Healthy Waters 101:

Water Quality Monitoring for Public Health

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Healthy Waters Programs
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.
131.1 Scope.
131.2 Purpose.
131.3 Definitions.
131.4 State authority.
131.5 EPA authority.
131.6 Minimum requirements for water quality standards submission.
131.7 Dispute resolution mechanism.
131.8 Requirements for Indian Tribes to administer a water quality standards program.

Subpart B—Establishment of Water Quality Standards

131.10 Designation of uses.
131.11 Criteria.
131.12 Antidegradation policy.
131.13 General policies.
Public water supplies
Global drinking water and sanitation

The MDG drinking water target has been met

<table>
<thead>
<tr>
<th>Year</th>
<th>Improved Sources</th>
<th>Unimproved Sources</th>
<th>MDG Target</th>
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<tbody>
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<td>1990</td>
<td>76</td>
<td>24</td>
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<td>2005</td>
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<td>2010</td>
<td>89</td>
<td>11</td>
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<td>2015 (projected)</td>
<td>92</td>
<td>8</td>
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Global drinking water and sanitation

Ten per cent of the population in least developed countries rely on surface water

Open defecation is practised by nearly a quarter of the population in least developed countries

Global drinking water and sanitation

*Diarrhoea is the second most common cause of child deaths worldwide*

Proportional distribution of cause-specific deaths among children under five years of age, 2004

- **17%** Pneumonia
- **16%** Diarrhoea
- **13%** Other
- **7%** Malaria
- **4%** Measles
- **2%** AIDS
- **31%** Prematurity and low birth weight
- **25%** Neonatal infections (mostly sepsis / pneumonia)
- **23%** Birth asphyxia and birth trauma
- **9%** Other
- **7%** Congenital anomalies
- **3%** Neonatal tetanus
- **3%** Diarrhoeal diseases

Figure 2 shows that 17 per cent and 16 per cent of deaths among children under five are due to pneumonia and diarrhoea, respectively. But these figures do not include deaths during the neonatal period (the first four weeks of life). Diarrhoea causes 1 per cent of neonatal deaths (or an additional 1 per cent of total under-five deaths), while 25 per cent of neonatal deaths are due to severe infections (of which one third are caused by pneumonia, adding another 3 per cent to under-five deaths). Therefore, pneumonia and diarrhoea actually cause about 20 per cent and 17 per cent, respectively, of total under-five deaths when estimates from the post-neonatal and neonatal periods are combined.

Note: Neonatal causes do not add up to 100 per cent due to rounding. Globally, more than one third of deaths among children under five are attributable to undernutrition.

Public water supplies

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Public water supplies – treatment benefits

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

Drinking water disease outbreaks

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

Drinking water disease outbreaks

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

CDC MMWR 2011;60(12),38-68.
Drinking water disease outbreaks

CDC MMWR 2011;60(12),38-68.
Drinking water disease outbreaks

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

Private water supplies

Salem Public Library Historic Photograph Collections,
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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%

Groundwater contaminants

• Most likely natural contaminants: As, Mn, Sr, B, F, Rn, Ra, U, gross α

• Most likely man-made contaminants: NO3, pesticides, VOCs
Groundwater contaminants

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

Groundwater contaminants

• Concentration in finished vs. raw: generally similar

• Wells most at risk: located in unconfined aquifers
Emerging contaminants

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

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

- High protein
- Low fat
- Omega-3
Fish and shellfish

• Hi protein
• Low fat
• Omega-3

• Mercury
• PCBs
• Ciguatera
Fish and shellfish

- Shellfish poisoning
- Vibrio infection
Agriculture
Recreation in and on the water
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

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

Recreational water disease outbreaks

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

Recreational water disease outbreaks

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

Who's who in public health

- American Public Health Association
- Council of State and Territorial Epidemiologists
- National Association of County & City Health Officials
- Coalition of Local Health Officials

U.S. Department of Health & Human Services

- HHS.gov
- CDC
- Oregon Health Authority
- Multnomah County Health Department

Leaders in Applied Public Health Epidemiology
Centers for Disease Control and Prevention
How to – program highlights

- PWI
- Fish
- Beach
- HABISS
- EPHT
Private well initiative (PWI)

- Describe private drinking water resources
- Tailor prevention activities
- National workgroup
Fish consumption advisory program

• Guidance for data collection, risk assessment, consumption surveys
• National listing of advisories
Beach monitoring & notification program

- Test and notify for bacteria
- Find and fix issues
Harmful algae bloom illness surveillance system (HABISS)

- Track blooms and illnesses
- Develop public health capacity
- National workgroup
- Federal funding to end
Environmental Public Health Tracking (EPHT)

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

Partners:
- Monitor waterbodies
- Take photos and samples
- Analyze for species/toxins
- Post and unpost advisory signs
- Consult with OPHD

Communicate water quality results

OPHD:
- Consult with partners
- Evaluate water quality results
- Issue and lift advisories
- Provide public health information
- Investigate illness reports

Communicate health risks

Stakeholders:
Potential exposure groups:
- Pets/pet owners
- Property owners
- Recreational users
- Water system customers

Interested groups:
- Advocacy groups
- Business owners
- Interested citizens

Legislators
Local governments
Medical providers
Regulatory agencies
Researchers
Veterinarians
Integrating water quality and public health

- Understand, protect, restore our waters
- Design monitoring program
- Collect field and lab data
- Compile and manage data
- Assess and interpret data
- Convey results and findings
- Develop monitoring objectives
- Communicate
- Coordinate
Healthy waters for healthy humans!

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• **Historical photographs:** Salem Public Library Historic Photograph Collections, Salem Public Library, Salem, Oregon. photos.salemhistory.net/cdm/


References
References

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