

# Public Health Surveillance: Policy Case Studies July 2004

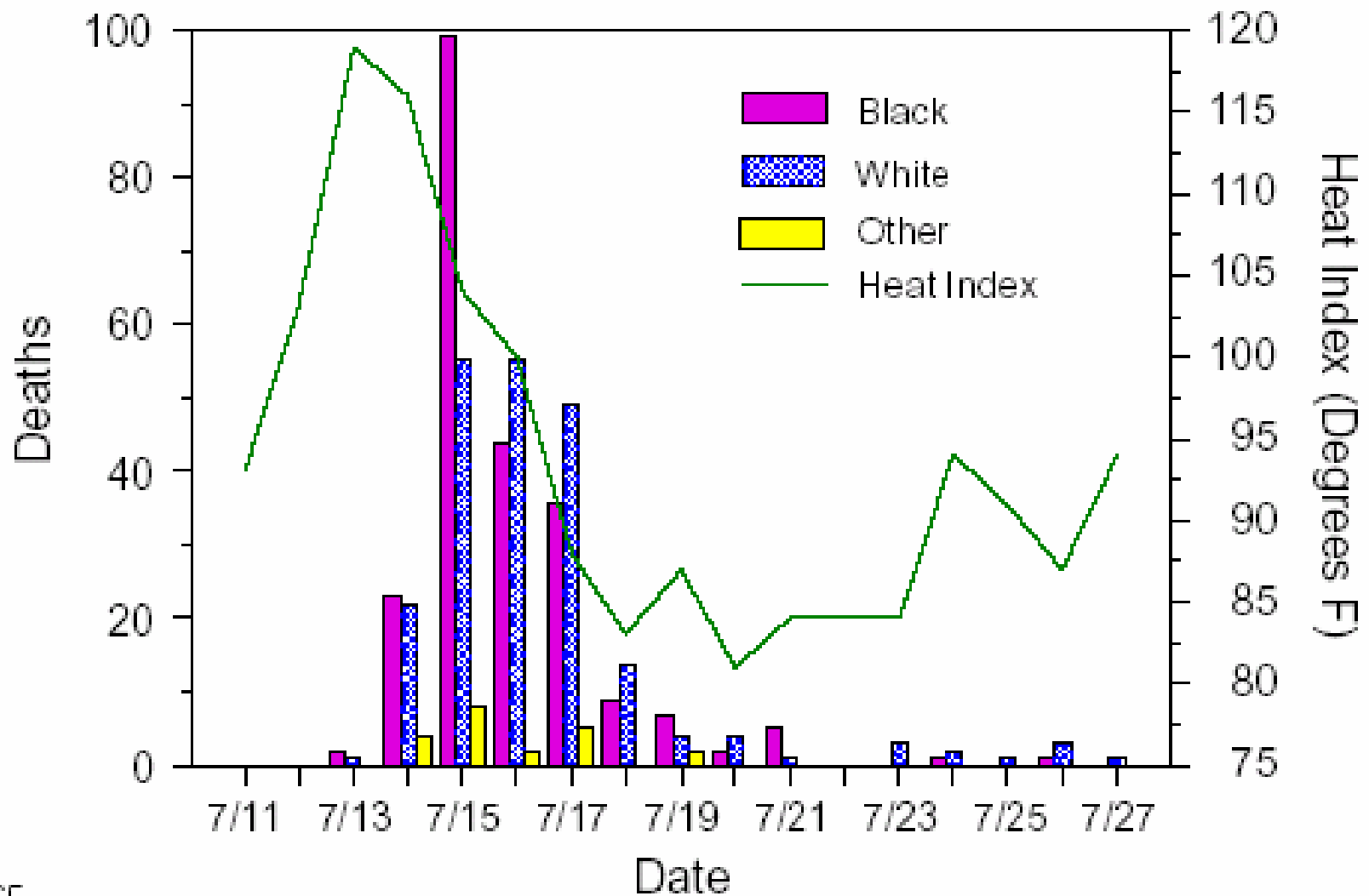
Lynn R. Goldman, MD, MPH

# Why Track the Leading Indicators of Public Health?

- Monitor of status and trends of health and conditions that impact health
- Develop interventions to promote health
- Build core capacity to respond to problems

# HEAT RELATED MORTALITY

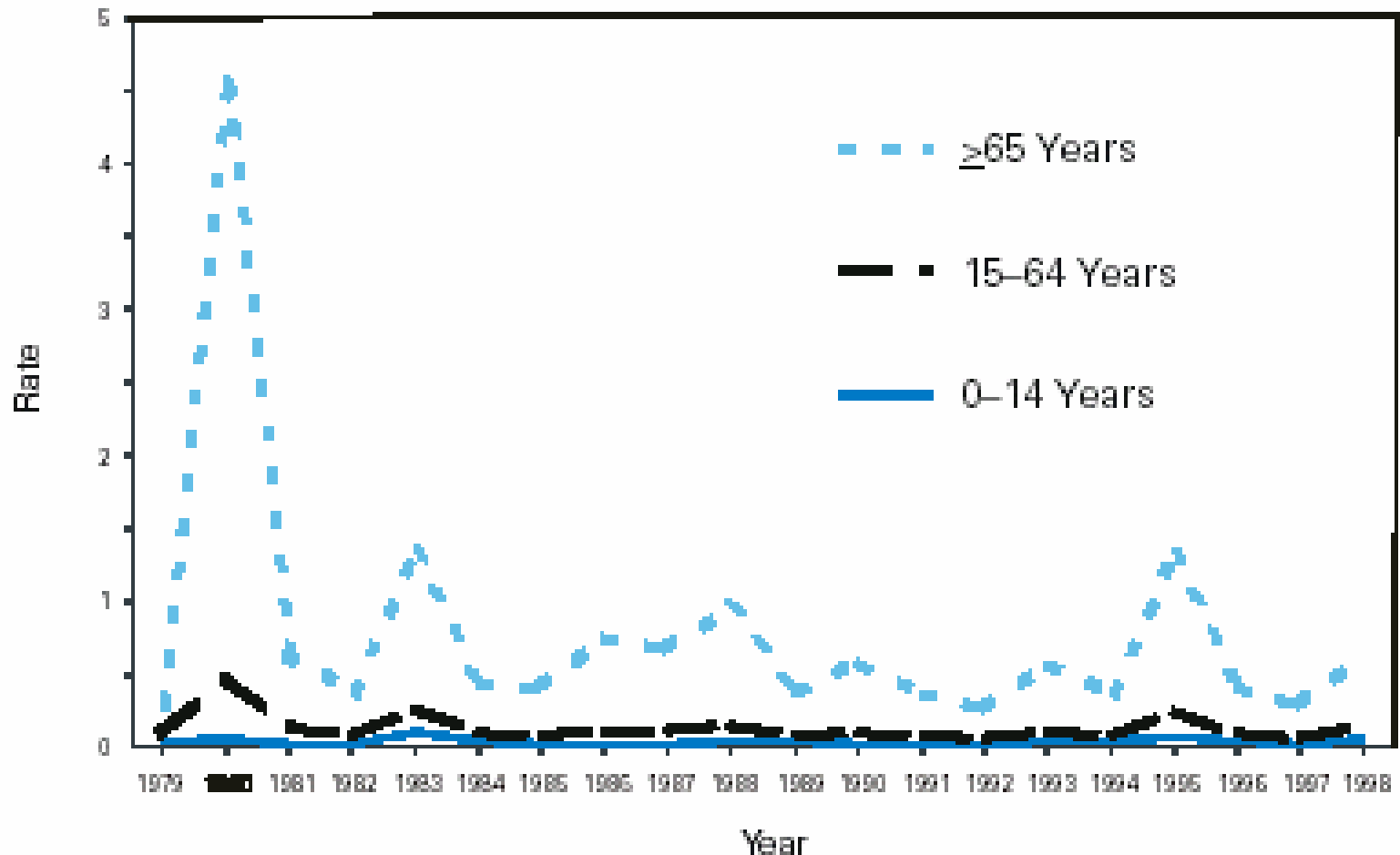
# Number of heat-related deaths, and heat index, by date — Chicago, July 11–27, 1995



\* n=465.

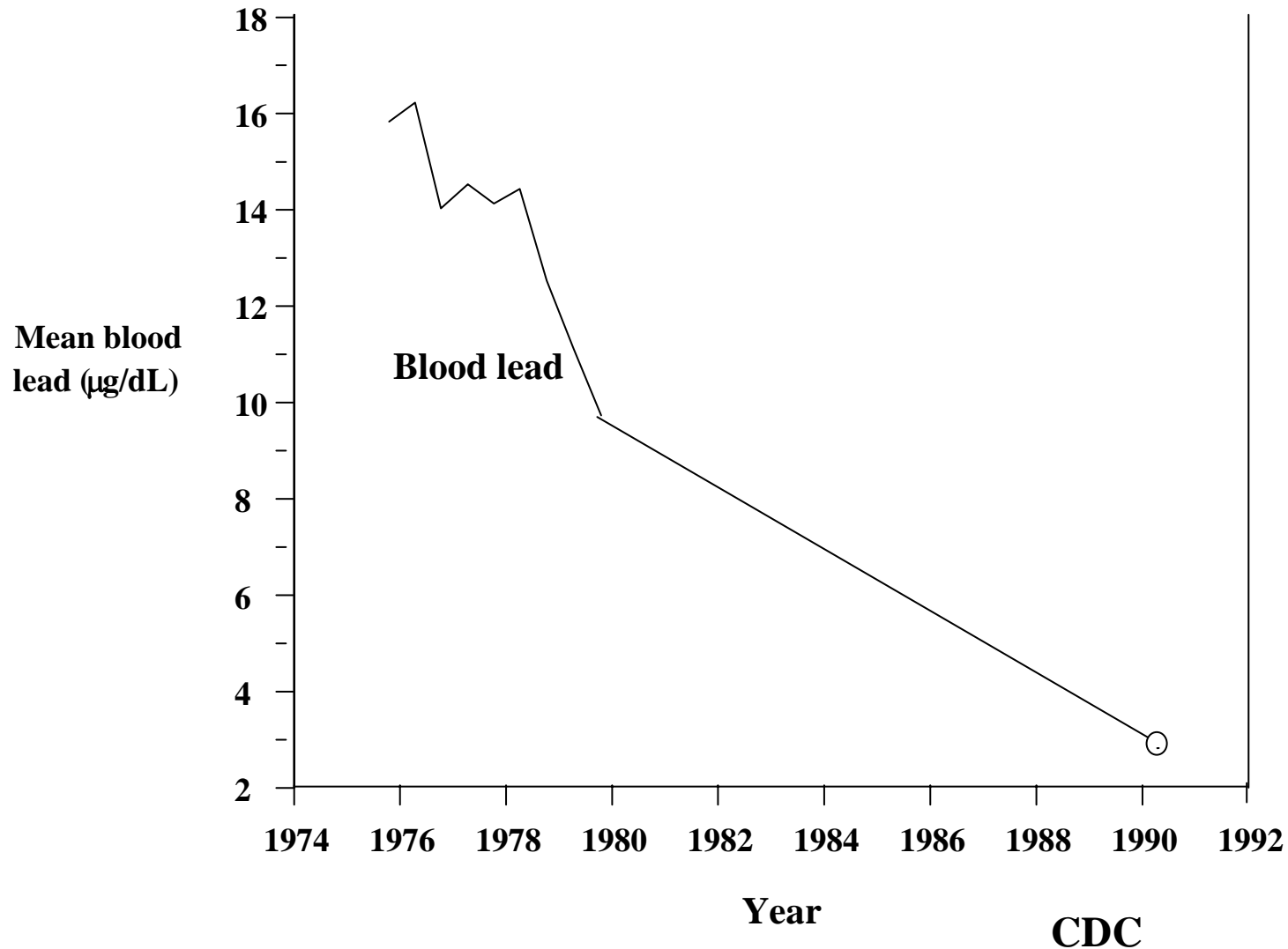
# Rate of heat-related deaths, by age group — United States, 1979–1998

(CDC MMWR)

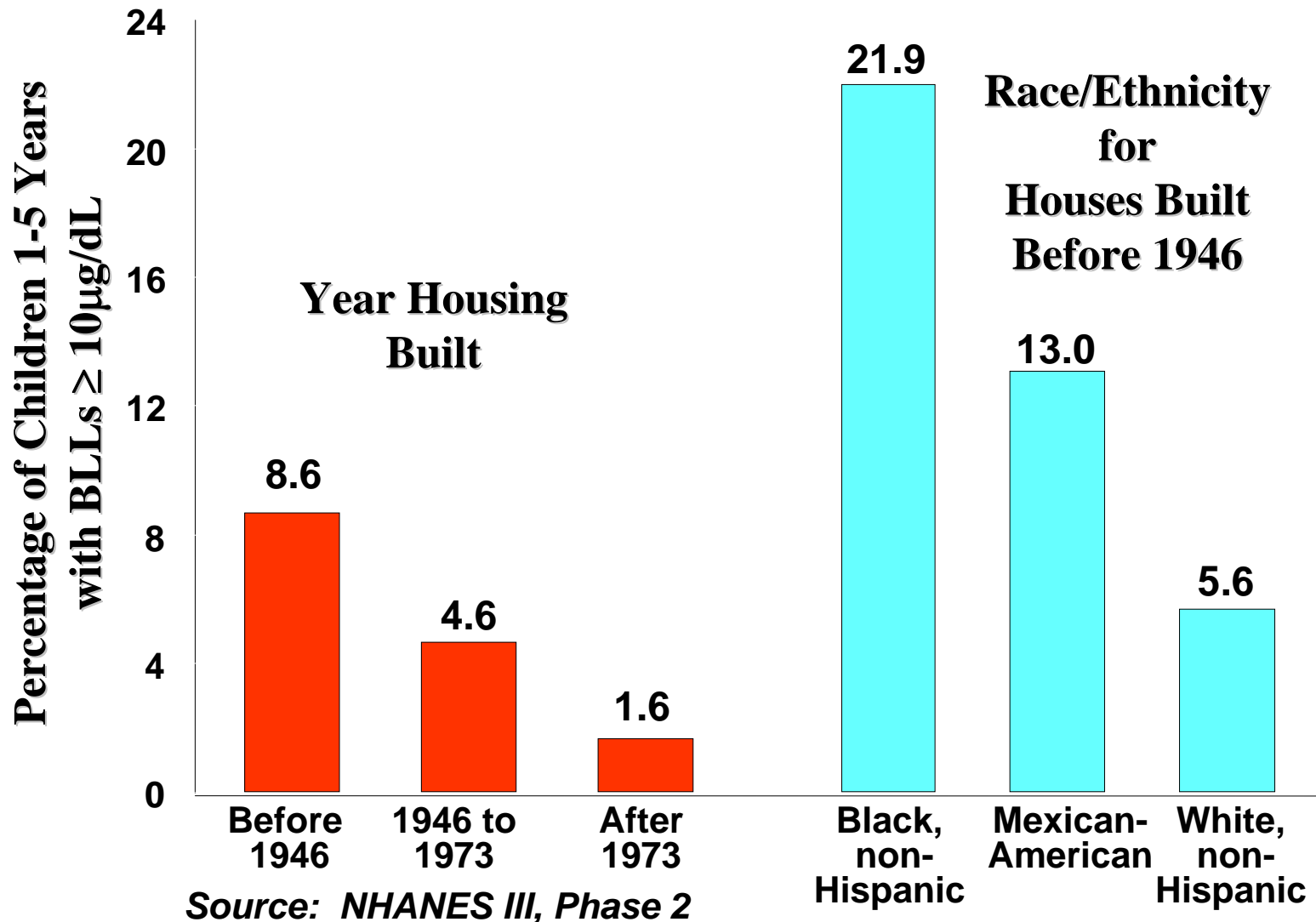


# CHILDHOOD LEAD POISONING

# Lead Levels of Children 1-5 Years of Age in the United States with Blood Lead Levels $\geq 10$ $\mu\text{g/dL}$ , 1974-1992



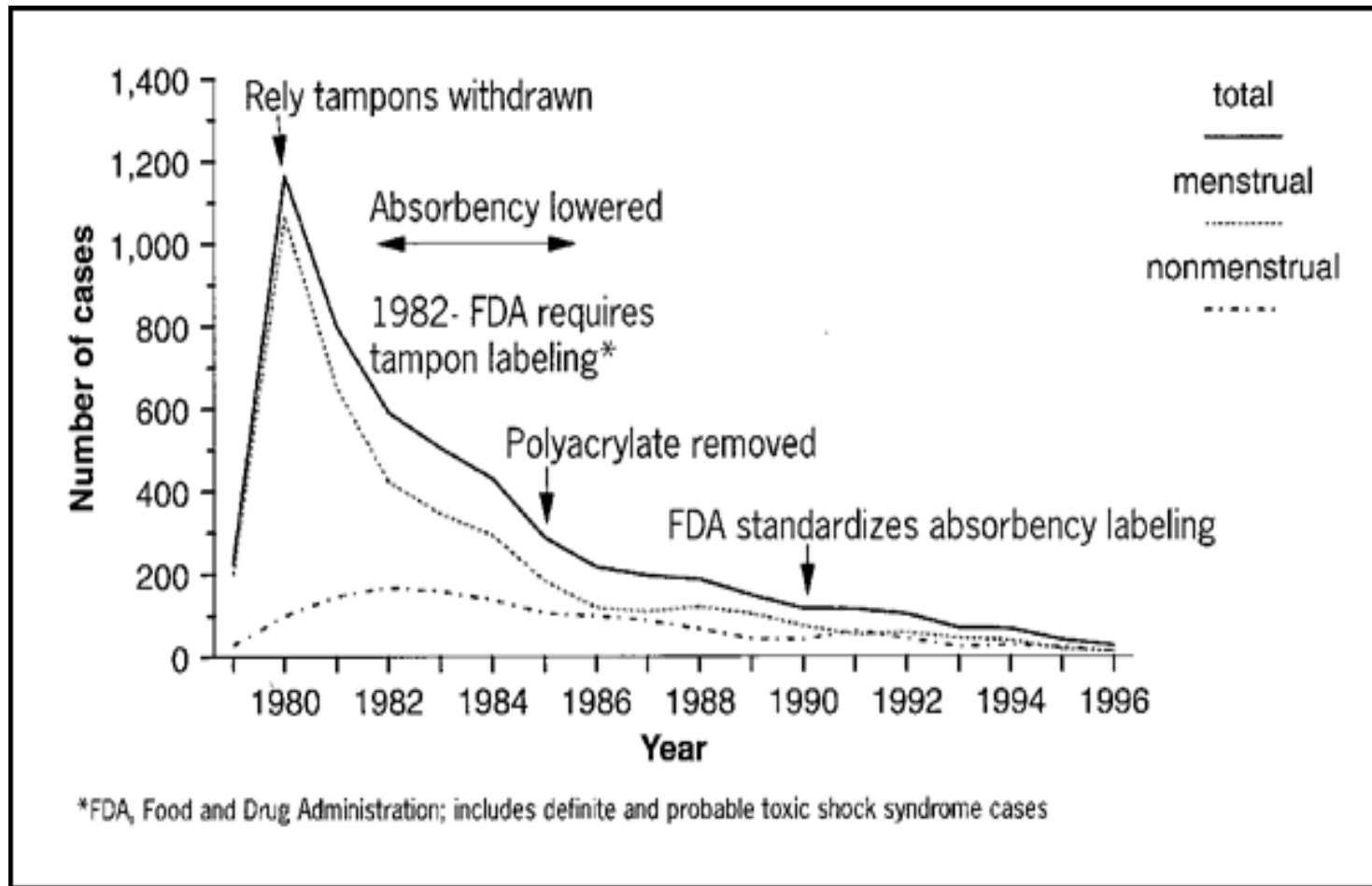
# Prevalence of Childhood Lead Poisoning in the United States by Housing and Demographic Characteristics, 1991 - 1994





# TOXIC SHOCK SYNDROME

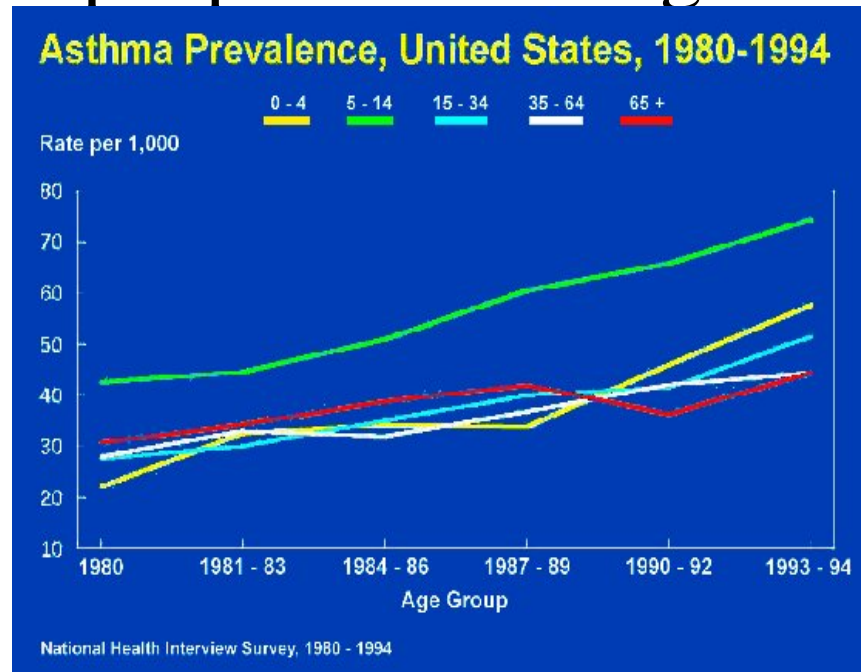
# Toxic Shock Syndrome Cases United States, 1979-1996



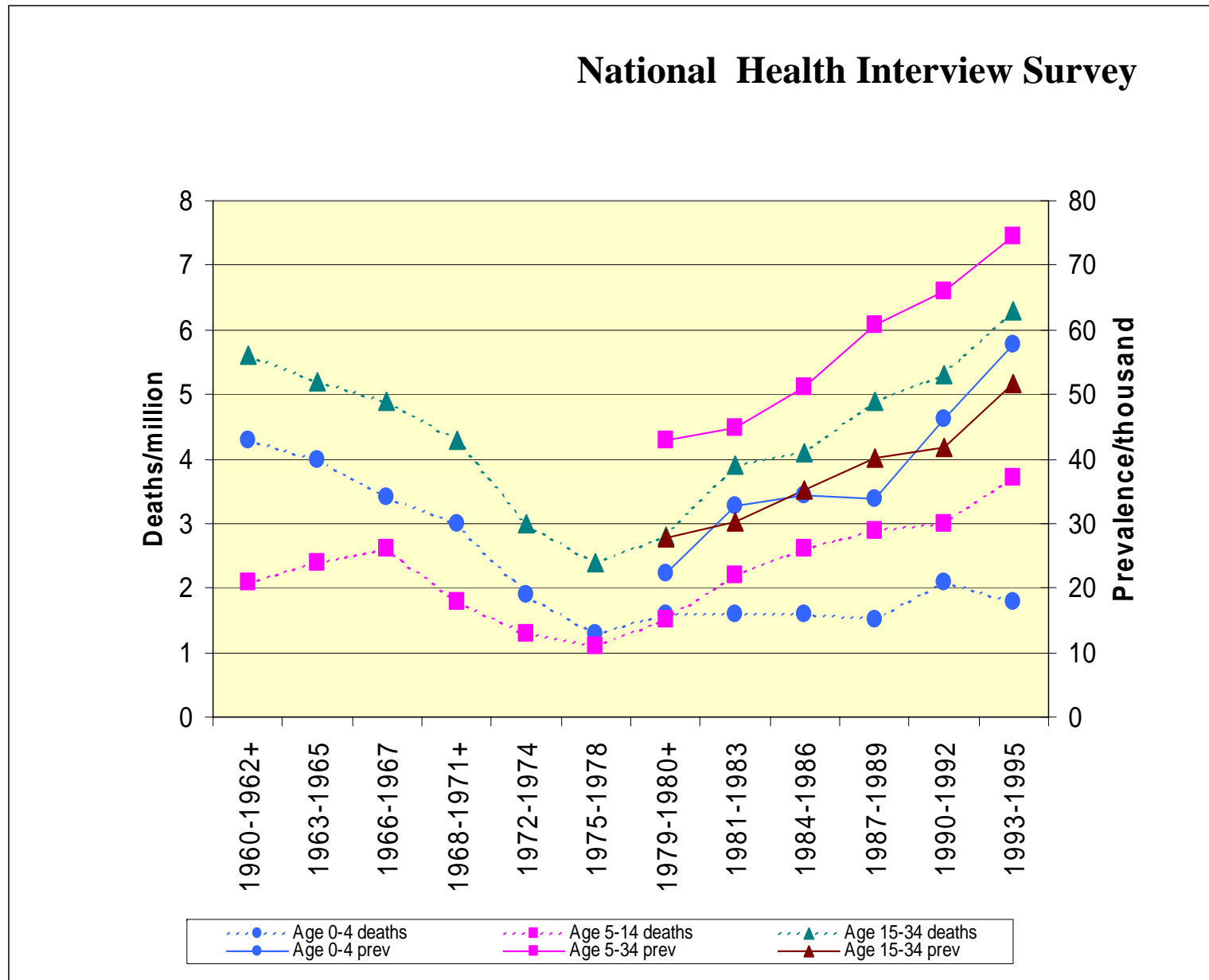
# ASTHMA

# Asthma

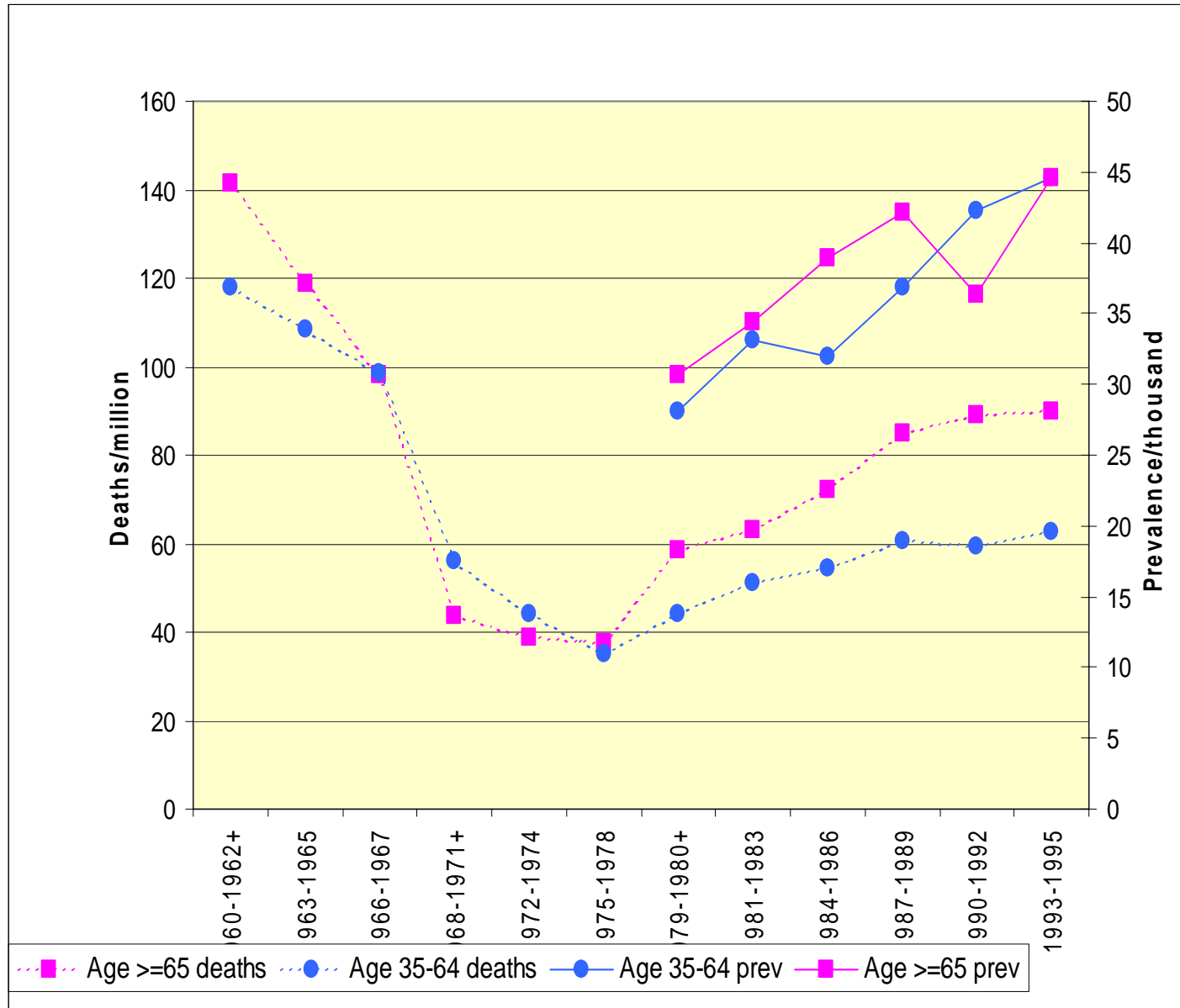
- Rates have increased 75% since 1980
- Affects about 17 million people - including nearly 5 million children
- Cost the economy \$14.5 billion last year



# Asthma Prevalence and Mortality for Children and Young Adults, 1960-1995



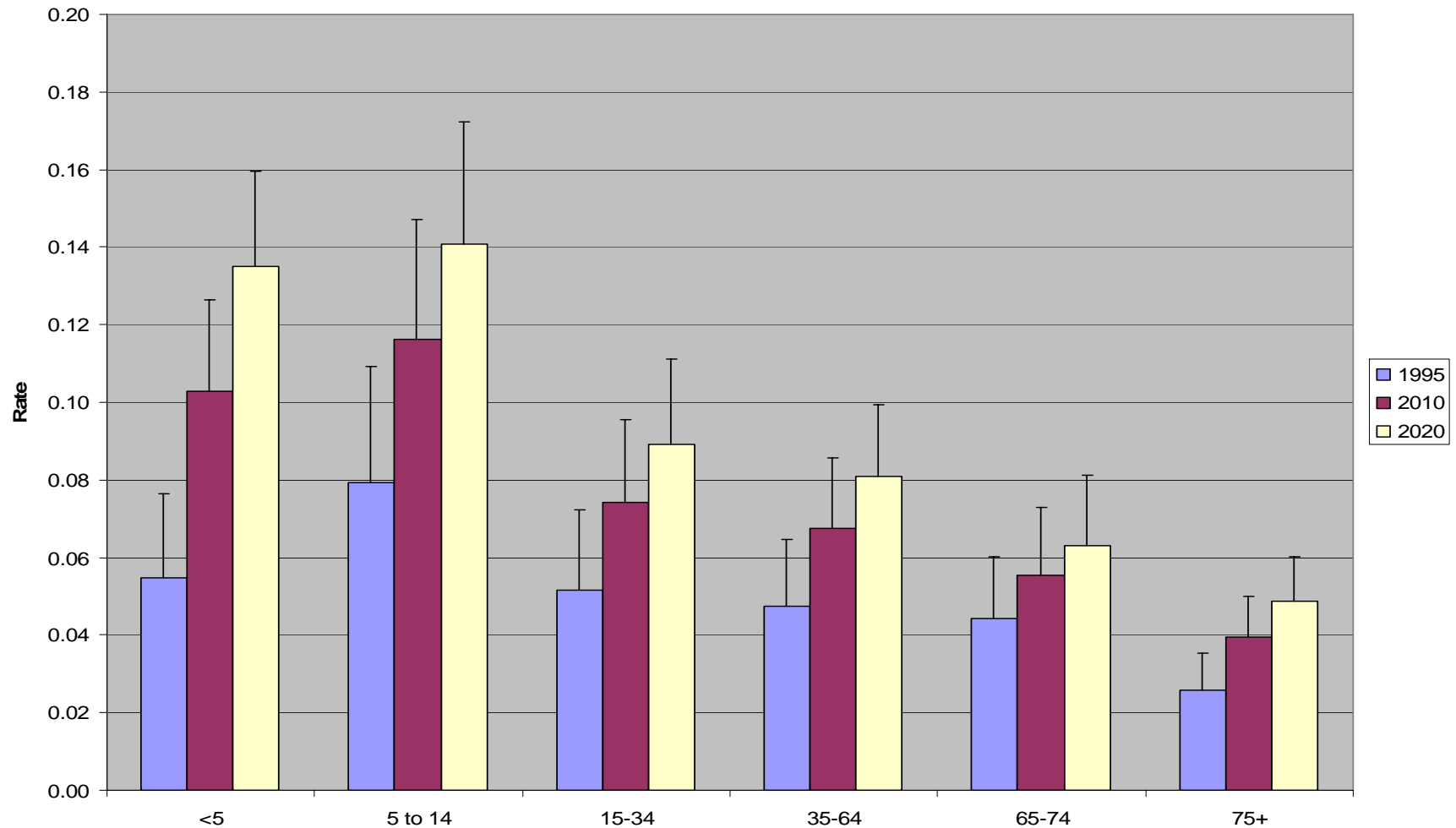
# Asthma Prevalence and Mortality for Adults 35+ years: 1960-95



National Health Interview Survey

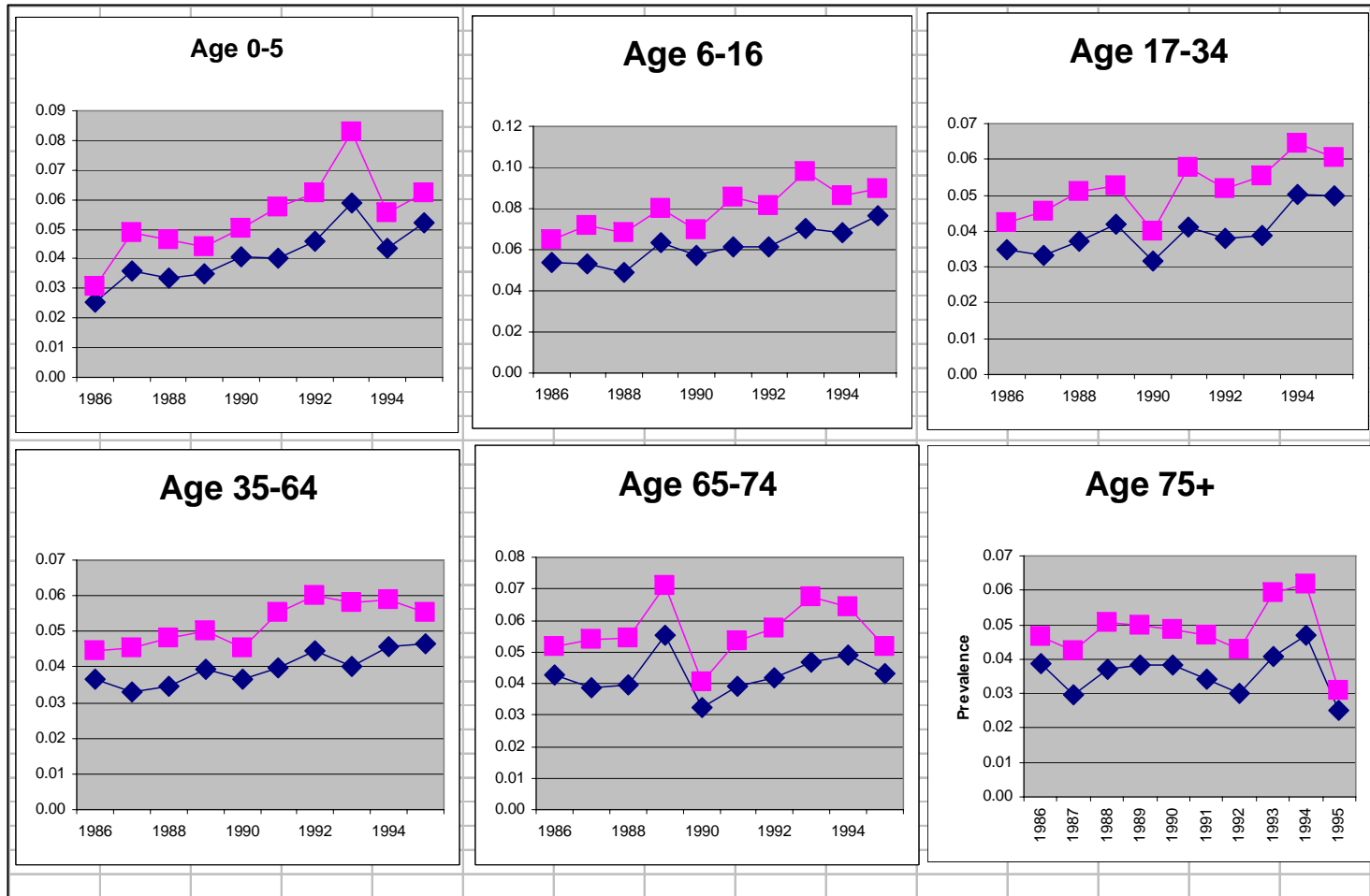
# Asthma projected rates of increase, 1995, 2010, 2020

Projected increase in rate of self reported asthma: 1995-2020



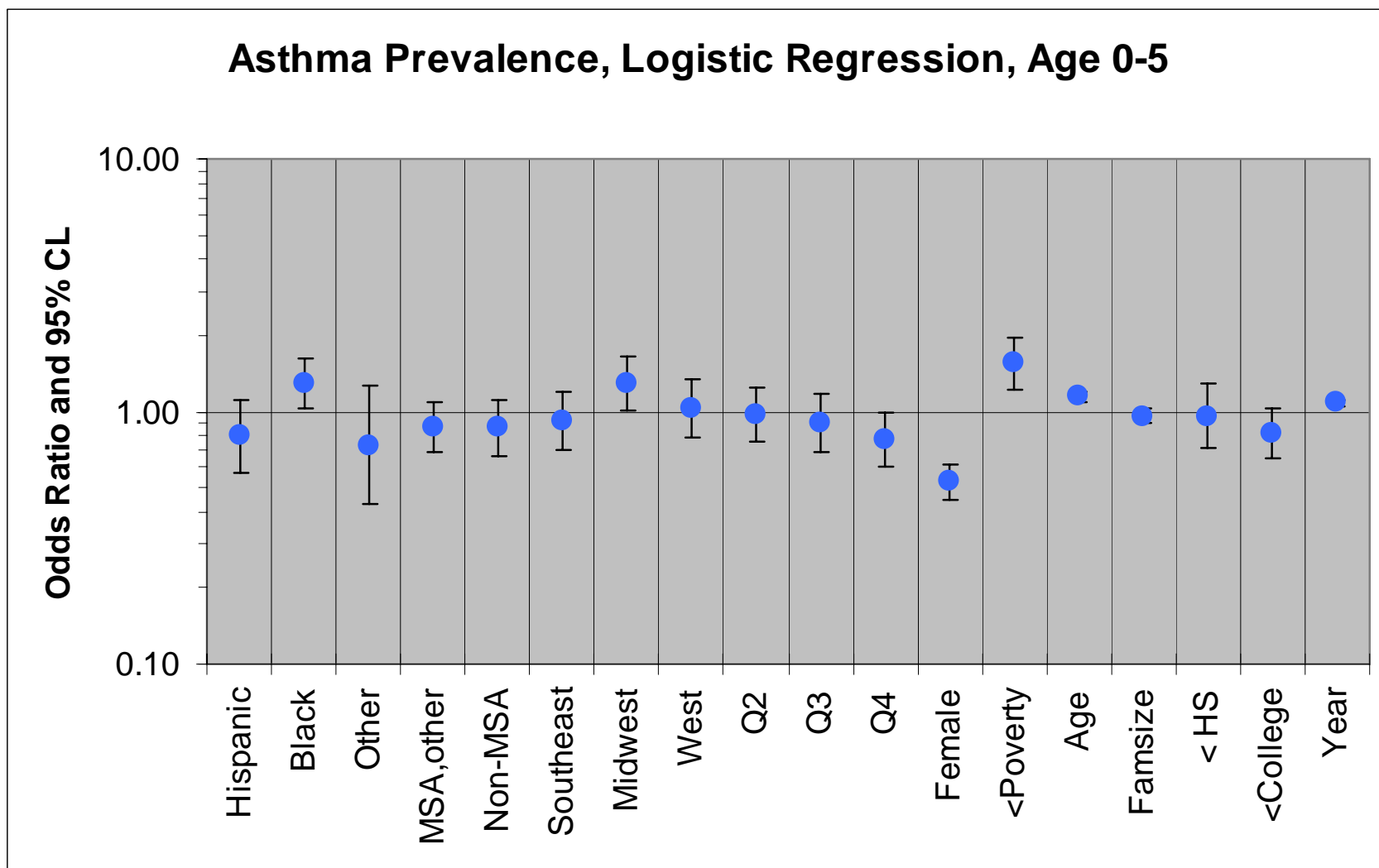
# Asthma by poverty, 1987-95

(Blue=below poverty line)





# Asthma NHIS Data (1987-95)

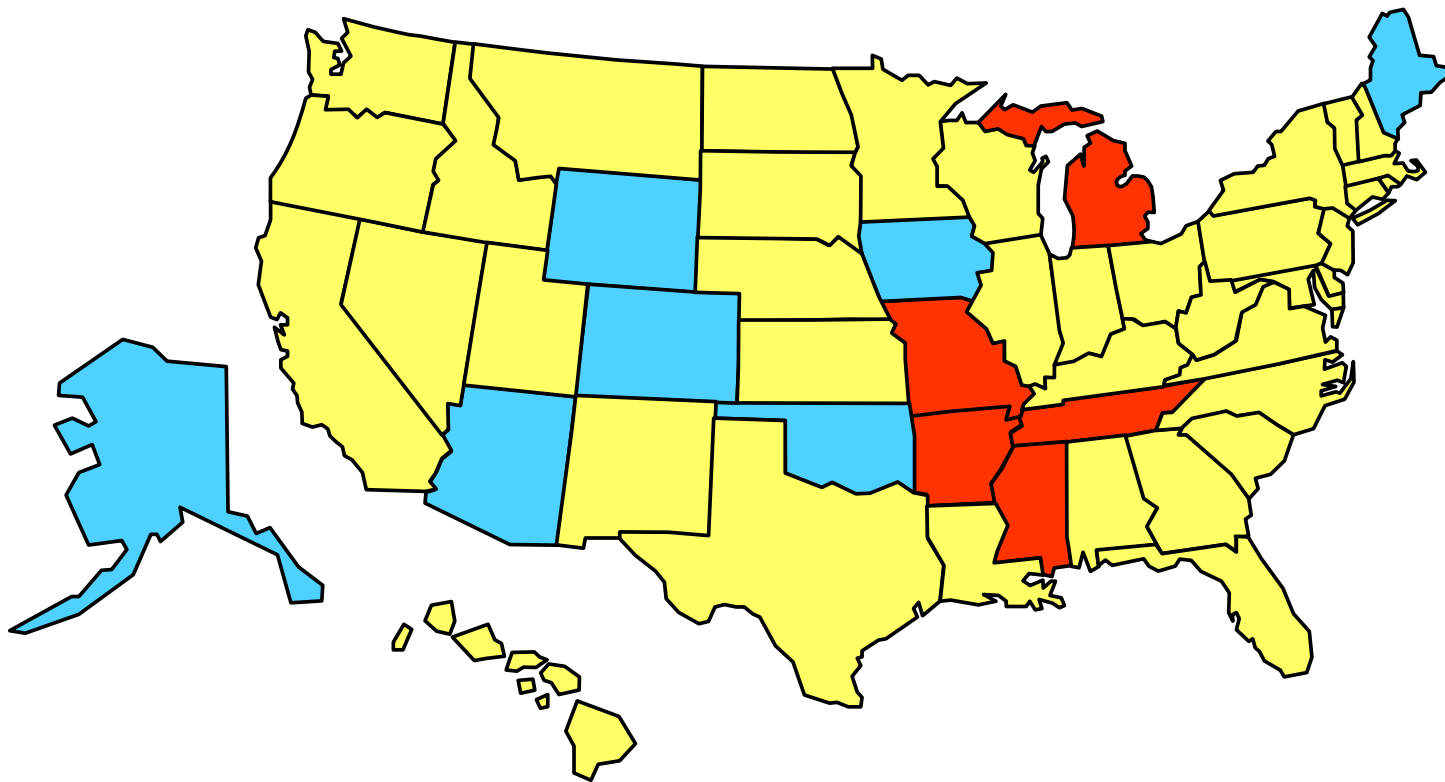


# DIABETES



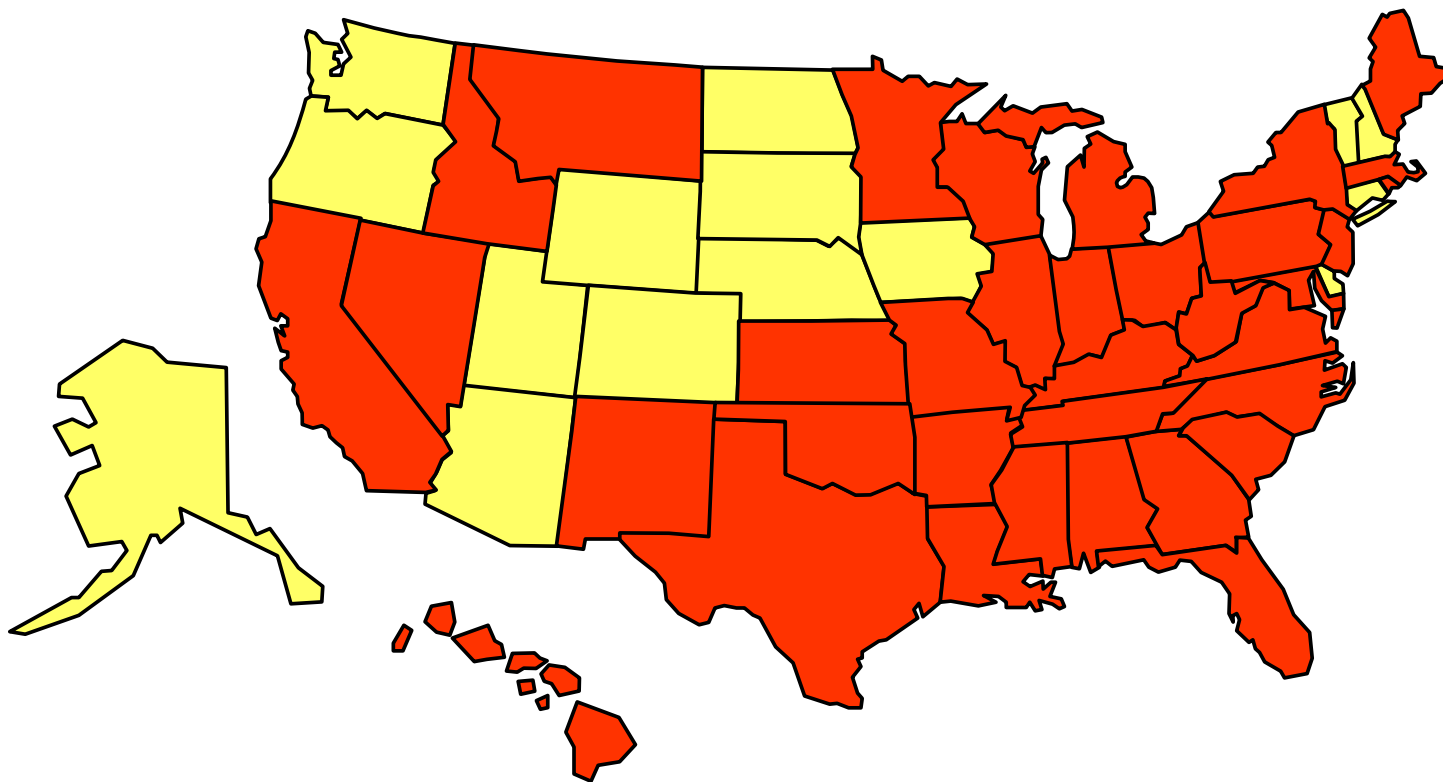
## Prevalence of Diabetes Among Adults

United States, BRFSS, 1993–1994



# Prevalence of Diabetes Among Adults

## United States, BRFSS, 1999



# Why an increase in diabetes?

- Increased diagnosis
- “Thrifty genotype” theory (e.g., “fat” mouse
- Thrifty phenotype (low birthweight, early deprivation, possibly arsenic and dioxins)
- Epidemic of obesity and sedentary lifestyle (which in turn relates to land use)
- Environmental agents (dioxins and arsenic)

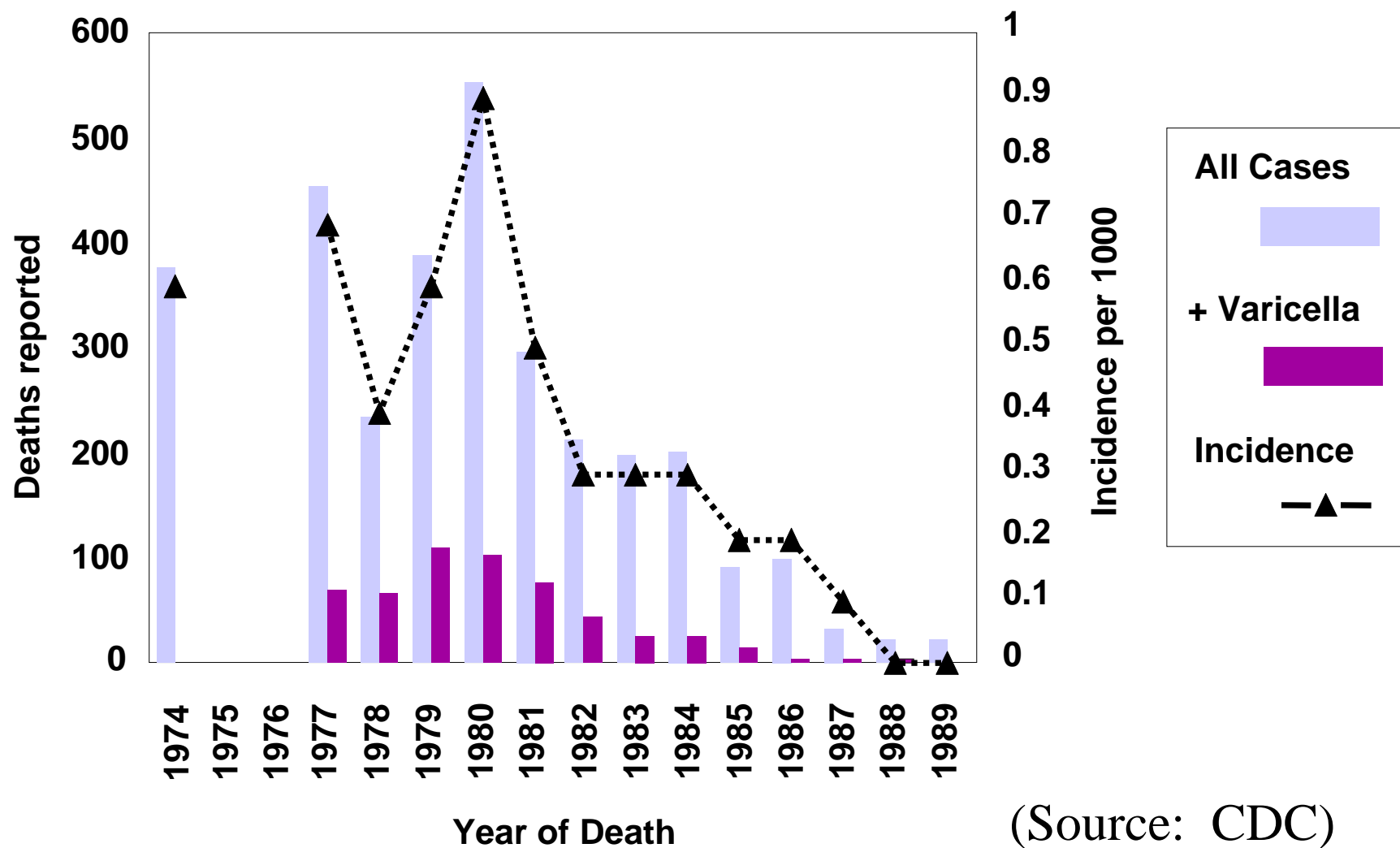
dz3

more verbage  
dzerbe, 1/20/2005

# REYE'S SYNDROME



# Reye's Syndrome, US, 1974-1985



dz4

I guess this is about giving children asperin  
dzerbe, 1/20/2005

# LOW BIRTHWEIGHT

# Trends: Low Birthweight

- Since the 1980s, rates of low birthweight (LBW) and preterm birth have been increasing steadily in the US
- Among singleton births, LBW has increased 4% and very low birthweight (VLBW) 7% since 1989
- Among 20-34 year old mothers of singleton births, LBW increased 2.2% and VLBW 5.9% from 1990-97

# Trends: Preterm Birth

- Among singleton births, rates of moderately preterm births (32-36 weeks) have increased 14% since 1989
- CDC reported that after taking into account a number of risk factors (age of mother, prenatal care, marital status) there was a 4.6% increase in preterm birth in white non-Hispanic infants between 1989-96

dz5

comments on why  
dzerbe, 1/20/2005

# BIRTH DEFECTS

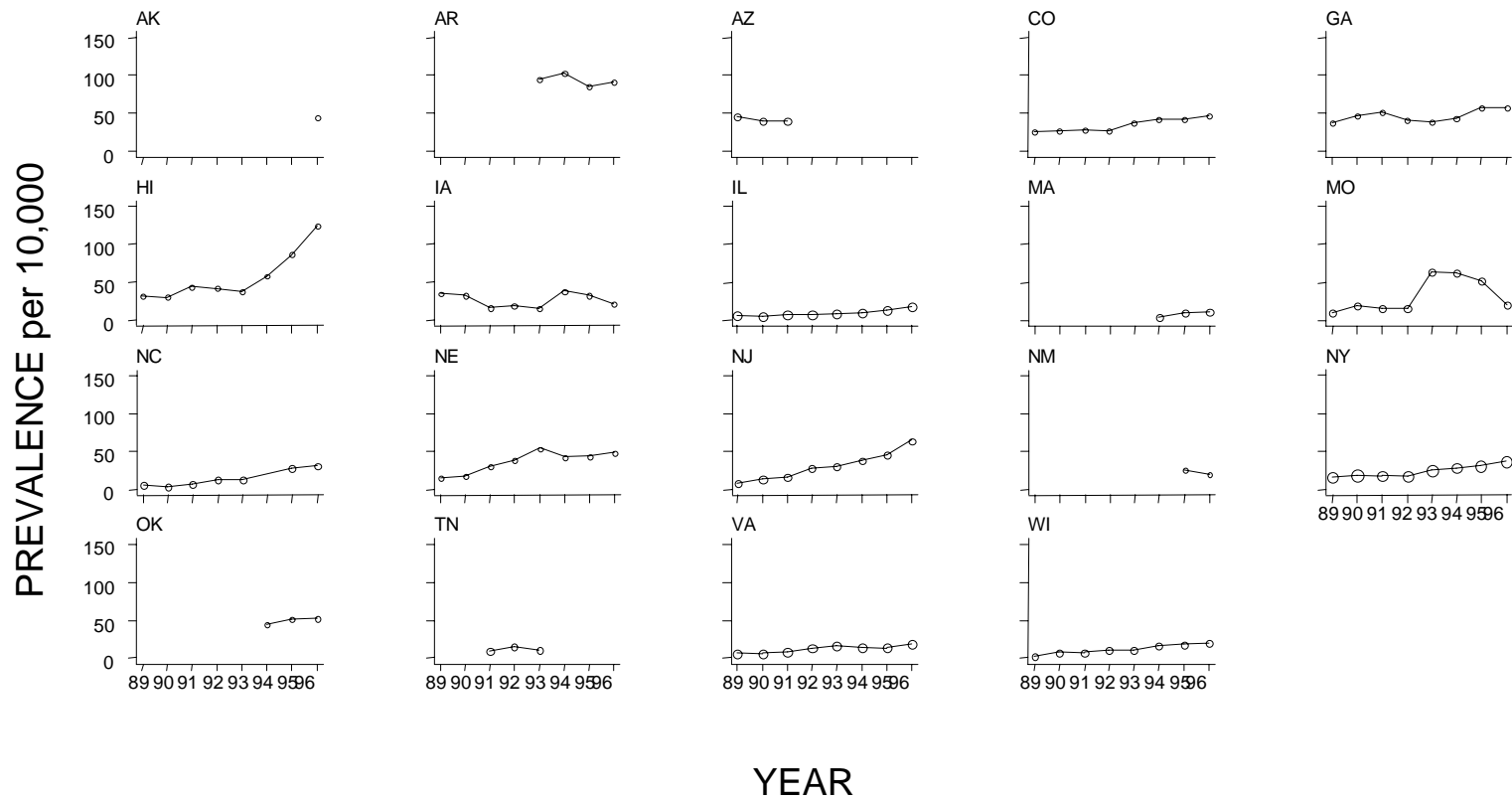
# Trends: Birth Defects

- Atrial Septal Defect
  - Prevalence of ASD for all states combined rose 148% from 1989 to 1996
  - Of the 13 states with at least four years of data, nine showed statistically significant positive linear trends



# Atrial Septal Defect

## ATRIAL SEPTAL DEFECT

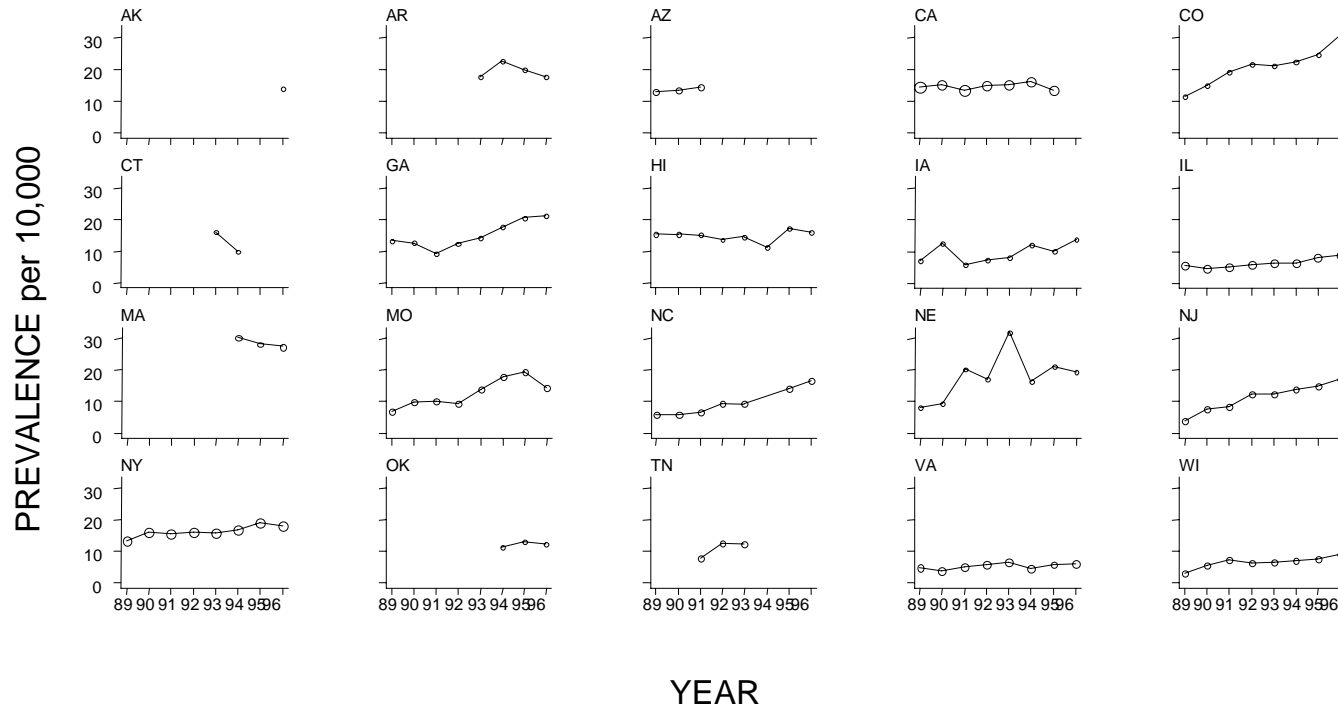


# Trends: Birth Defects

- Obstructive Genitourinary Defect
  - Prevalence of OGD for all states combined rose 60% from 1989 to 1996.
  - Of the 14 states with at least four years of data, eight showed statistically significant positive linear trends

# Obstructive Genitourinary Defect

## OBSTRUCTIVE GENITOURINARY DEFECT



# What does it mean?

- Are these true increases or related improved ascertainment and diagnostic techniques or some other factors?
- Do the current surveillance systems in place give us the information to come up with an answer?

# Surveillance Efforts

- No national system exists to track and report trends in birth defects
- As of 1999, 33 states had birth defects registries with different structures

# Assessment of Surveillance System Components

- Comparison of birth defect prevalences stratified by follow-up, active and passive ascertainment, and inclusion of stillbirths.
- The results suggest that more than 50% of anencephaly cases may be missed due to failure to count fetal deaths.

# Follow-up

**Table 7: Average state birth defect rates (per 10,000 births) 1989-1996 by follow-up category for selected birth defects.**

<b>Birth Defect</b>	<b>Ascertainment at birth</b>	<b>Follow-up past birth</b>	<b>Percent difference</b>
<b>Down Syndrome</b>	6.7 (n=4)	10.6 (n=25)	<b>+57%</b>
<b>Rectal and large intestinal atresia/stenosis</b>	1.4 (n=3)	4.2 (n=24)	<b>+206%</b>
<b>Renal agenesis /hypoplasia</b>	1.8 (n=3)	4.6 (n=23)	<b>+159%</b>
<b>Spina bifida</b>	2.4 (n=3)	4.3 (n=25)	<b>+79%</b>

Note: Includes the three states with birth certificate data.

# Active vs. Passive

**Table 8: Average birth defect rates (per 10,000 births) 1989-1996 for states with passive and active surveillance systems for selected birth defects.**

<b>Birth Defect</b>	<b>Passive</b>	<b>Active</b>	<b>Percent difference</b>
<b>Anencephaly</b>	1.7 (n=15)	2.8 (n=11)	<b>+62%</b>
<b>Obstructive genitourinary defect</b>	12.0 (n=12)	16.0 (n=8)	<b>+33%</b>
<b>Renal agenesis</b>	2.8 (n=14)	7.2 (n=10)	<b>+160%</b>
<b>Atrial septal defect</b>	23.6 (n=12)	45.7 (n=7)	<b>+94%</b>
<b>Transposition of great arteries</b>	3.0 (n=13)	4.3 (n=9)	<b>+45%</b>
<b>Tricuspid valve atresia and stenosis</b>	1.6 (n=13)	15.7 (n=7)	<b>+870%</b>

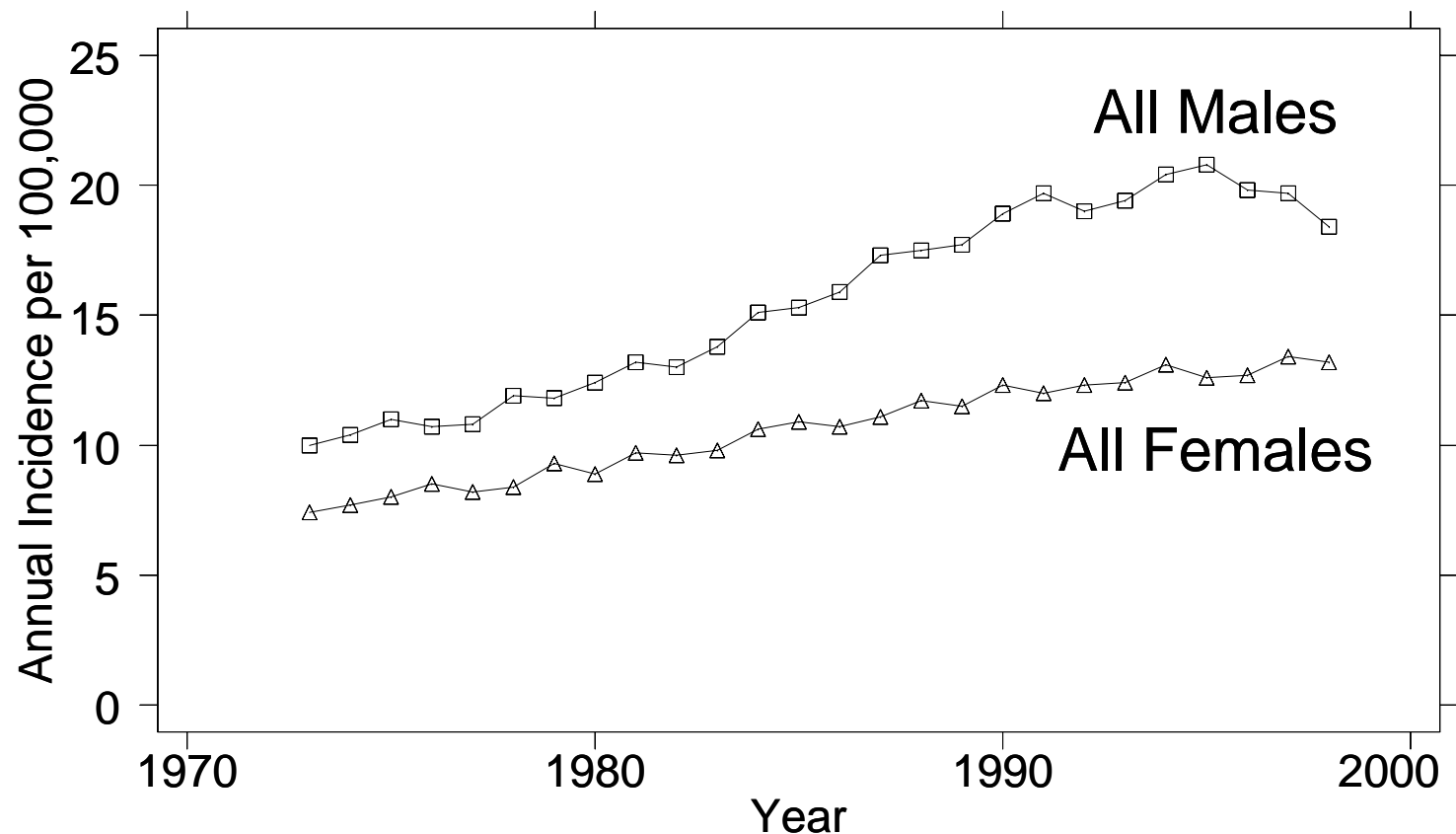


# Key Components of a Surveillance System

- Follow-up of the newborn past birth
- Active vs. passive surveillance
- Inclusion of stillbirths
- Timeliness
- Analytic capability
- Comprehensiveness

CANCER

# Trends in USA: 1973-1998



Trend in age-adjusted annual incidence for NHL

Based on Surveillance, Epidemiology and End Results (SEER) Data

dz6

Non Hodgkins Lymphoma  
dzerbe, 1/20/2005

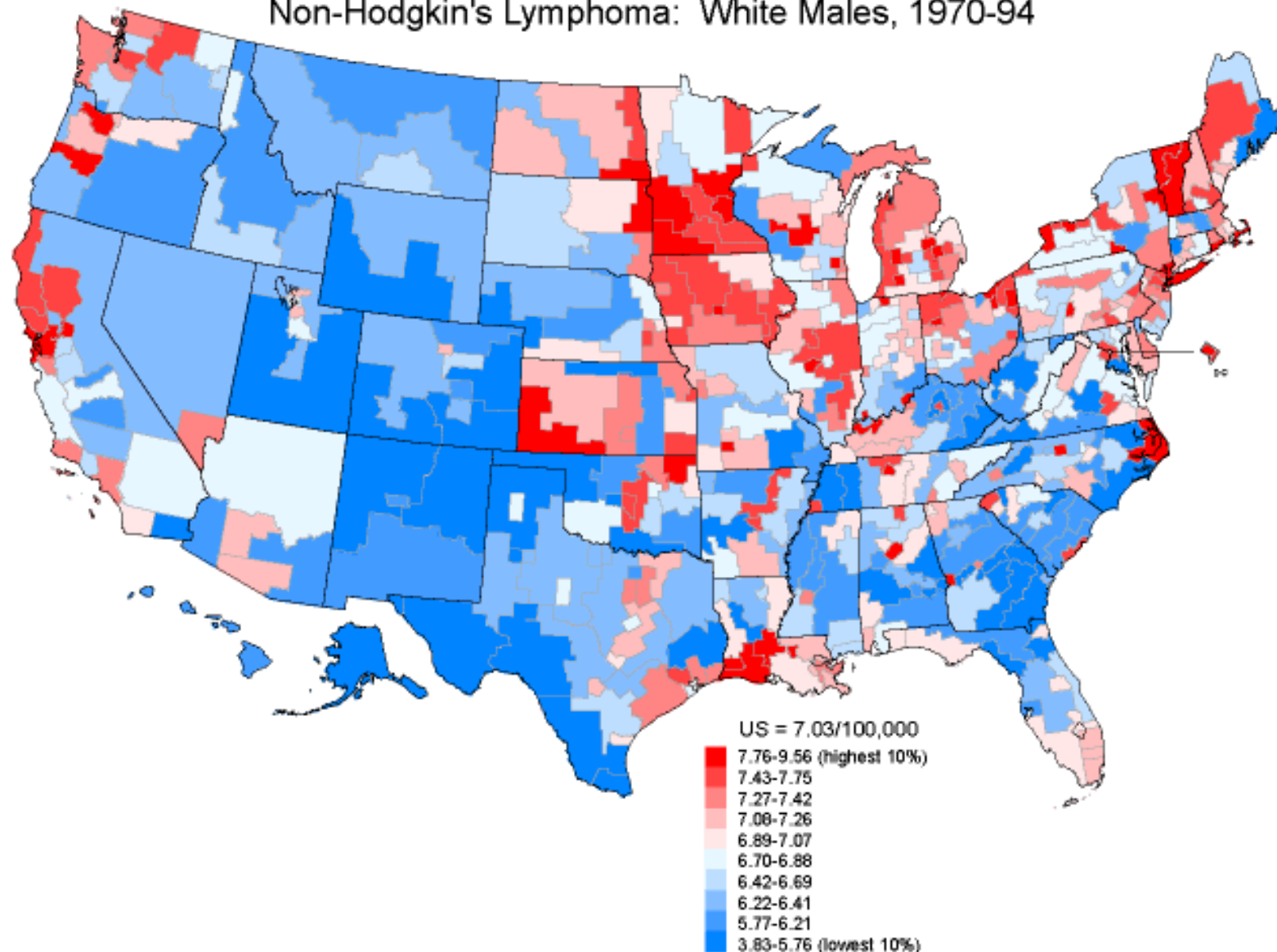
# Clues for the Causes of the Rise

- Similar increasing pattern (3~4% annual increase) all over world
- Incidence higher in developed areas, e.g., USA and Europe
- The rise is real, as opposed to purely artifactual as a result of, e.g.,
  - Increased detection
  - Change in classification
- **Only a part of increase is due to HIV**

# NHL Mortality MAP for USA

Cancer Mortality Rates by State Economic Area (Age-adjusted 1970 US Population)

Non-Hodgkin's Lymphoma: White Males, 1970-94



# www.Health-Track.org

## HEALTH-TRACK Cancer Mortality (1970-94)

Cancer Type: [\[info\]](#)

Breast

Demographic: [\[info\]](#)

White Female (CNTY)

Optional Overlays: [\[info\]](#)

☐ Toxic Release Inventory

☐ Hazardous Air Pollutants

Rate per 100,000

27.41 - 75.88

24.73 - 27.39

22.47 - 24.73

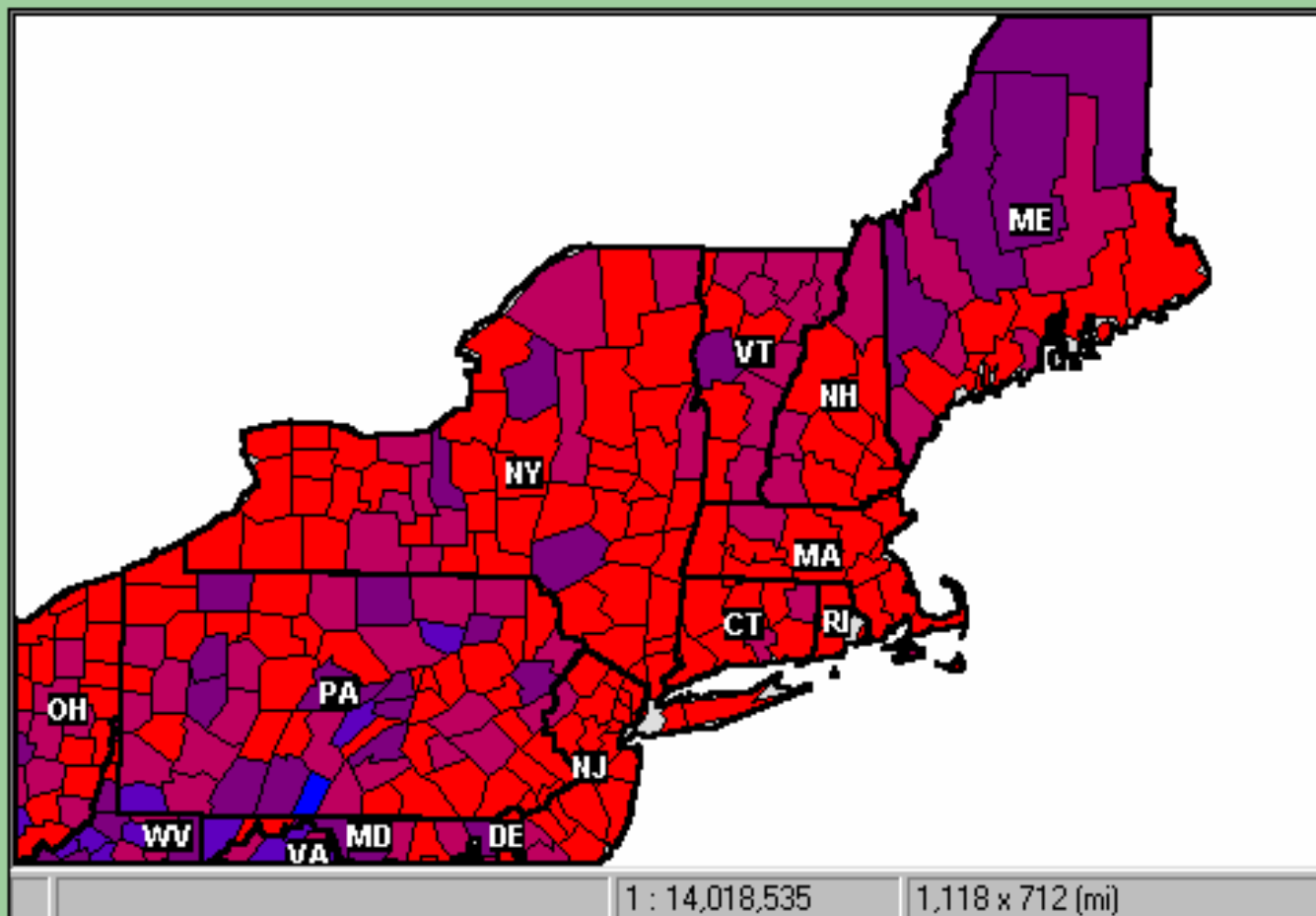
19.43 - 22.47

0 - 19.43

Sparse Data [\[info\]](#)

[How to Map](#)

Breast Cancer Mortality Rate for White Females by County



Optional

☒ State

☐ County

☐ Interstate

☐ Major City

Overlays:

☐ US Cong.

☐ St. Sen

☐ St. Hse

☐ City (zoom)

# www.Health-Track.org

## Web site health project maps cancer hot spots

By Kathleen Fackelmann  
USA Today

On the World Wide Web today:  
a map of the cancer hot spots in

that have been linked to cancer.

The group is touting its Web site as the first of its kind. People using the Web site can pull up a

map of the cancer hot spots in the Northeast, West Coast and Great Lakes regions of the country. No one knows the locations of the country's cancer hot spots from

among trends pinpointed by the maps are hot zones for breast cancer in the Northeast, West Coast and Great Lakes regions of the country. No one knows the locations of the country's cancer hot spots from

## Online mapping system provides cancer statistics

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CITIZEN'S VOICE WEEK-BARRE, PA., MONDAY, FEBRUARY 26, 2001

## New Web site will offer maps of cancer deaths

Two in the series in a two-part series about cancer.

2000  
U.S. Cancer Statistics

HealthTrack maps are at <http://www.health-track.org>. The Health Department's map can be found at [www.mshh.state.ms.us/idea.htm](http://www.mshh.state.ms.us/idea.htm).

## Cancer: Fight for registry a lengthy process

The maps, which rely on cancer mortality data from 1970 to 1994, allow the user to study information from the federal government's Toxic Release Inventory and Hazardous Air Pollutant reports, submitted to the Environmental Protection Agency by various industries. This is aimed at educating policy makers and the public about the health

cases," she said. "We need to fill in this gap in our public health defense and make basic investments in health information." Mississippi officials say that investment is already under way, with the collection of cancer incidence data to the state since 1996. Incidence data is more telling than mortality rates because they eliminate discrepancies in access to health care, said Mary Currie, state epidemiologist.

"We might find a long time to get a cancer registry started because of the industry, the industry, to cancer rates have traditionally fallen apart."

"There has historically not been a lot of causation shown in these studies," Benches said. "It has not been proven that 'When you have the information, you can decide whether you want to move to a place or whether you want to stay in a place. Most people don't even know the types of toxic substances they are surrounded by.'"

## Web site maps cancer cases

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# Health project maps cancer hot spots

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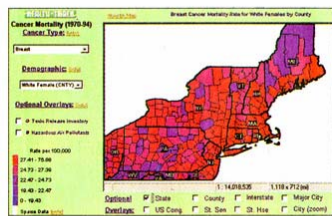
On the World Wide Web today: a map of the cancer hot spots in the USA and the toxic chemicals lurking nearby.

Health-Track, a national public health project supported by the Pew Charitable Trusts, is launching the Web site ([health-track.org](http://health-track.org)) to give Americans an easy way to get information on cancer death data and environmental toxins in their vicinity that have been linked to cancer.

The group is touting its Web site as the first of its kind. People using the Web site can pull up a map of the entire country or they can zoom in on a state, county or even a town.

"This gives communities information they have a right to know," says Jim O'Hara, Health-Track's executive director.

Health-Track took death statistics collected by the National Cancer Institute for eight cancers: bladder, brain, breast, Hodgkin's disease, leukemia, liver, non-Hodgkin's lymphoma and prostate. A color-coded map shows hot zones (in red) or regions with cancer deaths in the top 20% for the nation. Then users can pull up an overlay that highlights areas where the Environmental Protection Agency has given reports of carcinogenic chemicals that were released into the en-



Red is for concern: Health-Track's map shows hot spots, in red, where cancer deaths are in the top 20% in the nation.

states, adds Lynn Goldman, the scientist who analyzed the data for Health-Track.

Hot zones for breast cancer in the Northeast, West Coast and Great Lakes regions. No one knows why these parts of the country have elevated rates of deaths from breast cancer. One theory: Something in an urban polluted environment might increase the risk, Goldman says.

High death rates for non-Hodgkin's lymphoma in the Northeast and Great Lakes regions. The maps show a proliferation of toxic chemicals in these states.

An advocacy group for U.S. industry asserts there is no evidence that exposure to trace amounts of chemicals in the environment causes human cancers. Elizabeth Whelan, president of the American Council on Science and Health in New York City, says the Web site distracts from the known causes of cancer and generates unfounded fears.

O'Hara acknowledges that toxic chemicals are just one of many possible causes of cancer, along with diet and genetics. His group makes no claim that these toxins actually caused the cancer in question, he says. "We're not arguing cause and effect."

Instead, he says, the information will let people start asking local health officials about cancer and the pollutants that may be fouling their air, land or water.

Health-Track maps are at <http://www.health-track.org>. The Health Department's map can be found at [www.mshh.state.ms.us/idea.htm](http://www.mshh.state.ms.us/idea.htm).

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# Farming-related Exposures

- Higher incidence for mid-west states
- Farming as occupation increases risk (RR of 1.1 in a meta-analysis)
- Farming related to various potentially causal exposures to
  - Pesticides
  - Zoonotic viruses
  - Diesel exhaust
  - Sunlight
  - Hay/Dust
  - Healthy life style, etc

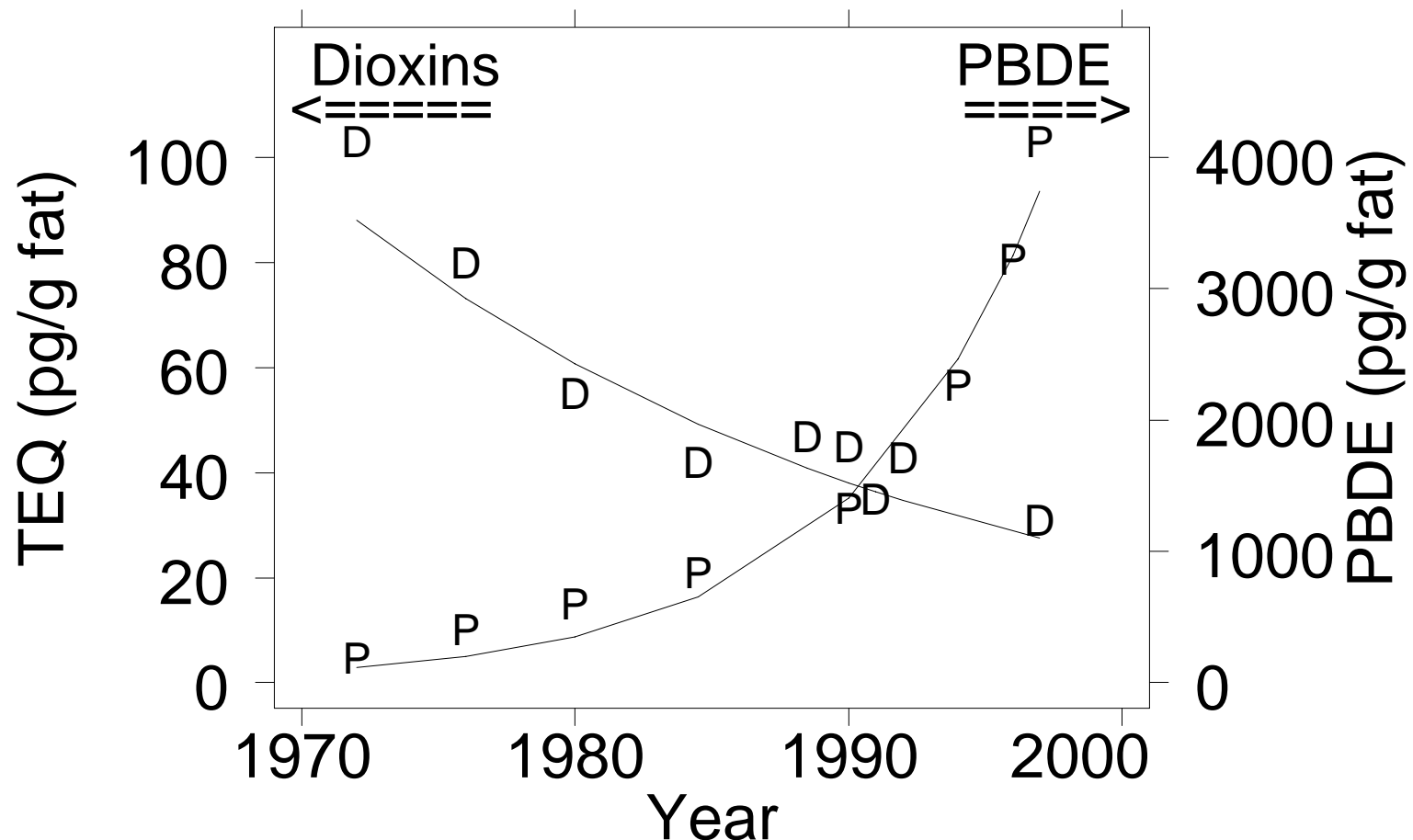
# Pesticides

- Phenoxy herbicides (2,4-D, 2,4,5-T, etc)
  - Agent orange (largely negative)
  - Dioxin as a contaminant
    - RR=2.6 in manufacturing workers
    - Increasing exposure-response relationship in farmers
- Triazine herbicides (largely negative)
- Organochlorines
  - Chlordane remains suspected
  - DDT & chlordane (effects diminishes after considering other pesticides)

# Other Persistent Chemicals

- Organophosphates & carbamates
  - Positive epidemiological studies
  - Immunotoxicity from animal studies
- PCB
  - mixed results w/ a positive study of high qual.
- PBB (one positive study)
- Dioxins (Large Occup. Cohort, Seveso)
- Polybrominated Diphenyl Ether (PBDE)
  - Used as flame retardant for plastics and fabrics
  - one positive study

# Polybrominated Diphenyl Ether (PBDE)



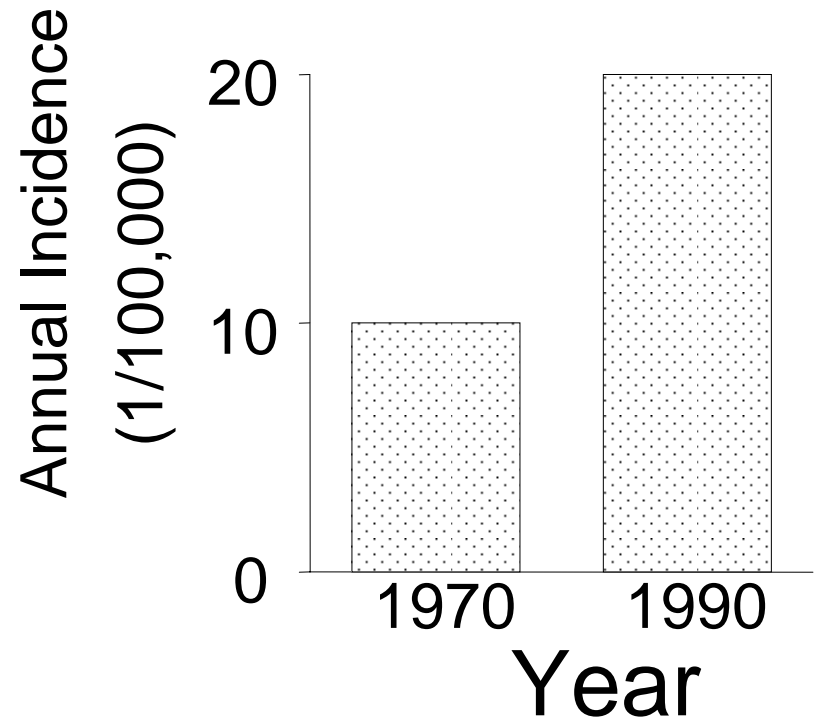
Human breast milk monitoring results for Sweden reported by Noren & Meironyte (2000)

# Other Environmental Exposures

- Solvents (mixed results)
  - trichloroethylene, tetrachloroethylene, benzene (controversial), other solvents, painter as occupation
- Wood dusts & wood-related work
  - Potential roles of chlorinated phenol wood preservatives
- Nitrate in groundwater
  - Connection with use of fertilizer

# How much of increase is explained by known factors?

- Let's think of a period of 20 years, 1970-90
- Annual increase of 3~4% means doubling of rate in 20 years
- A factor solely responsible for the increase
  - would have population attributable risk percent (PAR%) of 50 % in a study done in 1990 and
  - should have become more common over time



# How much of increase is explained by known factors? (cont'd)

- Some environmental exposures were consistently associated with NHL across studies
- Each of them accounts only up to about 10 % of the risk in each study
- In a single study, only one or a few of them considered
- Prevalence of some factors, e.g., farming, has decreased
- Taken together, the known/suspected factors can explain only a part of increase

# Other aspects of suspected or known risk factors/exposures

- Disruption of immune system confer high risk
  - HIV(RR~200)
  - Immunosuppressive therapies (RR~50)
  - Involvement of Epstein-Barr virus (EBV)
- Some pesticide “suspects” also are immunotoxic
- Some agents found in occupational setting as well as in non-occupational setting, e.g.,
  - Persistent chemicals in diet
  - Herbicides for crops and lawn
  - Solvents



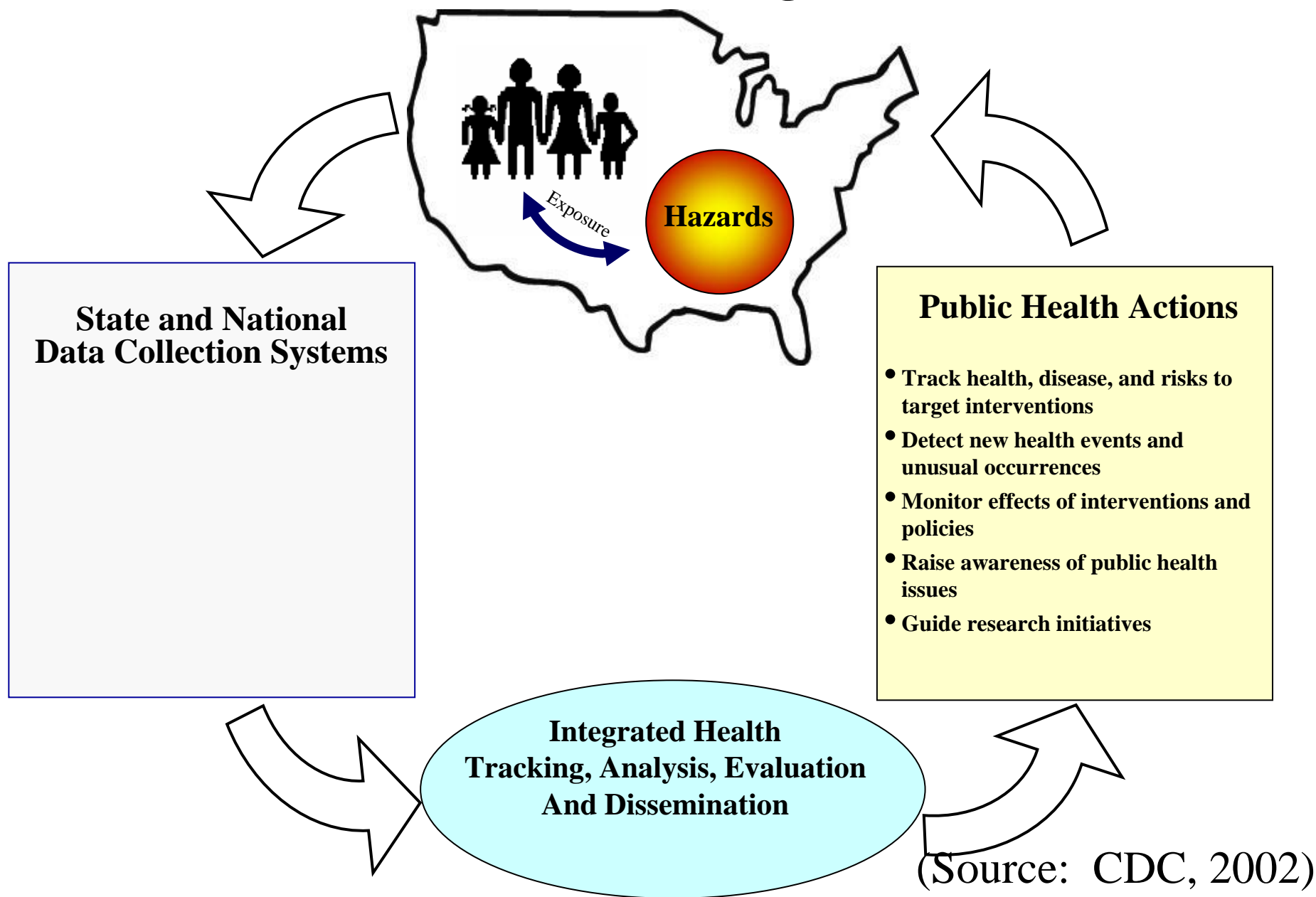
# Policy issues

- “Epidemic” detected
- Policy development
  - Identify and reduce toxic exposure
  - Some basis for reducing exposure, e.g., encourage IPM

→ **FURTHER SEARCH FOR CAUSES**
- Once policies implemented → Assessment
  - Have we been successful in reducing exposures?
  - Have we been successful in preventing disease?
  - Need to “track” changes

→ **PREPARE FOR FUTURE ASSESSMENT**

# Health Tracking



“Chance Favors the  
Prepared Mind”

Louis Pasteur