Healthy Waters 101:

Water Quality Monitoring for Public Health

Curtis Cude
Healthy Waters
Programs

Oregon Health Authority

Healthy Waters for Healthy Humans

So what?

Who's who?

How to?

So what? Nature bats last!

Salem Public Library Historic Photograph Collections,
Salem Public Library, Salem, Oregon

Codified stewardship

PART 131—WATER QUALITY STANDARDS

Subpart A—General Provisions

Sec.

Subpart B—Establishment of Water Quality Standards

Public water supplies

Global drinking water and sanitation

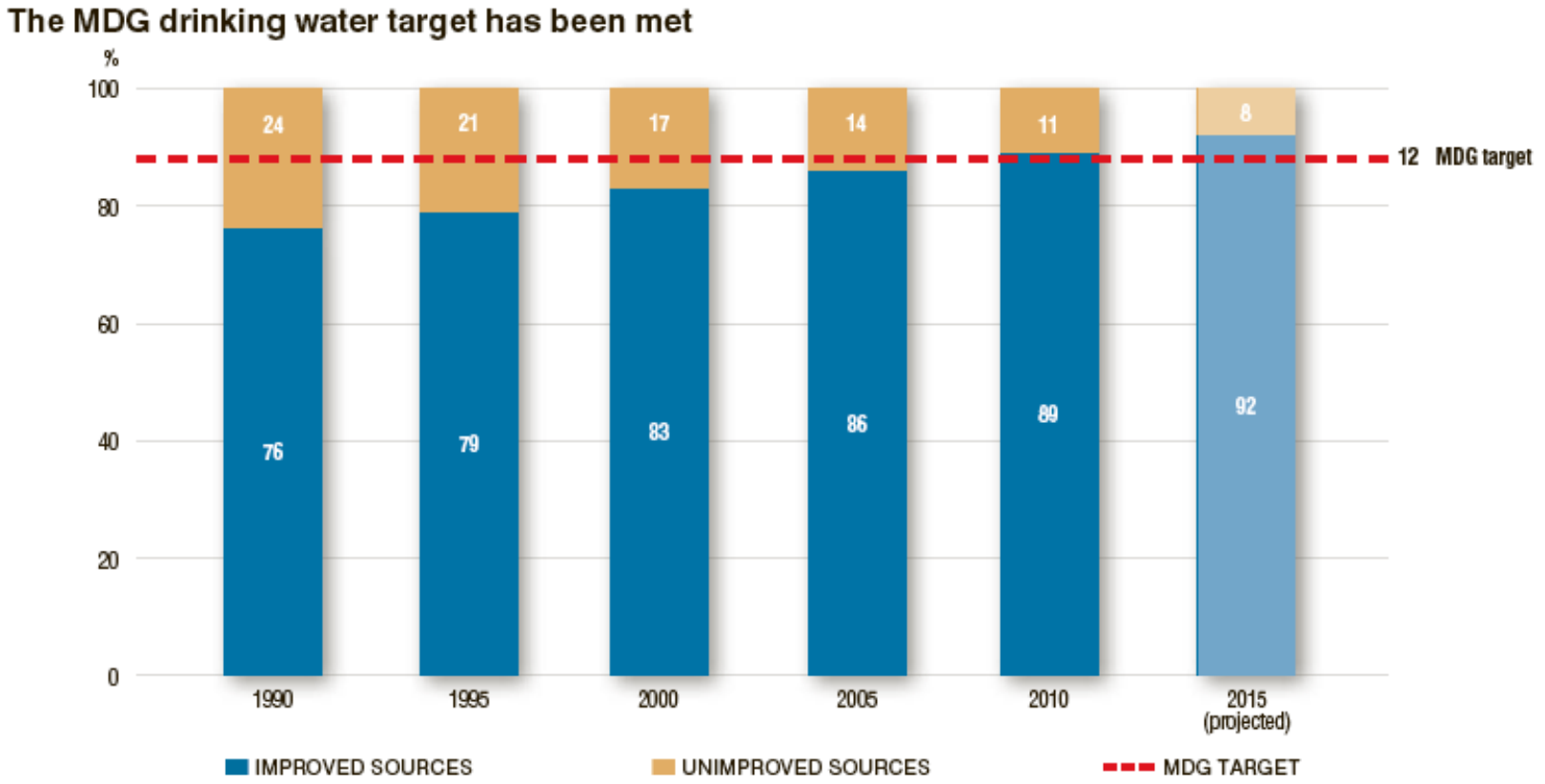
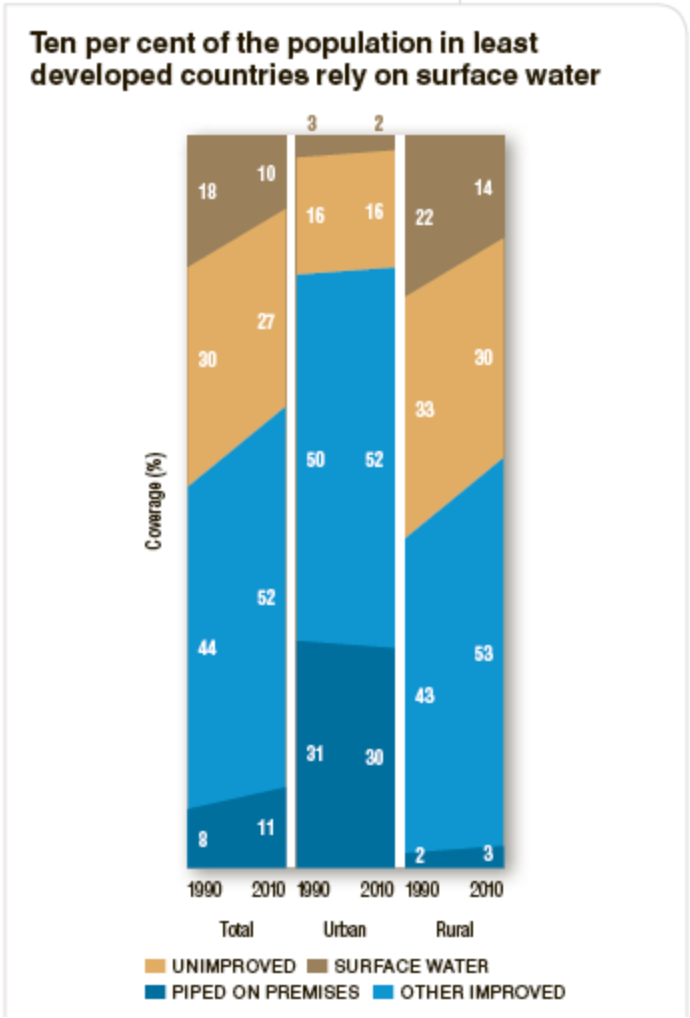
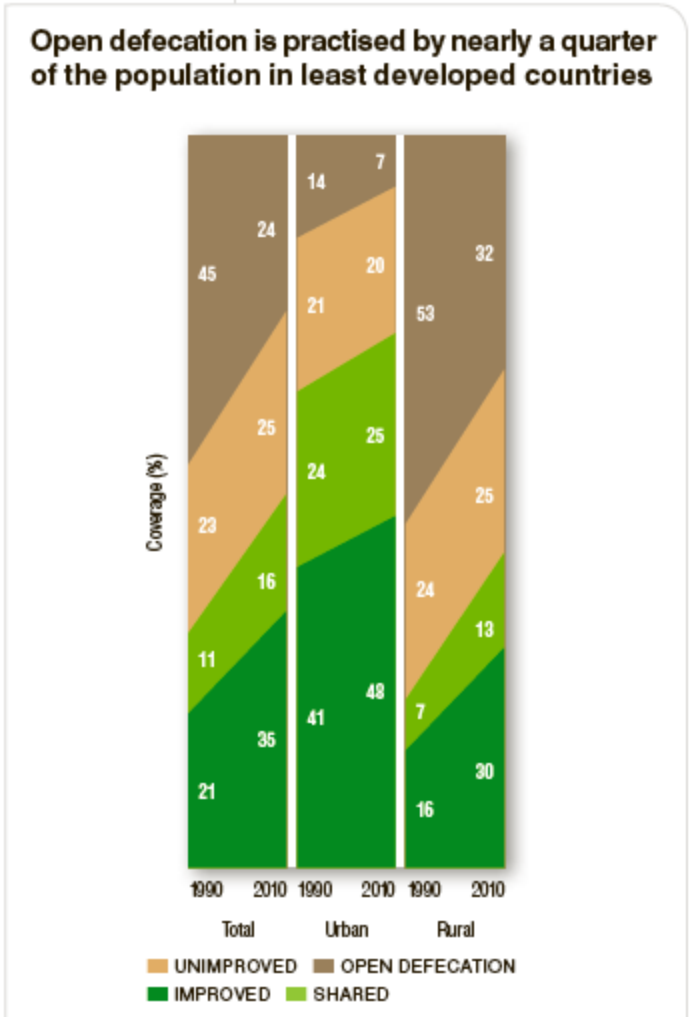


FIGURE 1 Trends in global drinking water coverage, 1990-2010, projected to 2015

World Health Organization and UNICEF. Progress on Drinking Water and Sanitation: 2012; United States: WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation; 2012.

Global drinking water and sanitation





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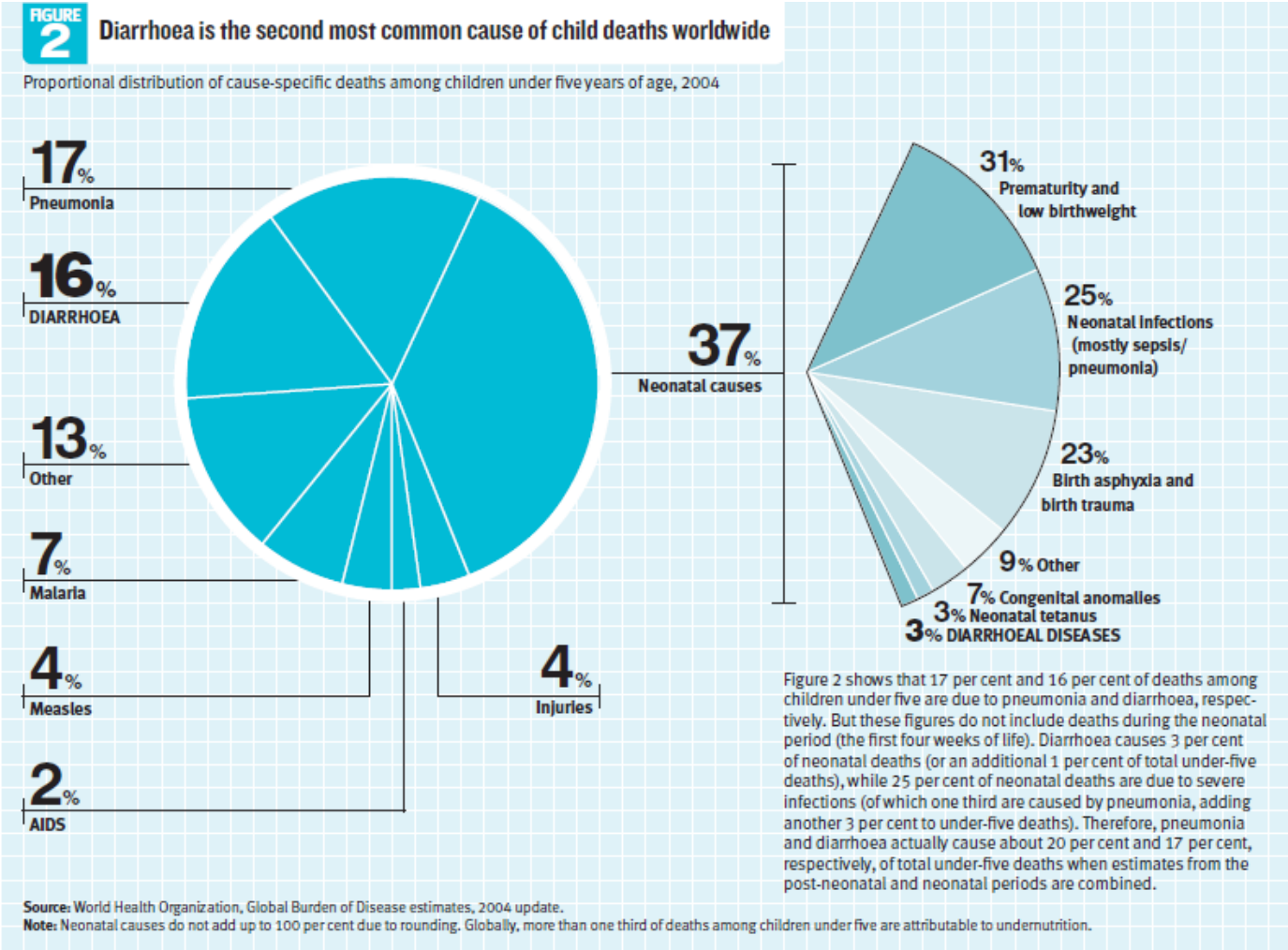
Global drinking water and sanitation



World Health Organization and UNICEF. Diarrhoea: Why children are still dying and what can be done, 2009.

Public water supplies

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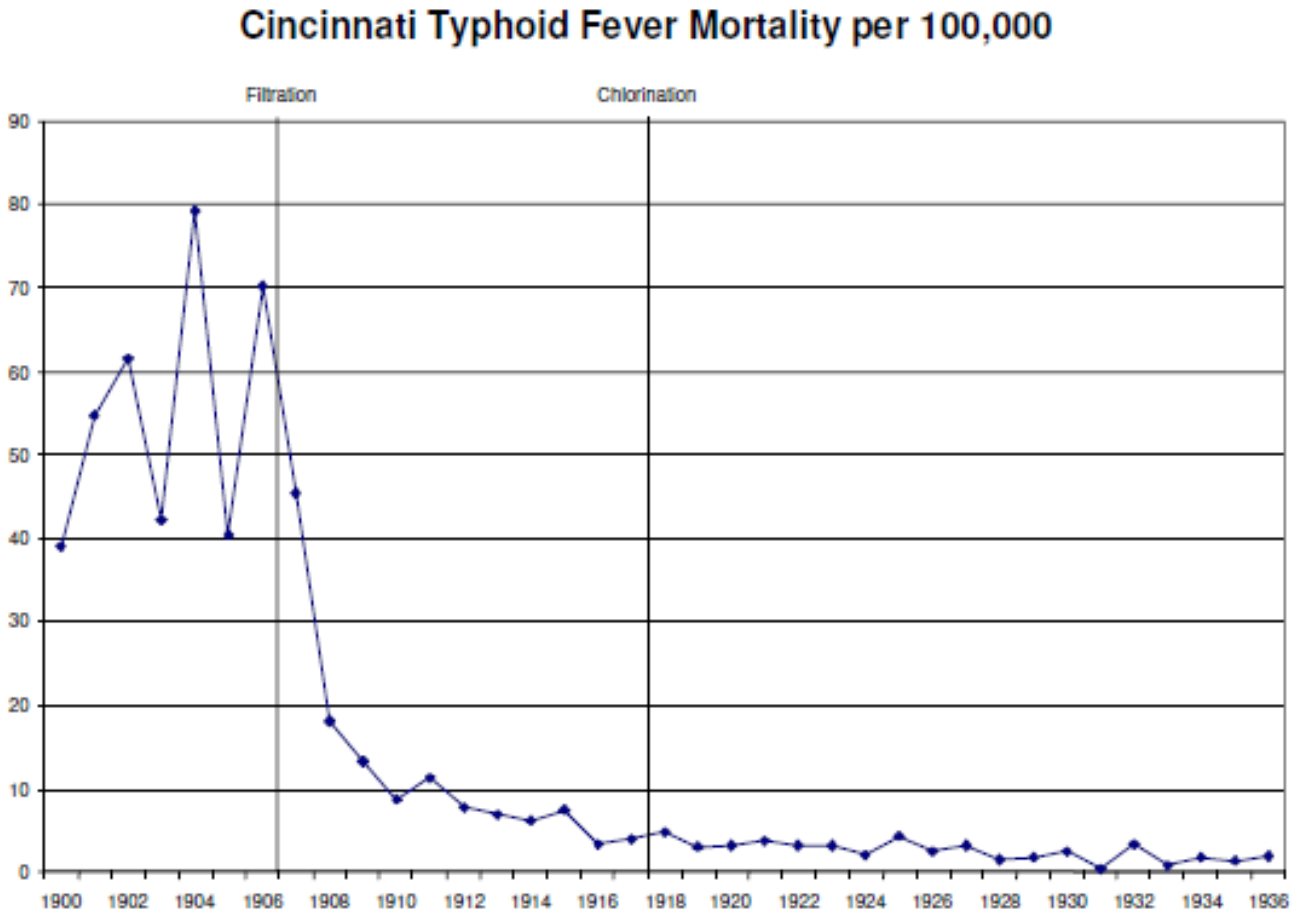
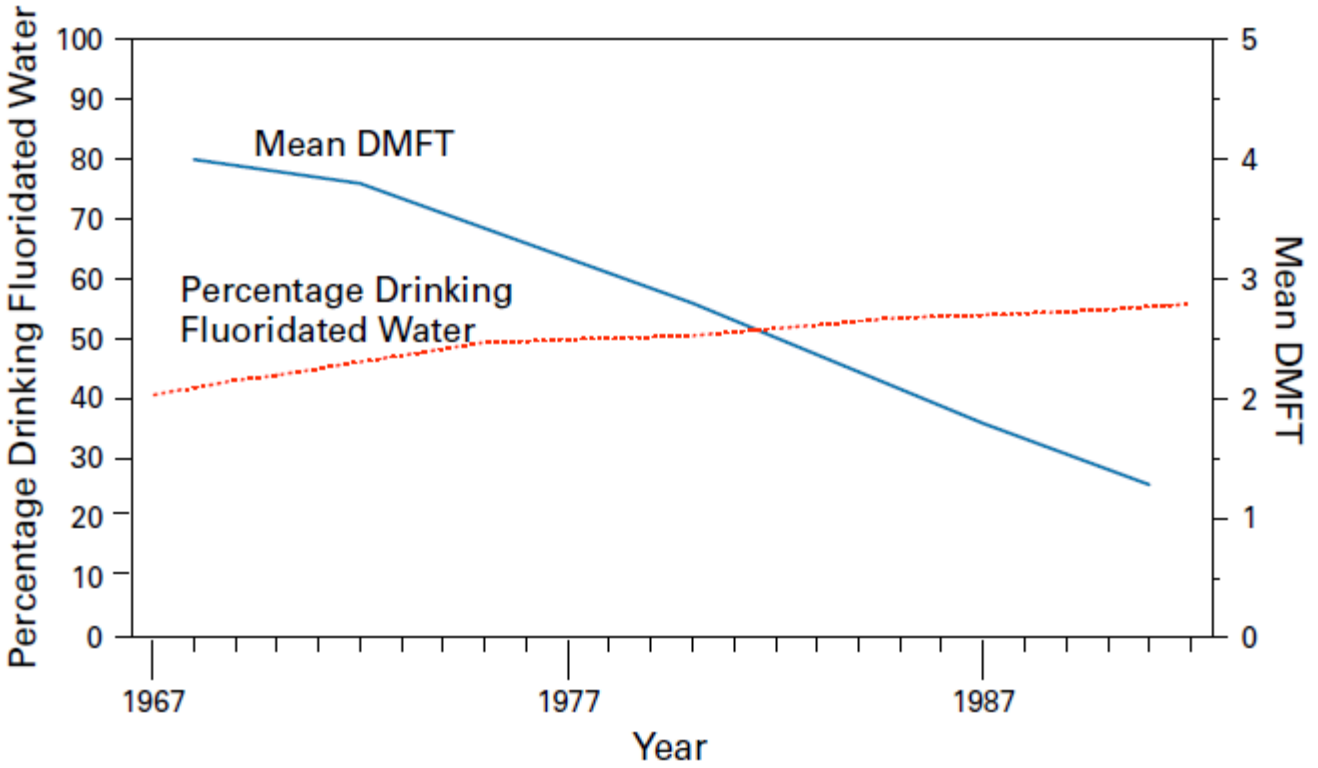
Public water supplies – treatment benefits



Cutler, D., G. Miller, 2004. The role of public health improvements in health advances: the 20th century United States. National Bureau of Economic Research. Working Paper 10511. Cambridge, MA, USA.

Public water supplies - fluoridation

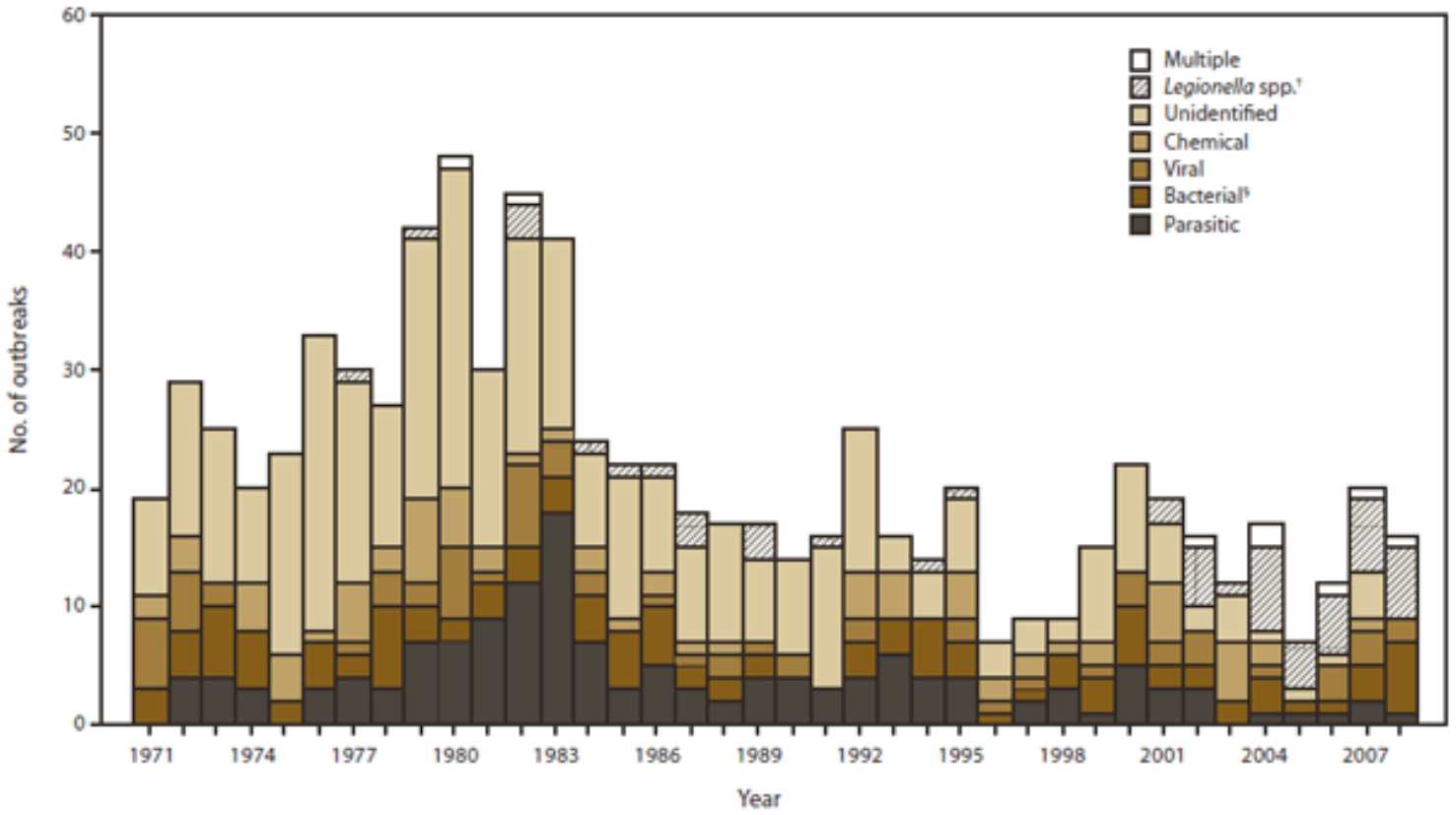
FIGURE 1. Percentage of population residing in areas with fluoridated community water systems and mean number of decayed, missing (because of caries), or filled permanent teeth (DMFT) among children aged 12 years — United States, 1967–1992



CDC. Achievements in public health, 1900-1999: Fluoridation of drinking water to prevent dental caries. MMWR Morb Mortal Wkly Rep. 1999;48:933-40

Drinking water disease outbreaks

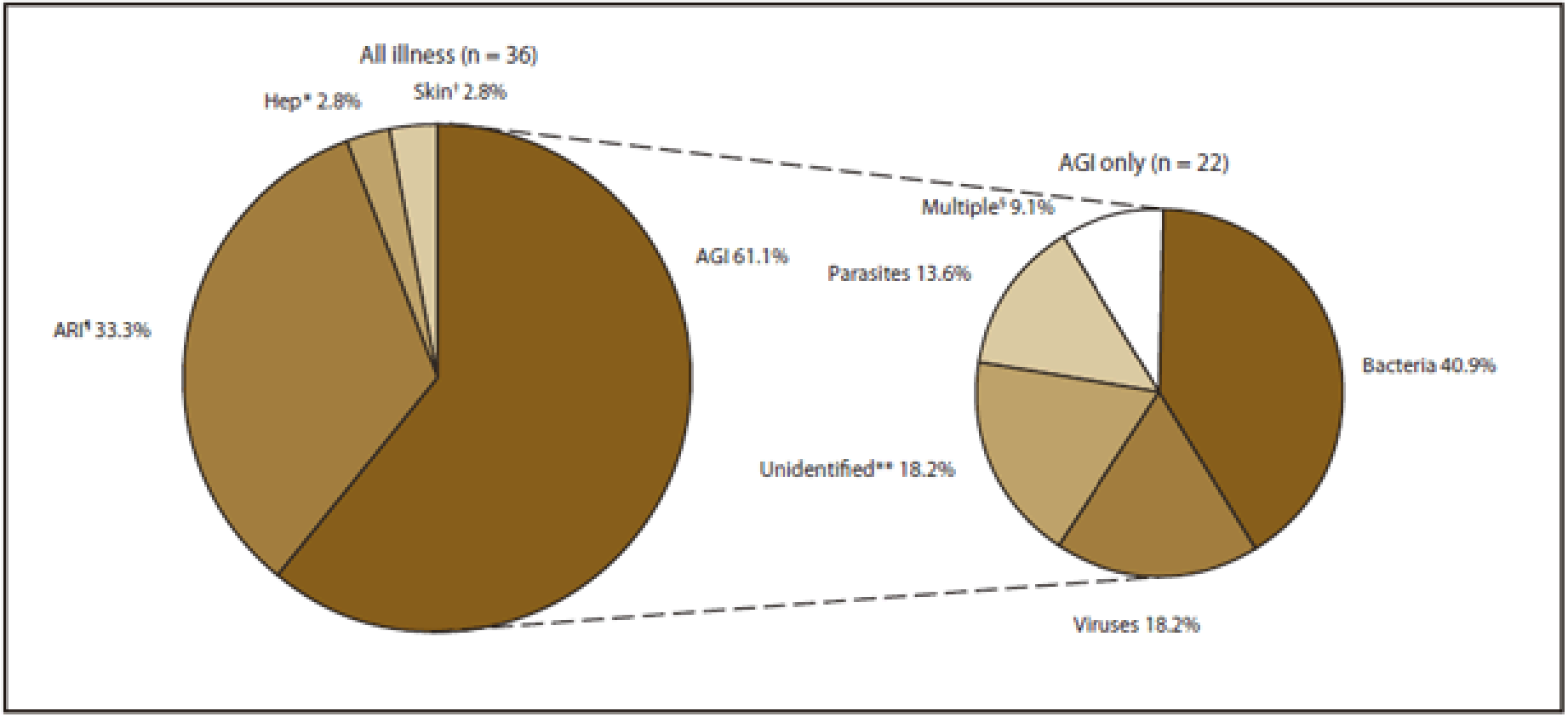
Number of waterborne disease outbreaks associated with drinking water (n = 818), by year and etiology, US, 1971-2008



Centers for Disease Control and Prevention. Surveillance for Waterborne Disease Outbreaks Associated with Drinking Water - United States, 2007-2008. MMWR 2011;60(12),38-68.

Drinking water disease outbreaks

Percentage of waterborne disease outbreaks associated with drinking water, by predominant illness and etiology , US, 2007--2008



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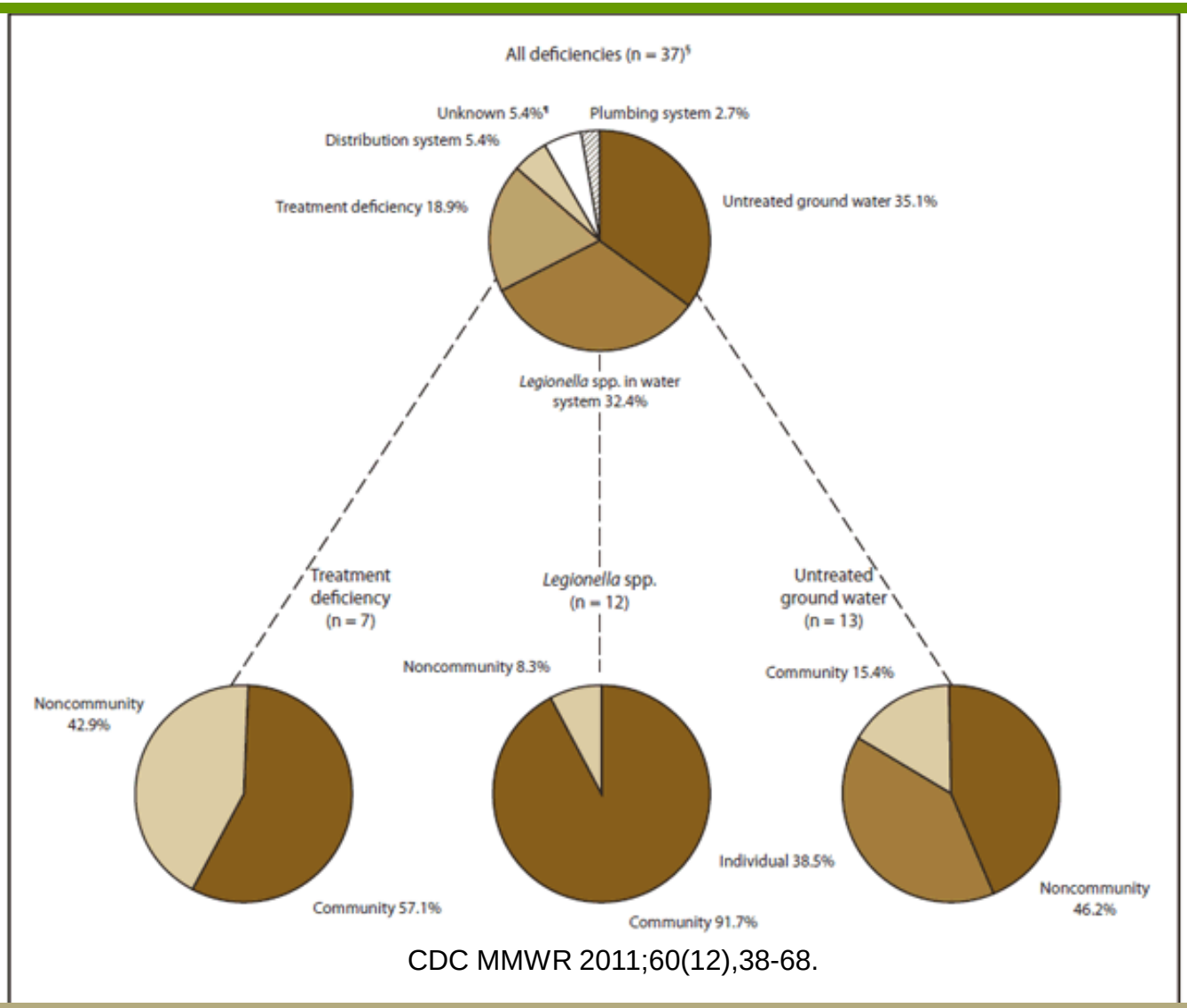
Drinking water disease outbreaks



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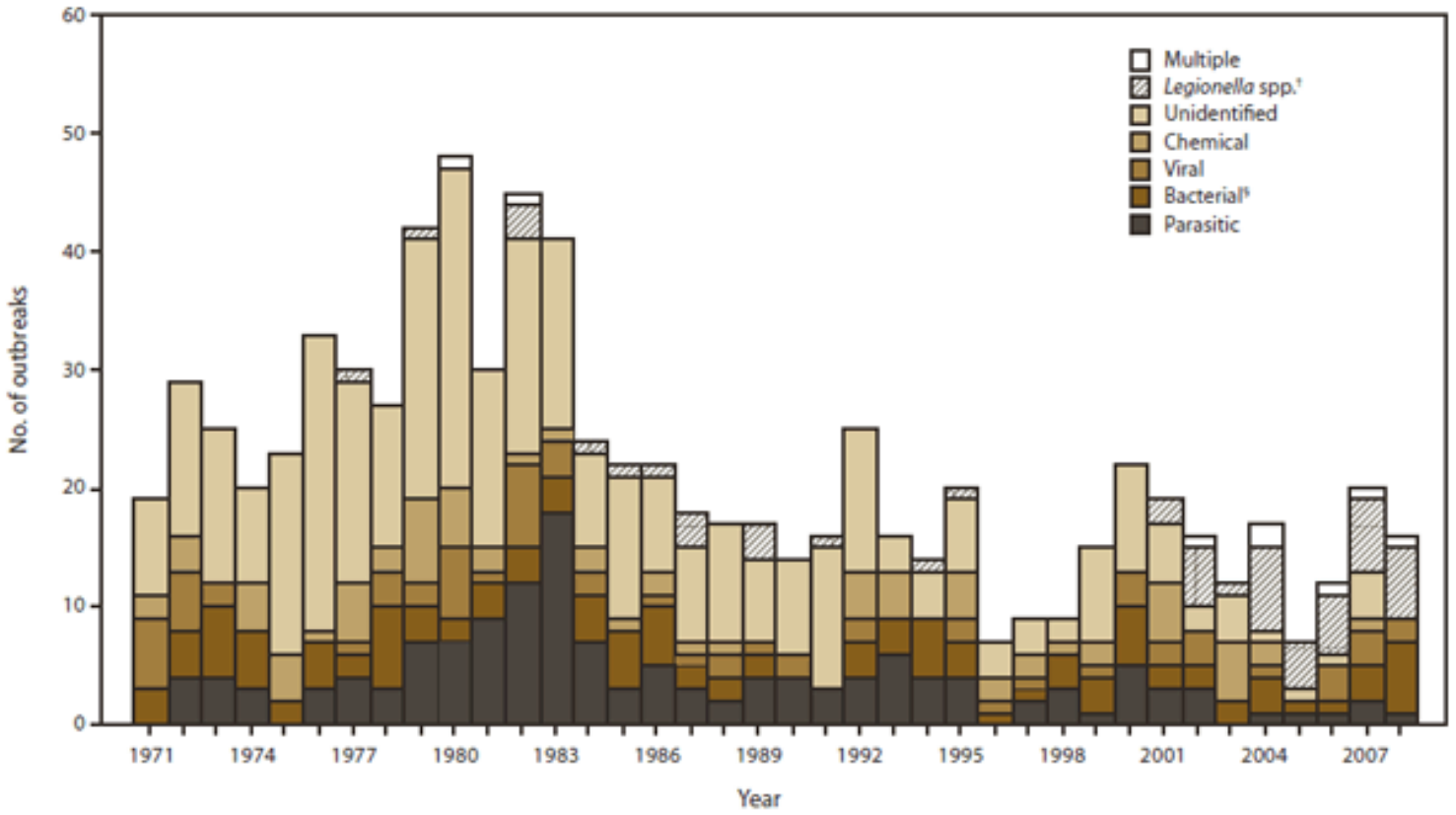

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Private water supplies

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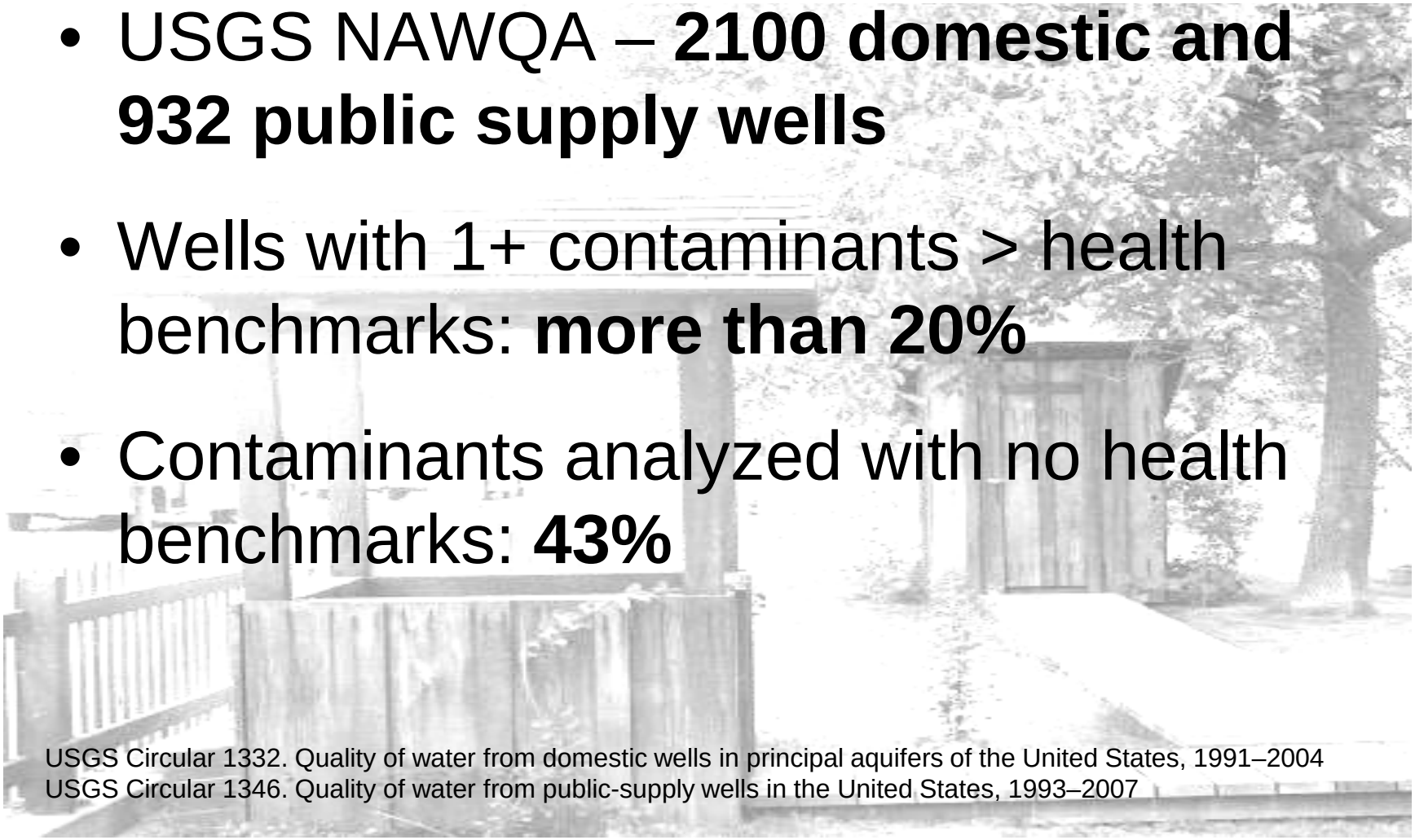
Groundwater contaminants

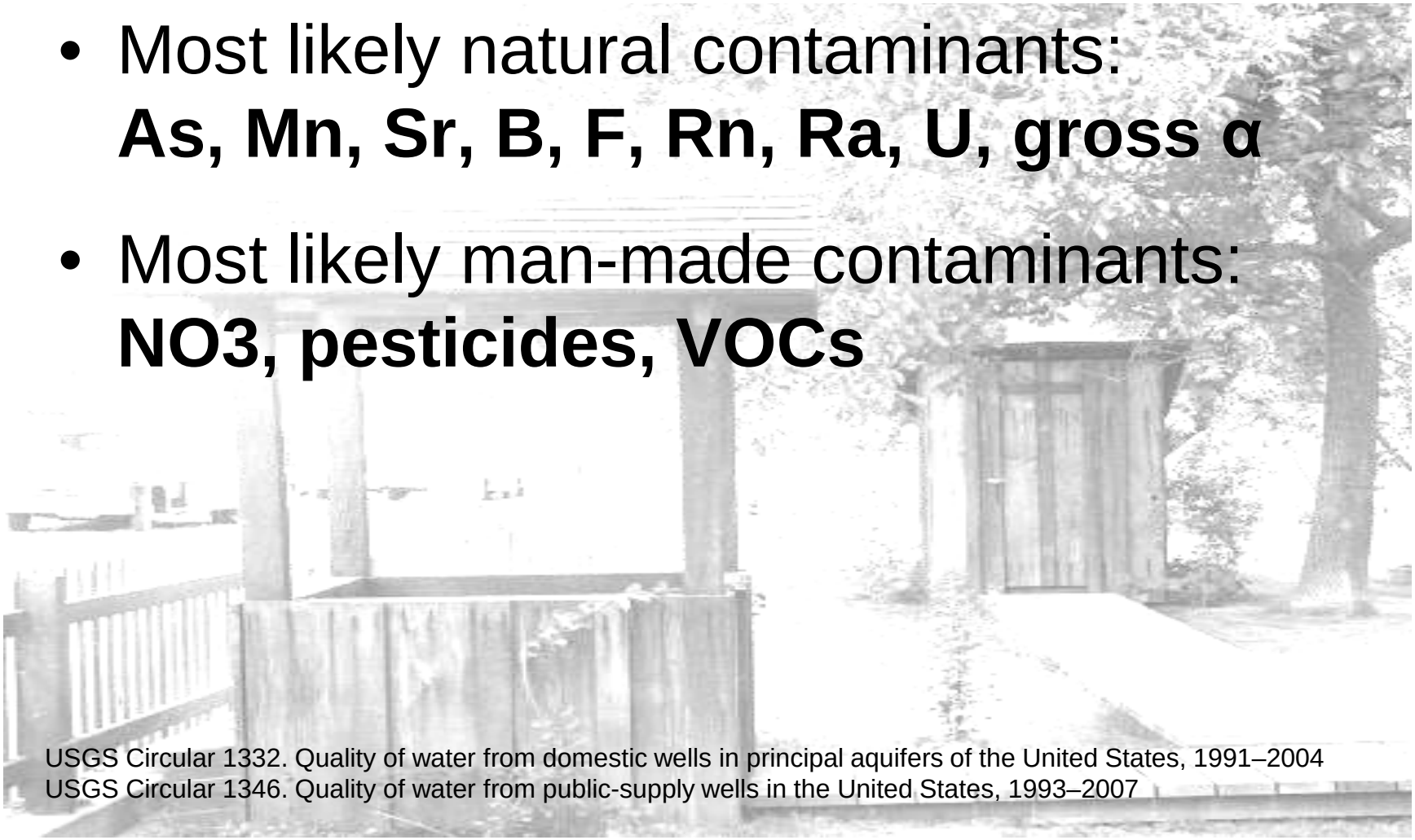
- USGS NAWQA – **2100 domestic and 932 public supply wells**
- Wells with 1+ contaminants > health benchmarks: **more than 20%**
- Contaminants analyzed with no health benchmarks: **43%**



USGS Circular 1332. Quality of water from domestic wells in principal aquifers of the United States, 1991–2004
USGS Circular 1346. Quality of water from public-supply wells in the United States, 1993–2007

Groundwater contaminants

- Most likely natural contaminants:
  As, Mn, Sr, B, F, Rn, Ra, U, gross α
- Most likely man-made contaminants:
  NO3, pesticides, VOCs



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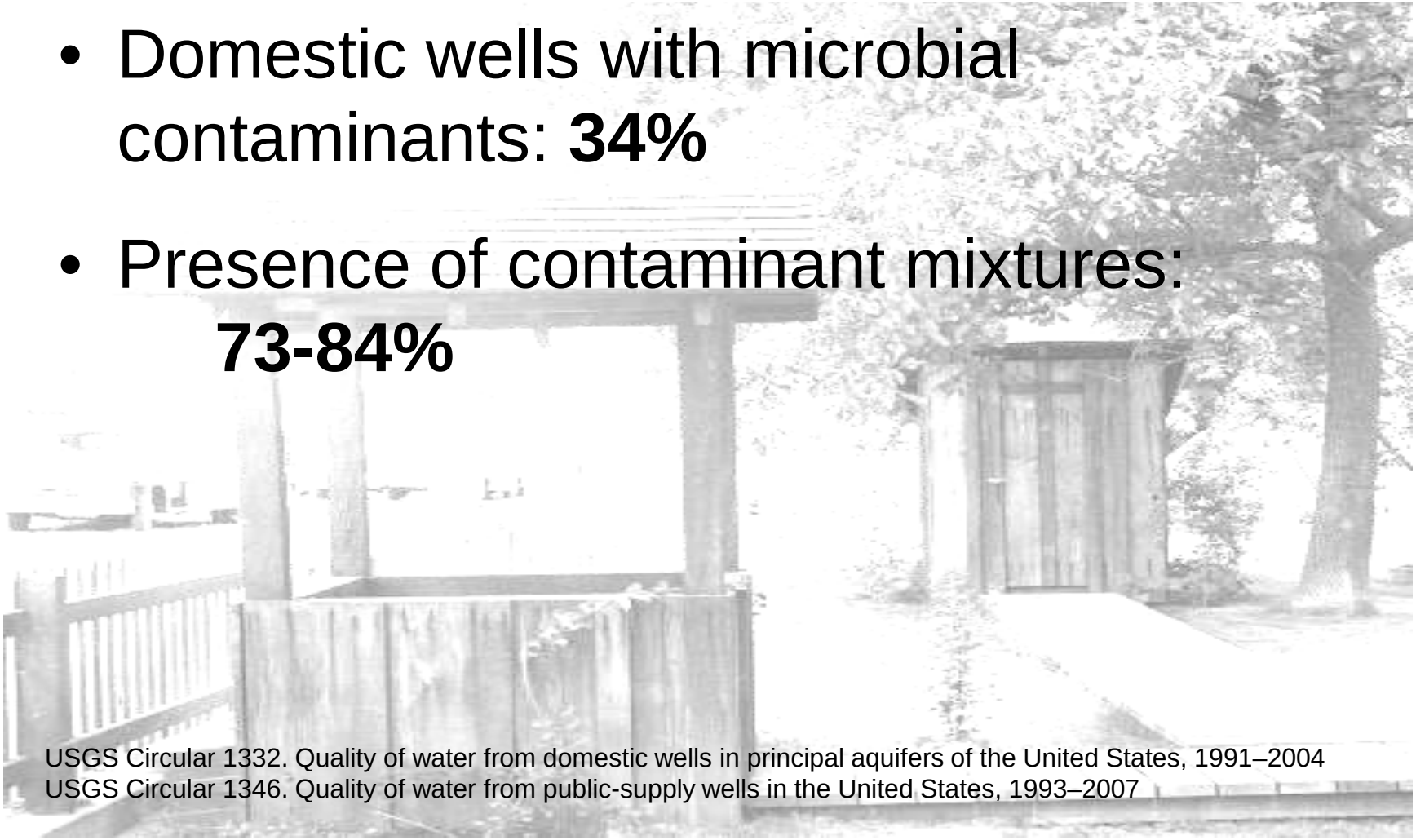
Groundwater contaminants

- Domestic wells with microbial contaminants: **34%**
- Presence of contaminant mixtures: **73-84%**



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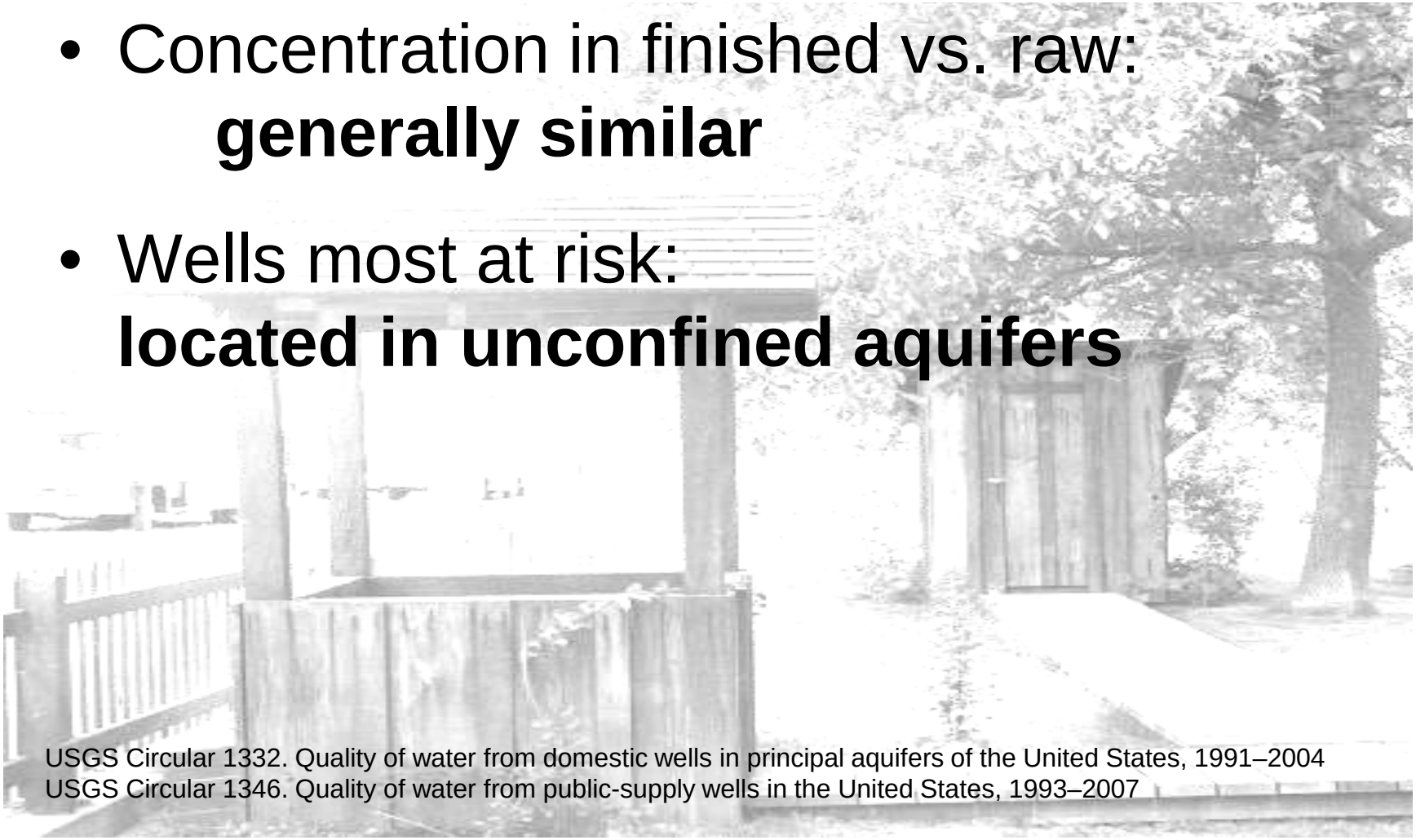
USGS Circular 1346. Quality of water from public-supply wells in the United States, 1993–2007

Groundwater contaminants

- Concentration in finished vs. raw:
  generally similar
- Wells most at risk:
  located in unconfined aquifers



USGS Circular 1332. Quality of water from domestic wells in principal aquifers of the United States, 1991–2004
USGS Circular 1346. Quality of water from public-supply wells in the United States, 1993–2007

Emerging contaminants

- Pharmaceuticals, personal care products, industrial & ag chemicals, endocrine disruptors
- Ubiquitous, low concentrations
- Documented environmental effects of endocrine disruptors and antibiotics

US GAO-11-346. Environmental Health – Action Needed to Sustain Agencies' Collaboration on Pharmaceuticals in Drinking Water., August 2011.

Emerging contaminants

- Uncertainty persists regarding human health risks:
  - acute vs. chronic exposure
  - effects to sensitive subpopulations,
  - effects of mixtures

US GAO-11-346. Environmental Health – Action Needed to Sustain Agencies' Collaboration on Pharmaceuticals in Drinking Water., August 2011.

Fish and shellfish

- Hi protein
- Low fat
- Omega-3

Salem Public Library Historic Photograph Collections, Salem Public Library, Salem, Oregon

Fish and shellfish

- Hi protein
- Low fat
- Omega-3

- Mercury
- PCBs
- Ciguatera

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Fish and shellfish

•Shellfish poisoning

•Vibrio infection

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Agriculture

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Recreation in and on the water

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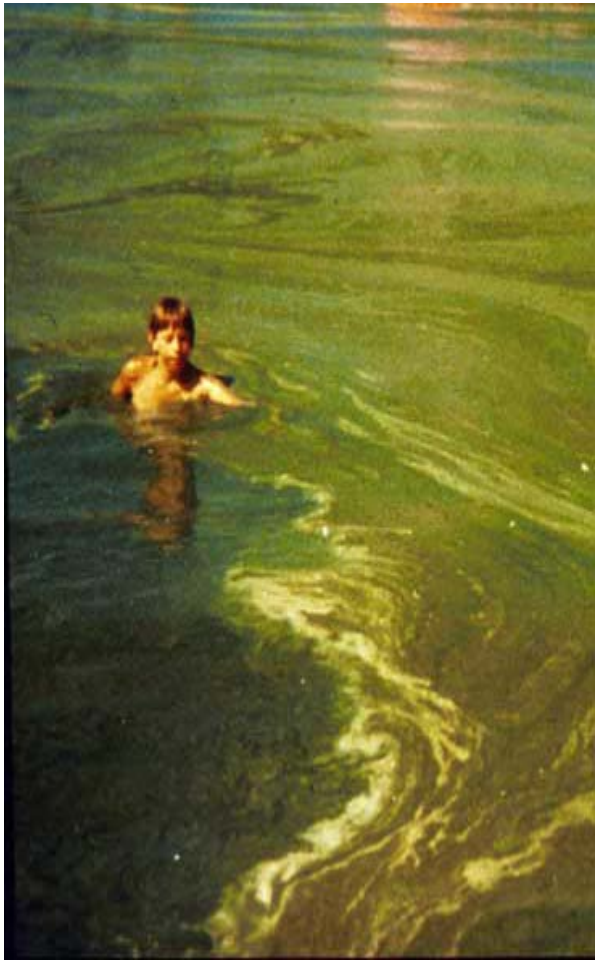
Cyanobacterial harmful blooms

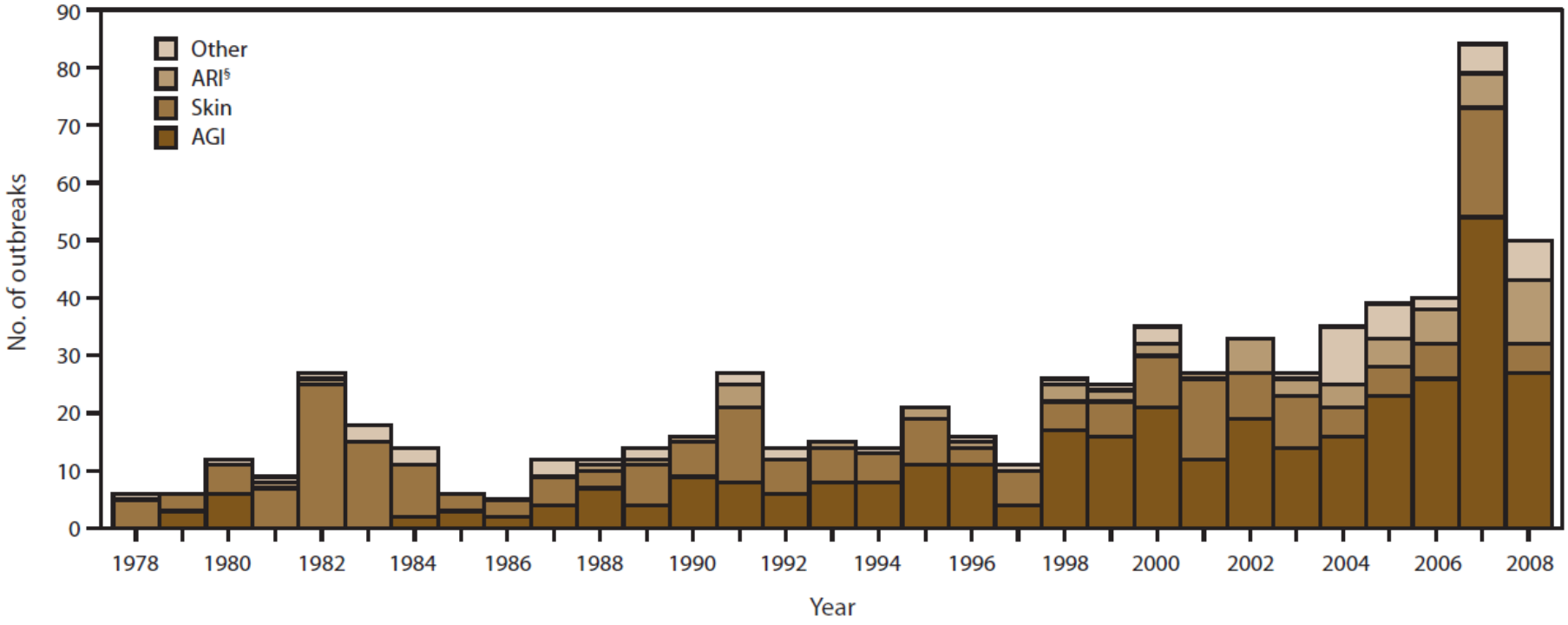
- Microcystin
- Anatoxin
- Saxitoxin



- Cylindrospermopsin
- Lyngbatoxin
- Nodularin
- Etc., etc., etc.

Recreational water disease outbreaks

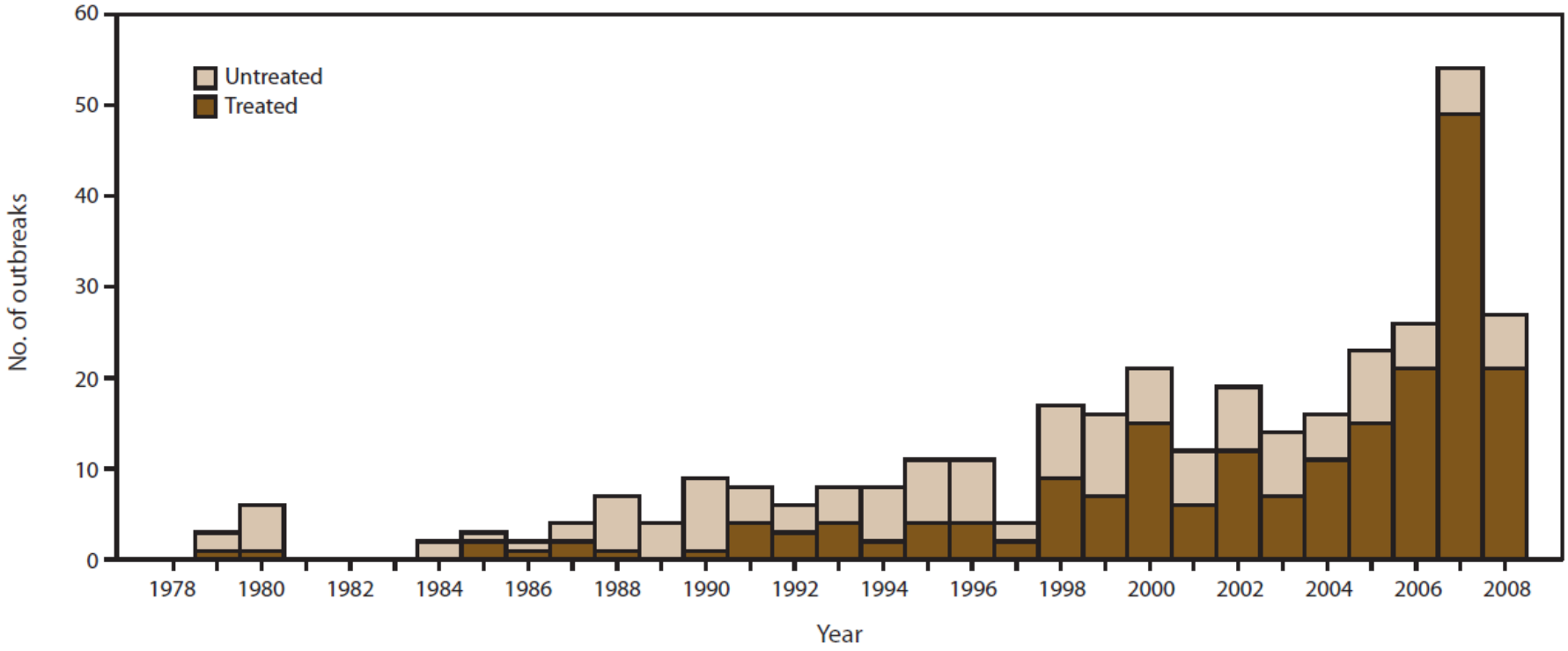
Number of waterborne disease outbreaks associated with recreational water (n = 696), by year and predominant illness, US, 1978-2008



Centers for Disease Control and Prevention. Surveillance for Waterborne Disease Outbreaks Associated with Drinking Water - United States, 2007-2008. MMWR 2011;60(12),1-37.

Recreational water disease outbreaks

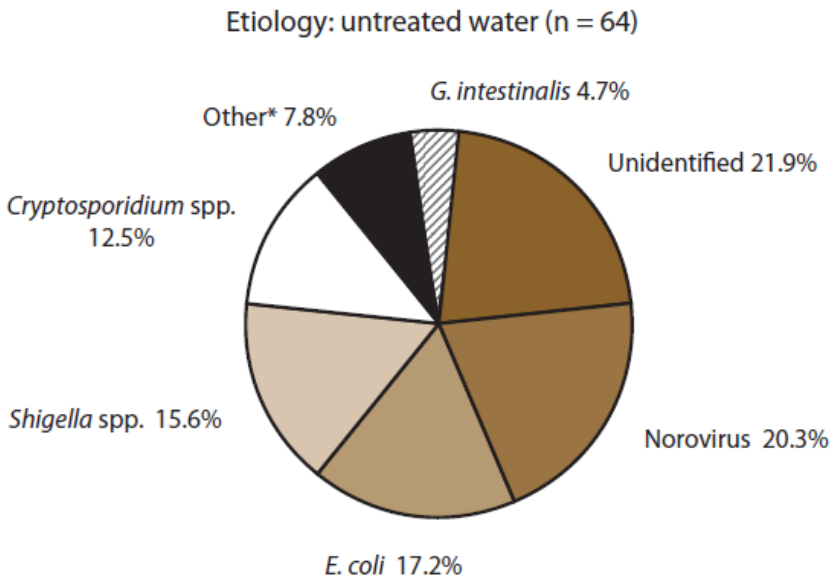
Number of outbreaks of acute gastrointestinal illness associated with recreational water (n = 341), by year and predominant illness, US, 1978-2008

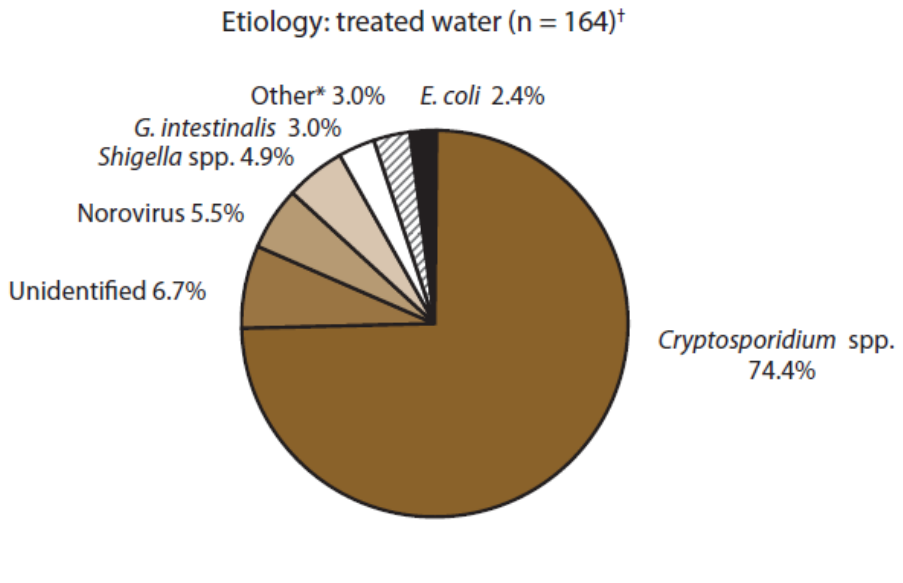


Centers for Disease Control and Prevention. Surveillance for Waterborne Disease Outbreaks Associated with Drinking Water - United States, 2007-2008. MMWR 2011;60(12),1-37.

Recreational water disease outbreaks

Etiology of outbreaks of acute gastrointestinal illness associated with recreational water (n = 228), US, 1999-2008

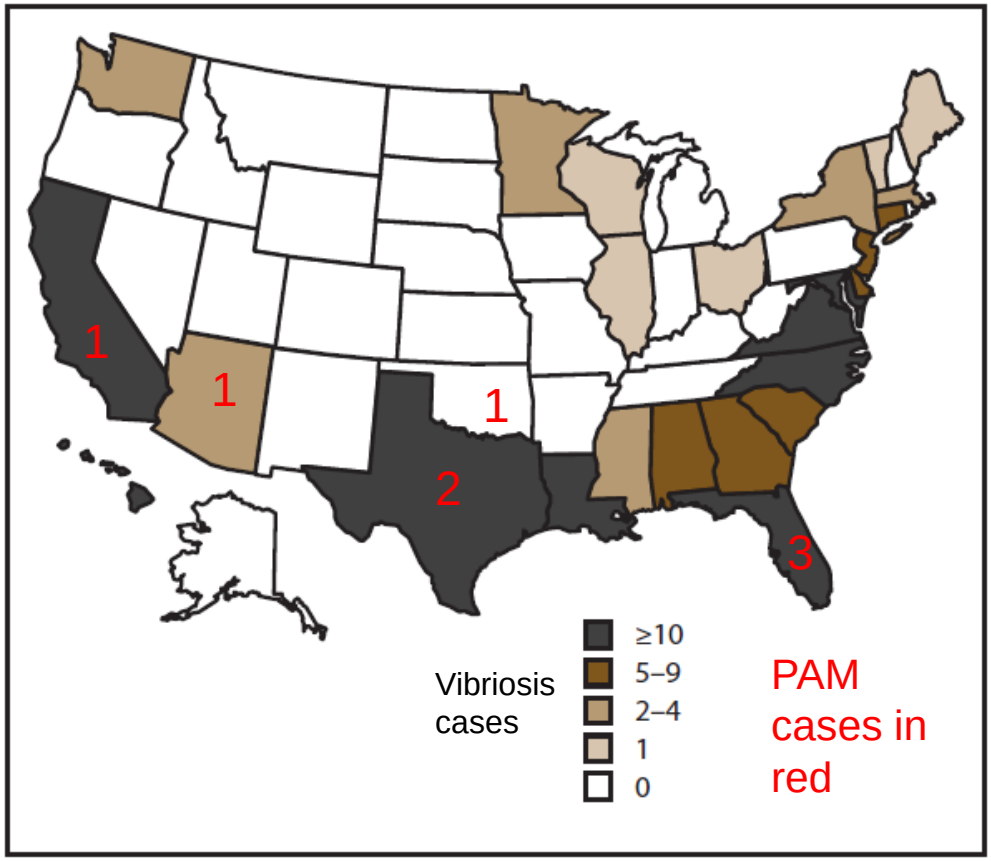




Centers for Disease Control and Prevention. Surveillance for Waterborne Disease Outbreaks Associated with Drinking Water - United States, 2007-2008. MMWR 2011;60(12),1-37.

Recreational water disease outbreaks

Number of vibriosis cases (n=236) and primary amebic meningoencephalitis (PAM, n=8) by state, US, 2007-2008



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Who's who in public health

HHS.gov
U.S. Department of Health & Human Services

APHA AMERICAN PUBLIC HEALTH ASSOCIATION
protect • prevent • live well

CDC

Oregon Health Authority

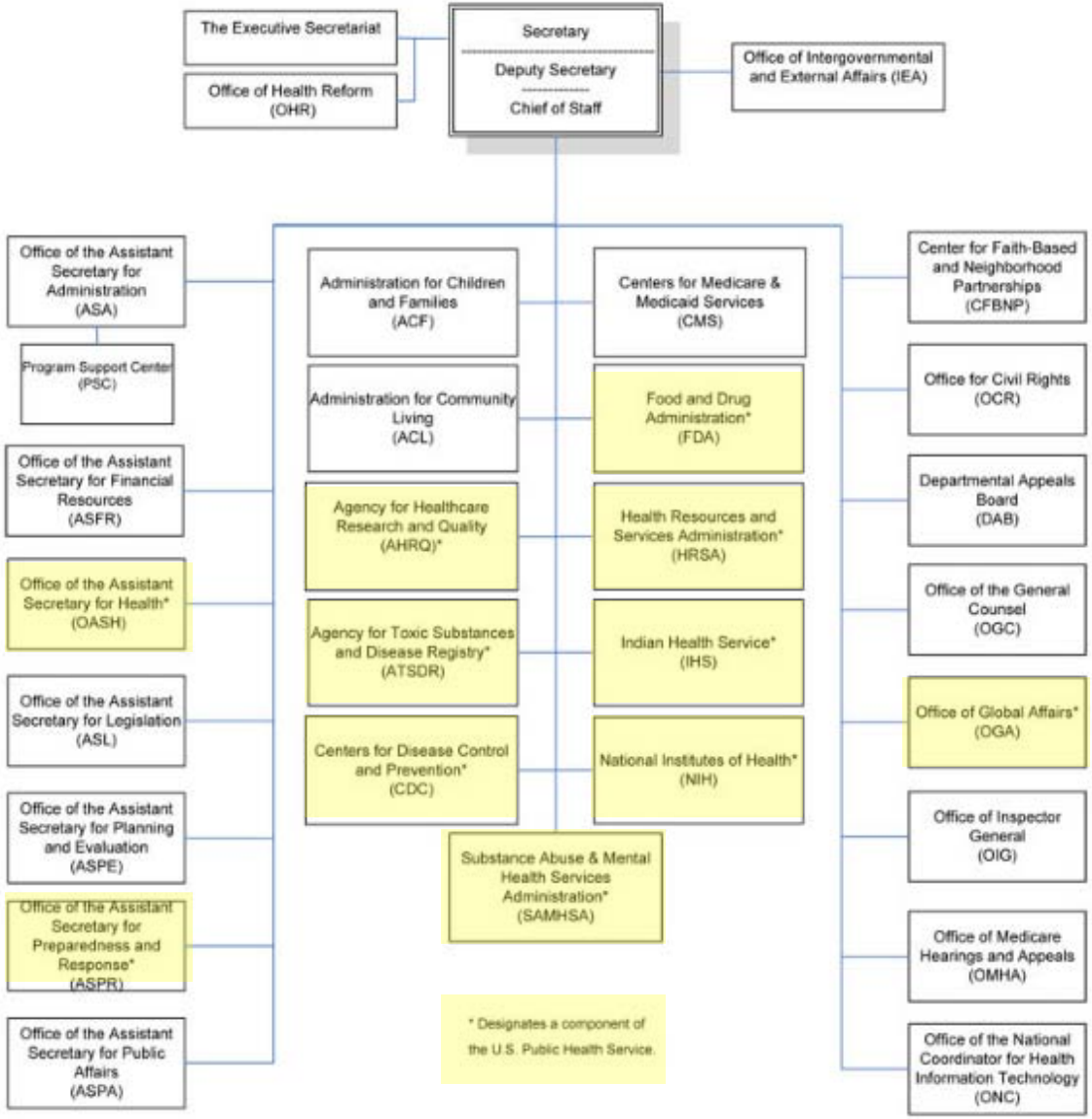
MULTNOMAH COUNTY Health Department

NACCHO
National Association of County & City Health Officials

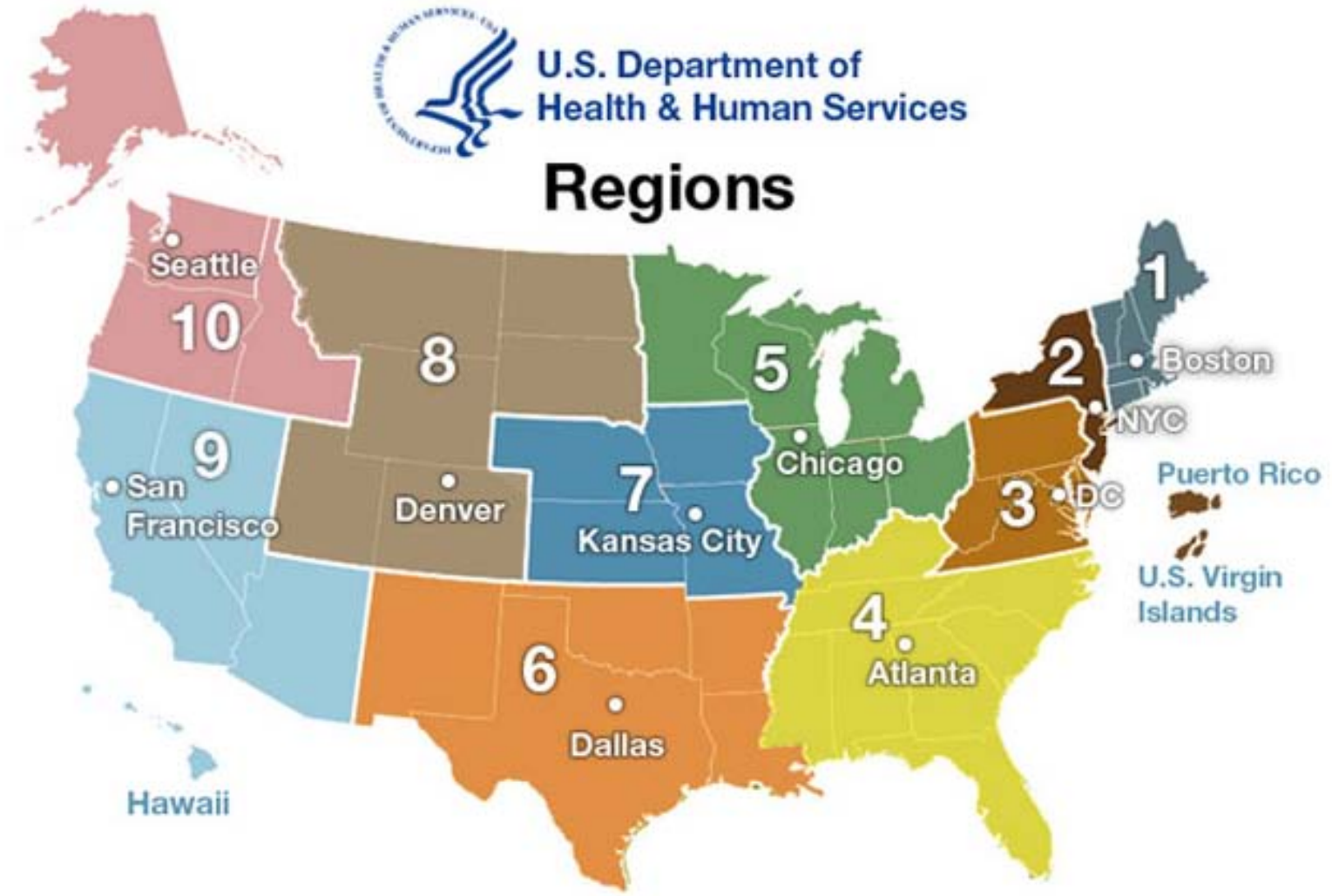
CLHO
Coalition of Local Health Officials

Council of State and Territorial Epidemiologists
Leaders in Applied Public Health Epidemiology

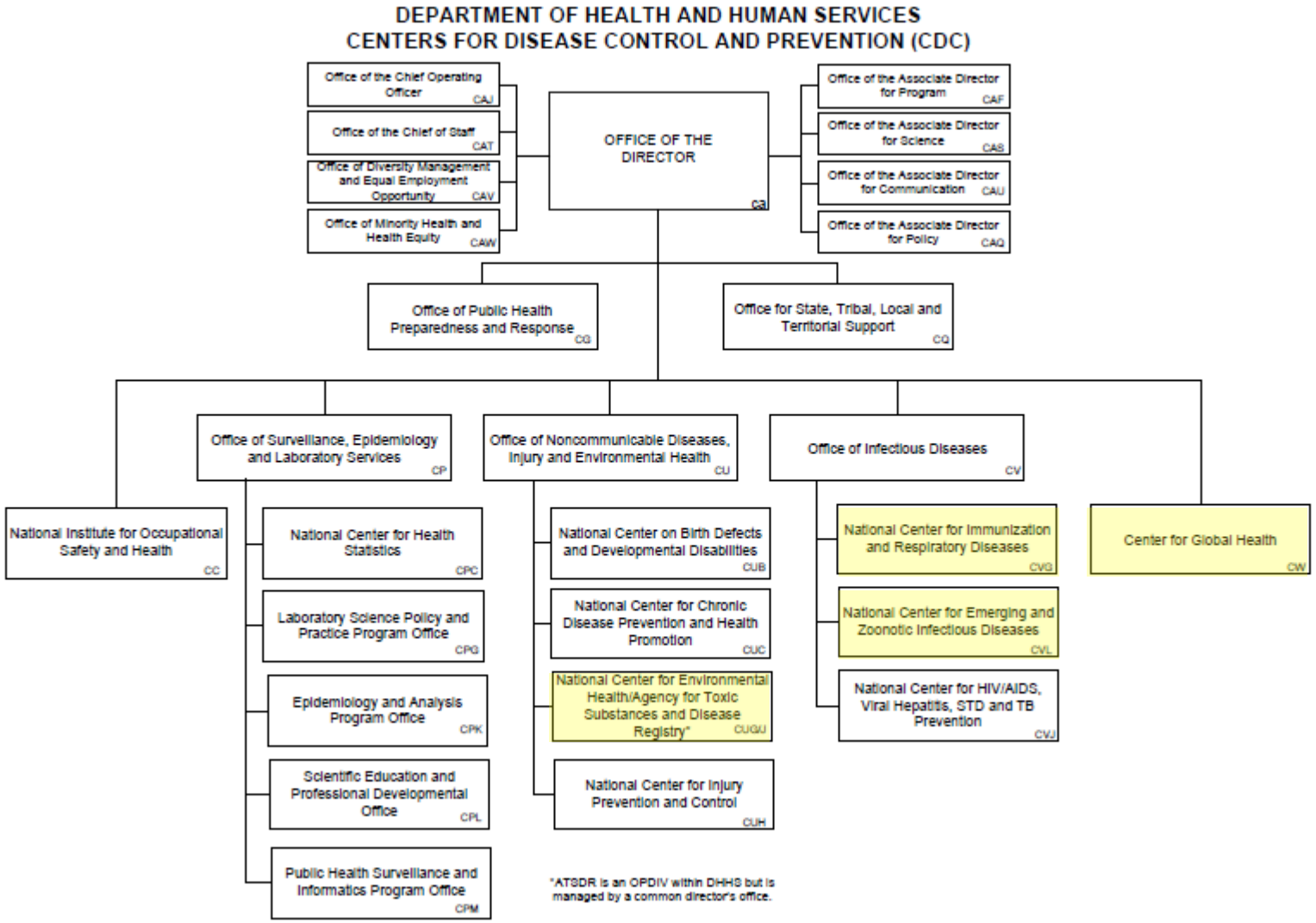
US Department of Health and Human Services



US Department of Health and Human Services



Centers for Disease Control and Prevention



How to – program highlights

- PWI
- Fish
- Beach
- HABISS
- EPHT

Oregon Health Authority

Private well initiative (PWI)

- Describe private drinking water resources
- Tailor prevention activities
- National workgroup

Oregon Health Authority

Fish consumption advisory program

- **Guidance for data collection, risk assessment, consumption surveys**
- **National listing of advisories**

Oregon Health Authority

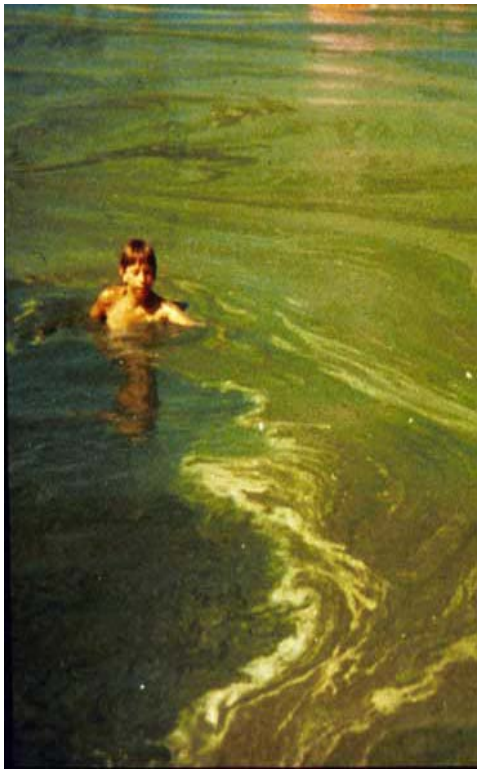
Beach monitoring & notification program

- **Test and notify for bacteria**
- **Find and fix issues**

Oregon Health Authority

Harmful algae bloom illness surveillance system (HABISS)

- Track blooms and illnesses
- Develop public health capacity
- National workgroup
- Federal funding to end



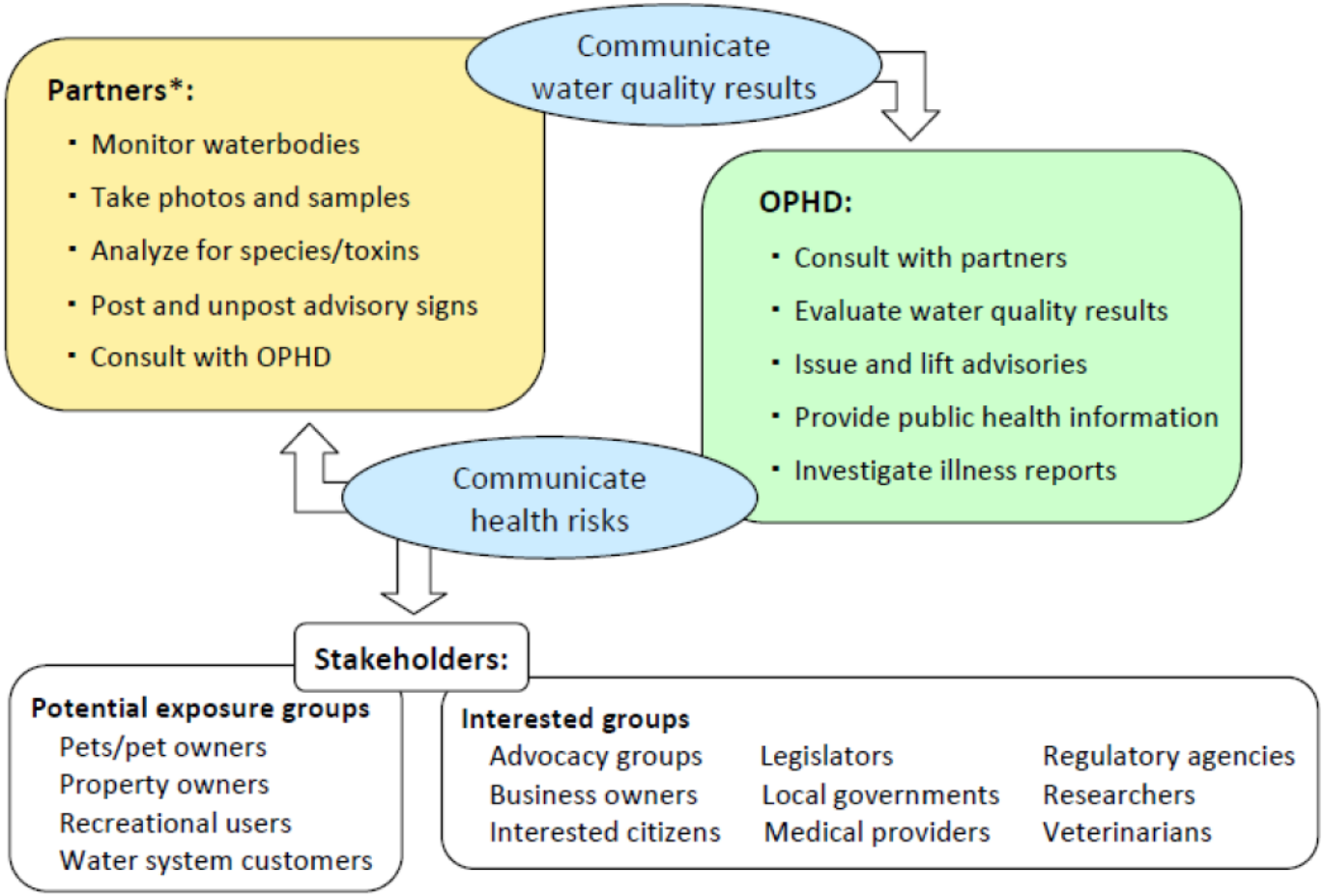
Oregon Health Authority

Environmental Public Health Tracking (EPHT)

- **Integrate environment and health data**
- **Drinking water and HABs**
- **Develop public health capacity**

Oregon Health Authority

Integrating water quality and public health



Integrating water quality and public health

Oregon Health Authority

Healthy waters for healthy humans!

Curtis Cude

Manager, Oregon EPHT & Healthy Waters Programs

Public Health Division - Oregon Health Authority

Curtis.G.Cude@state.or.us

971-673-0975

Oregon Health Authority

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• **40 CFR 131 – Water Quality Standards.** www.gpo.gov/fdsys/pkg/CFR-2011-title40-vol22/pdf/CFR-2011-title40-vol22-part131.pdf

•**Global access to safe drinking water facts:** World Health Organization and UNICEF. Progress on Drinking Water and Sanitation: 2012; United States: WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation; 2012. www.who.int/water_sanitation_health/publications/2012/jmp_report/en/index.html. From CDC Safe Water System website www.cdc.gov/safewater/index.html#two

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•**Private water supply facts:** From CDC Drinking Water website www.cdc.gov/healthywater/drinking/index.html

•**Contaminants in drinking water facts – Public Water Supply Wells:** USGS. Toccalino, P.L., and Hopple, J.A., 2010, The quality of our Nation's waters—Quality of water from public-supply wells in the United States, 1993–2007—Overview of major findings: U.S. Geological Survey Circular 1346, 58 p. http://pubs.usgs.gov/circ/1346/pdf/circ1346.pdf.

•**Contaminants in drinking water facts – Domestic Wells:** USGS. DeSimone, L.A., Hamilton, P.A., and Gilliom, R.J., 2009, The quality of our nation's waters—Quality of water from domestic wells in principal aquifers of the United States, 1991–2004—Overview of major findings: U.S. Geological Survey Circular 1332, 48 p. http://pubs.usgs.gov/circ/circ1332/includes/circ1332.pdf

•**Fish and shellfish toxin facts:** Sobel, J and Painter J, 2005. Illnesses Caused by Marine Toxins. Clinical Infectious Diseases 2005:41:1290-6. http://cid.oxfordjournals.org/content/41/9/1290.full.pdf+html From CDC National Center for Emerging and Zoonotic Infectious Diseases website www.cdc.gov/nczved/divisions/dfbmd/diseases/marine_toxins/; Woods Hole Oceanographic Institute Red Tide Impacts on Human Health website: www.whoi.edu/redtide/impacts/human-health

•**Recreational water disease outbreak facts:** Centers for Disease Control and Prevention. Surveillance for Waterborne Disease Outbreaks Associated with Drinking Water - United States, 2007-2008. MMWR 2011;60(12),1-37. www.cdc.gov/mmwr/pdf/ss/ss6012.pdf. From CDC Surveillance Summaries for Waterborne Disease and Outbreaks website www.cdc.gov/healthywater/statistics/wbdoss/surveillance.html

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