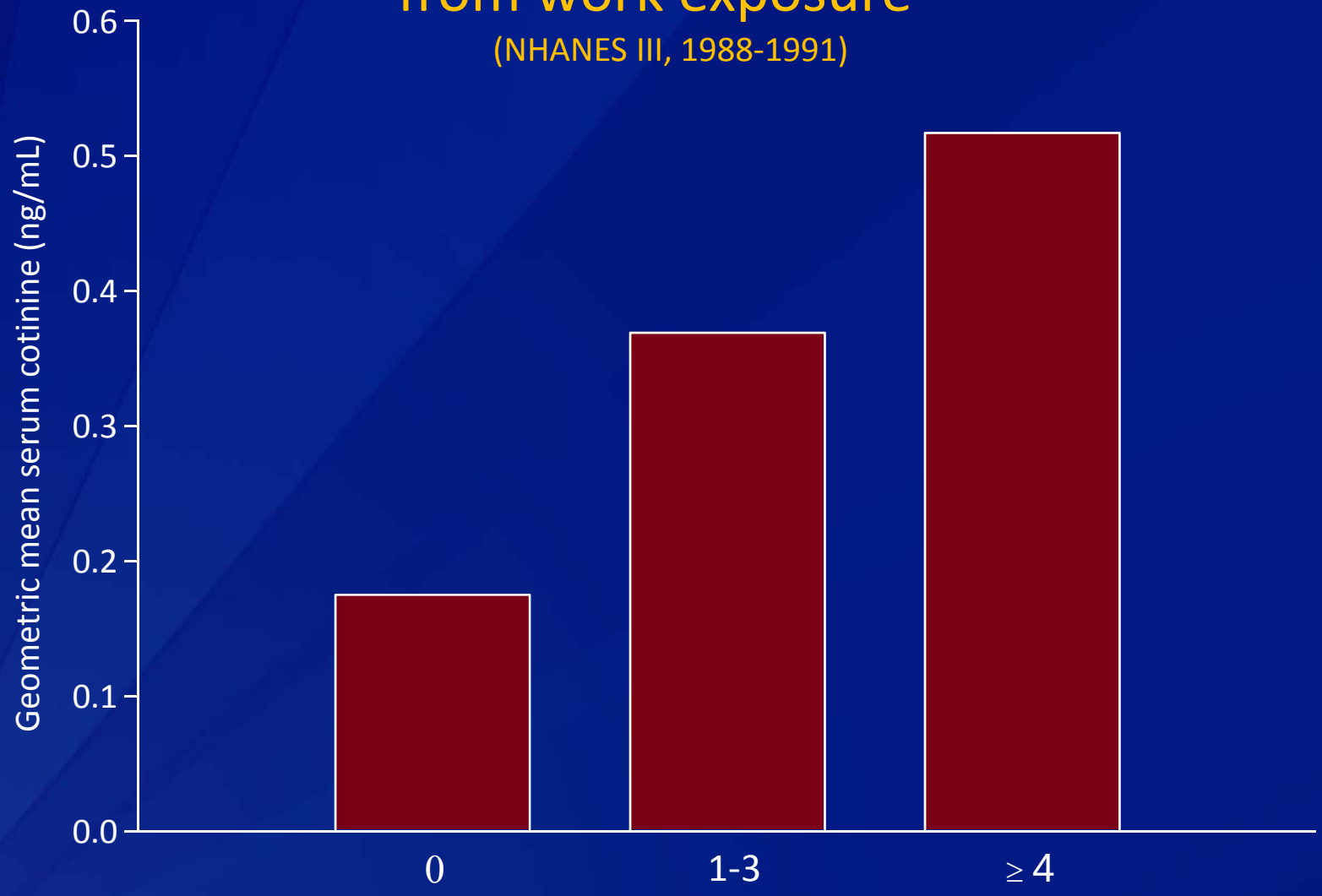
(NHANES III, 1988-1991)



*Ages 4 & older

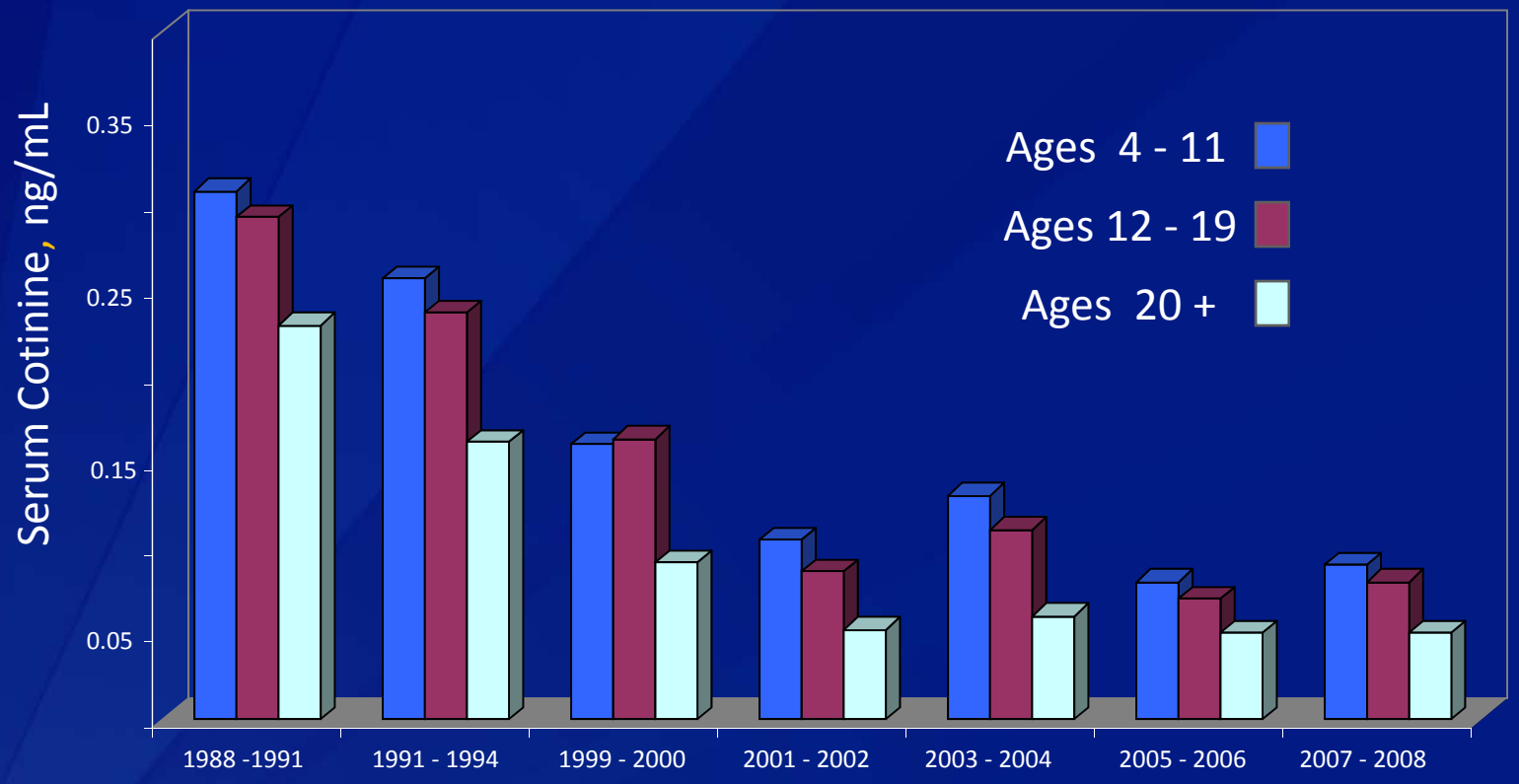
Serum Cotinine Levels for Non-Tobacco Users from work exposure*

(NHANES III, 1988-1991)

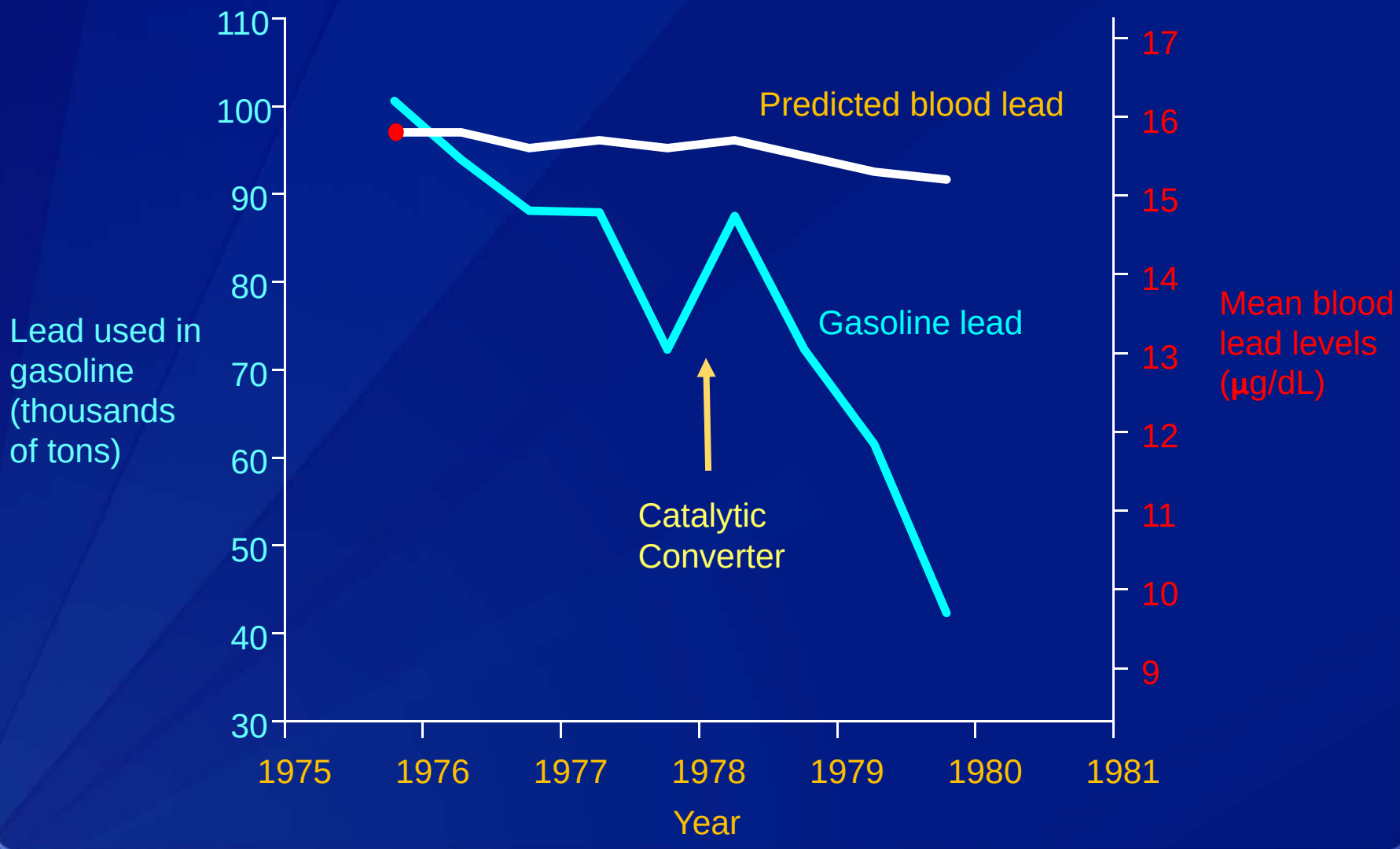


*Ages 17 & older

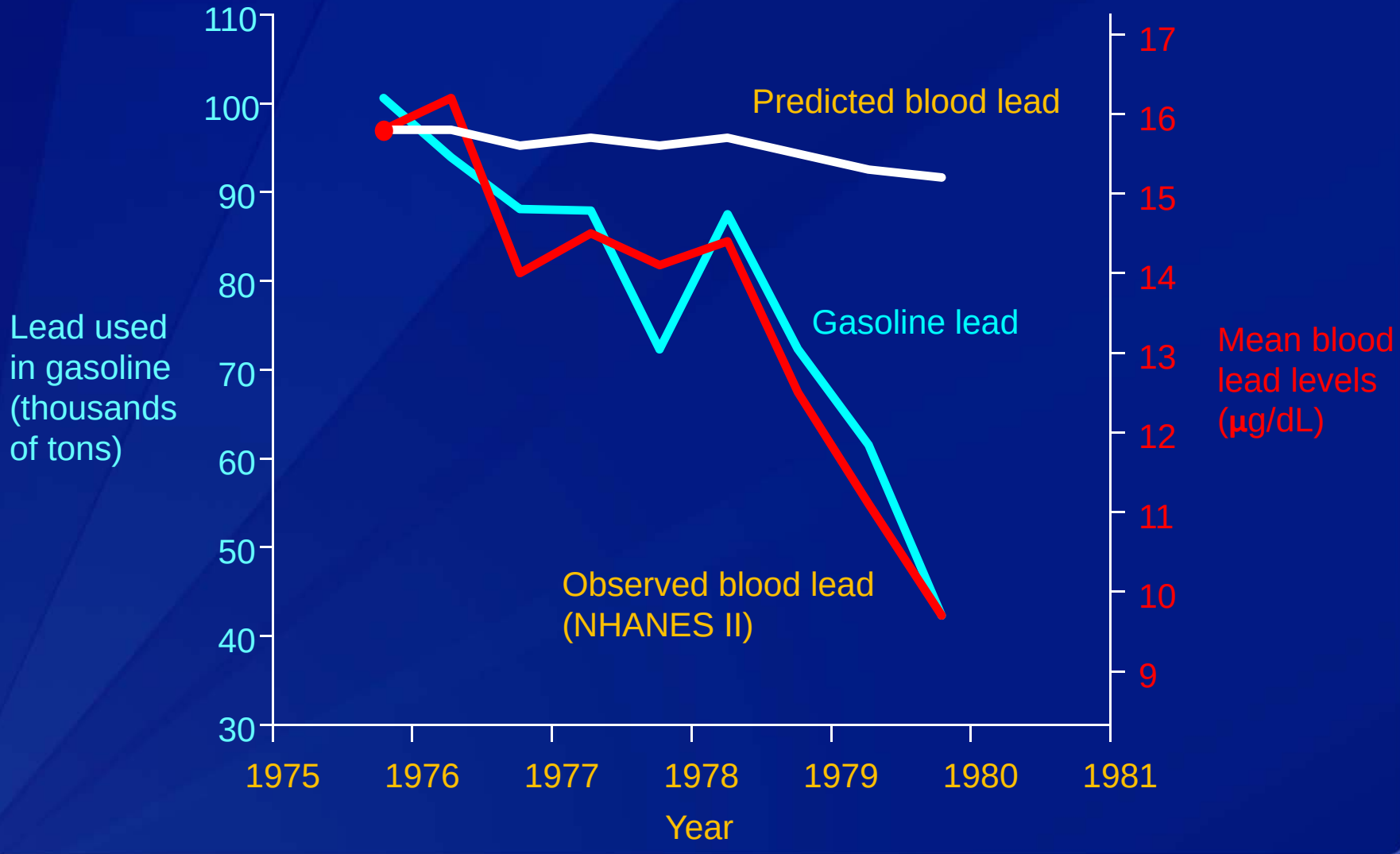
Children and Teenagers are Still More Exposed to Second Hand Smoke than Adults



Environmental modeling predicted only a slight decline in blood lead levels in people



Blood lead measurements showed a substantial decline in blood lead, 10 times more than predicted from modeling



Biomonitoring Public Health Policy Impact Examples

- U.S. Consumer Product Safety Improvement Act of 2008 restricted use of some phthalates in children's toys and child care articles
- FDA's Family Smoking Prevention and Tobacco Control Act of 2011
- FDA re-evaluation of its assessment of BPA for use in food contact applications (on-going)
  - July 2012, FDA banned the use (already abandoned) of polycarbonate resins in baby bottles and spill-proof cups
- U.S. EPA is developing a proposed national primary drinking water regulation for perchlorate
- U.S. EPA is relying on NHANES data to propose future actions under the Toxic Substances Control Act (TSCA)
  - Hearings in the US Congress about the need to reform TSCA are underway

Value of Biomonitoring for Public Health Policy

- NHANES provides ongoing data on U.S. population exposure to environmental chemicals (reference values, trends, subgroups)
- Biomonitoring, clinical, and nutritional data in NHANES can be linked to explore health outcomes **BUT**
- NHANES limitations:
  - Cross-sectional design
  - National estimates only; no geographical or seasonal information
  - No data for specific subgroups, sources, or uses of chemicals
  - Very limited data for children < 6 years of age
- Additional studies are required to assess exposures in select populations
- Separate studies of varying exposure levels and health effects are required to determine levels that are safe or result in disease
- Biomonitoring data can be used to support public health policy

Thank You !

Questions?

For more information please contact Centers for Disease Control and Prevention
1600 Clifton Road NE, Atlanta, GA 30333
Telephone, 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348
E-mail: cdcinfo@cdc.gov Web: www.cdc.gov