

DRINKING WATER, POLLUTION PREVENTION AND PUBLIC HEALTH: A Matrix for Disease Prevention and Environmental Protection

*"...Clean, safe water is the first line of defense for public health.
Safe, clean water keeps our communities healthy and thriving."*

Carol M. Browner, Administrator
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Introduction

In order to fulfill their mission of "assuring the conditions in which people can be healthy," local health officials must understand how environmental factors affect health, as well as strategies for protecting the public's health and the environment. **The purpose of this fact sheet is to clarify the relationship between pollution prevention, drinking water, and public health, and to promote steps local health officials can take to reduce health risks by helping to safeguard the nation's water supply.**

Concern about drinking water safety is widespread. An environmental health study of local health departments conducted by the National Association of County and City Health Officials found that contamination of groundwater, private wells, surface water, and public water are leading problems in communities nationwide. Moreover, the American public ranks water issues at the top of their environmental concerns, according to a poll commissioned by the Natural Resource Conservation Service, USDA (formerly Soil Conservation Service)¹. The challenge is to transform concern into action that ensures a safe and sufficient drinking water supply. Pollution prevention is one means to that end. **Pollution prevention (P2) is any practice that prevents or reduces pollution at the source.** It is a method for reducing both the quantity and toxicity of waste generated, thereby lessening the likelihood that such substances will reach the water supply and, ultimately, be consumed by humans. Thus, when we prevent pollution, we protect human health.

ALL ABOUT WATER

Ninety-seven percent (97%) of the earth's water is saltwater in oceans and seas. Only one percent is available for drinking water supplies. The water available for human consumption (fresh water) is divided into groundwater and surface water. **Groundwater** is water absorbed into the earth's crust and stored in underground **aquifers** (large areas of permeable rock, gravel or sand that are saturated with water). Only .5% of all water is groundwater, but it supplies much of the world with fresh drinking water. Approximately 93% of all the public water systems in the United States are served by groundwater, and groundwater sources account for nearly 96% of the small systems.² In all, more than 50% of the people in the United States, including nearly everyone who lives in rural areas, use groundwater for drinking and other household uses. Groundwater is also used in some way by about 75% of cities and by many factories. The largest use of groundwater is to irrigate crops. Groundwater resources are threatened by contamination sources such as leaking storage tanks, septic systems, hazardous waste sites, landfills, and the widespread use of chemicals.³ Available data indicate that 20-25 percent of groundwater sources are contaminated with viruses or bacteria.⁴ Water found on the surface of the earth is called **surface water**. About .02% of water is in the form of surface waters. Surface water is susceptible to contamination from animal waste, pesticides, industrial waste and other materials and can contain bacteria and other microorganisms.

Questions & Answers

How does water quality affect the public's health?

The safety of water has been a concern of public health officials since the recognition of drinking

water as a transmitter of bacteria and other microorganisms capable of causing disease and death. Later discoveries that other contaminants, such as toxic chemicals, could cause acute and chronic illnesses heightened this concern and, along with it, efforts to safeguard the nation's drinking water supply.

It is not known how many people become sick each year from contaminated water, since the majority of waterborne disease cases go unrecognized and unreported. Symptoms can range from diarrhea and dehydration from exposure to natural pathogens to reproductive disorders and chronic illnesses, such as cancer, from exposure to chemicals. Since 1971, the Centers for Disease Control and Prevention (CDC) and the U.S. Environmental Protection Agency (EPA) have maintained a collaborative surveillance system for collecting and reporting data related to occurrences and causes of waterborne-disease outbreaks (WBDOs). State, territorial, and local public health departments are primarily responsible for detecting and investigating WBDOs and voluntarily reporting them to CDC on a standard form. For the two-year period 1993-1994, 30 outbreaks associated with drinking water were reported, causing an estimated 405,366 persons to become ill. However, because not all WBDOs are recognized, investigated and/or reported to CDC or EPA, these data do not

reflect the true incidence of WBDs, which is probably significantly higher.⁵ Estimates of the number of annual waterborne microbial illnesses in the United States are 1-10 million cases.⁶

What are the sources of water contamination?

The four categories of possible contamination in the public drinking water supply are:⁷

- **natural (or microbial) pathogens** which occur in the source water or in the distribution system: bacteria (eg. *E. coli*), viruses (eg. Hepatitis A) and protozoa (eg. *Cryptosporidium*, *Giardia*);
- **organic, inorganic, and radioactive chemicals**, naturally occurring and man-made, which occur in the source water;
- **disinfectants and coagulants** used to treat the water to kill the pathogens or remove the chemicals; and
- **chemical byproducts** resulting from the reaction of the disinfectants with organic or other materials in the water.

Pollutants enter water from many sources. Some come through specific points, such as the discharges of factories, which can contain untreated waste. This type of pollution, called **point** source pollution, is easier to monitor and control. **Nonpoint** source pollution is contamination from non-specific sources and is harder to control. Examples include farm and lawn nutrients that move through the soil

into the ground water or enter local waters directly through runoff during heavy rains; uncontrolled stormwater runoff from construction sites; forestry operations; animal wastes; and pollutants released directly into the atmosphere.⁸

What are the main strategies for assuring a safe drinking water supply?

Pollution prevention is the preferred strategy. Once water is contaminated, clean-up may be technologically or economically impossible. A recent study by the National Research Council found it could cost as much as \$1 trillion over the next 30 years to clean up the estimated 300,000 to 400,000 contaminated ground water sites in the United States.⁹ Moreover, treatment carries with it other risks – the chemicals used to clean up the water. The cleaner the source water the less disinfectant needed and, thus, the less chemical contamination.

Pollution prevention, or “source reduction,” is any practice that prevents or reduces pollution at the source. By minimizing the use and production of pollutants, we can prevent those substances from entering the air, water, soil and food chain and reduce human exposure to them. Examples include product substitution and educating consumers and businesses about proper disposal of hazardous or toxic substances.

Milwaukee, WI

The largest ever documented waterborne disease outbreak in US history occurred in Milwaukee, WI in April 1993. Over 400,000 areas residents were sickened by the parasite, *Cryptosporidium*. The "silver lining" is that the outbreak led to many changes in water-related policies in Milwaukee and representatives from the local health department are still sharing "lesson's learned" with other public health officials. Key among them are: Existing water quality standards were inadequate even though they were within regulatory limits – communities need to set their own monitoring standards; public health agencies and water utilities must reform old partnerships; municipalities must invest in their infrastructure; and there cannot be complacency about source water. Although the health department may never know the exact cause of the outbreak, it was believed to be a confluence of events including agricultural runoff after heavy snow-melt and spring rains; sewage overflow due to the water volume in the metropolitan system; and possible aggravation by meat and hide processing practices along the rivers, which empty into the lake, upstream from the treatment plant. The local health department has taken steps to improve source water quality by moving the treatment plant intake farther from the river mouth, improving disinfection with the addition of ozone, and optimizing filtration.

What protections are in place to safeguard the nation's water supply?

Responsibility for the quality of the water supply is shared by many. Public water system owners are accountable for the quality and availability of drinking water from its source to the consumer. More than 13 million households drink from their own private wells, and they are responsible for protecting their water supply.

Several federal statutes include provisions for protection of groundwater, surface water and drinking water supplies. Chief among them is the Safe Drinking Water Act (SDWA), passed by Congress in 1974 and revised most recently in 1996, with amendments that include new guidelines for EPA to use in developing rules to protect public water supplies, public notification requirements and funds for upgrading local infrastructure.. States also set standards for contaminant levels and take additional steps to safeguard their water supplies.

Local level activities, such as land use laws, homeowner and business education programs, water conservation standards, operation of used oil or hazardous waste collection sites, community and business stewardship programs, groundwater protection policies, and public/private partnerships can greatly influence the quality of our nation's drinking water supply.

Anne Arundel County, MD:

Anne Arundel County, MD is participating in the U.S. Environmental Protection Agency's National Onsite Demonstration Project (NODP). The NODP, a four-year project, is assisting 6 communities in developing strategies to treat wastewater and ensure that it does not contaminate the drinking water supply. The chief environmental consideration in Anne Arundel County is controlling and preventing pollution of the Chesapeake Bay and its shoreline. This can be done by treating wastewater to reduce the amount of nitrogen, phosphorus, and pathogens in it. Through NODP, the Anne Arundel County Health Department has installed several alternative wastewater treatment systems in the community, including recirculating sand filters, a peat filter, a trickling filter designed for use with a septic tank, filtering pump basin and expanded filter. The health department is working with EPA to evaluate these systems. The health department has also developed a public education program targeting public health sanitarians and contractors from the region.

What is the role of local health departments in safeguarding our drinking water supply?

While many entities play important roles in drinking water protection, local health departments are uniquely positioned because they are responsible for protecting both the health of the community and the environment. They are also the first place the public turns for

information about water safety and health concerns. This sets health departments apart from other local agencies or organizations that focus on one or the other. Local health officials use their expertise in population-based health and their understanding of community environmental health issues to develop pollution prevention and other policies to protect human health.

How do the core public health functions relate to P2 and drinking water?

*The core public health functions – **assessment, policy development and assurance** – capture the range of activities local health departments can undertake around drinking water and public health.*

***ASSESSMENT:** Identifying local level water issues, community concerns, populations at-risk and available resources*

➤ *Identify the main contaminants in the water supply through a Contaminant Source Inventory or similar process.*

➤ *Determine the sources of identified water contaminants, such as businesses, industry, agriculture, government and consumers, so that steps can be taken to help them reduce their use of those contaminants that affect water quality.*

Thurston County, WA

This community relies on approximately 5,000 public and private wells for 100% of its drinking water. The "Groundwater Guardian Team" has been formed to serve as an advisory board on groundwater protection and includes citizens and representatives from business, agriculture, and government. Its regional program involves 3 cities and the county. Activities include data collection, education and regional wellhead policy development. Education is done through National Drinking Water Week and by incorporating the message about the importance of groundwater into all pollution prevention activities. The wellhead protection program focuses on developing uniform, regional policies so that businesses and consumers are not plagued by a patchwork of requirements. A local land use ordinance is in effect that establishes more stringent protection measures for facilities locating in sensitive groundwater areas. A comprehensive hazardous waste prevention program was begun in 1991 that offers a mix of education, technical assistance, waste collection and enforcement programs for local businesses and residents.

➤ *Identify groups in the community working on water issues (i.e. utility companies, water quality agencies, advocacy organizations, etc.) and explore ways to collaborate with them.*

➤ *Measure the community's perceptions, attitudes and needs to determine the best way to address*

water-related issues and the best avenues for conveying your message.

➤ *Identify practices within the health department (in both business offices and clinics) that threaten to pollute water so you can practice what you preach.*

➤ *Develop a water-related disease surveillance system to track the prevalence in your community.*

POLICY DEVELOPMENT:

Developing responsive and proactive programs, policies and outreach strategies to minimize health threats and support and promote safe drinking water.

➤ *Use information gained through the assessment process to determine how water issues can be incorporated into the local health department's environmental health agenda.*

➤ *Draft local ordinances or best management practices standards defining steps to prevent pollution.*

➤ *Work with policymakers to develop incentives for local businesses and government operations to become engaged in pollution prevention and water protection efforts.*

➤ *Develop campaigns and ongoing public information about steps consumers, business and government can take to reduce*

threats to the drinking water supply.

➤ *Incorporate pollution prevention into the land use and planning process, (i.e. protection of water supplies at the source using buffers or other protection).*

➤ *Set up a task force of stakeholders, including citizens, to study issues affecting wellhead protection areas.*

➤ *Develop programs to recognize and publicize the work of individuals or businesses involved in protecting groundwater above and beyond normal expectations.*

ASSURANCE: *Assuring that communities have services that protect their water supplies, such as pollution prevention strategies and resources, and that responsive strategies are in place for instances in which water quality is found to be unsatisfactory.*

➤ *Take steps to ensure that local health department staff are trained to respond to public inquiries about drinking water and health.*

➤ *Work with other entities involved in drinking water and pollution prevention activities, such as: soil and water conservationists, planning departments, extension services, waste disposal utilities or companies, recycling centers, real estate/financial institutions,*

Lincoln-Lancaster County, NE

In 1994, the Lincoln-Lancaster County Health Department published a Contaminant Source Inventory Report that identifies groundwater related concerns and problems in the community. Recommendations for ensuring a safe water supply were developed from that report and are being implemented with the help of a groundwater guardian team comprised of citizens, business, agriculture, education, and government representatives. They include the development of a "Groundwater and Environmental Pollution Self-Help Checklist" that farmers can use to evaluate their use of water. As an incentive, the health department will provide a free water inspection for all who complete the checklist; and the involvement of high school students in contaminant source inventories in an effort to educate them about the importance of a sound water supply. That checklist was so successful that the health department developed a similar one for acreage and rural home owners.

agriculture workers, public utilities, developers, consumers/advocates, local well drillers, state health departments, industry, large and small businesses, public health laboratories, local elected officials and advocacy groups.

➤ *Engage in ongoing outreach and education activities regarding safe drinking water, including campaigns targeted at communities that are disproportionately at-risk for unsafe drinking water.*

➤ *Use regulatory and non-regulatory strategies, such as permitting, zoning, advocacy and interagency collaboration to safeguard drinking water.*

RESOURCES FOR ADDITIONAL INFORMATION

League of Women Voters Education Fund
1730 M Street, NW, Washington, DC 20036
202/429-1965, www.lwv.org/~lwvus

National Association of Counties
440 First Street, NW,
Washington, DC 20001, 202/393-6226
www.naco.org

The Groundwater Foundation
P.O. Box 22558, Lincoln, NE 68502-0558
402/434-2740, www.groundwater.org

National Drinking Water Clearinghouse
West Virginia University, P.O. Box 6064,
Morgantown, WV 26506-6064,
800/624-8301, www.ndwc.wvu.edu

U.S. Environmental Protection Agency
Office of Groundwater and Drinking Water
401 M Street, SW, (4602), Washington, DC 20460,
202/260-7077, www.epa.gov/owow/ogwdr

U.S. Environmental Protection Agency
Pollution Prevention Information Clearinghouse
401 M Street, SW, Washington, DC 20460
202/260-1023

U.S. Geological Survey
Branch of Distribution
P.O. Box 25286, Denver, CO 80225
800/426-9000 (Water Information
Clearinghouse), <http://h20.usgs.gov>

Water Environment Federation
601 Wythe Street, Alexandria, VA 22314-1994
703/684-2492, www.wef.org

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Endnotes

¹ *The Aquifer: Journal of the Groundwater Foundation*. Vol. 10, No. 1. June 1995.

² *The Aquifer*. September 1995.

³ U.S. EPA. *Protecting Our Groundwater*. May 1995.

⁴ *The Aquifer*. September 1995.

⁵ Centers for Disease Control and Prevention. *Morbidity and Mortality Weekly Report*. Vol. 45, No. SS-1, April 12, 1996.

⁶ *The Aquifer: Journal of the Groundwater Foundation*. Vol. 10, No. 2. September 1995.

⁷ U.S. Environmental Protection Agency. *Technical and Economic Capacity of States and Public Water Systems to Implement Drinking Water Regulations: Report to Congress*. September 1993.

⁸ Water Environment Federation. "Nonpoint Source Pollution: You are the Key to the Cleanup." 1992.

⁹ *The Aquifer: Journal of the Groundwater Foundation*. Vol. 9, No. 3. December 1994.