Health Data & Surveillance: An Overview

Tom Sinks, Ph.D.

Deputy Director

National Center for Environmental Health/

Agency for Toxic Substances & Disease Registry

Centers for Disease Control and Prevention

"The findings and conclusions in this presentation have not been formally disseminated by the Centers for Disease Control and Prevention and should not be construed to represent any agency determination or policy."

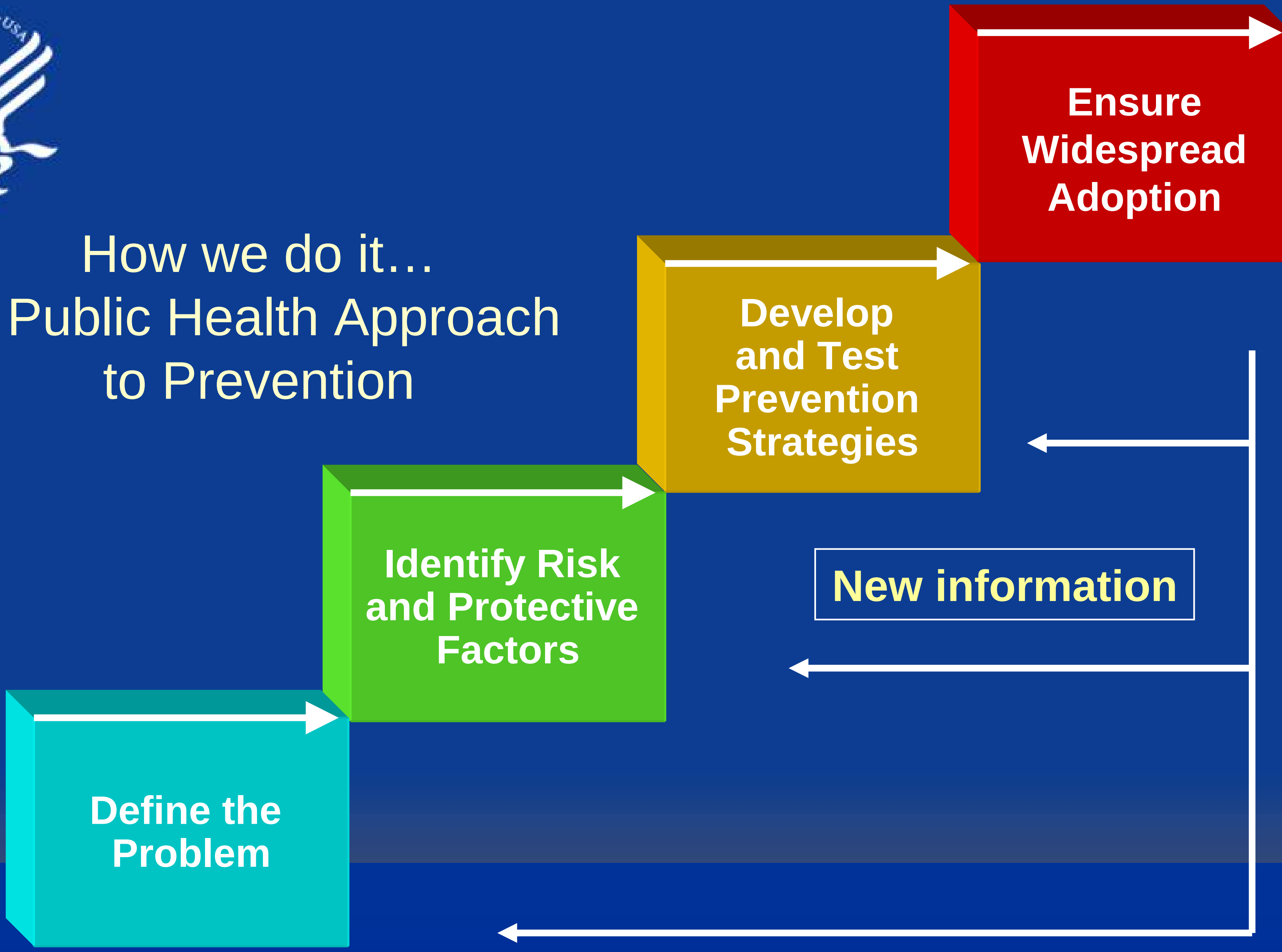
What I'm going to say …

- Strengths and limitations of data sources for evaluating air pollution related health effects.
- Opportunities within CDC's biomonitoring program.
- Protecting personal information and encouraging research.

What we do …

- Health Tracking
- Asthma Prevention
- CO poisoning
- Emergency Response (CBRN – outbreaks and exposures)
- ATSDR – SARA/CERCLA, NCP

How we do it… A Public Health Approach to Prevention



Public Health Surveillance

Ongoing, systematic collection, analysis, interpretation of outcome-specific data for use in the planning, implementation and evaluation of public health practice.

Purposes of Public Health Surveillance

- Assess public health status
- Define public health priorities
- Evaluate programs
- Develop and target interventions
- Disseminate information

The Classics

- Reportable conditions
- Health Care Services Data
- Vital Statistics
- Disease Registries
- Surveys
  - NHIS
  - NHANES
  - Behavioral Risk Factor Surveillance System

Air Pollution-Related Health Effects

Disease	Deaths	Prevalence - Incidence	Air Pollutant	Attributable %
Asthma	4,600 Annually[1]	14.6 M have asthma[1]; 478,000 annual hospitalizations[1]	O3, PM; Air Toxics; Traffic Emissions	Resp. hospitalizations rise ~7 to 10% for each 0.05ppm increase in ozone[2]; During a 22.5% reduction in peak traffic flow associated with Summer Olympics, # of acute asthma care events in Atlanta decreased by 41.6% [3]
COPD	120,000 Annually[4]	11.2 M adults have COPD;	O3; PM; Traffic Emissions	In the U.S., 80 – 90% of COPD has been attributed to cigarette smoking (United States Surgeon General, 1984).
CVD	910,000 Annually[5]	70 M have CVD[5]	PM; Traffic	60,000 of 350,000 annual sudden cardiac deaths attributed to short term increases in PM[6]
Mortality		All Age, Age Adjusted 832 per 100,000	03; PM; Traffic	Short Term Exposures~ 1 to 8% for each PM10 50μ/m^3 increase; 2 to 6% for each PM2.5 25μ/m^3 increase[7]; Long Term Exposures: RR Most vs Least Polluted City 1.26 (1.08-1.47)[8]; 4, 6, 8% of all-cause, cardiopulmonary, & lung cancer for each annual increase of 10μ/m^3 of PM2.5[9]

State/Local Data Sources for Air Pollution-Related Tracking & Research

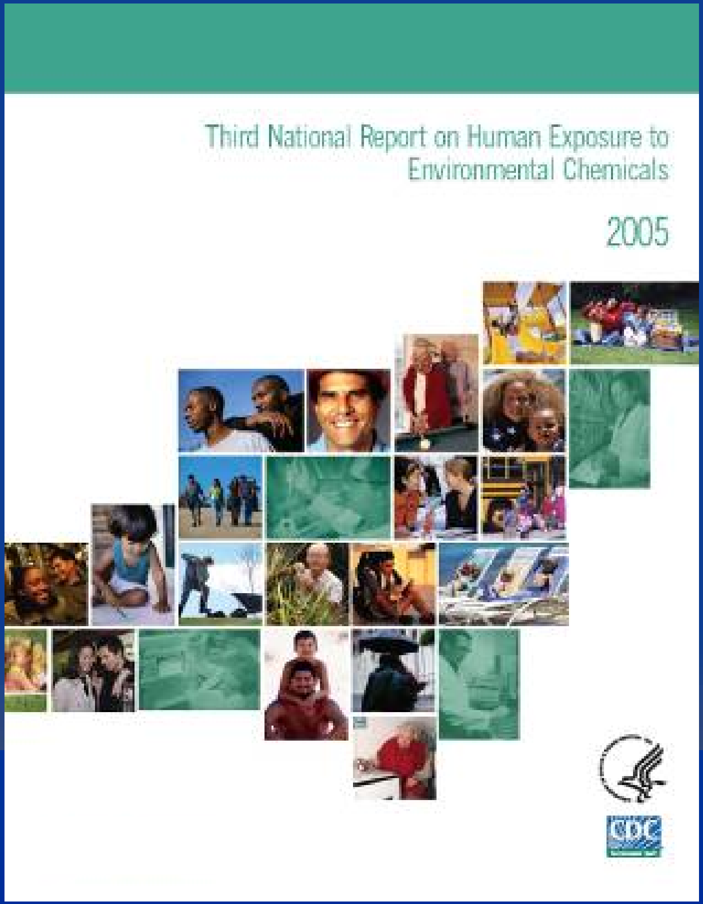
Health Outcome	Hospital Discharge & ED	Vital Statistics	Disease Registries	Outpatient
Perinatal	R	R/S	R/S	R
Asthma	R/S	R/S	NA	R
COPD	R	R/S	NA	R
Cancer	NA	R/S	R/S	NA
CVD	R*	R/S	R/S	R
Other*	R	R/S	NA	R

S = Surveillance R = Research

* Other includes diseases, such as neurodegenerative and autoimmune conditions

CDC's *Third National Report*
on Human Exposure to Environmental Chemicals

- Selected participants in NHANES
- Produced every two years
  - *First Report* (2001) - 27 chemicals
  - *Second Report* (2003) - 116 chemicals
  - *Third Report* (2005) - 148 chemicals
  - *Fourth Report (2007)* – 280+ chemicals
- Blood and urine levels of chemicals and metabolites
  - Metals, tobacco smoke, phthalates phytoestrogens, polycyclic aromatic hydrocarbons (PAHs), pesticides, herbicides, insecticides, dioxins, furans, and polychlorinated biphenyls (PCBs)
  - VOCs included in 4th report

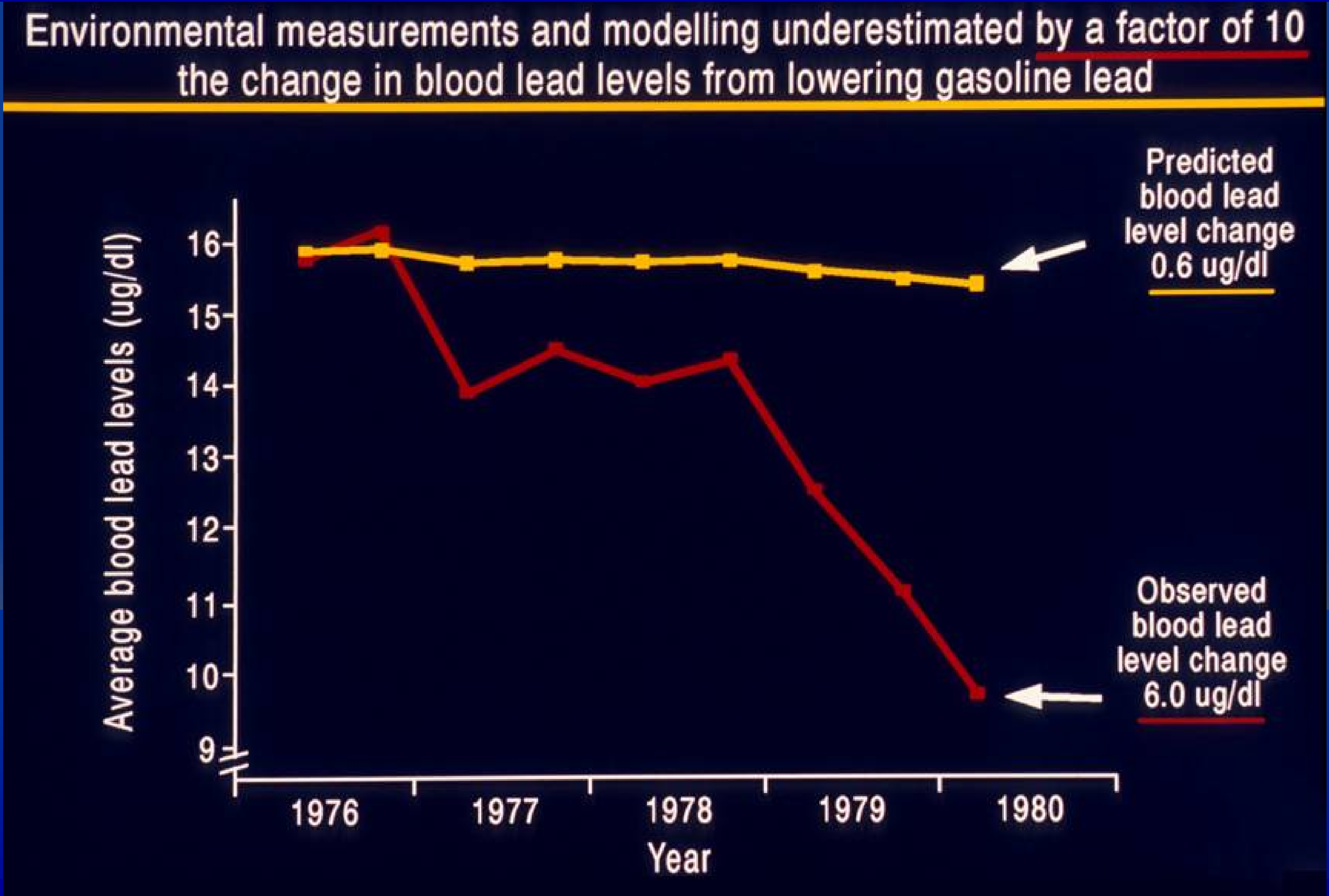


www.cdc.gov/exposurereport

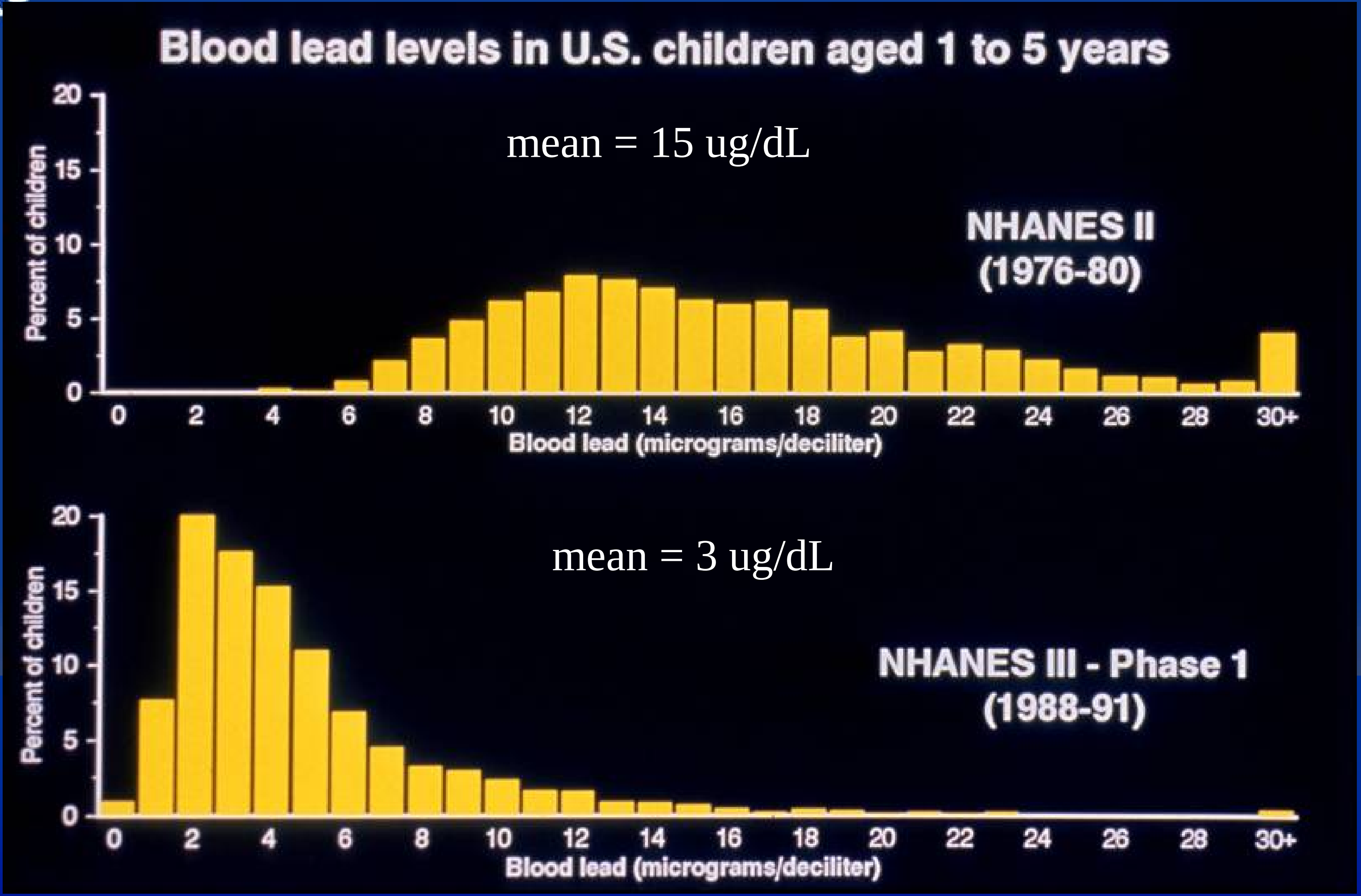
Geometric mean and selected percentiles of blood concentrations (in µg/L) for males and females aged 1 to 5 years and females aged 16 to 49 years in the U.S. population, National Health and Nutrition Examination Survey, 1999-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval) 50th	75th	90th	95th	Sample size
Age Group							
1-5 years (females and males)	99-00	**.343** (.297-.395)	**.300** (.200-.300)	**.500** (.500-.600)	**1.40** (1.00-2.30)	**2.30** (1.20-3.50)	705
	01-02	**.318** (.268-.377)	**.300** (.200-.300)	**.700** (.500-.800)	**1.20** (.900-1.60)	**1.90** (1.40-2.90)	872
Females	99-00	**.377** (.299-.475)	**.200** (.200-.300)	**.800** (.500-1.10)	**1.60** (1.00-2.80)	**2.70** (1.30-5.50)	318
	01-02	**.329** (.265-.407)	**.300** (.200-.300)	**.700** (.500-.800)	**1.30** (1.00-2.10)	**2.60** (1.30-4.90)	432
Males	99-00	**.317** (.269-.374)	**.200** (.200-.300)	**.500** (.500-.600)	**1.10** (.800-1.60)	**2.10** (1.10-3.50)	387
	01-02	**.307** (.258-.369)	**.300** (.200-.300)	**.600** (.400-.700)	**1.30** (.900-1.70)	**1.70** (1.40-2.00)	440
16-49 years (females only)	99-00	**1.02** (.825-1.27)	**.900** (.800-1.20)	**2.00** (1.50-3.00)	**4.90** (3.70-6.30)	**7.10** (5.80-11.3)	1709
	01-02	**.833** (.728-.940)	**.700** (.700-.800)	**1.70** (1.40-1.90)	**3.00** (2.70-3.50)	**4.60** (3.70-5.90)	1928
Race/ethnicity (females, 16-49 years)							
Mexican Americans	99-00	**.820** (.664-1.01)	**.900** (.700-1.00)	**1.40** (1.20-2.00)	**2.60** (2.00-3.60)	**4.00** (2.70-5.50)	579
	01-02	**.667** (.541-.824)	**.700** (.500-.800)	**1.10** (1.00-1.40)	**2.10** (1.70-3.00)	**3.50** (2.30-4.40)	527
Non-hispanic blacks	99-00	**1.35** (1.06-1.73)	**1.30** (1.10-1.70)	**2.60** (1.80-3.40)	**4.80** (3.30-6.60)	**5.90** (4.20-11.7)	370
	01-02	**1.06** (.871-1.29)	**1.10** (.800-1.20)	**1.80** (1.50-2.20)	**3.20** (2.20-3.90)	**4.10** (3.30-6.00)	436
Non-hispanic whites	99-00	**.944** (.726-1.23)	**.900** (.700-1.10)	**1.90** (1.30-3.30)	**5.00** (3.00-6.90)	**6.90** (4.50-12.0)	588
	01-02	**.800** (.697-.919)	**.800** (.700-.800)	**1.50** (1.30-2.00)	**3.00** (2.20-3.70)	**4.60** (3.30-6.80)	806

NHANES & Biomonitoring
Childhood blood levels declined with leaded gasoline consumption from 1976 – 1981.



Childhood blood levels declined with banning of leaded gasoline.



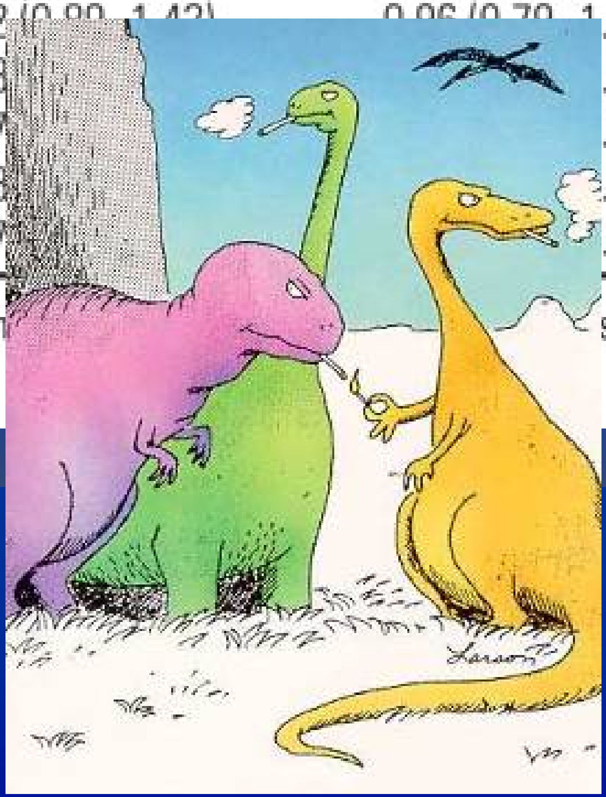
Metals in Urine and Peripheral Arterial Disease Ana Navas-Acien, Ellen K. Silbergeld, A. Richey Sharrett, Emma Calderon-Aranda, Elizabeth Selvin, Eliseo Guallar1,2,3. Environ Health Perspect. 2005 Feb;113(2):164-9.

Table 2. Ratios (95% CIs) of the geometric means of metal levels in urine (μg/L) in PAD cases versus noncases.

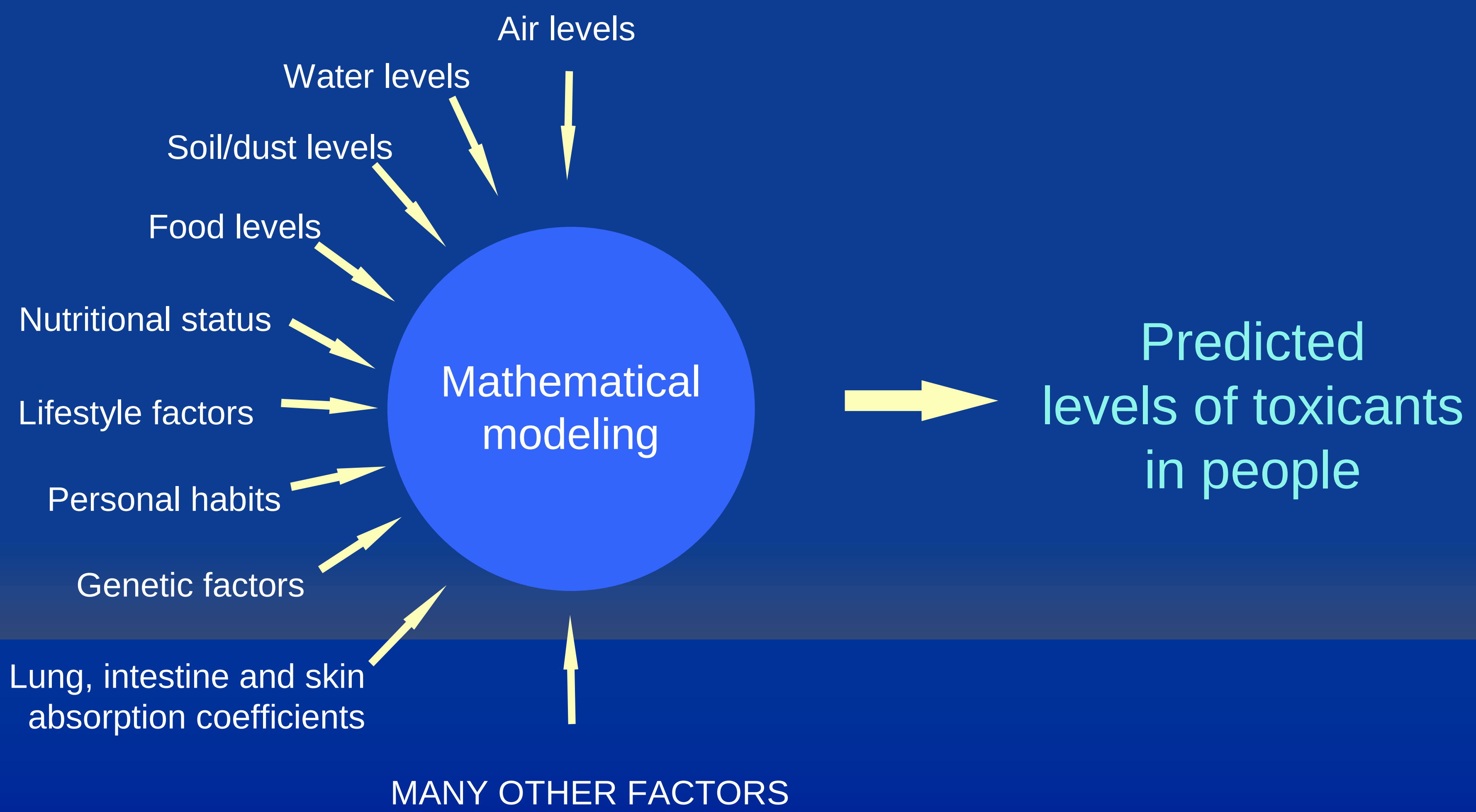
	Cases	Noncases	Model 1[a]	Model 2[b]	Model 3[c]
Cadmium	49	679	1.81 (1.24–2.62)	1.62 (1.19–2.21)	1.36 (1.01–1.83)
Lead	54	736	1.09 (0.86–1.37)	1.08 (0.85–1.38)	0.92 (0.74–1.15)
Barium	45	659	0.99 (0.67–1.47)	0.99 (0.68–1.45)	0.82 (0.60–1.11)
Cobalt	54	736	1.13 (0.80–1.59)	1.13 (0.82–1.57)	0.98 (0.69–1.40)
Cesium	54	736	1.05 (0.83–1.32)	1.12 [illegible]	[illegible] .16)
Molybdenum	49	679	0.97 (0.66–1.42)	1.08 [illegible]	[illegible] .15)
Antimony	49	676	1.18 (0.92–1.51)	1.17 [illegible]	[illegible] .22)
Thallium	54	722	0.97 (0.71–1.34)	1.08 [illegible]	[illegible] .19)
Tungsten	51	700	1.75 (0.98–3.10)	1.67 [illegible]	[illegible] .49)

[a]Adjusted by age, sex, race, and education. [b]Further adjusted by smoking status (n [illegible] sted by urinary creatinine.

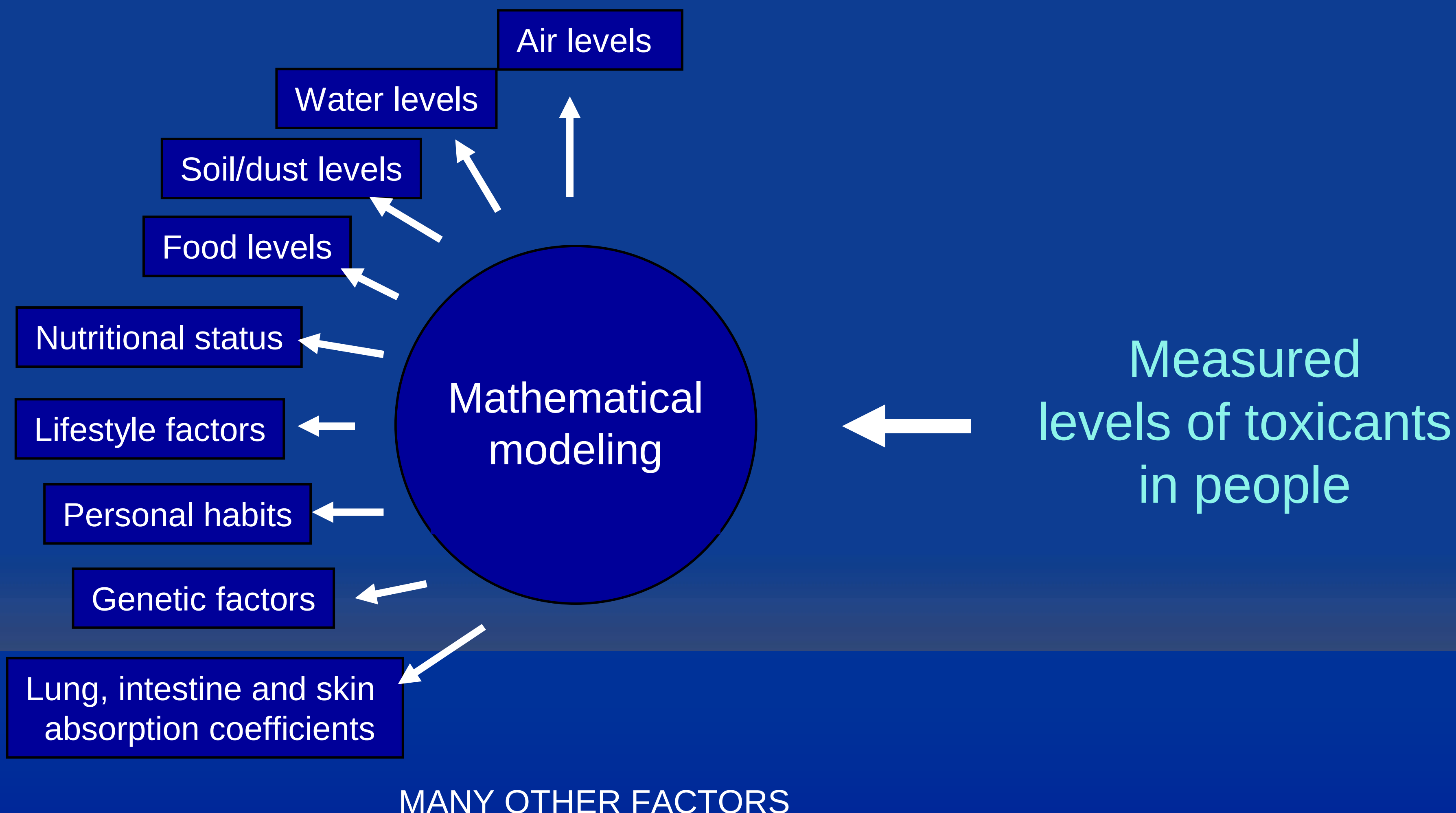
Cd – the real reason dinosaurs became extinct?



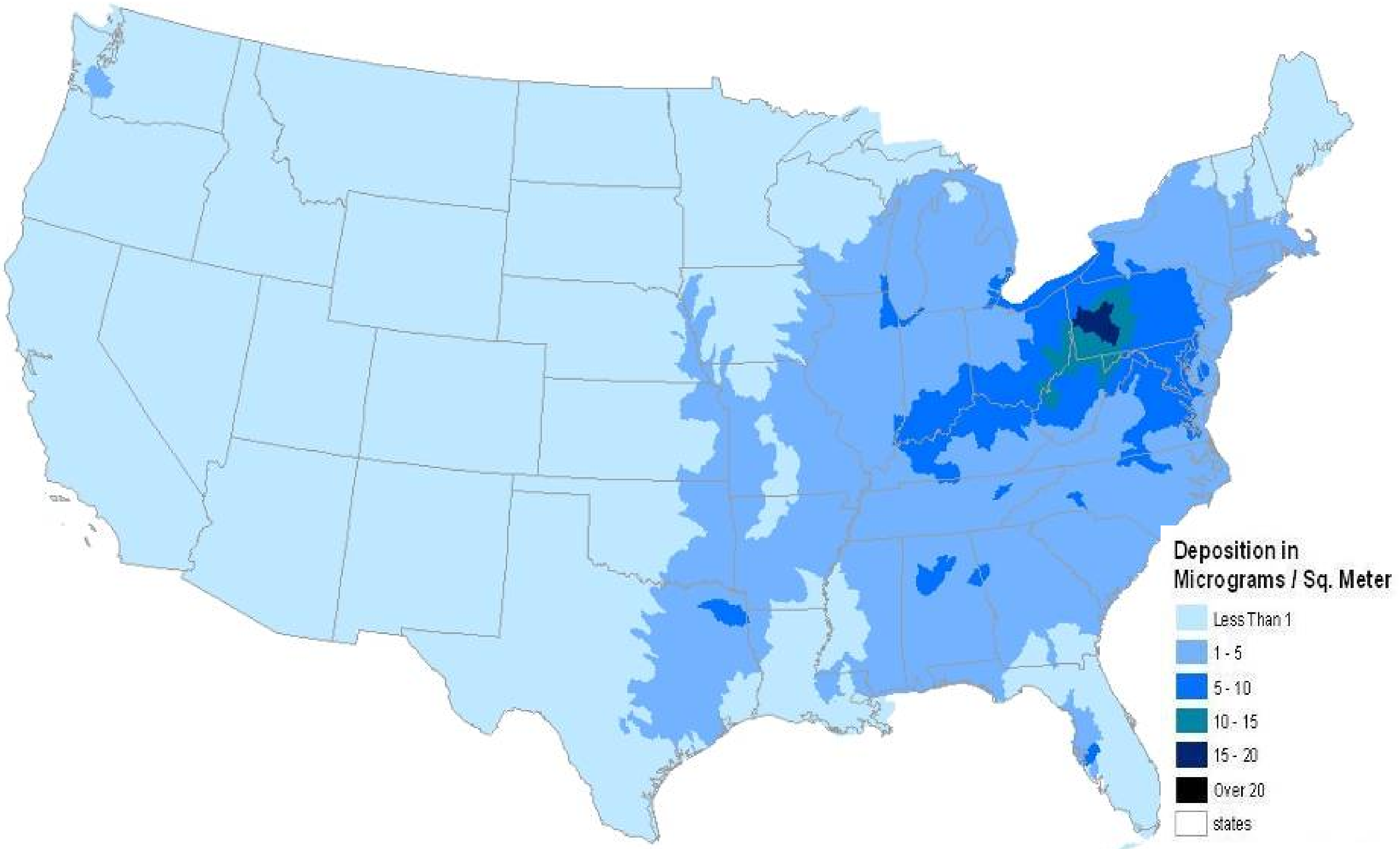
Predicting levels of toxicants in people using environmental monitoring is very difficult and includes many assumptions



Source Contribution of toxicants found in people using biomonitoring is also difficult and requires follow-up studies.

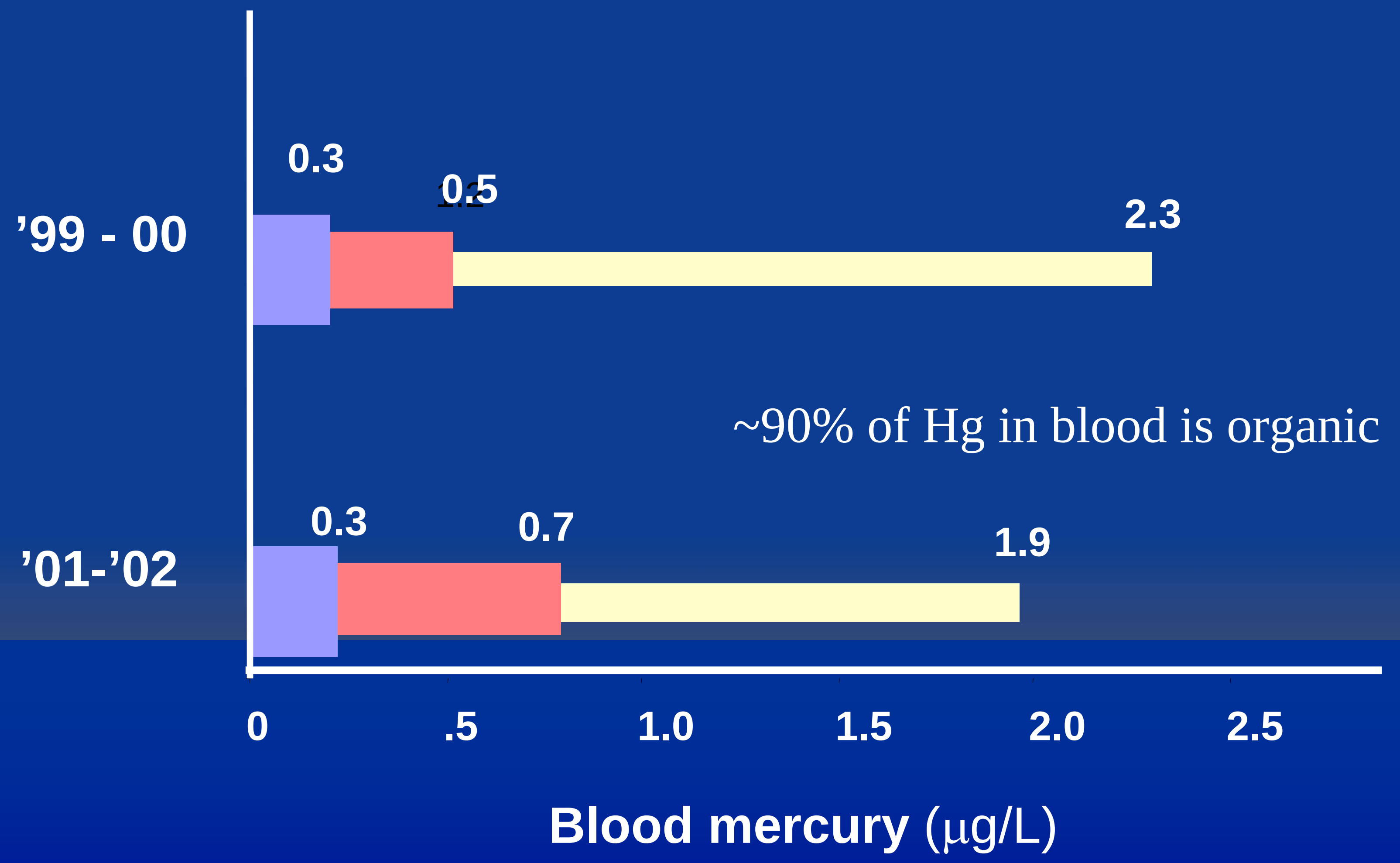


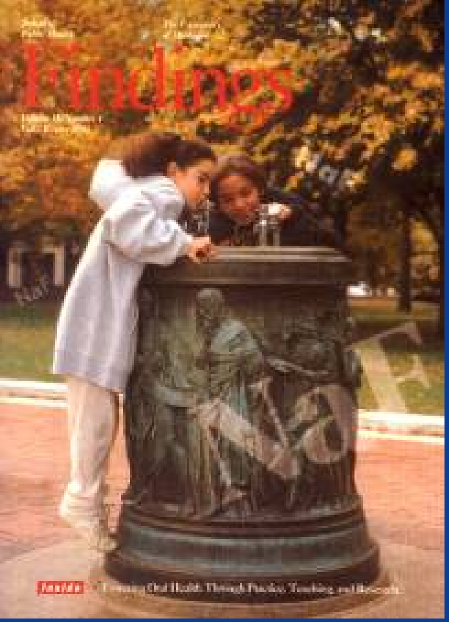
Mercury Deposition From US Power Plants in 2001



Total Blood Mercury in Children Aged 1 to 5, United States, 1999-2000 and 2001-2002

50th, 75th and 95th percentiles

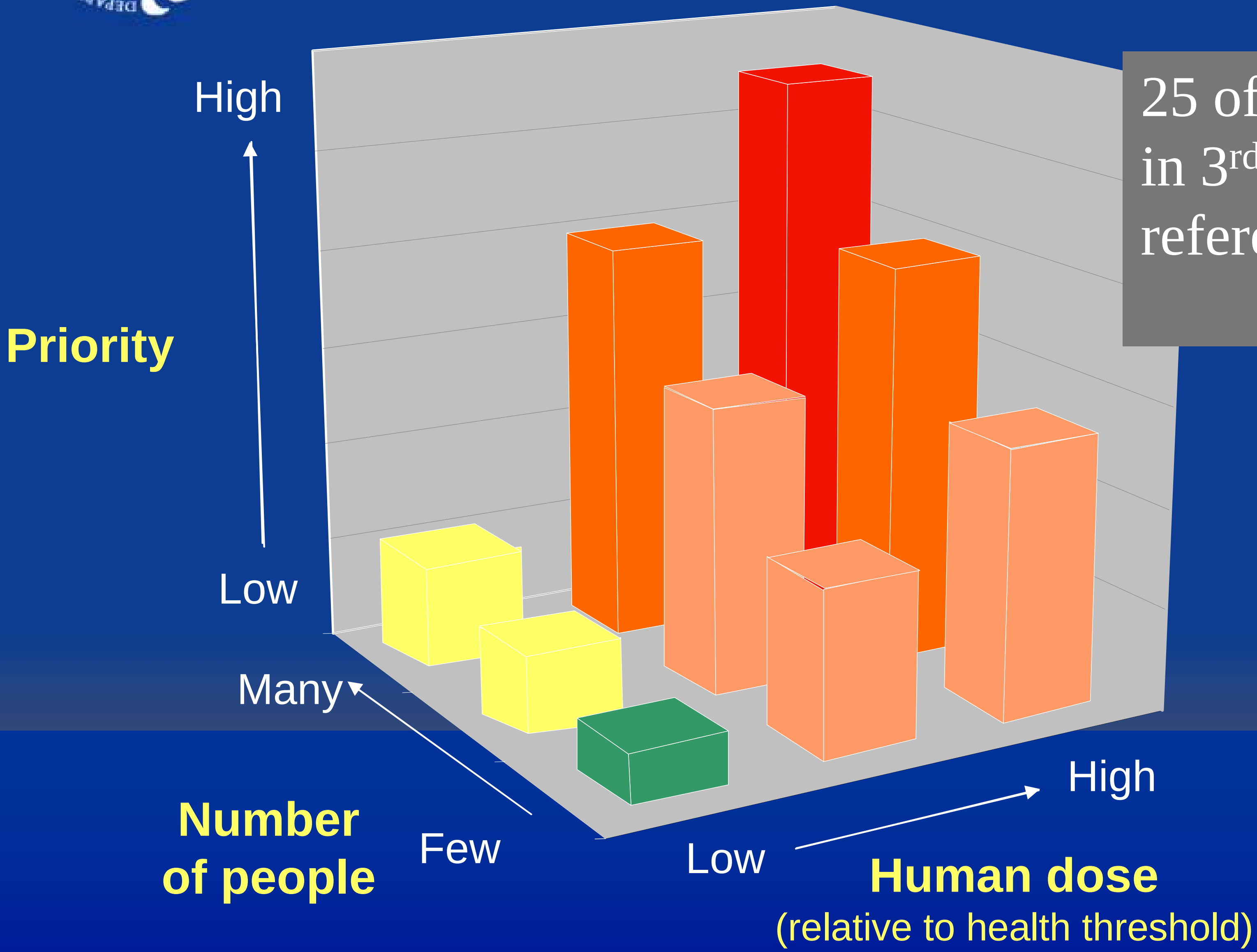




To assess total dioxin … emissions, EPA used a “bottom-up” approach … to identify all source categories … However, a “top-down” approach … to account for measured (biologic) levels and considers emission(s) required for those levels would provide useful additional information. … EPA could benefit substantially from using the(se) approaches simultaneously. – (Health Risks from Dioxins and Related Compounds - NAS 2006 pg 15)

Biomonitoring … can inform risk assessment by identifying data gaps, replacing default assumptions reducing exposure misclassification, or elucidating factors that affect exposure variability in a population. (National Research Council – Human Biomonitoring for Environmental Chemicals - pg 117).

Prioritizing Exposures to Toxicants



25 of 148 chemicals in 3rd report had an EPA reference value.

Health Information Protection and Barriers

- HIPAA
- FERPA
- Certificates or Assurances of Confidentiality
- FOIA