Biomonitoring and California

Sacramento, California
December 17, 2007

Richard Joseph Jackson, MD MPH

Dickjackson@berkeley.edu

Institute of Medicine

The purpose of public health is to fulfill society's interest in

…… ?

Future of Public Health **1988**

Institute of Medicine

The purpose of public health is to fulfill society's interest in assuring the conditions in which people can be healthy

The Need for and Contributions of Biomonitoring

- People, their doctors, policy makers, and industry need biomonitoring
- The Public has a right to this information, and can handle it.
- Biomonitoring will not go away
- Do it right (good science)
- Some California specific recommendations

Dickjackson@berkeley.edu

In 1979 – The Unthinkable

- Removal of Lead from virtually every consumer use
- Jail terms for putting hazardous chemicals such as halogenated solvents in municipal landfills
- Smoking banned in workplaces, airplanes, even restaurants and bars

Pesticides and their hazards to human health, especially workers, and the difficulty of epidemiology when you don’t know who is exposed to how much of what.

Lessons from the Past

- Medflies discovered in Santa Clara County
- State declares Malathion spraying over populated areas is essential to maintain California's $30 Billion agriculture industry

Malathion and Medfly -- 1981

- At a public meeting: 1000 protesters arrive, shouting: you are "Doctor Mengele"
- "How do you know the exposures are negligible?"
- Ten university professors sign on to full page protest ads in major newspapers and hold press conferences.

Thurs., July 16, 1981 San Francisco Chronicle 3

State Official Says He Drank Malathion and 'Feels Fine'

B.T. Collins, director of the California Conservation Corps, said yesterday he drank a glass of diluted malathion to prove its safety to his dubious teenage troops — and that he feels fine.

The notoriously cocky Collins, who is leading the corps' land war against the Mediterranean fruit fly, said he swilled down a 6-ounce glass of the pesticide solution at a camp rally at Agnews State Hospital Tuesday night, while "giving my typical Martin Bormann speech" to 600 youths.

"The fact is that the stuff is not harmful," the 40-year-old CCC director, who lost an arm and a leg in the Vietnam War, said in a telephone interview yesterday. "This was a much greater exposure than anyone will get from the spray."

"I drank it because you don't ask your troops to do anything you wouldn't do," Collins added.

By 4:30 yesterday afternoon, Collins was answering a deluge of phone calls to his Sacramento office with the words, "Yes, I drank malathion, yes I feel fine; this is a tape recording."

Insisting that the substance he drank was actually malathion, Collins said he felt a little queasy after he drank the liquid but felt great by yesterday afternoon.

"It tasted horrible, like kerosene," he admitted. "No wonder the Medflies hate it."

Collins is no stranger to drinking either traditional or unorthodox concoctions. During his stint as an Army captain, he said, he downed a bottle of Aquaveda aftershave lotion.

The malathion he said he drank Tuesday night was diluted to the same strength as that sprayed by the helicopters over the Medfly infested regions, Collins said.

State official B. T. Collins joked about the malathion he said he downed in an attempt to prove it harmless

Test-Tube Baby In Australia

Melbourne, Australia

A 28-year-old Australian woman gave birth yesterday to the country's tenth test-tube baby — her first child in 18 years of marriage.

The baby girl was the twelfth test-tube baby in the world and a spokesman for the Queen Victoria Medical center said the baby, named Alison Ngeru, was delivered by caesarian section and weighed nearly 6 pounds.

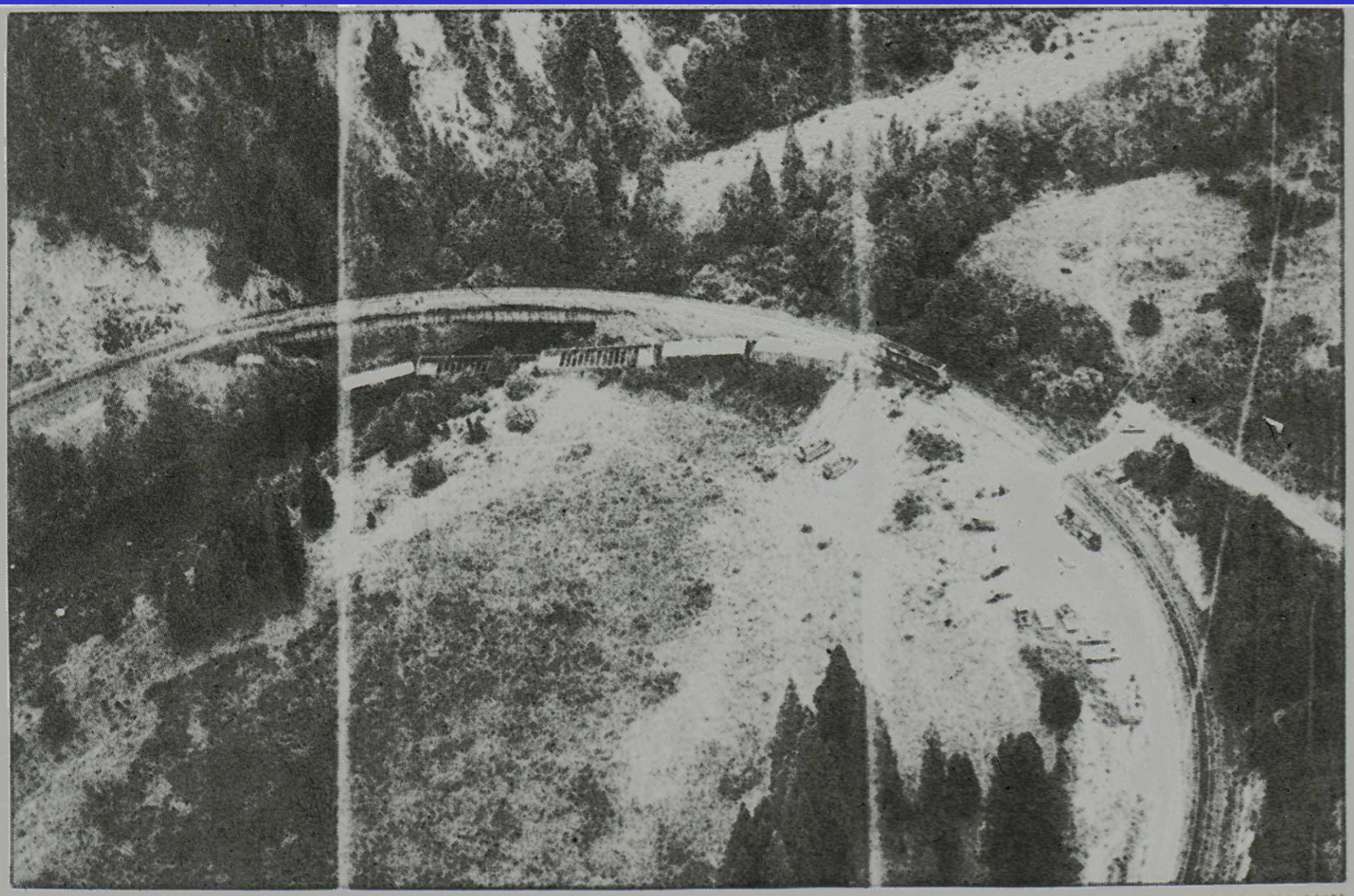
United Press

An advisor to the Governor performs a bioassay

Malathion Bait Application

- Citizens shoot at helicopters
- Community surveys ask about OP symptoms, allergies, etc.
- There is no evidence as to actual community exposures
- The control program costs close to $100 million

June 1991 Dunsmuir California



The string of derailed cars *is seen scattered along the upper Sacramento riverbank; the tank car that spilled metam sodium into the river is at left.*

18000 gallons of Metam sodium flushes down the Sacramento River

Conversations reveal confusion at derailment

By Katherine Shaver
STATES NEWS SERVICE

WASHINGTON — Transcripts of radio conversations among Southern Pacific rail officials the night of the July 14 train derailment and toxic herbicide spill into the Sacramento River reveal mass confusion, dark humor and that workers were unaware of the chemical's poisonous nature.

▶ 10:47 p.m., Southern Pacific train conductor warning a company engineer approaching the accident scene by car: "I don't know what weed killer does, but that one tank car in the river there, boy, the fumes are pretty strong. You might watch it if you walk up on it."

▶ 10:48 p.m., Southern Pacific train yardmaster in Eugene, Ore. to local dispatcher: "Heard you're screwing up down there again."

Dispatcher: "Yeah, we've done did it big this time."

▶ 11:02 p.m., dispatcher to unknown person: "We can't get a hold of emergency people here to find out what the hell it (the chemical) is. You know, uh, if it's going to be toxic if mixed in (with water) or what."

Dispatcher regarding strength of odor: "That's pretty good, huh? I mean, hell, we could've had half the city of Dunsmuir knocked off by now."

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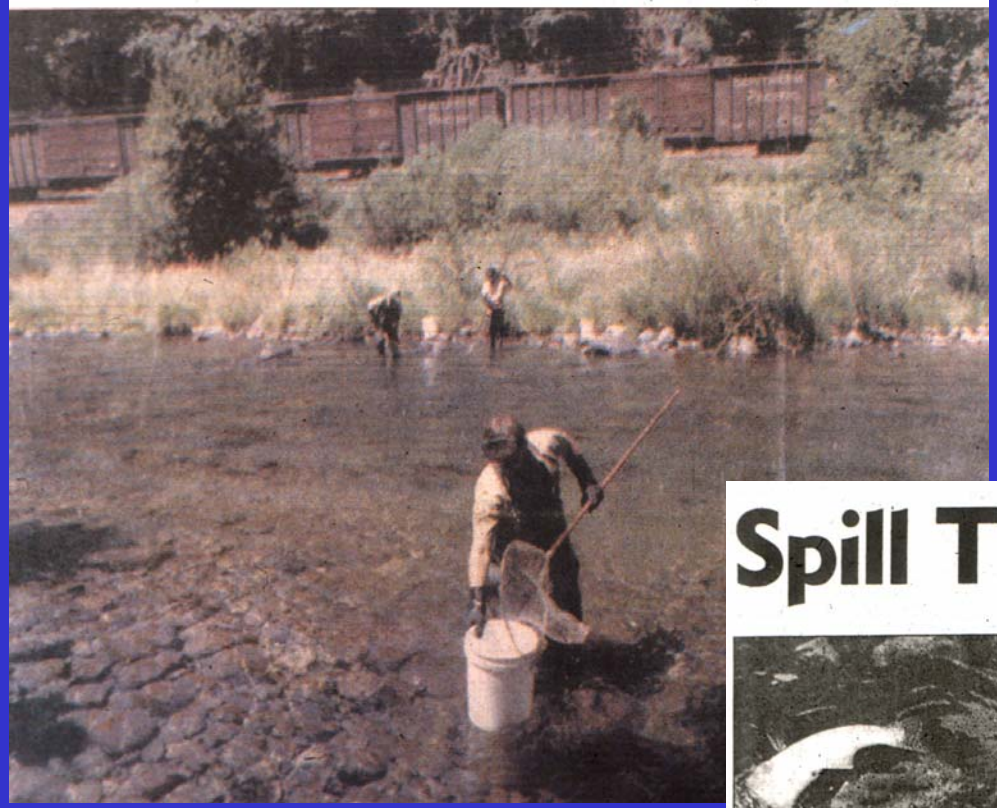
D.M. Monan, Southern Pacific president, defended the exchanges as "a sidephone conversation between the yard master and a guy in Oregon," both of whom were trying to handle the stress of responding to the accident. Only parts of the transcript were made public during Thursday's House subcommittee hearing into the train accident.

A committee staff member said he could not release the full transcript, which Southern Pacific supplied at the subcommittee's request, until the transcripts were compared to the audio tapes.

CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION
CDF
FIRE
EMERGENCY OPERATIONS SUPPORT
MOBILE KITCHEN

300,000 fish estimated dead in spill



S.F. Chronicle 7-17-91

Spill Threatening Shasta

PHOTOS BY BRANT WARD/THE CHRONICLE

Dead trout collected in rocks after the spill passed through the part of the river near Dunsmuir

Response to accident was slow

By Dawn Garcia
Chronicle Staff Writer

Dunsmuir, Siskiyou County

A plume of toxic pesticide that was dumped into the Sacramento River by a derailed train approached the vital Shasta Lake reservoir yesterday as questions mounted about regulations covering the spilled pesticide and the response to the emergency of the Southern Pacific rail system.

Federal and state water experts said they were sure that 19,500 gallons of the lethal chemical, metam-sodium, would dissipate before reaching the water taps of millions of Californians and the fields of hundreds of farmers.

"The message right now is there is no concern for any area other than the immediate area right up at Shasta in terms of public health and safety in any form," said John Budd, a spokesman for the U.S. Bureau of Reclamation.

Meanwhile, the tally of the damage grew from the Sunday night spill, which occurred when a

RIVER DISASTER

Here is a summary of the Sacramento River pesticide spill:

■ **ACCIDENT:** On Sunday night, cars of a Southern Pacific train derailed on a sharp curve along the Sacramento River near Dunsmuir in Siskiyou County.

■ **PESTICIDE:** A ruptured tank car dumped 19,500 gallons of metam-sodium, a potent pesticide used to kill soil pests and vegetation, into the stream.

■ **CASUALTIES:** Tens of thousands of trout and other fish along a 45-mile stretch of river. About 190 people were treated at a local hospital for respiratory and related illnesses brought on by the spill.

■ **HEALTH PRECAUTIONS:** Residents along the river have been warned to avoid contact with the tainted water. Boaters and fishermen were advised to stay away from the area of Lake Shasta where the chemical will enter.

■ **WATER SUPPLIES:** Once tainted flows reach Lake Shasta, a source of water for millions of Californians, samples will be taken to determine quality of water.

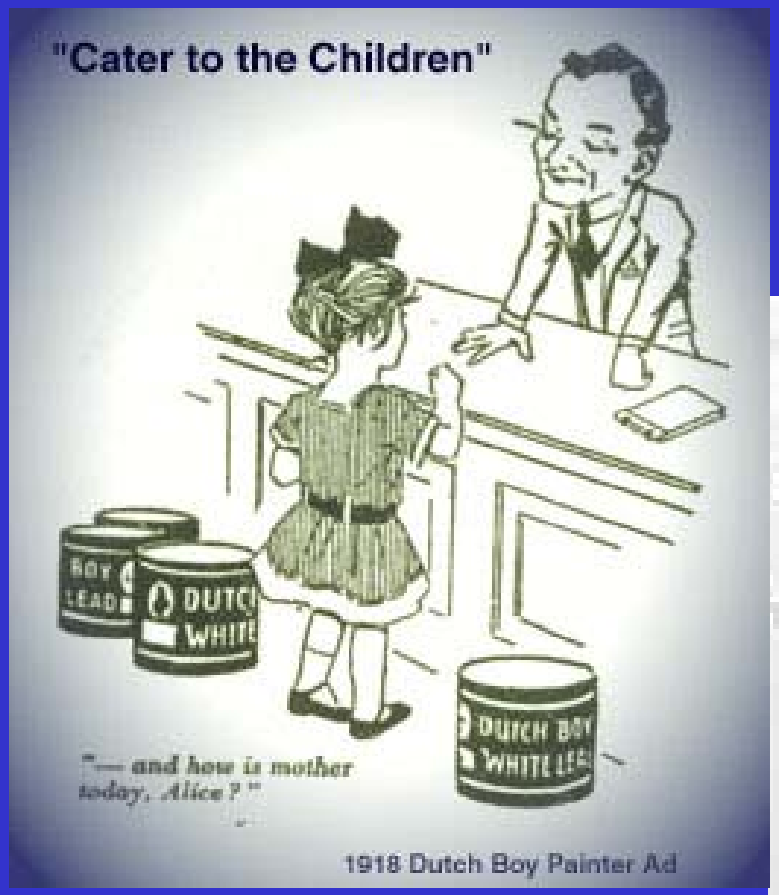
SPILL INSIDE

■ **EFFECT ON TOURISM:** Resort, motel and marina owners are already feeling the effects of the spill PAGE A4

HONK
YOUR
OUTRAGE
ABOUT THE
SPILL!!

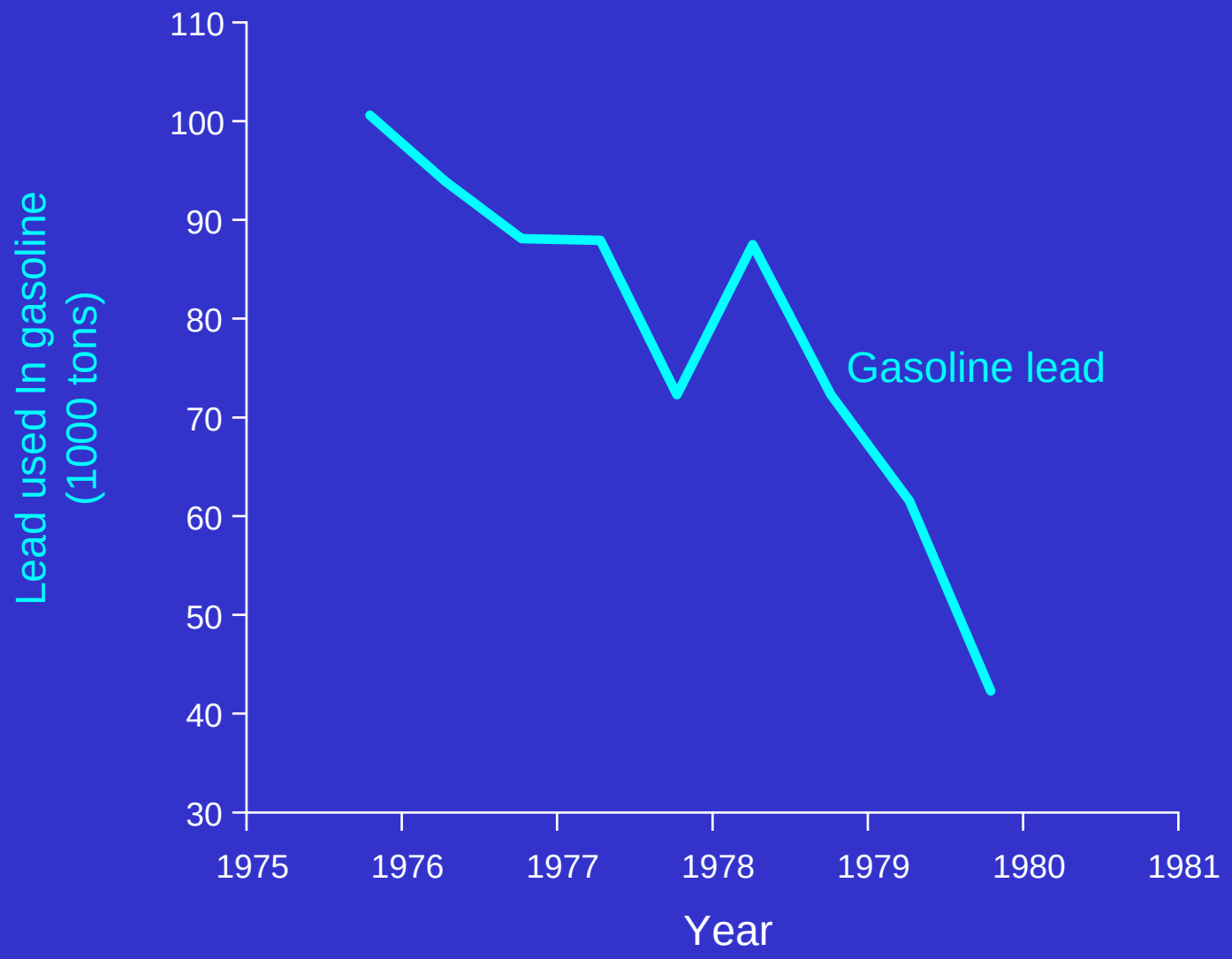
CANTARA INCIDENT

Lessons from Lead Poisoning

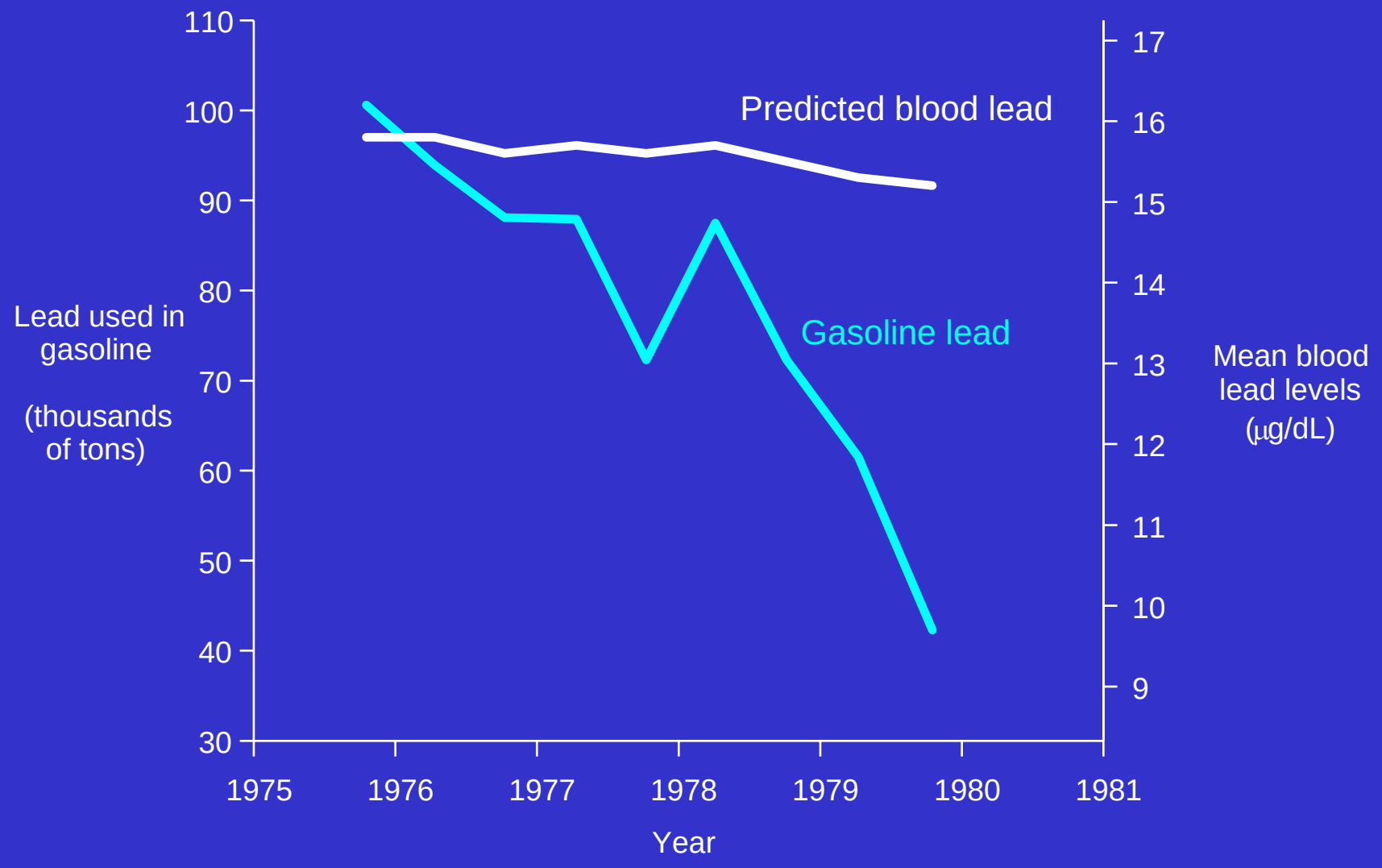

"Cater to the Children"
"— and how is mother today, Alice?"
1918 Dutch Boy Painter Ad

DUTCH BOY WHITE-LEAD...
DUTCH BOY LEAD MIXING OIL

Lead used in gasoline declined from 1976 through 1980

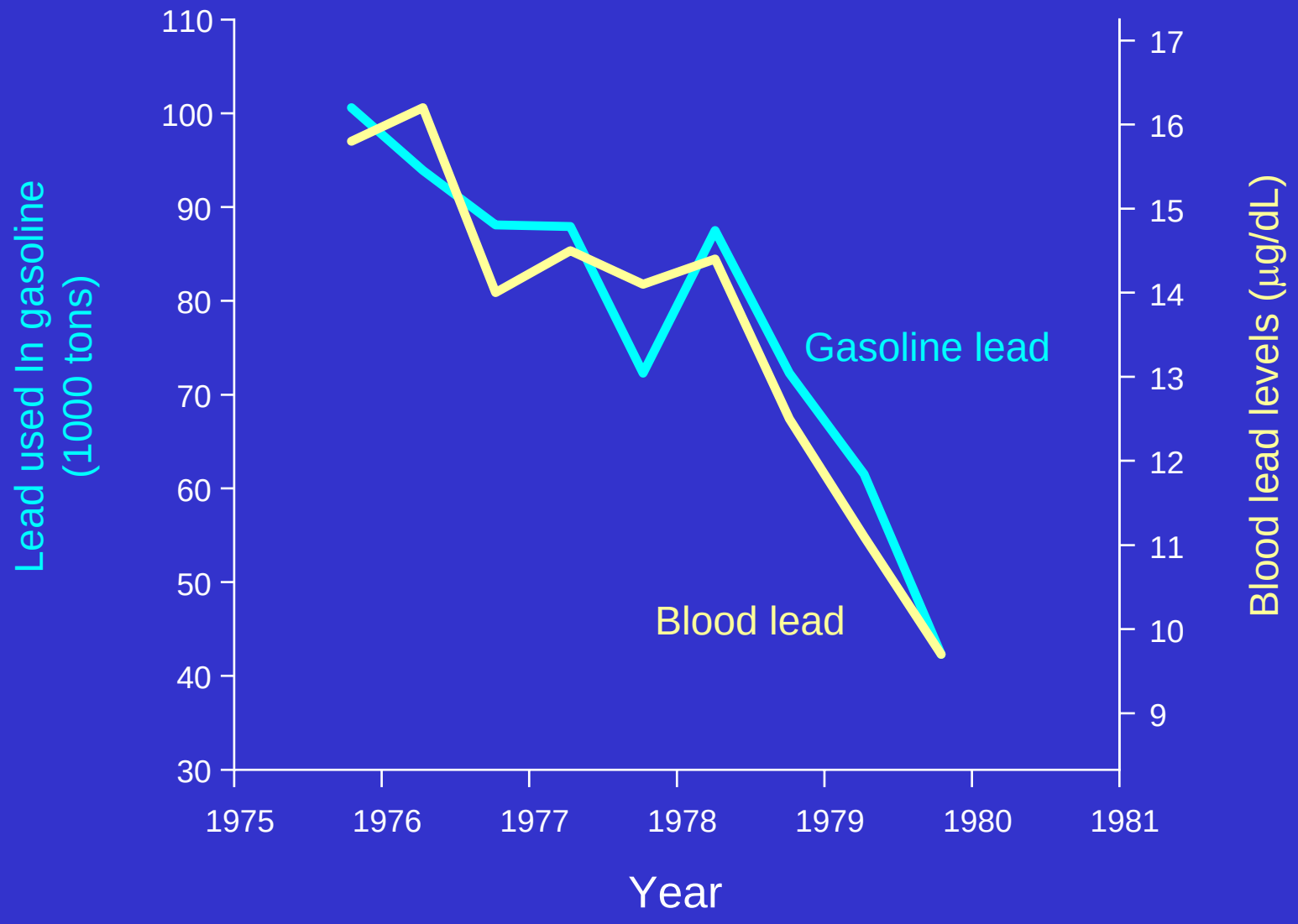


Environmental modeling predicted only a slight decline in blood lead levels in people



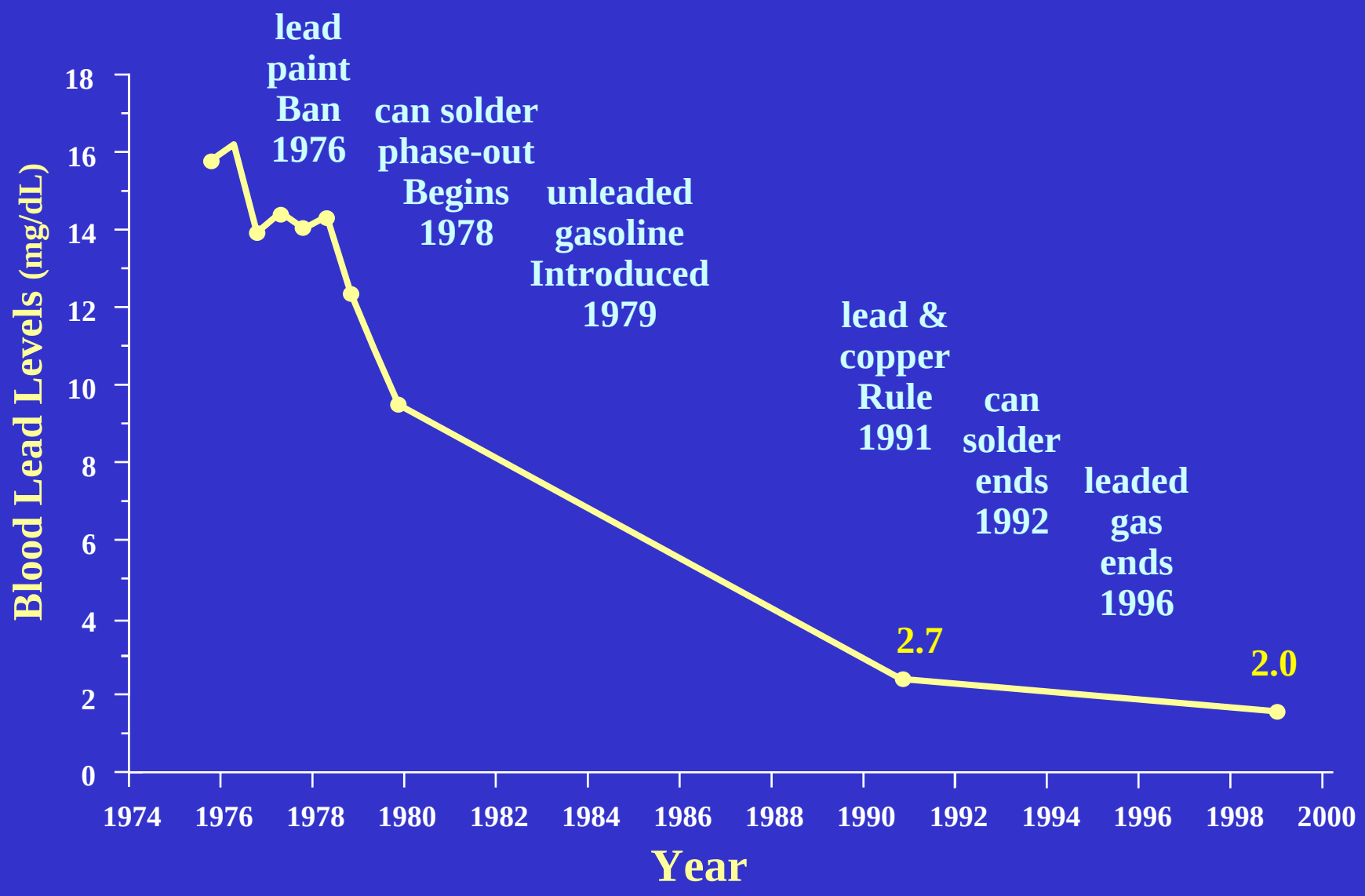
Lead in gasoline and lead in blood

NHANES II, 1976-1980



Blood Lead Levels in the U.S. Population 1976–1999

NHANES II, III, 99+

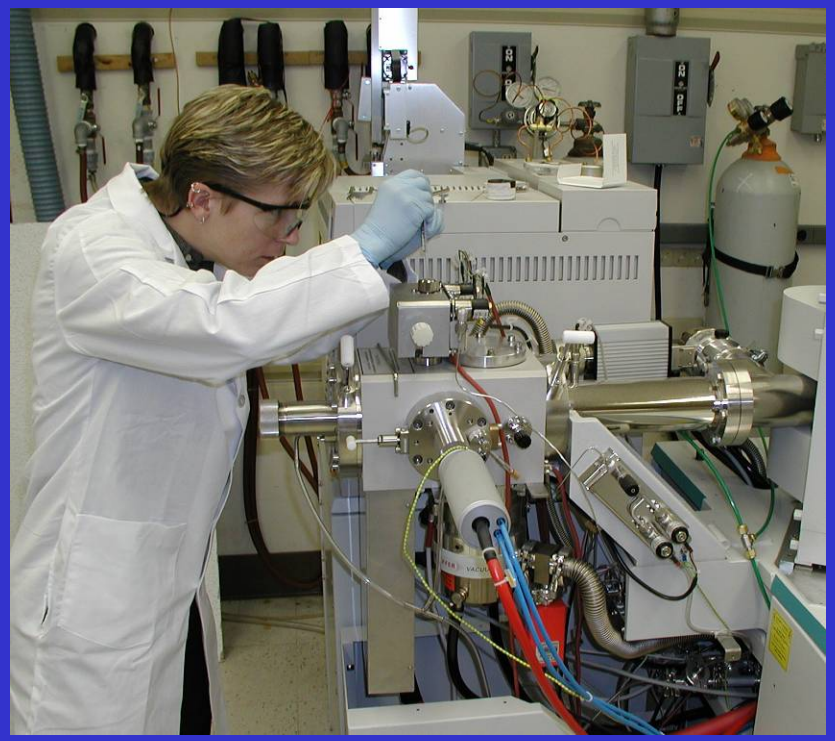


National Center for Environmental Health

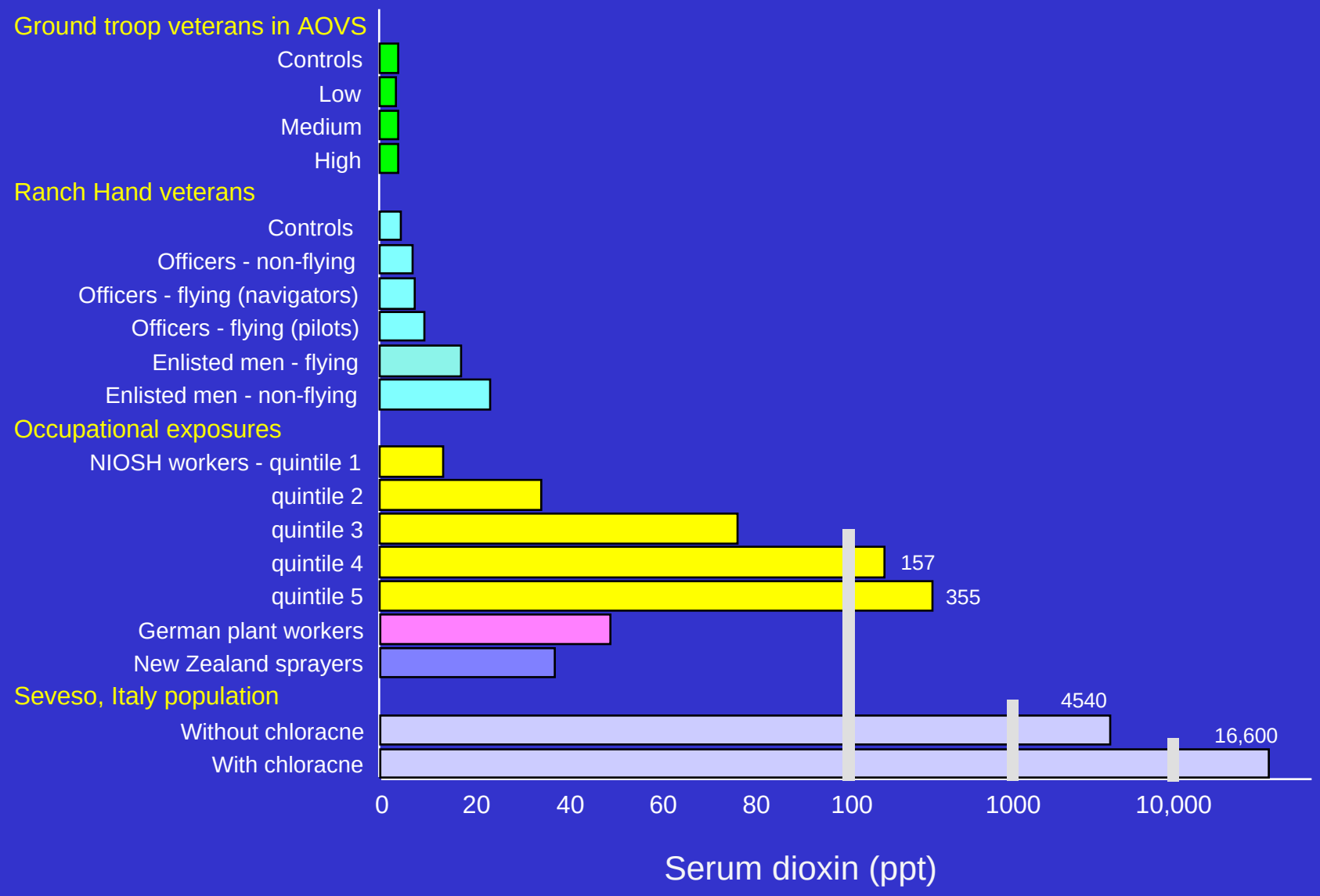
One of 16 NHANES Examination Trailers: 5000 person sample of the US per year

Biomonitoring at CDC

- National and specific-population studies
- Many Disease Endpoints
- Used to measure potential chemical terrorism agents
- Major output is CDC's *National Report on Human Exposure to Environmental Chemicals*

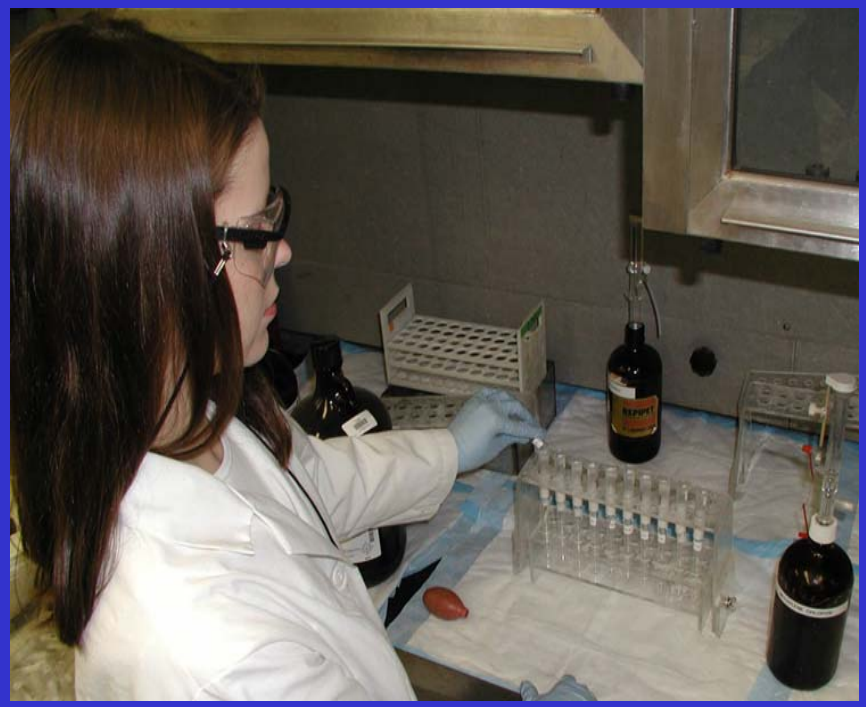


Median serum dioxin levels in selected populations

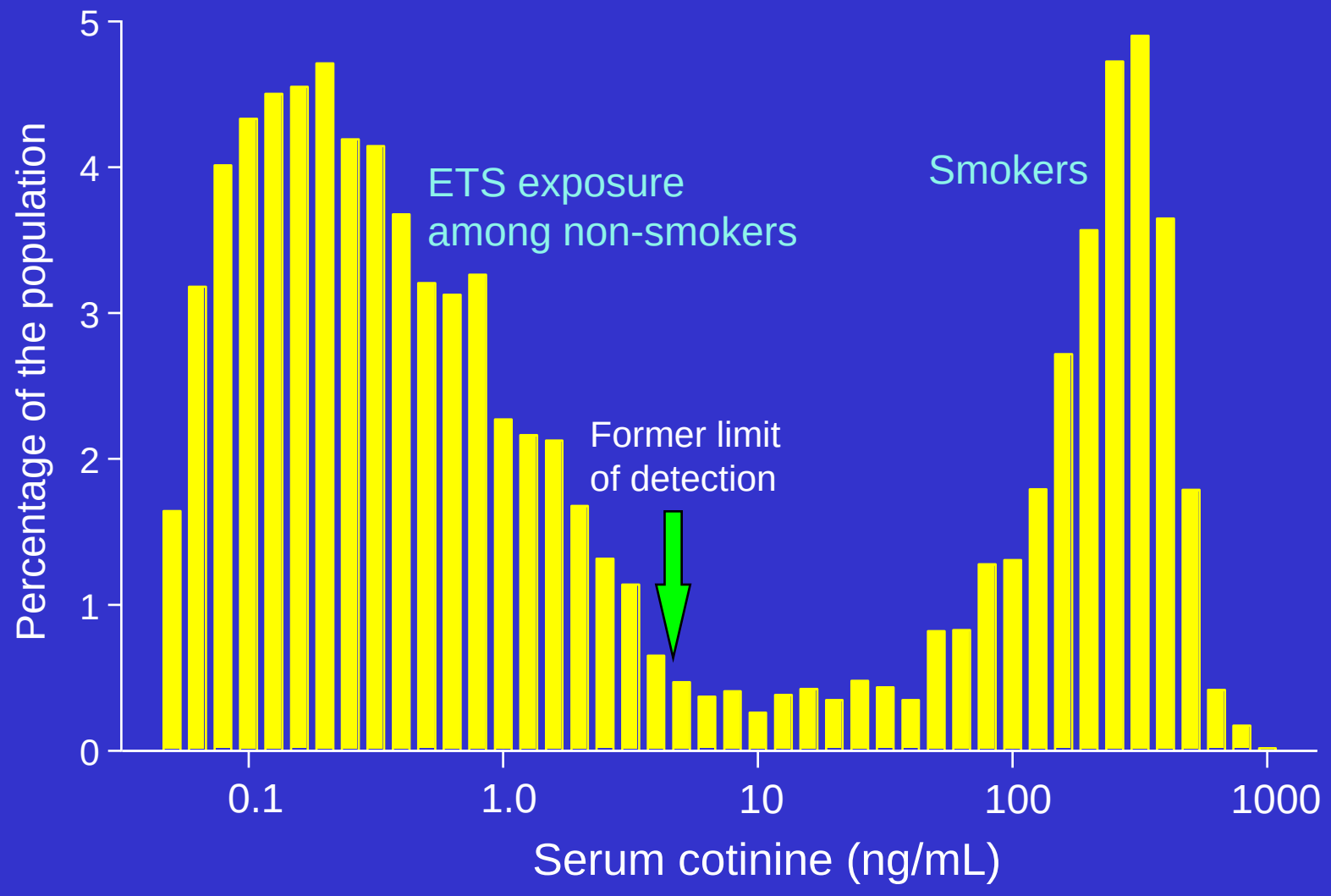


Cotinine

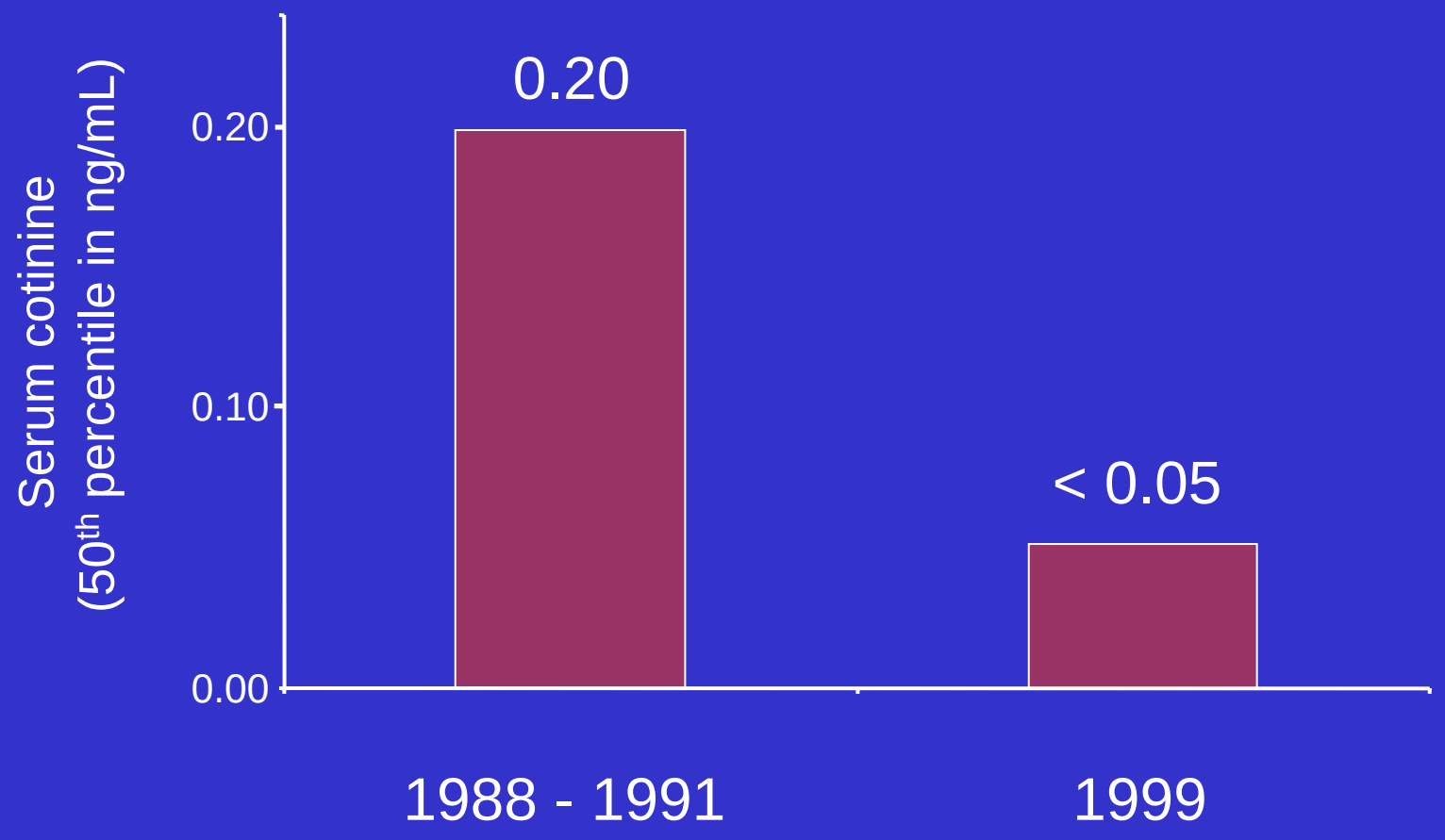
- A nicotine metabolite that tracks exposure to tobacco smoke.
- For nonsmokers, tracks exposure to secondhand smoke.



Exposure of the U.S. population to tobacco smoke: serum cotinine levels for persons aged 4 years and older NHANES III, 1988-1991 (n=11,800)

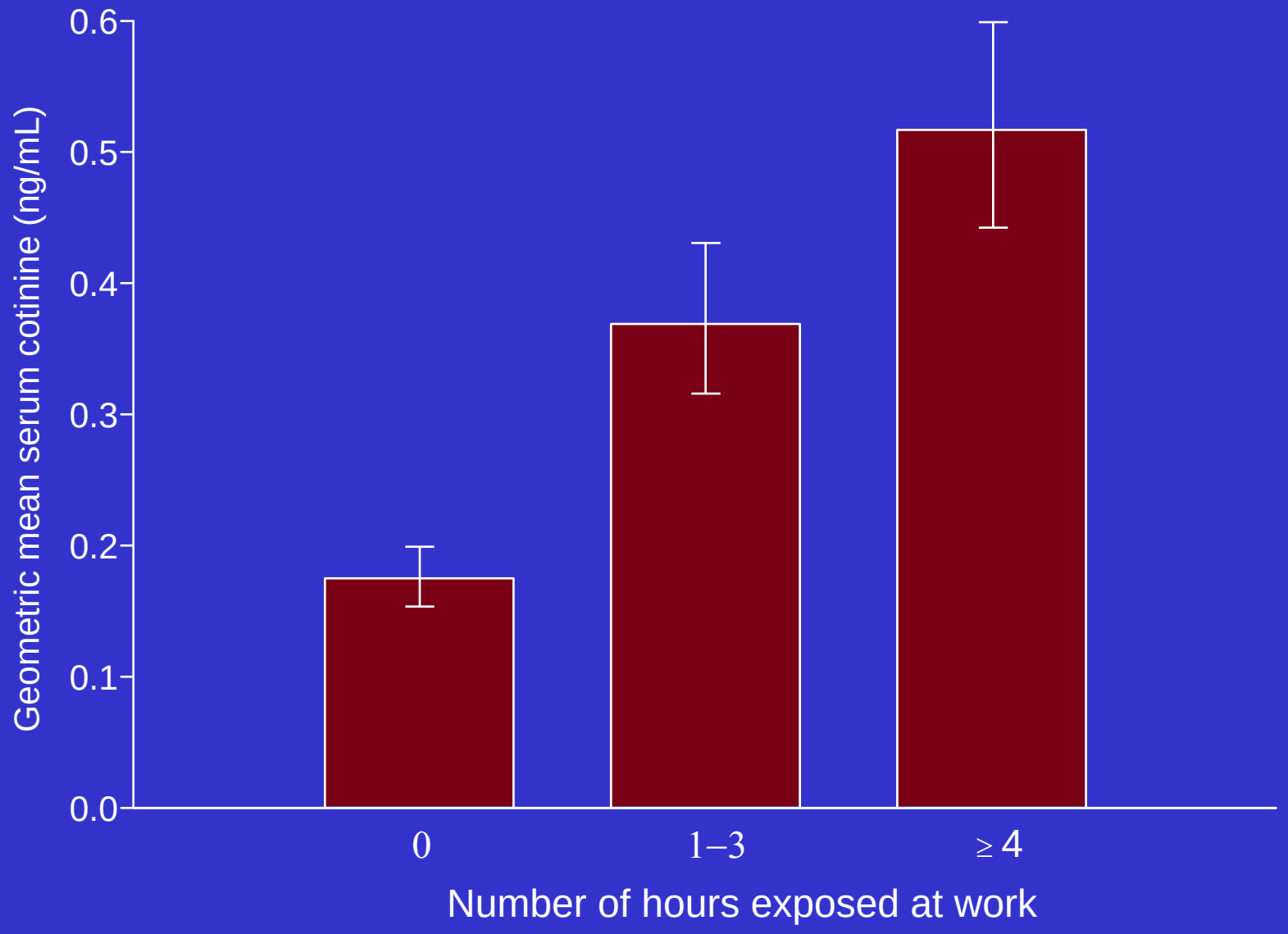


Decline in exposure of U.S. population to environmental tobacco smoke



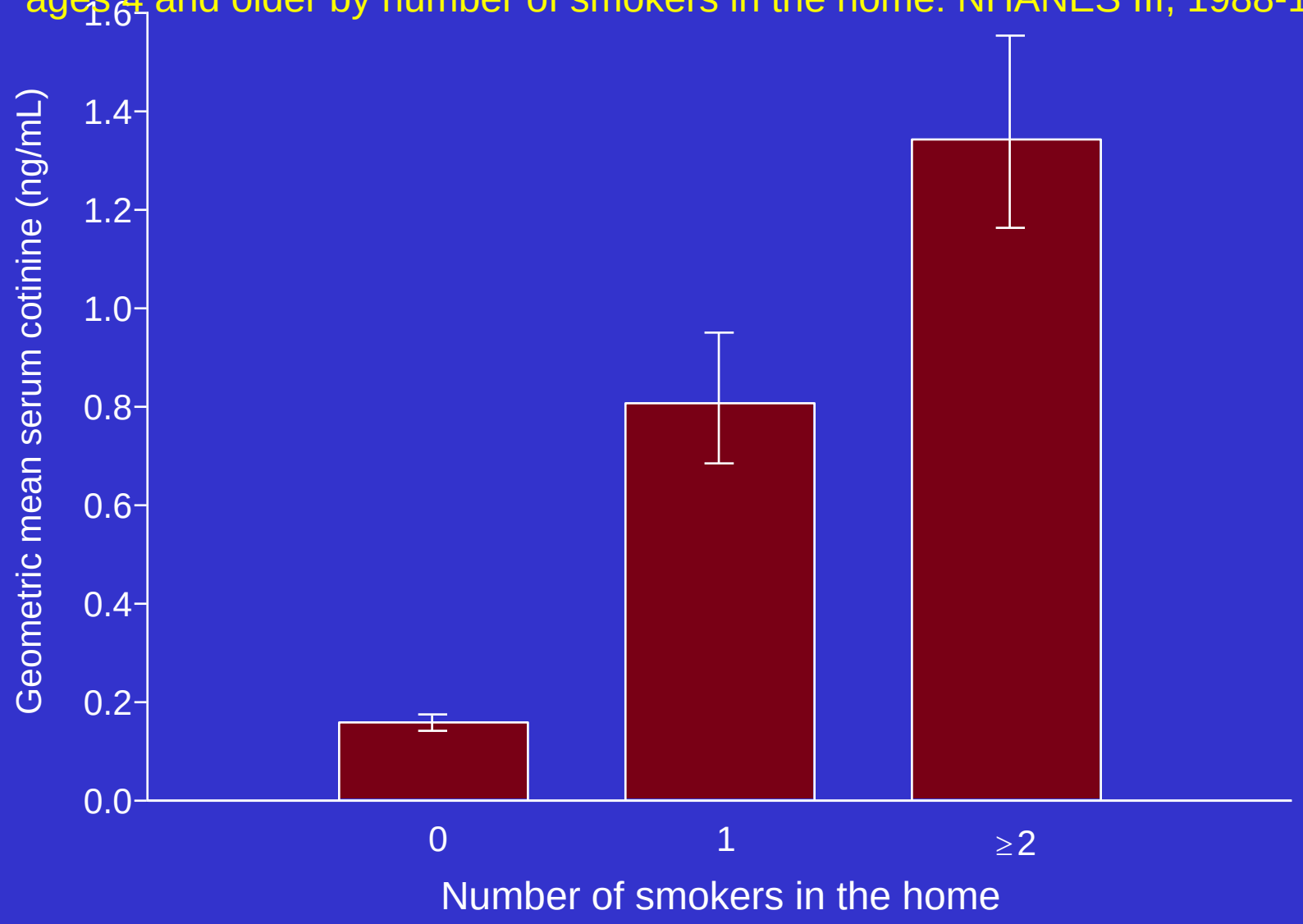
Serum cotinine levels for non-tobacco users in the U.S. population

ages 17 and older, by number of hours exposed at work: NHANES III, 1988-1991

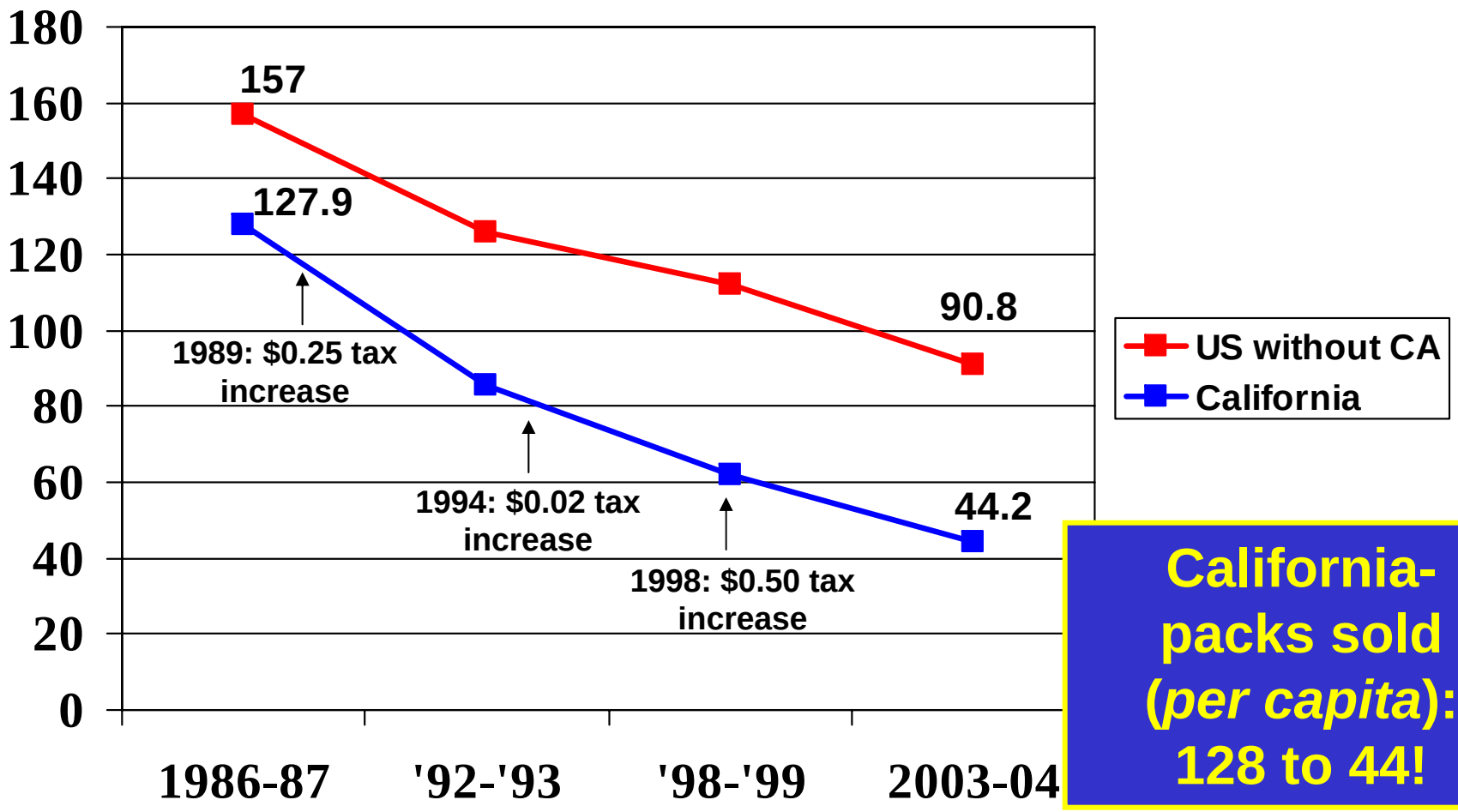


Serum cotinine levels for non-tobacco users in the U.S. population

ages 4 and older by number of smokers in the home: NHANES III, 1988-1991



California vs. Rest of US: Adult Cigarette Consumption 1984 to 2004

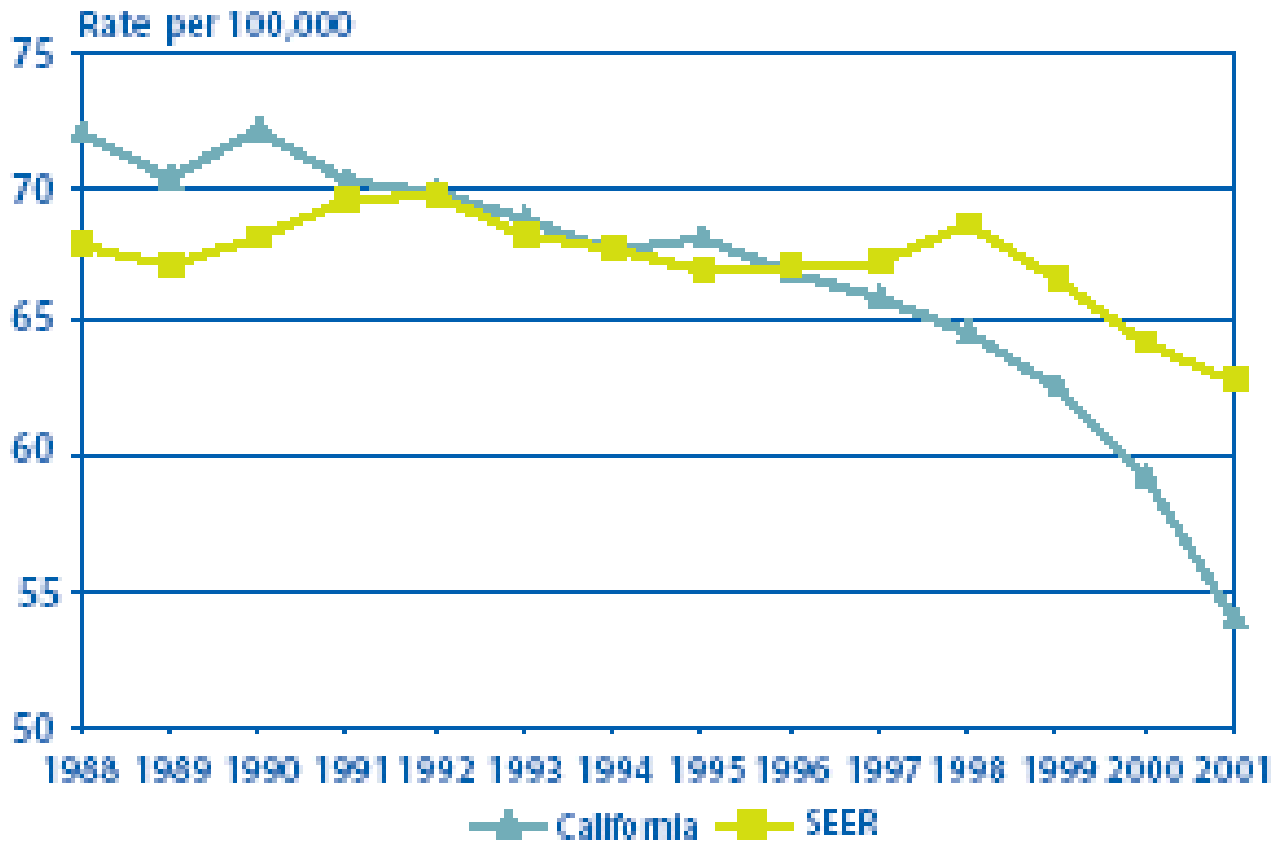


California-packs sold (*per capita*): 128 to 44!

California State Board of Equalization (packs sold) and California Department of Finance (population). U.S Census, Tax Burden on Tobacco, and United States Department of Agriculture. Note that data is by fiscal year (July 1-June 30).

Lung Cancer Incidence: California Vs. Rest of U.S.

1988-2001



Note: Rates are age-adjusted to the 2000 US population.
Source: California Cancer Registry, California Department of Health Services.
Prepared by the California Department of Health Services, Cancer Surveillance Section.

U.S minus CA (SEER)*: ↓5.9%

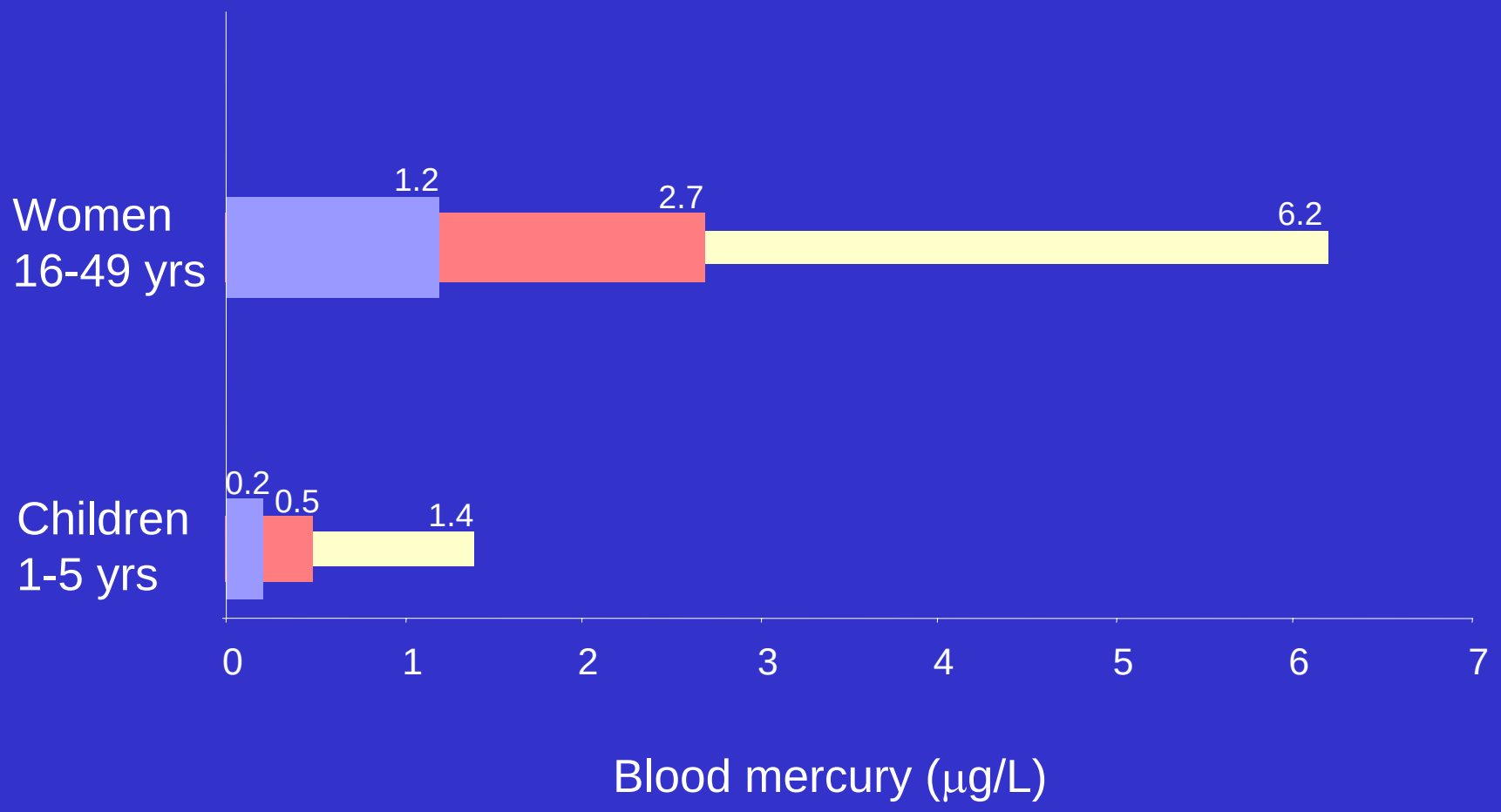
California: ↓19.5%!

***SEER includes 14 cancer registries from across U.S**

American Cancer Society, CA Division and Public Health Institute, CA Cancer Registry. California Cancer Facts and Figures 2005. September 2004.

Mercury

50th, 75th and 90th percentiles in blood

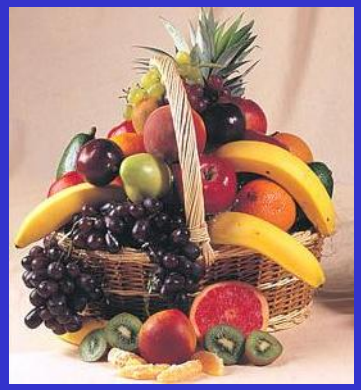


Perchlorate

- Component of propellant for rockets and missiles
- Explosives, fireworks, road flares, tanning
- Contaminant in Chilean nitrate fertilizers

Potential sources for human exposure to perchlorate

- Direct consumption of contaminated water
- Crops grown with contaminated water, fertilizer or soil
  - Food crops
  - Forage crops



Perchlorate In NHANES

- Perchlorate detected in 100% of urine samples tested
- Log normal distribution
- Children (6 – 11 yrs) have higher urine perchlorate compared with older age groups (12 + yrs)
- 95th percentile of dose estimates is approximately 1/3 the EPA reference dose
- Urinary nitrate and thiocyanate also measured

CDC Perchlorate and TSH T4 Study

Associations of urine perchlorate with serum TSH or T4:

- Men: Not significant for either TSH or T4
- Women: Significant for both TSH and T4
- Women with urinary iodine < 100 μg/L (susceptible group)
  - Significant for both TSH and T4
- Women with urinary iodine ≥ 100 μg/L
  - Significant only for TSH

Significance

- Perchlorate exposure is more prevalent than expected
- The predicted effect on T4 and TSH is at lower levels of perchlorate than previously determined experimentally in humans or in observational studies.
- Data provides additional information on perchlorate dose-response in the U.S. population

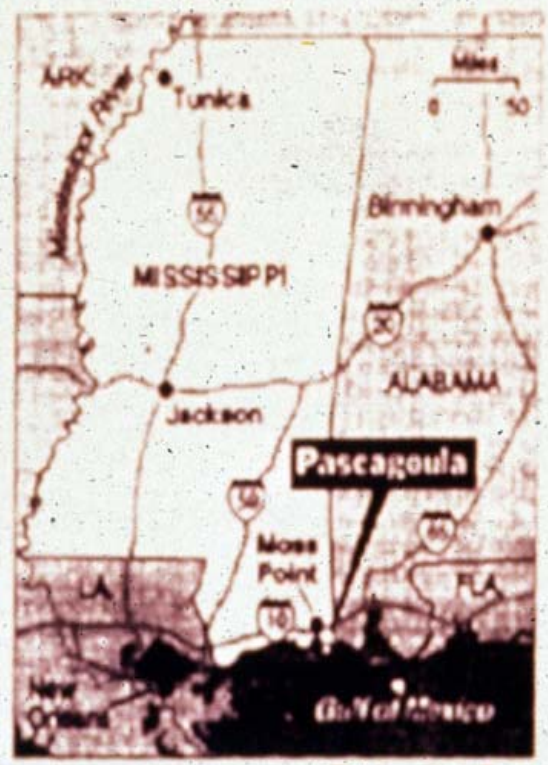
An Insect Spray Leaves Homes Uninhabitable

By The New York Times

PASCAGOULA, Miss., Nov. 16 — Beth Hobdy did not become suspicious of the man who sprayed her house near here last month for roaches and ants until her two toddlers began vomiting and running high fevers.

When the family's doctor could not pinpoint why 2-year-old Christopher and 8-month-old Courtney were ill, Ms. Hobdy and her husband, William, began wondering about the strong odor that clung to the interior of their hous.

Unknown to the Hobdy family, the rotten-egg smell was the same odor that often hangs above the cotton fields of the Mississippi Delta, 200 miles northwest of this Gulf Coast city. The exterminator whom Mrs. Hobdy had paid $65 to spray for pests common to the humid South had coated her walls and floors with methyl parathion, a toxic farm insecticide that the Federal Agriculture Department approves only for outdoor spraying on some crops.



The New York Times

Two exterminators are accused of using a toxic weevil spray indoors.

Point, Miss. The two purchased enough methyl parathion to have sprayed at least 2,000 buildings, the investigators said.

ommended for fighting boll weevils.

The authorities would not say where the men bought the methyl parathion, although they said it was from legal sources. The homes of the two men were searched after the authorities obtained warrants.

At the Hobdy house, carpet samples and wall swabbings taken by the Mississippi Department of Agriculture and Commerce "tested off the scale," E.P.A. agents said. Those tests, and later ones taken from other sites, found contamination at least five times the level that requires immediate evacuation of humans and animals, agents said.

Comparable levels of methyl parathion found in a house in Tunica, Miss., in 1984 — the result of a farmer using it as a home pesticide — led to the deaths of two young children.

A teaspoon of methyl parathion can be lethal. The manufacturer, the Shell Chemical Company, warns farmers who use the product to stay out of fields for at least 48 hours after

Assessing human exposure to uranium by measuring uranium in urine

	Oak Ridge method	NCEH method
Technique:	Alpha spectroscopy	ICP-MS
Amount of urine:	1000 mL	0.5 mL
Time for analysis:	5 days	5 minutes

Cancer Cluster Investigations

- CDC worked with Nevada Department of Health to investigate 15 cases of leukemia in children
- Analyzed 132 chemicals in blood and urine
- Measured 15 volatile organic compounds
- Assessed gene variations
- Stored DNA from blood and buccal cells for future studies

The Science Must Be Impeccable

Table 8. Mercury

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, 1999-2000.

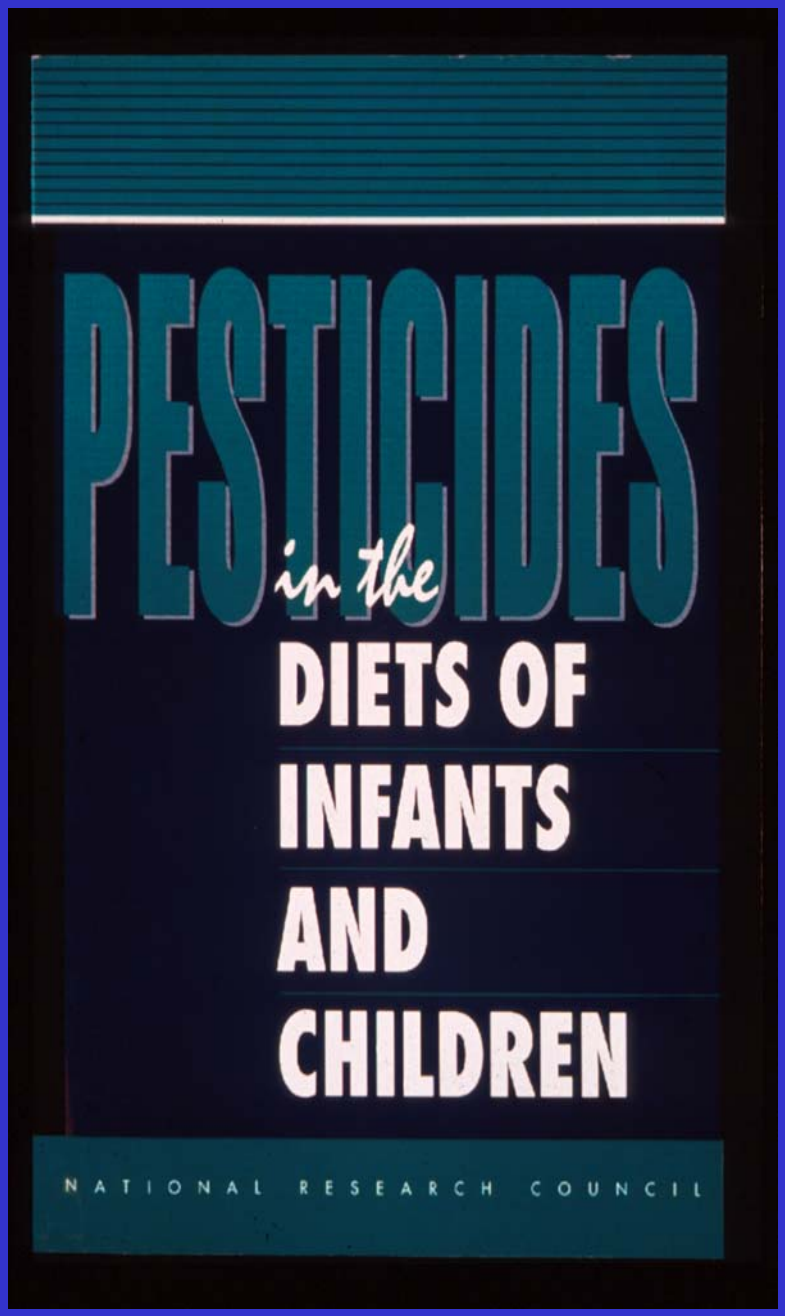
	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)						Sample size
		10th	25th	50th	75th	90th	95th	
Age group								
1-5 years (males and females)	.343 (.299-.393)	< LOD	< LOD	.300 (.200-.300)	.500 (.500-.600)	1.40 (1.10-2.00)	2.30 (1.40-3.20)	705
Males	.317 (.270-.372)	< LOD	< LOD	.200 (.200-.300)	.500 (.500-.600)	1.10 (.800-1.50)	2.10 (1.10-3.50)	387
Females	.377 (.311-.457)	< LOD	< LOD	.200 (.200-.300)	.800 (.500-1.00)	1.60 (1.20-2.30)	2.70 (1.80-4.80)	318
16-49 years (females)	1.02 (.860-1.22)	.200 (<LOD-.200)	.400 (.400-.600)	.900 (.800-1.20)	2.00 (1.60-2.70)	4.90 (4.00-6.10)	7.10 (5.60-9.90)	1709
Race/ethnicity (females, 16-49 years)								
Mexican Americans	.820 (.691-.974)	.200 (<LOD-.200)	.400 (.300-.500)	.900 (.700-1.00)	1.40 (1.20-1.90)	2.60 (2.10-3.40)	4.00 (2.70-5.50)	579
Non-Hispanic blacks	1.35 (1.11-1.64)	.300 (.200-.500)	.600 (.500-.900)	1.30 (1.10-1.60)	2.60 (1.90-3.30)	4.80 (3.30-6.60)	5.90 (4.40-10.9)	370
Non-Hispanic whites	.944 (.765-1.17)	< LOD	.400 (.300-.400)	.900 (.700-1.10)	1.90 (1.40-2.90)	5.00 (3.40-6.50)	6.90 (5.40-10.6)	588

< LOD means less than the limit of detection, which is 0.14 µg/L.

Third National Report on Human Exposure to Environmental Chemicals

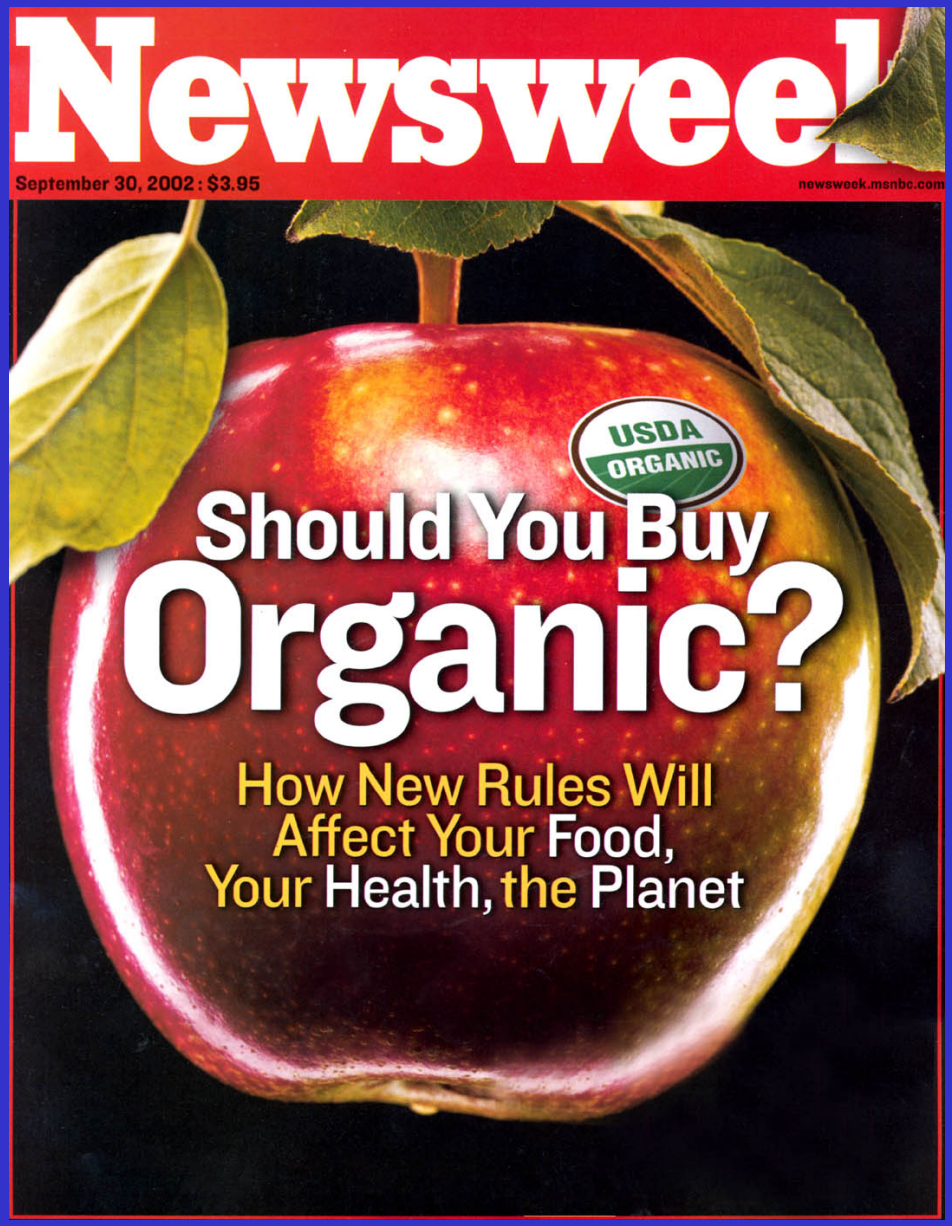
2005

Executive Summary



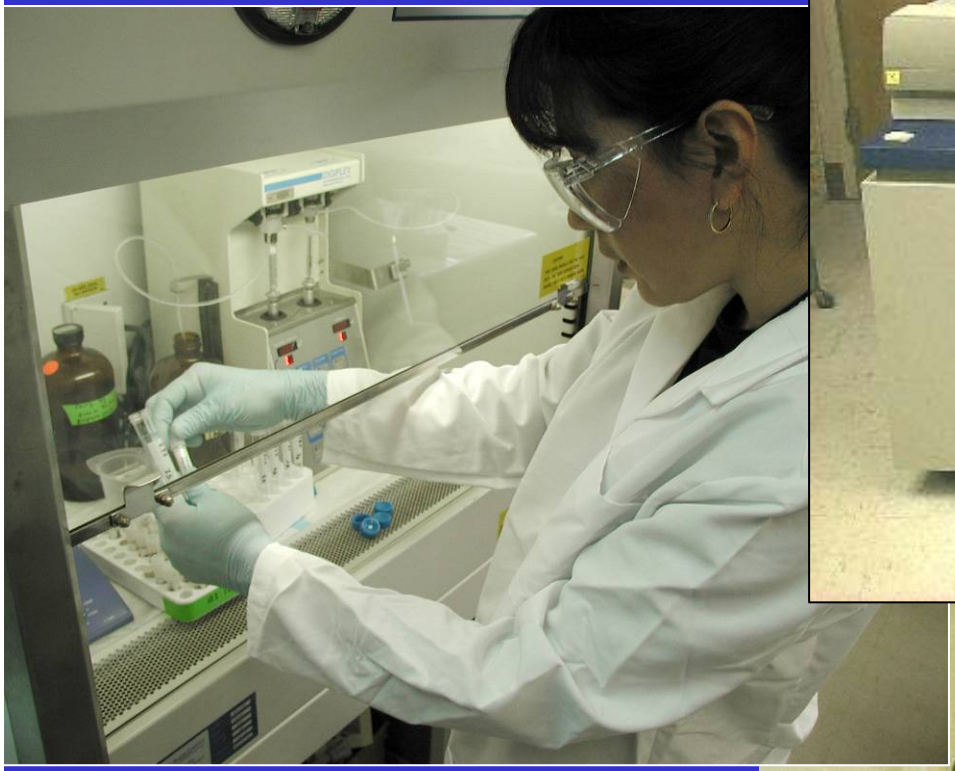
The Report was right – Biomonitoring confirms that:

Children do have higher exposures and body burdens



Body Burdens are lower in people who consume organic food.

A Laboratory's most important element

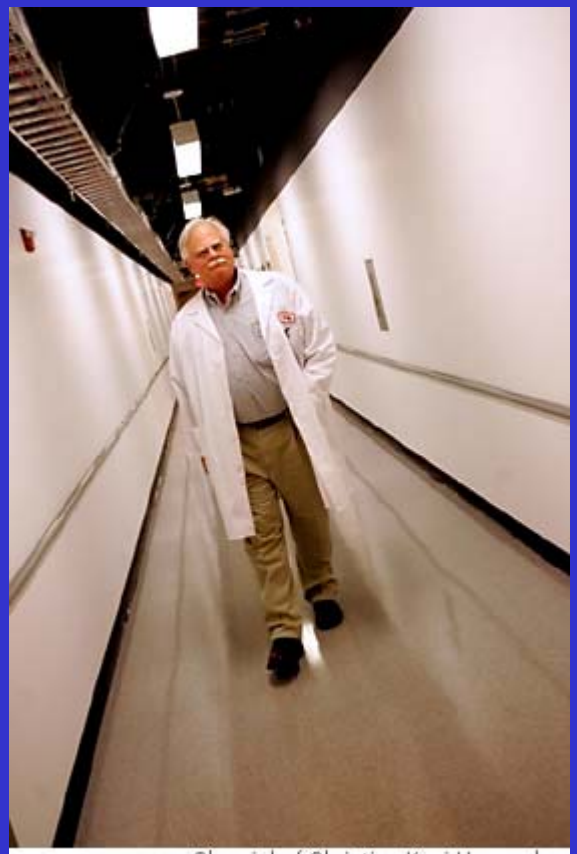


The people

Disease-fighting labs languish on critical care list : State's failure to replace retiring scientists limits ability to respond to medical crises

Sabin Russell, Chronicle Staff Writer

Sunday, July 31, 2005



Chronicle / Christina Koci Hernandez

Chronicle / Christina Koci Hernandez

My Recommendations

- Do Not Undercapitalize
  - Critical to adequately fund
- Very personnel dependant
- California Capacity is Important
- CDC partnership will be powerful
- …But Federal data is not enough

dickjackson@berkeley.edu

Biomonitoring and California

Sacramento, California
December 17, 2007

Richard Joseph Jackson, MD MPH

Dickjackson@berkeley.edu