

Clinical Care and Population Care Require Each Other*

And a Personal Journey



Richard J Jackson MD MPH

FAAP HonAIA HonFASLA

dickjackson@ucla.edu

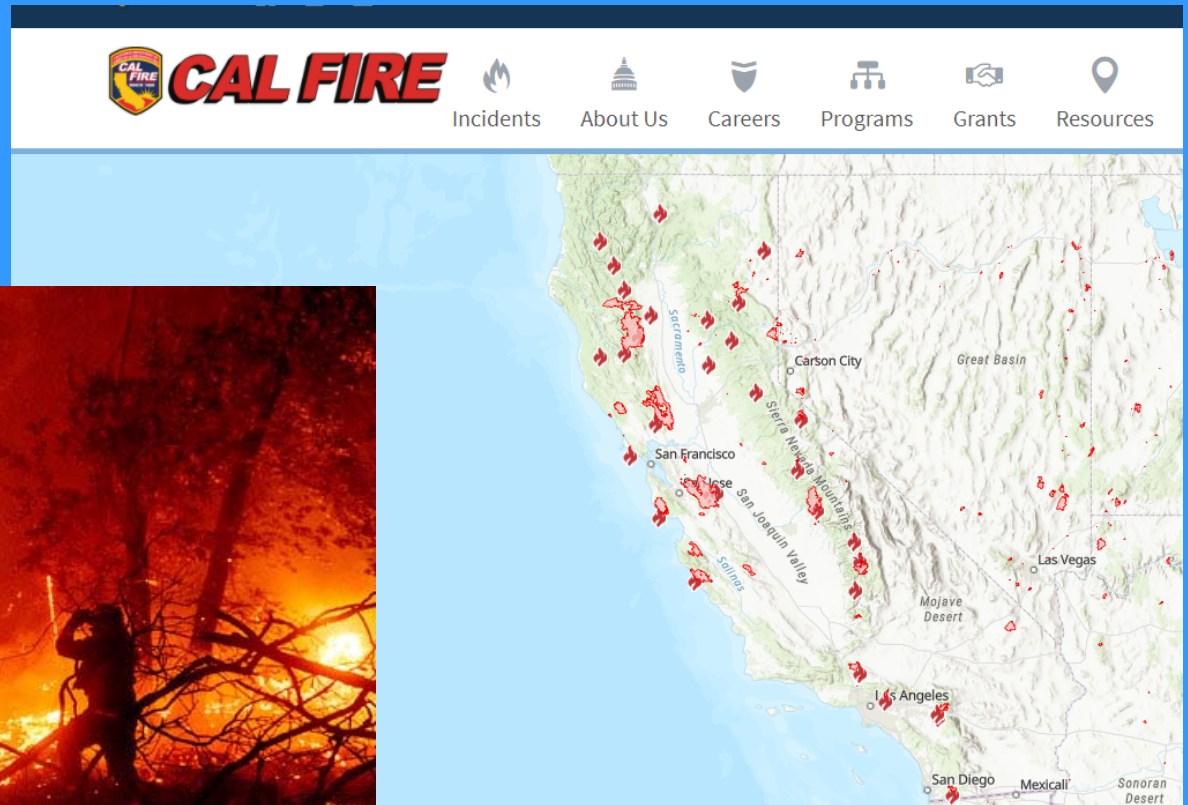
Professor emeritus,

UCLA Fielding School of Public Health

Lecturer, UC Berkeley SPH

** Especially with BIG challenges*

California September, 2020



December 7, 1941



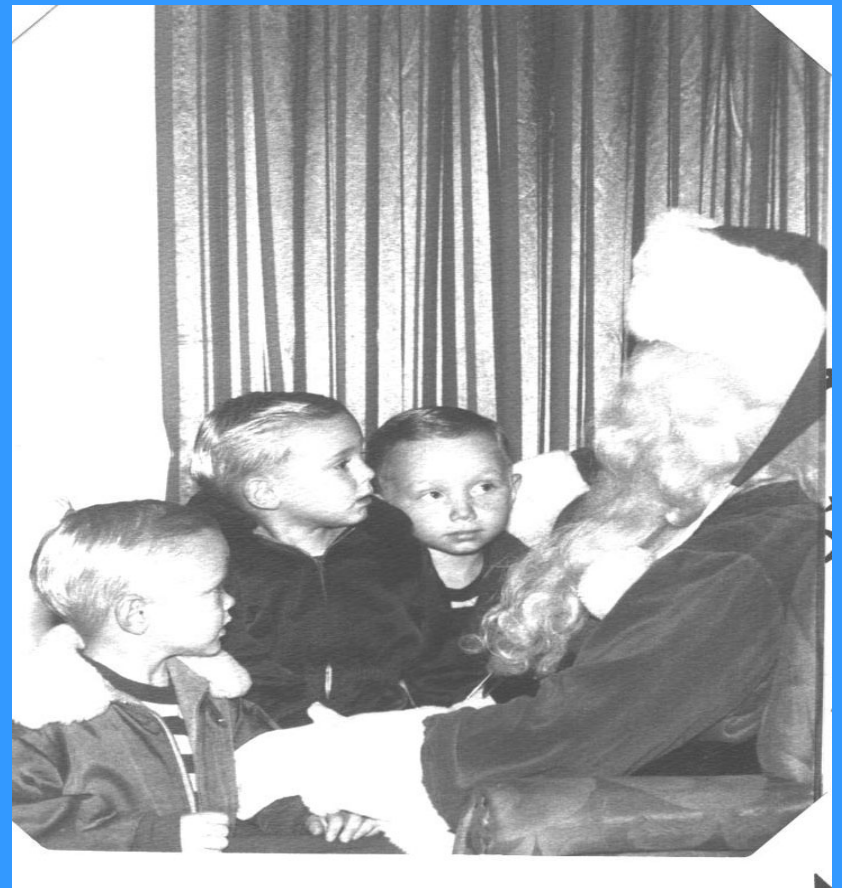
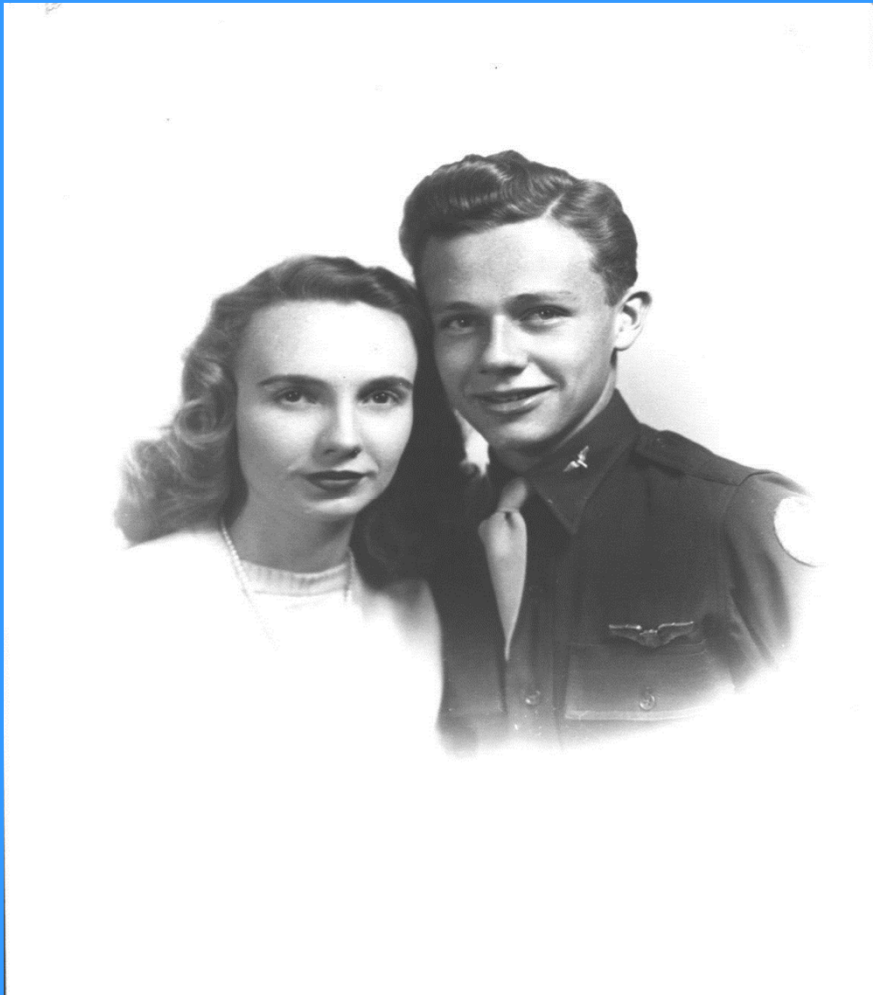
December 8, 1941





Lt. Robert J Jackson
Brooks Field, Texas







Polio Victims
in Iron Lungs
~1950



Polio Claims First Local Victim Of '49

Airport Employee Dies In Hospital

Polio claimed a 27-year-old airport traffic control operator as its first Greater Portland victim of the year Friday.

Robert J. Jackson, 84 Wermuth Road, South Portland, died in a local hospital two days after he was admitted suffering from bulbar polio—describe by his doctor as “often fatal.”

His death was Maine's second fatality this year. The first was that of an infant in a Monmouth summer camp two weeks ago.

Portland,
Maine
August,
1949

Department of Health, City of Newark, N. J.

QUARANTINE RELEASE & SCHOOL PERMIT

Date 8.31.49

To the School Principal or Teacher:

The isolation and quarantine period is terminated in the

person of Richard William Jackson

Address 806 Mcraw Ave who being free
from infection, may return to school.

Affidavit or physician's certificate filed at Health Dep't.

For Polio
F. E. Becker

Inspector.

J. W. Barden and

Dir. Bur. of Communicable Diseases.



Radium Dial painters ~ 1920 East Orange NJ



Moon Walk

July, 1969

Earth Population

3.6 billion

Earth Atmosphere CO₂

324ppm



UC San Francisco Medical Center

Parnassus Heights Campus



San Francisco
General Hospital
Nursery
1975



Intensive Care
Nursery
UCSF

Infant With Gastroschisis



Infant with Spina Bifida



Could It Be From Pesticides?

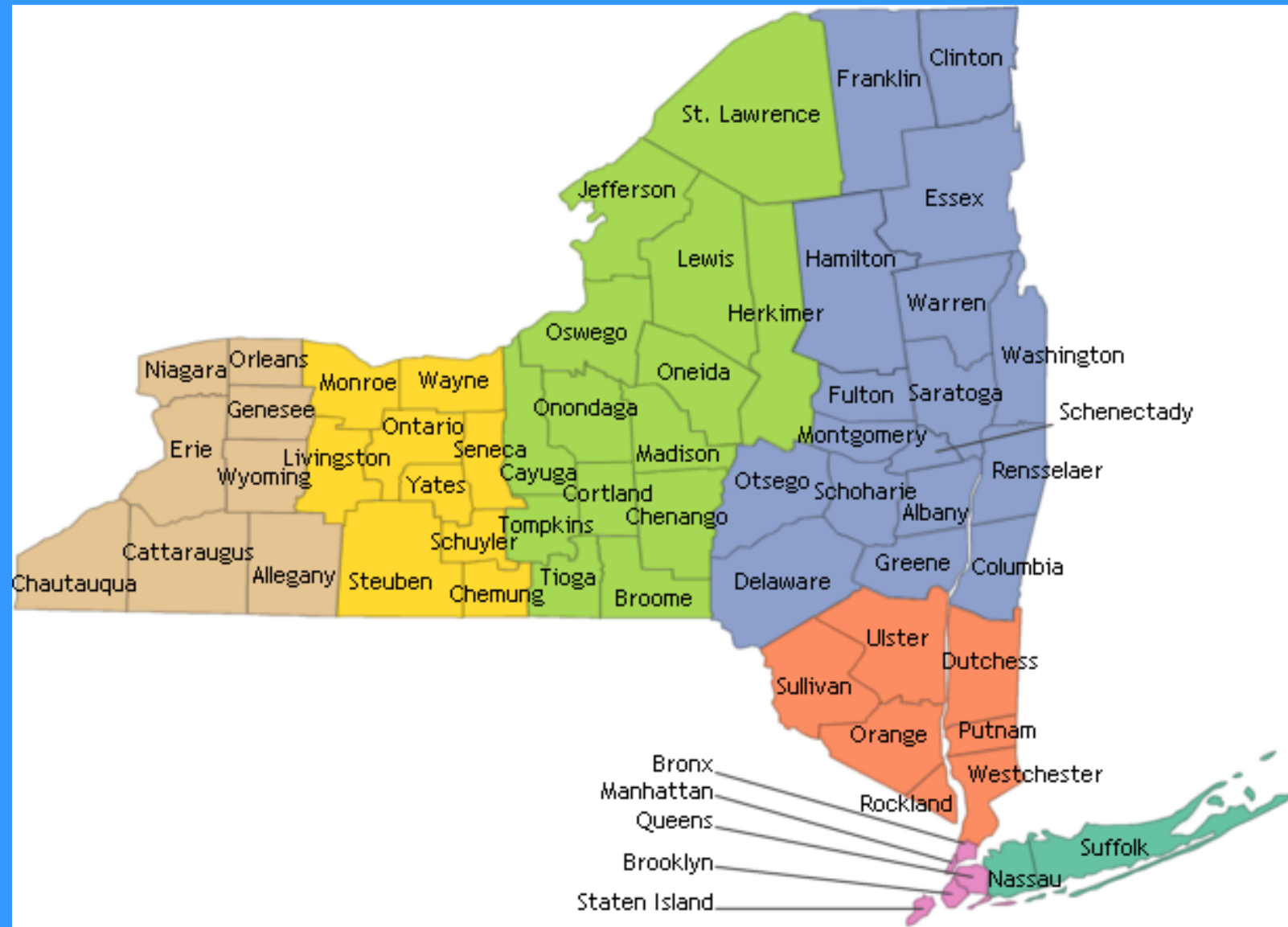


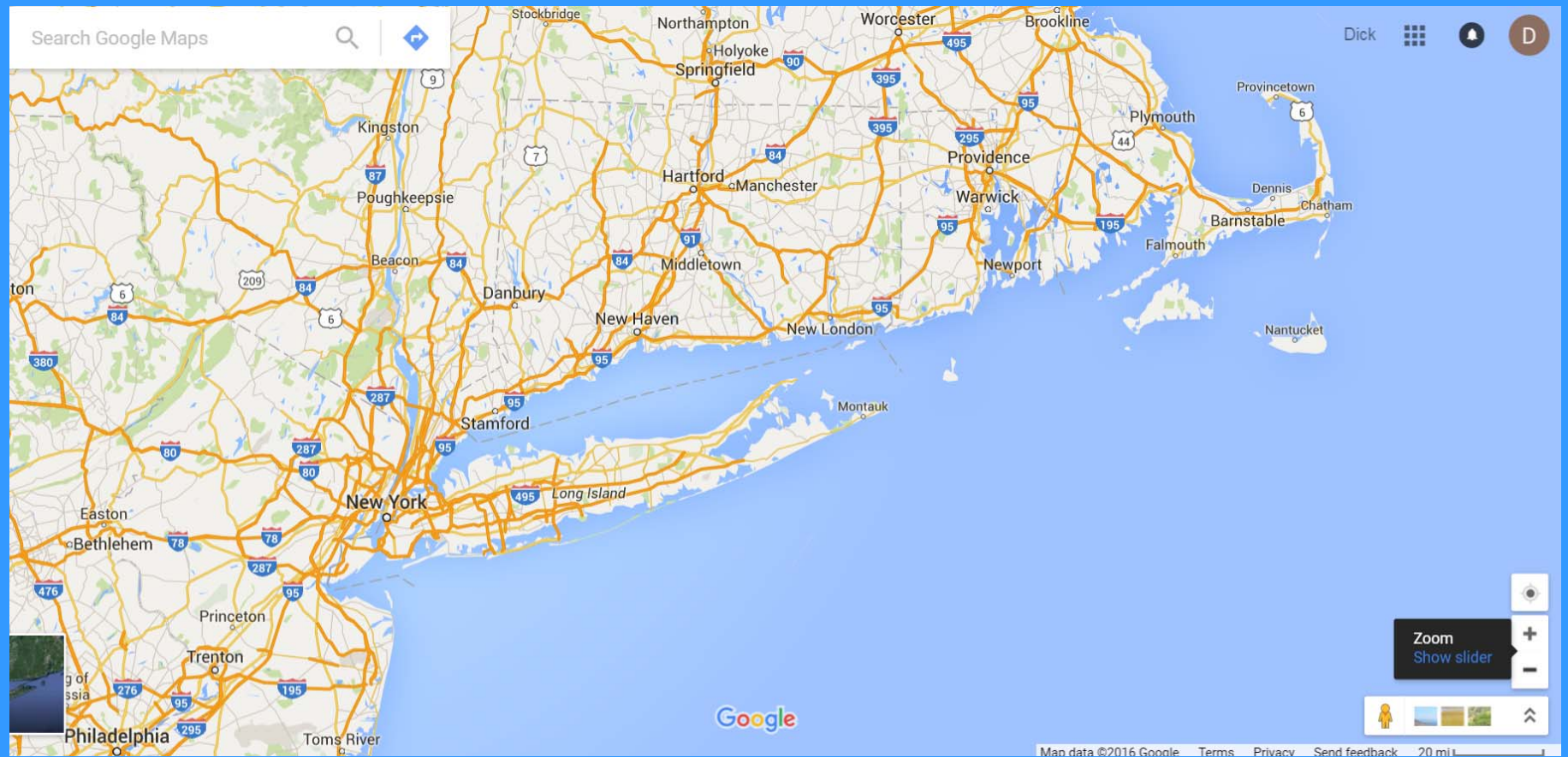
A photograph of a modern building's exterior. A prominent feature is a covered walkway or entrance area supported by several thick, white, cylindrical columns. The building's facade is composed of light-colored brick or concrete blocks. Above the walkway, there are multiple rows of windows, some with white frames. The foreground is a well-maintained green lawn, partially shaded by large, leafy trees on the left. A paved path leads towards the building. A blue signpost is visible on the lawn.

[illegible]

CDC Assigned me to NY State







Governor's Mansion, Albany, NY



10 Undergo Appendicitis Operation Till Ailment Is Found as Yersiniosis

HOLLAND PATENT, N.Y., Oct. 20 (AP)

As many as 10 youngsters underwent emergency surgery in the last three weeks for appendicitis when they had another disease, an intestinal disorder treatable with antibiotics, two physicians said today.

State Health Department officials said they believed a contaminated water system in this central New York village was responsible for the outbreak of the disease, called yersiniosis, which is named after the genus *Yersinia* and which is caused by a highly contagious bacteria.

One doctor defended the surgery, saying it would have been "too dangerous" to have ignored the symptoms.

"In the judgment of the people who saw the patients initially, they all had the symptoms of appendicitis," said Dr. Daniel Stowens, director of the laboratory at St. Luke's Hospital in Utica, about 15 miles south of Holland Patent. Dr. Stowens said his hospital had handled five or six cases of illness from the Holland Patent area. "It was only after two or three of them turned out not to have been appendicitis that the suspicion [of yersiniosis] dawned."

Surgeons also performed three or four emergency appendectomies on children at City Hospital in nearby Rome, according to a hospital pathologist who declined to be identified. He said the hospital's laboratory later isolated yersiniosis bacteria in the patients' stools.

At least 30 people, mostly children, have come down with the illness in Holland Patent, according to Dr. Kenneth MacLeod, the Oneida County Health Commissioner. He said the symptoms included fever, vomiting, diarrhea and skin rashes—symptoms similar to those of appendicitis.

Holland Patent, a village of 600 people, was named for Henry Lord Holland, who received a grant, or patent, of 20,000 acres of land from the British Government in 1769.

Epidemiologists from the State Health Department are interviewing people who had symptoms of the disease, asking them what they have eaten and drunk, and where they have been during the last month.

However, a spokesman said the department was not examining the question of whether the appendectomies should have been performed, saying: "I don't believe it's our area of responsibility".

Dr. Stowens said the patients' symptoms were "clinically indistinguishable" from appendicitis.

A dammed-up, stream-fed pool, which provides the water for Holland Patent, flows through a pasture in which cows and horses graze, resulting in the possibility of bacteria from animal wastes entering the system, health officials said.

There have been no reports of deaths linked to the disease here.

Public Health Depends on “Alert Clinicians”

Epidemics As Urgent “Natural Experiments”

- Need to get onsite...“Ground Truth”
 - Evaluate Assets, Personnel, Environment
- Time Urgent
 - Urgency enhances cooperation
- Must confirm the diagnosis
 - Good laboratories are essential

Epidemics As Urgent “Natural Experiments”

- Ask the right questions
 - Develop Hypothesis
- Figure out what is a case, what isn't
 - “Case Definition” Must Be Robust, and is often Updated
- Identify potential Cause(s)
- Purpose is protection and control, but also for prevention (which requires “research”)



The only ones we are pretty sure have had *Yersinia* infection are...

The Times Record, Thursday, October 21, 1976

Appendicitis 'mimic' causes furor

By PETER SLOCUM
Associated Press Writer

HOLLAND PATENT, N.Y. (AP) — Mrs. Barbara Ernst says she is "madder than hell" at the local school system because two of her daughters have been hospitalized—including one who had an appendectomy she apparently didn't need.

"There's no way I blame the doctor," she said, her youthful face red with anger as she sipped coffee in the hospital snack shop.

"But you figure if you send your kids to school healthy, normal, at least (the school could) send them back the same way."

One daughter, Cindy, 14, had her appendix taken out. The other, Tammy, 13, was in Rome City Hospital today, getting pain killers as treatment for the same symptoms which afflicted at least 30 other youngsters in this small, central New York community.

A dozen youths aged five to 15, had their appendixes removed in the past month, after suffering what state health officials now believe was yersiniosis, a rare disease they think came from bacteria in the village water supply.

State health detectives said Wednesday they suspect the village's water source, Beaver Creek, was contaminated by cows or chickens upstream. The disease mimics appendicitis, with its symptoms of a painful stomach, fever and sometimes shortness of breath.

Dr. Richard Jackson, a state epidemiologist, said it was the biggest known outbreak of yersiniosis in the United States. Two epidemiologists arrived in Utica Wednesday night from the National Center for Disease Control in Atlanta to aid in the investigation.

Mrs. Ernst, who lives with her husband and four children in Floyd, said school authorities told her nothing about the mysterious disease.

"No one has ever said anything to me," she said. She said she finally called the county health office to get information.

What bothers her particularly is that her daughter, Cindy, has apparently had a recurrence was most likely due to the upset to Cindy's system from the operation.

Jackson said he thinks, but has no "iron-clad" proof that the youngsters became ill by drinking contaminated water at one of the schools, or that the bacteria was passed through food prepared at the high school, and then sent to the other schools. He said it may take at least a week to complete tests.

"You're just about drinking raw water," Jackson said. He said chlorination is the only treatment the creek water gets before it is pumped into about 200 homes and three of the district's five schools.

As with the recent outbreak of "legionaire's disease" in Philadelphia, there is no immediate and complete explanation for the yersiniosis.

Beaver Creek meanders through a cow pasture before arriving at the village intake point, and there is a chicken farm upstream.

The schools have been using bottled water for drinking since school opened this year. On Aug. 21, the Oneida County Health Department told persons to boil water before using it, because of high bacteria counts discovered.

But, Philip Lambert, the county's director of environmental health, said the suspect water was still used in bathrooms, showers and kitchens.

"What do you do, shut the school down?" he asked.

Jackson said "nearly all" the sick students he has interviewed admitted drinking water from bathroom faucets, while in the shower, or from a water fountain that reportedly was not shut off.

"In the judgment of the people who saw the patients initially, they all had the symptoms of appendicitis," said Dr. Daniel Stowens, director of the laboratory at St. Luke's Hospital in Utica, about 15 miles south of here.

He said the symptoms were "clinically indistinguishable" from appendicitis.

While yersiniosis can be fatal and tends to resist penicillin and some other common antibiotics, Jackson said, it does respond to proper treatment.

TWO youngsters are now minus their appendixes after an outbreak of a disease which mimics appendicitis. Cindy Ernst, 14, left, and Charles T. Mowers II, 10, are students in the Holland Patent School System. Doctors admit that at least 12 children have had their appen-

cost the village of about 500 persons about \$15,000 to develop plans for a linkage, although the project itself could be fully paid by the state and federal governments.

Some residents have resisted the idea of joining Utica, fearing they would lose control of their water.

dices removed when they were not suffering from appendicitis but rather from Yersinia. Cindy's younger sister, Tammy, is in the hospital suffering from the same symptoms as her older sister. (AP Laserphoto)

warnings

"I'd hold the glass up to the window and if it looks crumbly, I wouldn't drink it," one woman told a reporter who asked if she'd boil the water. "If you're going to die, you're going to die."

HOLLAND PATENT, N.Y. (Times Record)

The 32 Hospitalized School Children

So we began an interview survey of the sick children and selected “controls”

QUESTIONNAIRE

Name _____ Age ____ Sex ____ Grade ____
Address _____

1. Since September 1, 1976, did you have stomach (belly) aches or pains? YES/NO
2. Since September 1, 1976, have you had a fever requiring medicine or bed rest? YES/NO
3. Did any member of your family have these complaints? YES/NO
If YES, who? _____ Relationship _____
4. If you were ill, what dates? YES/NO
5. Were you hospitalized? YES/NO
6. Did you have an appendectomy ? YES/NO







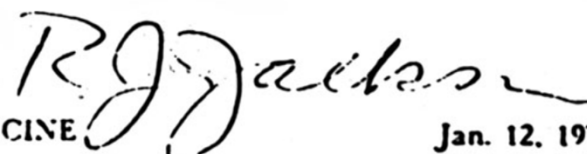
Culture Results: Humans

Holland Patent *Yersinia* Investigation

Group	Tested	Positive
• “Case” Group	27	11
• Other ill school children	51	16
• H P Village Survey ill	21	4*
• Trenton Survey ill	12	4
• HP School Employees	4	0
• Case Family Members	9	0
• Dairy Employees	3	2

All isolates were *Yersinia enterocolitica* 0:8N2W1 except where indicated (*)

*includes 1 *Yersinia enterocolitica* 0:5,27,N2W1



Jan. 12, 1978

EPIDEMIC *YERSINIA ENTEROCOLITICA* INFECTION DUE TO CONTAMINATED CHOCOLATE MILK

ROBERT E. BLACK, M.D., RICHARD J. JACKSON, M.D., THEODORE TSAI, M.D., MICHAEL MEDVESKY, M.P.H.,
MEHDI SHAYEGANI, PH.D., JAMES C. FEELEY, B.S., KENNETH I. E. MACLEOD, M.D., M.P.H.,
AND ADAH M. WAKELEE, B.S., M.T., S.M.

Abstract In September and October, 1976, an outbreak of illness due to chocolate milk contaminated with *Yersinia enterocolitica* resulted in hospitalization of 36 children, 16 of whom had appendectomies. Infection with *Y. enterocolitica* serotype 0:8 was demonstrated in 38 ill persons. Sixty-one per cent of the persons who were infected had a titer greater than 1:160 OH agglutinins to serotype 8 yersinia, whereas 48 per cent of the hospitalized children had a fourfold

change in agglutinin titer.

An epidemiologic investigation demonstrated that illness was associated with drinking of chocolate milk purchased in school cafeterias, and *Y. enterocolitica* 0:8 was subsequently isolated from the milk. The investigation suggested that the bacterium was introduced at the dairy during the mixing by hand of chocolate syrup with previously pasteurized milk. (N Engl J Med 298:76-79, 1978)

HUMAN illness caused by *Yersinia enterocolitica* was first described in New York State, in 1933.¹ Despite this initial observation, yersiniosis has been recognized in this country much less frequently than in other areas of the world, such as Scandinavia,^{2,3} Northern Europe,^{4,5} Japan⁶ and Canada.⁷

Outbreaks of yersiniosis have occurred in schools^{8,9}

On October 24 we performed a case-control study (cases were in 32 Holland Patent District schoolchildren who had been hospitalized for an abdominal illness in September and October, and controls were age-matched and sex-matched children from the same classroom). Of 10 identified exposures at school, only drinking of chocolate milk was significantly associat-

Love Canal, New York State

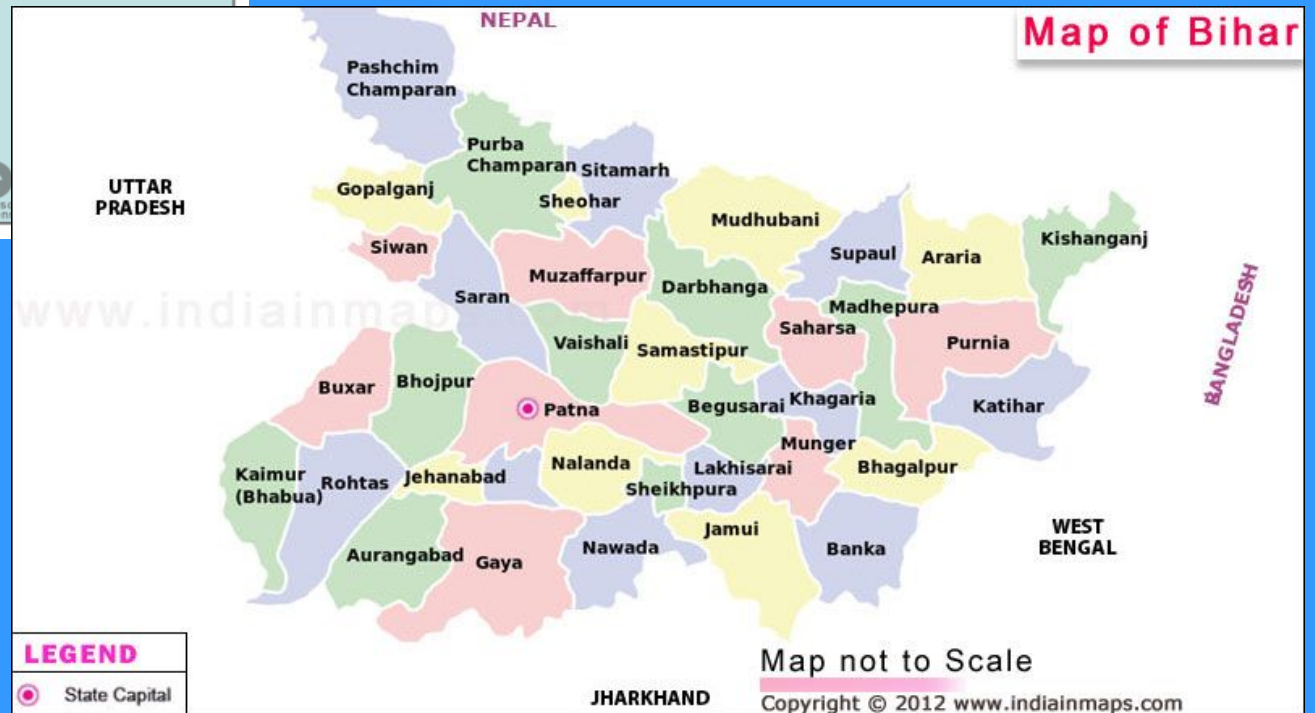


CDC Assigned me to Bihar State India to Work on Smallpox Eradication late 1975-1976

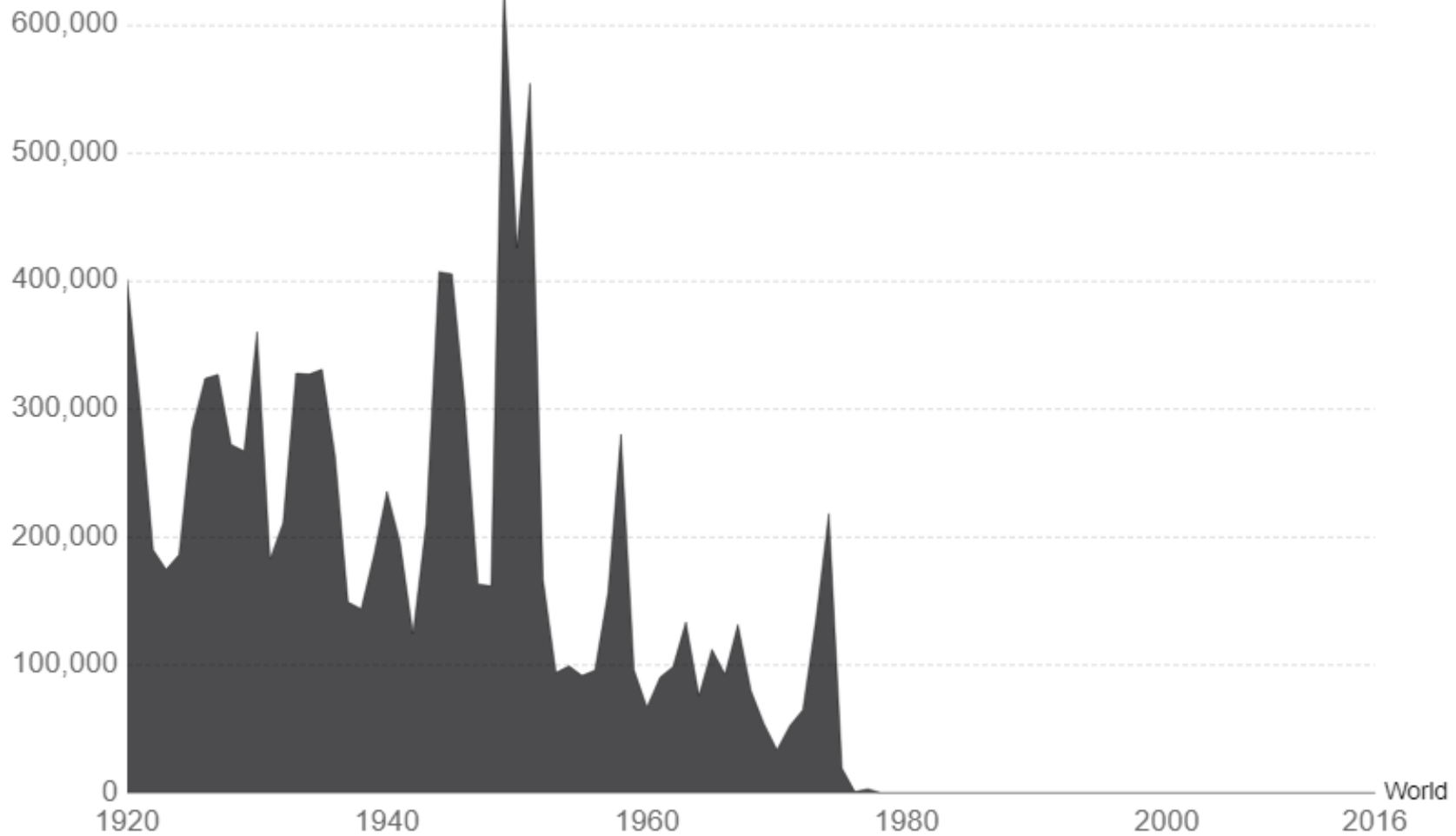


Photo: JG Breman

Bihar State, India



Global Number of Reported Smallpox Cases



Source: World Health Organization (2011)

CC BY

Pediatrics



THE SUSCEPTIBILITY OF THE FETUS
AND CHILD TO CHEMICAL POLLUTANTS

Proceedings of a Conference held at Browns Lake, Wisconsin, under the auspices of the American Academy of Pediatrics, Committee on Environmental Hazards, in cooperation with the National Institute of Child Health and Human Development and the National Institute of Environmental Health Sciences, June 11-13, 1973

Committee on Environmental Hazards

PAUL F. WEHRLE, M.D., Chairman, Los Angeles County-University of Southern California Medical Center, Los Angeles, California
WILLIAM B. BRENDEN, M.D., San Antonio, Texas
ROBERT L. BRENT, M.D., Ph.D., Thomas Jefferson University, Philadelphia
J. JULIAN CHISOLM, JR., M.D., Baltimore City Hospitals, Maryland
JOHN L. DOYLE, M.D., Grand Rapids, Michigan
EMMETT L. FAGAN, M.D., Rutland, Vermont
LAURENCE FINBERG, M.D., Montefiore Hospital, New York, New York
ROBERT W. MILLER, M.D., National Cancer Institute, Bethesda, Maryland
ANDRÉ J. NAHMIAS, M.D., Emory University, Atlanta, Georgia
G. D. CARLYLE THOMPSON, M.D., Salt Lake City, Utah

How a pediatrician became decided on Environmental Public Health

Children Take in More Air, Water and Food Per Pound Than Adults

2 times resting air intake

3 times skin absorption

3 - 4 times food intake

3 times water intake





Intensive Care Nursery UCSF



Return to SF Bay Area to Attend
Public Health School at Berkeley

Institute of Medicine

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



One Billion Pounds of Pesticides are Used
in California per year (25% of US Total)





The most heavily
Pesticide exposed
members of the
population are
applicators and
farmworkers.

Omite (propargite) dermatotoxicity in citrus workers Kern County



Outbreak of Omite-CR-Induced Dermatitis
Among Orange Pickers in Tulare
County, California

L. Duncan Saunders, MBBCh; Richard G. Ames, PhD, MPH; James B. Knaack, PhD; and
Richard J. Jackson, MD, MPH



Challenges To Farmworker Pesticide Investigations:

- Trust
- Lack of
Toxicology Data
- Use Reporting
- Chemical Residue
Measurement
- Human exposure
measurement

1984

This child was
born to a
farmworker who
worked through
most of her
pregnancy.



Discoveries & Data Center

Overview

All Birth Defects

Specific Conditions

Exposures & Risk Factors

Geographic Data

Publications

FAQs

[Take Our Online Survey](#)

Publications are available for download as Adobe Acrobat (PDF) files. You will need the Acrobat Reader to view these files

Program Publications

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- [2001 - 2003 Publications](#)
- [1998 - 2000 Publications](#)
- [1995 - 1997 Publications](#)
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GENERAL PROGRAM INFORMATION

- [Confidentiality Requirements & Procedures \(Spanish\)](#)
- [Investigating Birth Defects Clusters: A Systematic Approach](#)
- [Statutory Authority](#)
- [Scientific Collaboration Protocol](#)



AVAILABLE SUMMARIES ABOUT RESEARCH RESULTS

- [Birth Defects & Hazardous Waste Sites \(Spanish\)](#)
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- [Cerebral Palsy in Twins](#)
- [The Cost of Birth Defects, California](#)
- [The National Cost of Birth Defects](#)
- [Gastroschisis \(Spanish\)](#)
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The Washington Post

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TUESDAY, AUGUST 30, 1988

1

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Met

Pesticides And Death Amid Plenty

*Cancers Claim Youth
Of the San Joaquin*

By Michael Weisskopf
Washington Post Staff Writer

MCFARLAND, Calif.—For most of his 14 years, Mario Bravo lived a childhood idyll, racing bicycles and rummaging cotton fields for jack rabbits, until doctors found a lump under his right arm.

The diagnosis last August was liver cancer, and by Thanksgiving, he was dead.

Mario was the 16th childhood cancer victim and the ninth to die since 1975 in this rural town of 6,000 people. Half the cases were diagnosed from 1982 through 1985, eight times the number expected for a town of McFarland's size during a four-year pe-



Tina Bravo holds photo of son, Mario, who died of liver cancer at age 14.

PESTICIDES, From A1

a higher volume of chemicals comes in: About 7 percent of the pesticides used in the United States are sprayed, injected and sprinkled onto an area that represents one percent of the nation's crop land.

Pesticides are made to kill, and they leave a deadly trail. They hang in the foggy air of the valley, burrow into its loose, sandy soil, and contaminate underground drinking-water supplies.

The ecology is so steeped in chemicals linked to cancer, birth defects and genetic damage that a local health official has described life in the San Joaquin as a "grand experiment" on the human effects of pesticides, and the state's lieutenant governor has warned of "poisoning prosperity" with the wanton use of pesticides. It was to protest the use of pesticides of known danger, that United Farm Workers President Cesar Chavez earlier this summer undertook a widely publicized 36-day fast in Delano, a few miles from here.

Forty years after pesticides became integral to American farming, the valley is a living laboratory. Pesticides are the only pollutants purposefully put into the environment. But little is known of their long-term health effects and little is done to protect farm communities from contamination of soil, water and air.

Although dozens of pesticides have been

McFarland and Rosamond, California, Cancer Clusters

McFarland Cancer Cluster Advisory Committee Had Multiple Recommendations

Important for the long
term was:

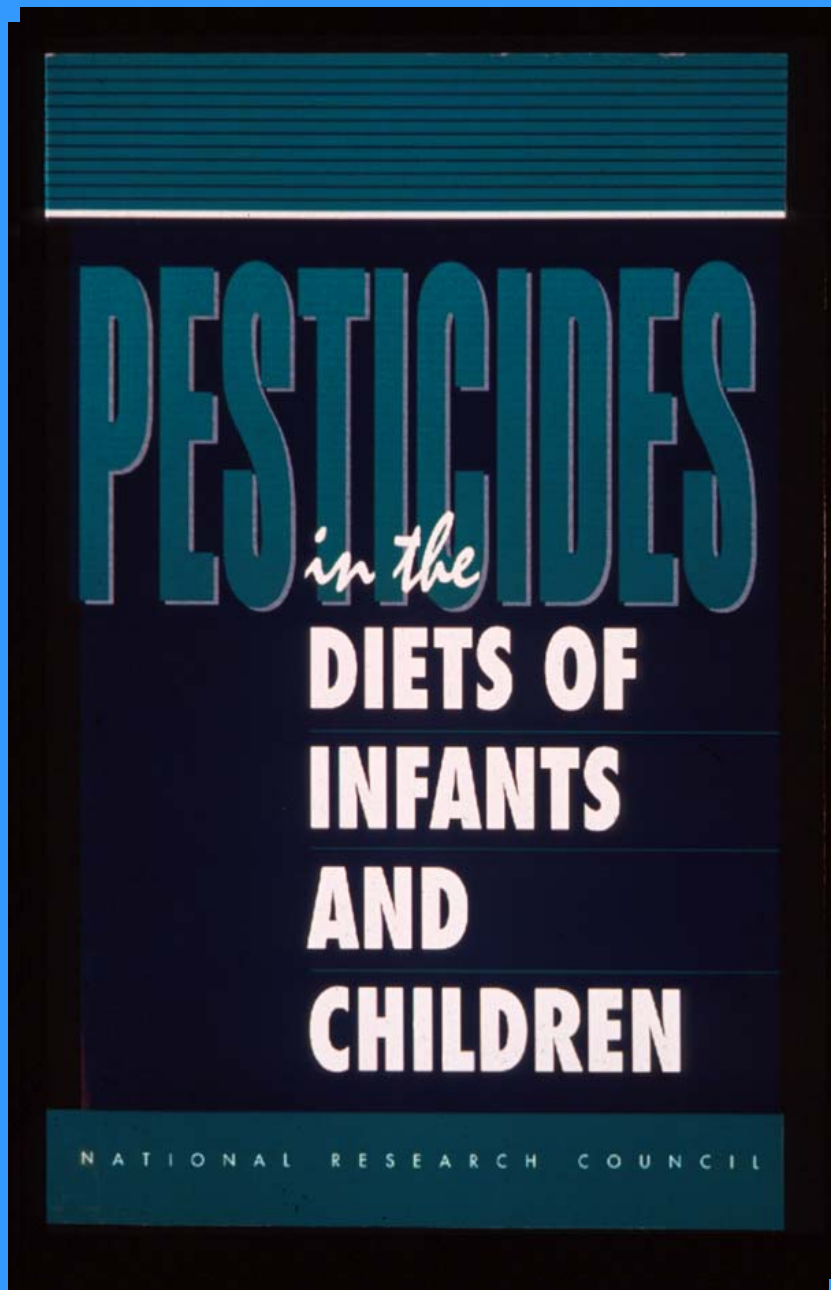
Full Reporting of Pesticide Use in California



In 1990, California established the nation's first system for mandatory reporting of all agricultural pesticide use.

60 Minutes: Mothers' Day 1989





This 1993 NAS
IOM Report
Led to the US
Food Quality
Protection Act
of 1996

Pesticide Risk May Be Higher in Children

Citing 'Potential for Concern,' Panel Calls for More Stringent Federal Exposure Standards

By Carole Sugarman
Washington Post Staff Writer

A long-awaited report released yesterday has found serious scientific and regulatory deficiencies in the way the federal government assesses the health effects of pesticides on infants and children.

The study, conducted by a committee of the National Academy of Sciences (NAS), concludes that far too little is known about how such chemicals affect the young, and that there is "potential for concern" that some children may be ingesting unsafe amounts of pesticides.

It recommends that when adequate data on a given chemical are lacking, "there should be a presumption of greater toxicity to infants and children." In such cases, the NAS panel called for exposure standards 10 times more stringent than would normally be applied.

But the study emphasizes that parents should not reduce their children's consumption of fruits or vegetables.

"The single most important point is that the current system for regulating pesticide residues for foods in the United States needs to be fundamentally restructured so that health concerns become the priority, especially when it comes to children," said pediatrician Philip J. Landrigan, chairman of the NAS

tries had been planning months in advance ways to head off public panic. For weeks, organic food companies, environmental groups and food industry associations have been distributing press kits.

"This is a huge chunk of the economy that's very sensitive to panic-driven scares," said Jeff Nesbit, a consultant to the Grocery Manufacturers of America, a trade group representing the food industry. Annual revenue of the food industry totals more than \$360 billion; agricultural chemical sales reach nearly \$7 billion a year.

On Friday, the Clinton administration issued a statement announcing its commitment "to reducing the risks to people and the environment that are associated with pesticides." The joint announcement, made by the Environmental Protection Agency, the Department of Agriculture and the Food and Drug Administration, included a pledge to promote alternative pest control methods and to make it easier for industry to develop and register safer pesticides.

That announcement, originally scheduled for Tuesday, was pushed ahead after an environmental group held a press conference Friday releasing the results of its own study. The Environmental Working Group, a nonprofit research organization, concluded that children can receive up to 35 percent of their

mental policy at Yale University and a consultant to the NAS committee, urged the environmental group to refrain from preempting the NAS report with its own study. Wargo called the environmental group's study "primarily a piece of advocacy, not yet a work of science." Richard Wiles, the author of the environmental group's study, was formerly the project director for the NAS report.

Industry and environmental groups reached for comment yesterday supported the academy's recommendations, as well as the administration's commitment to reducing pesticide use.

"The academy's recommendations are very good news for consumers and the industry," said Jeff Nedelman, a spokesman for the Grocery Manufacturers of America. "It will help us achieve our goal of

eliminating detectable residues in food." The National Agricultural Chemical Association said in a statement: "We will work with everyone to further strengthen the food safety system."

Wendy Gordon, program director for Mothers and Others for a Livable Planet, an environmental group, said that the agencies' joint announcement "signals a real change in direction."

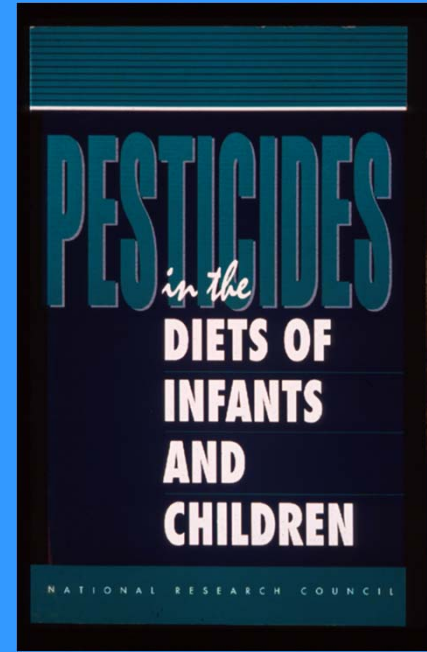
NAS panel chairman Landrigan, of the Mount Sinai School of Medicine in New York City, said he was "very pleased" that the administration appeared to support the panel's findings. But he expressed concern that "the remedies proposed by the agencies are vague promises for actions for the future" and said he "didn't see anything that spoke to the here and now."

Washington Post

NAS Pesticides in the Diets of Infants and Children Report Recommendations -- 1993

- Set food residue limits for food that reflect children's dietary patterns and exposures
- Put in place an extra safety margin for children (ten fold)
- Regulate chemicals that have common toxic effects as a group

Recommendations of
NAS *Pesticides in the
Diets of Infants and
Children* report -- 1993



- Regulate chemicals that have common toxicologic Action as a group
 - More than 25 chemicals that inhibit cholinesterase are permitted as residues in food

Additional Benefits of Safe Tolerances

- Pesticide use reduced to more essential uses
 - Smaller amounts
 - Fewer applications
- Longer pre-harvest intervals
 - Worker benefits
- Incentive to develop less hazardous agents



CDC Headquarters - Atlanta





Richard Jackson MD Sworn in by CDC Director David Satcher as
Director, National Center for Environmental Health
September, 1994

CDC National Exposure Report

Address <http://www.cdc.gov/exposurereport/>

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Second National Report
on Human Exposure
to Environmental Chemicals

National Center for
Environmental Health >
Division of Laboratory
Sciences > Second
National Exposure
Report



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The *Report* is the second in a series of publications that provide an ongoing assessment of the exposure of the U.S. population to environmental chemicals using biomonitoring. Biomonitoring is the assessment of human exposure to chemicals by measuring the chemicals or their metabolites in human specimens such as blood or urine.

Released January 31, 2003:

- [View the CDC Telebriefing Transcript](#)
- [View the CDC Press Release](#)



[Download the Report Summary \(Full Color PDF 2.2MB\)](#)

[Download the Full Report \(PDF 2.9MB\)](#)

Second National Report on Human Exposure to Environmental Chemicals

Inside the Report

Introduction

- [Overview](#)
- [Public Health Uses of the Report](#)
- [Data Presented for each Chemical](#)
- [Interpreting the Data](#)
- [Selection of Chemicals](#)
- [Biomonitoring Exposure Measurements](#)

Data Sources

- [National Health and Nutrition Examination Survey \(NHANES\)](#)
- [Data Analysis](#)

Toxicology and Health Risk Information

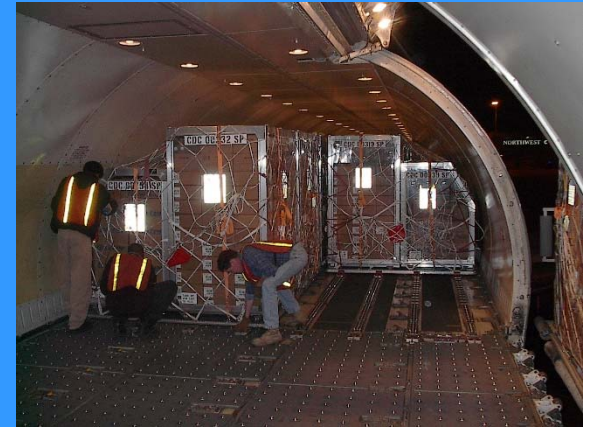
- [Overview](#)
- [Information Available on the Internet](#)

Report Results by Category:

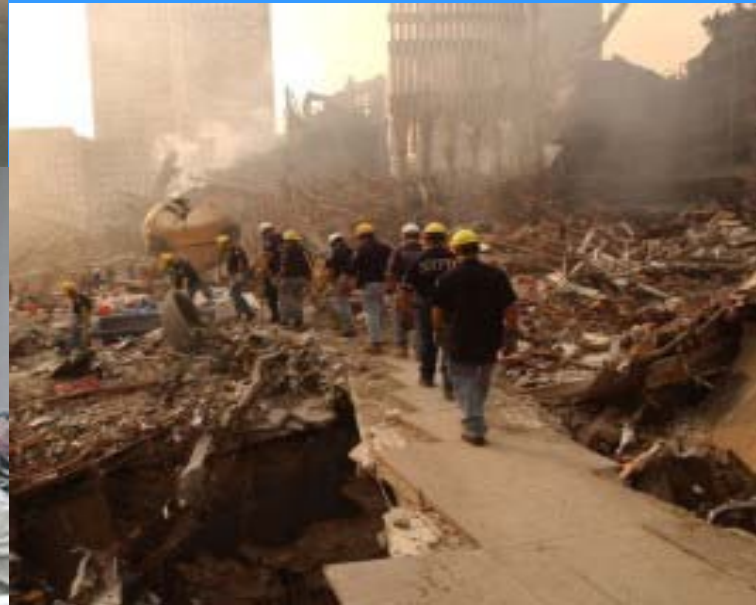
■ Metals	■ Organophosphate Pesticides: Dialkyl Phosphate Metabolites
■ Polycyclic Aromatic Hydrocarbons (PAHs)	■ Organophosphate Pesticides: Specific Metabolites
■ Tobacco Smoke: Cotinine	■ Organochlorine Pesticides
■ Phthalates	■ Carbamate Pesticides
■ Dioxins, Furans, & Coplanar Polychlorinated Biphenyls (PCBs)	■ Herbicides
■ Non-coplanar PCBs	■ Pest Repellents & Disinfectants
■ Phytoestrogens	

National Pharmaceutical Stockpile

- Life-saving pharmaceutical and medical supplies
- Team of emergency pharmacists and public health advisors



The CDC Response to 9/11



NCEH – Emergency Response



Sacramento 2005



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The National
Academies of

SCIENCES
ENGINEERING
MEDICINE

HEALTH AND MEDICINE



National Academy of Medicine
Annual Meeting 2020

October 19, 2020 | 10:00 AM - 5:30 PM ET

[Register](#)

On October 19, 2020, the National Academy of Medicine will host a scientific symposium titled "Confronting Urgent Threats to Human Health and Society: COVID-19 and Climate Change," as part of its 50th Annual Meeting. **For the first time ever, the event is free to attend and will be held entirely online.**

Program Highlights



THE STATE OF THE COVID-19 PANDEMIC: Virus Emergence, the Impact of the Pandemic, and U.S. and Global Preparedness and Response

- **Anthony Fauci**, National Institute of Allergy and Infectious Diseases (*Session Keynote*)
- **Sanjay Gupta**, Grady Memorial Hospital, Emory University School of Medicine, and Chief Medical Correspondent, CNN (*Moderator*)
- **Chikwe Ihekweazu**, Nigeria Centre for Disease Control (*Panelist*)
- **Nicole Lurie**, Coalition for Epidemic Preparedness Innovations (*Panelist*)
- **Susan Weiss**, University of Pennsylvania (*Panelist*)

CLIMATE CHANGE AND HUMAN HEALTH: Navigating Environmental, Societal, and Individual Impacts

- **Sir Andrew Haines**, London School of Hygiene and Tropical Medicine (*Session Keynote*)
- **Richard Jackson**, University of California, Los Angeles (*Moderator*)
- **Georges Benjamin**, American Public Health Association (*Panelist*)
- **The Honorable Jane Lubchenco**, Oregon State University (*Panelist*)
- **Jacqueline Patterson**, NAACP (*Panelist*)

PRESIDENT'S FORUM: Responding to Global Crises: Future Directions in Science and Policy Making to Address Complex Threats to Society

- **Victor Dzau**, National Academy of Medicine
- **Ursula von der Leyen**, European Commission (*Session Keynote*)
- **Judith Rodin**, University of Pennsylvania and The Rockefeller Foundation (*Moderator*)
- **Sir Jeremy Farrar**, The Wellcome Trust (*Panelist*)
- **Niall Ferguson**, Stanford University (*Panelist*)
- **Adrienne Hollis**, Union of Concerned Scientists (*Panelist*)
- **Jim Yong Kim**, Global Infrastructure Partners (*Panelist*)
- **U.S. Congresswoman Donna Shalala** (FL-27) (*Panelist*)

[Full speaker bios](#)

See the complete agenda online at
nam.edu/AnnualMeeting2020

Moon Walk July, 1969

Earth Population

3.6 billion

Earth Atmosphere CO₂

324ppm



First All Woman Space Walk

October 2019

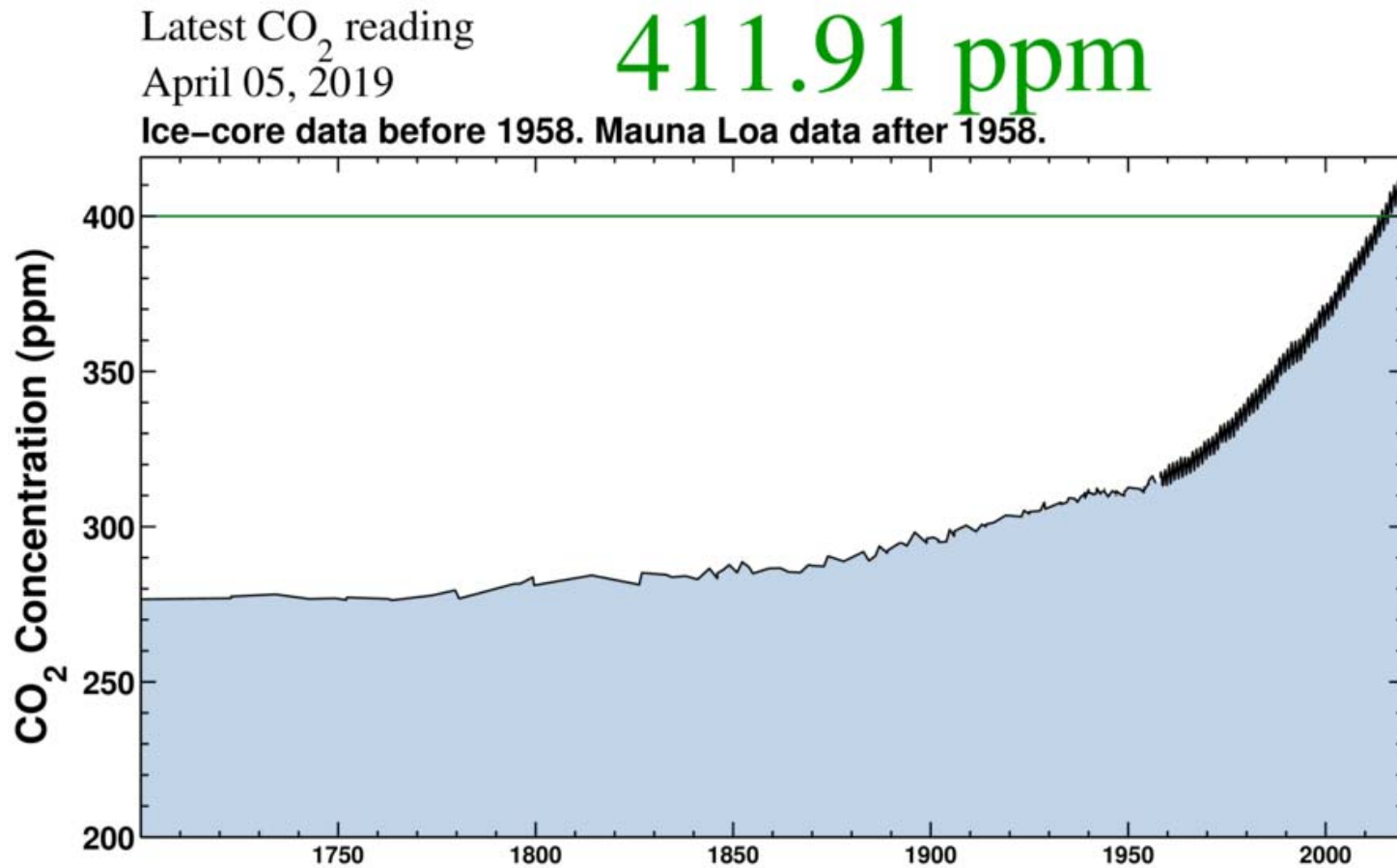
Earth Population

7.53 billion

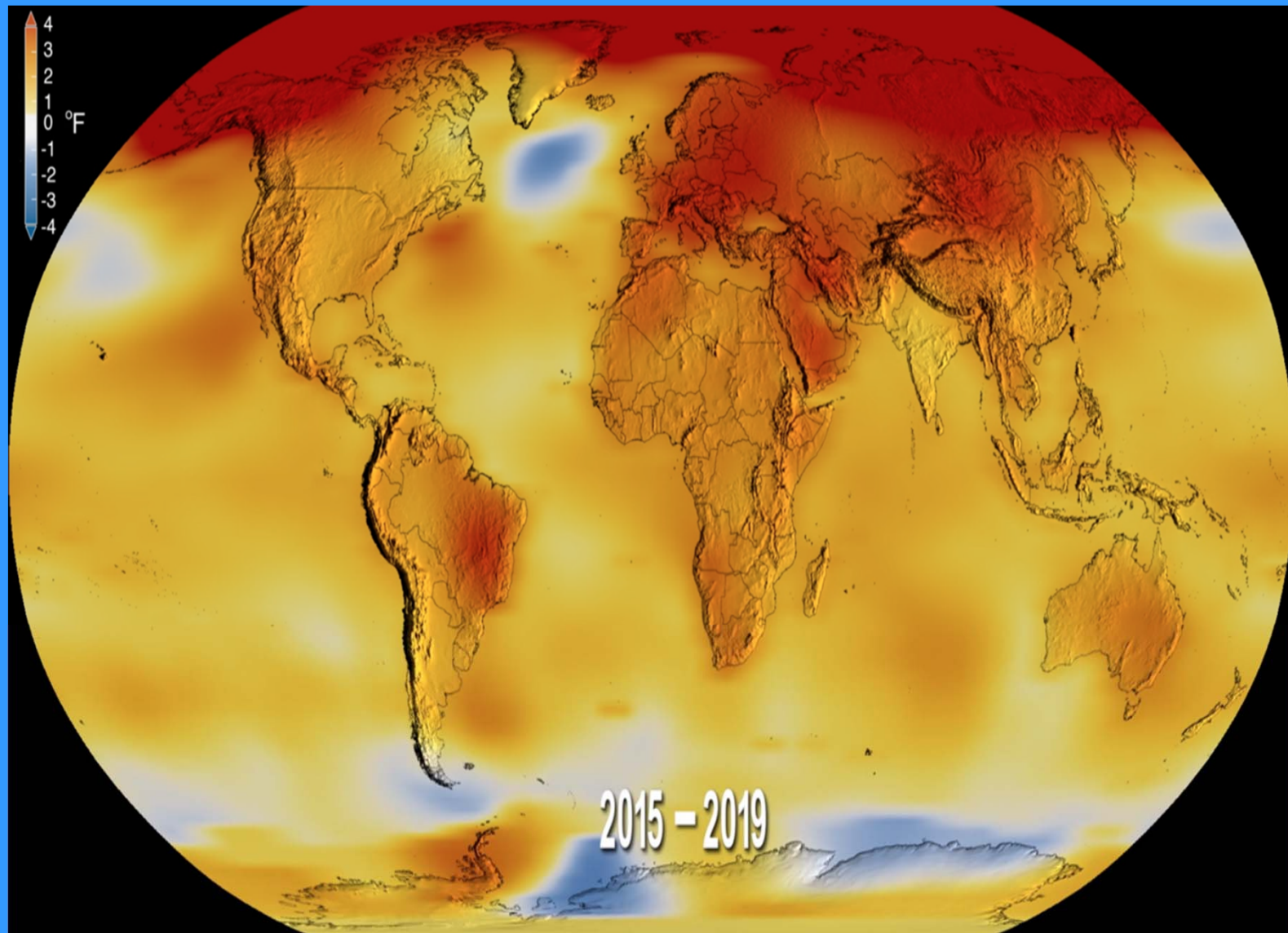
Earth Atmosphere CO₂

414 ppm

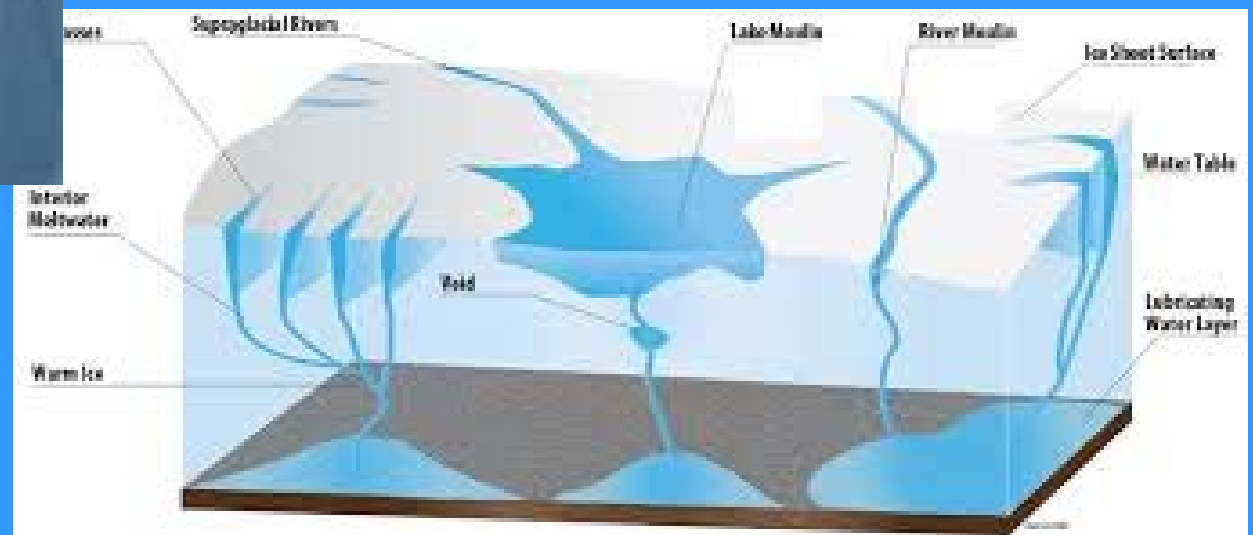
Keeling Curve



Carbon Dioxide Levels in Earth's Atmosphere

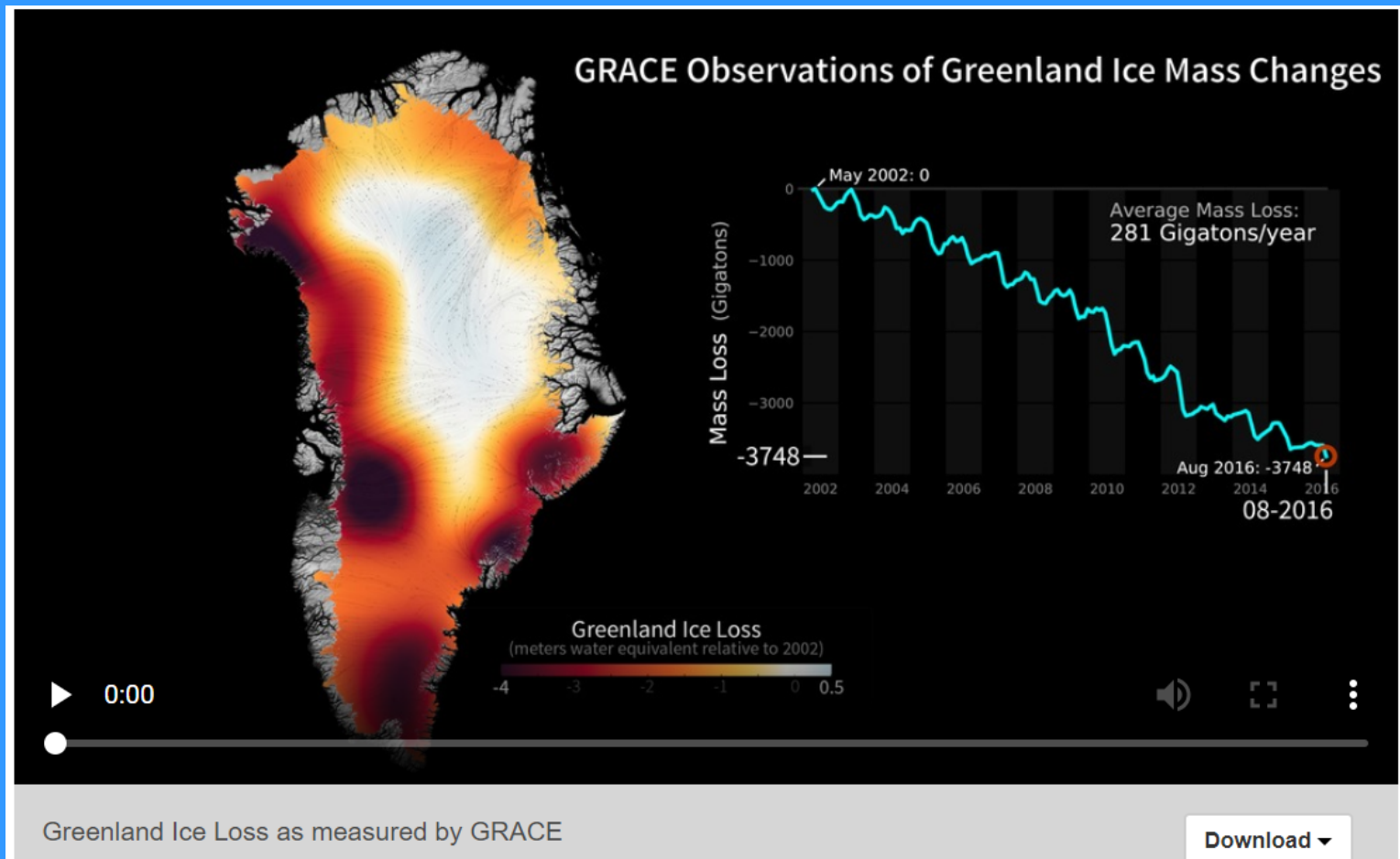


2016 & 2019 Are Hottest Years Yet Recorded

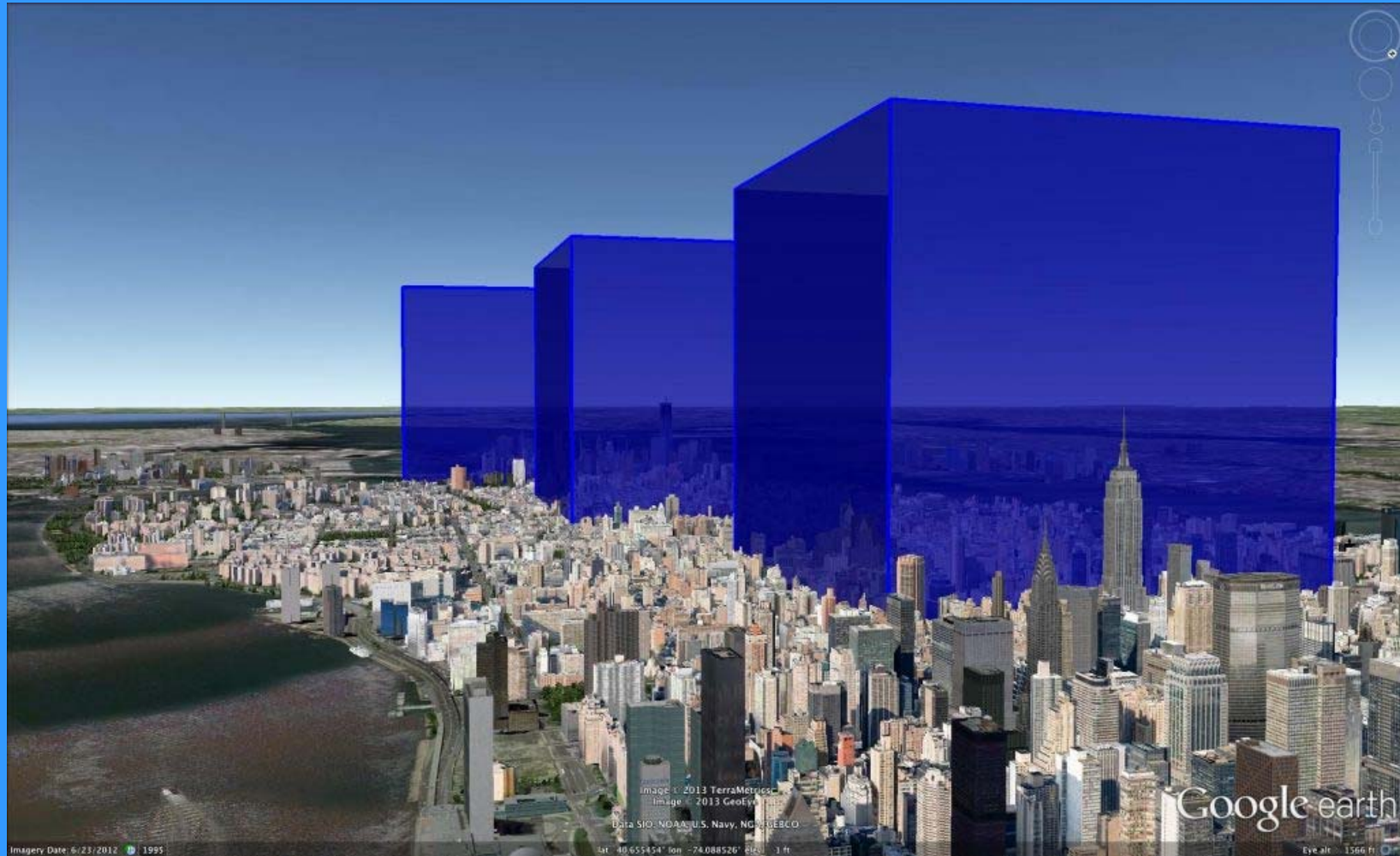


Greenland's Ice Mass Loss

281 Gigatons per year



May 2002 to August 2016 -- 3748 gigatonnes of Ice Mass Loss



Envisioning 3 gigatonnes of water
compared to Manhattan Skyline

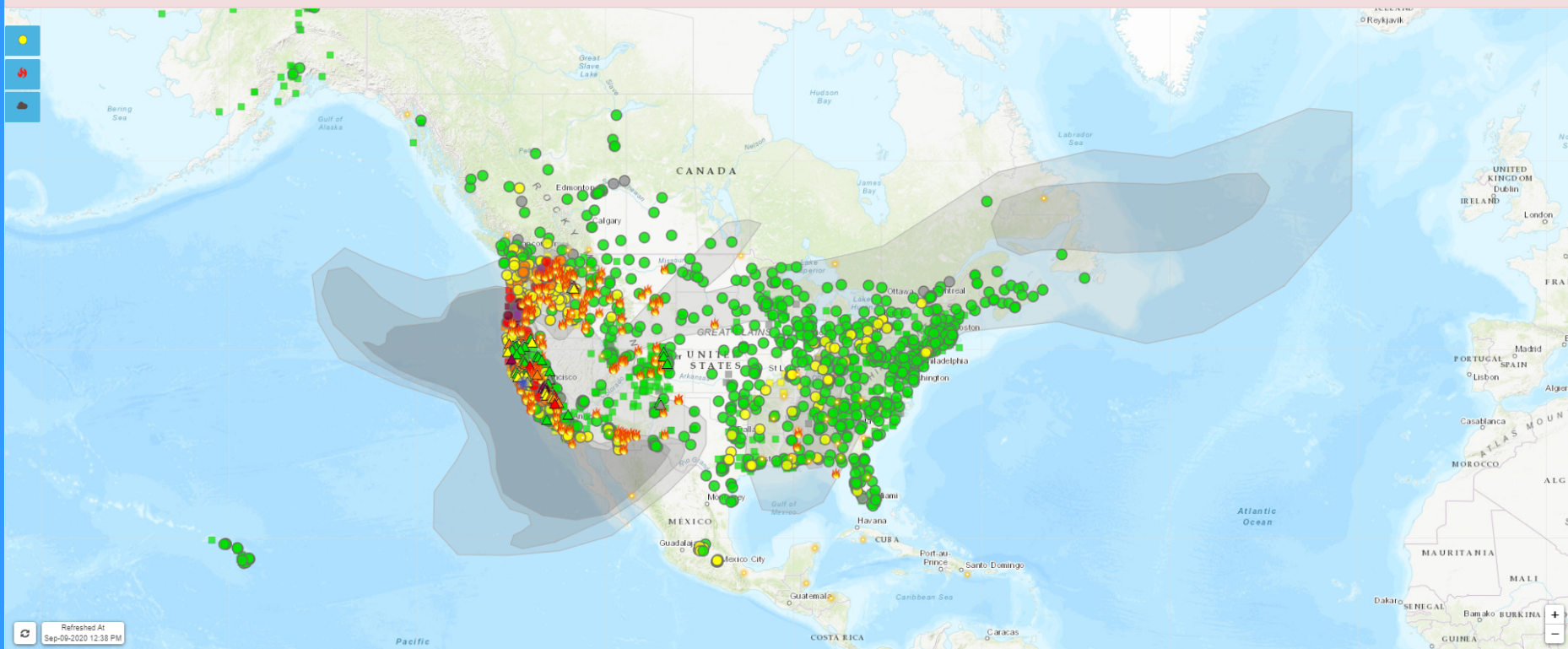


Fire and Smoke Map

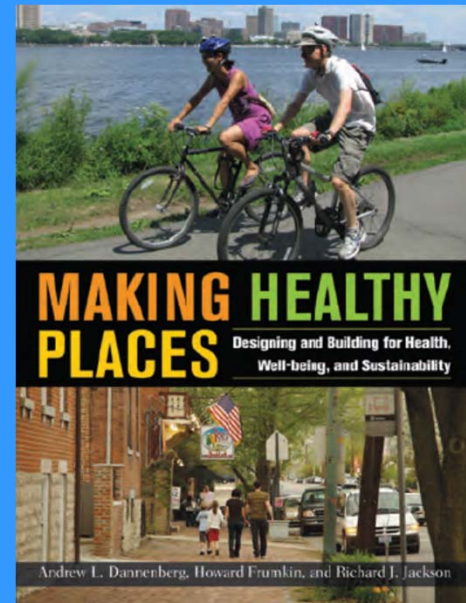
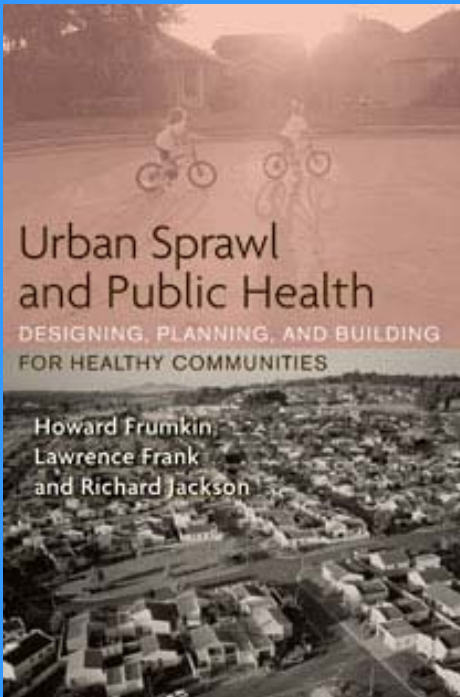


Notice: The Sensor Data Pilot adds a new layer of air quality data from low-cost sensors. [Learn more here.](#)

Special Smoke Statement Issued for Your Location



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



Richard J Jackson MD MPH

FAAP HonAIA HonFASLA

dickjackson@ucla.edu

Professor Emeritus UCLA Fielding School of Public Health

