



Always Drink Upstream of the Herd: Moving the Dial on Waterborne Disease Prevention with Limited Resources

CSTE

Nashville, TN June 6, 2014



**“Always drink upstream
from the herd.”**

**WILL ROGERS
1879-1935**



Waterborne Disease Prevention Objectives: Learn from Each Other to Maximize Progress with Limited Resources

- ❑ Challenges and opportunities**
- ❑ Available resources**
- ❑ Impact of partnerships in reaching long-term goals**
- ❑ Inform about waterborne disease prevention initiatives**
- ❑ How and why to report unreported outbreaks**
- ❑ Identify state/local needs for guidance documents/tools**
- ❑ Drive fed/state/local interaction and sharing to avoid “reinventing the wheel”**
- ❑ Inform future CDC work to optimize assistance level**

**WATERBORNE DISEASE AND
OUTBREAK SURVEILLANCE:
BACKGROUND AND FRAMING THE
ISSUES**

U.S. Drinking Water History

□ 1900

- Approximately 100 cases typhoid for every 100,000 Americans

□ 1908

- First filtration and disinfection of U.S. public water supply in NJ

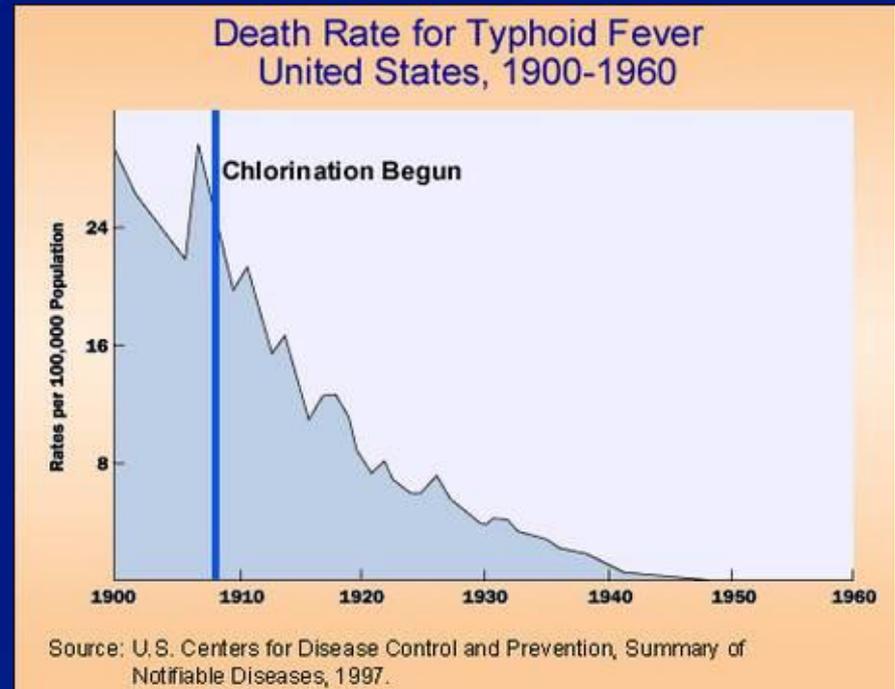
□ 1910-1920

- Thousands of U.S. cities begin disinfecting drinking water

□ 2006

- Approximately 0.1 cases of typhoid for every 100,000 Americans (mostly travel-related)

□ One of the greatest public health achievements of the 20th Century



EPA. The History of Drinking Water Treatment: 2000.; CDC. Achievements in Public Health, 1900-1999: Safer and Healthier Foods. MMWR 1999; 48(40): 905.; CDC. Summary of Notifiable Diseases—United States, 2006. MMWR 2008; 55(53): 17

No More Waterborne Disease Issues in the U.S., Right?



Moving from an Under-Developed to a Developed World Paradigm of Waterborne Disease

Tainted Well: Illinois demands answers Water



Legionnaires' bug found in hospital cooling tower

47 Contract *Salmonella* From Drinking



Dallas Spends Summer Fighting Crypto and Crypto is Winning



Boil Water Advisory Issued for Nearly 2 million in Massachusetts

Pharmaceuticals Found in Source Water



Routes of Transmission

Ingestion



Contact
(dermal, ear,
eye, wound,
urinary tract)

Inhalation

Nasal

Waterborne Pathogens and Chemicals Affect Many Systems

Neurologic infections
Echovirus, Naegleria fowleri

Eye infections & irritation
Acanthamoeba keratitis, Adenoviruses

Ear infections
Pseudomonas

Respiratory infections & irritation
Legionella, non-tuberculus mycobacteria, chemicals

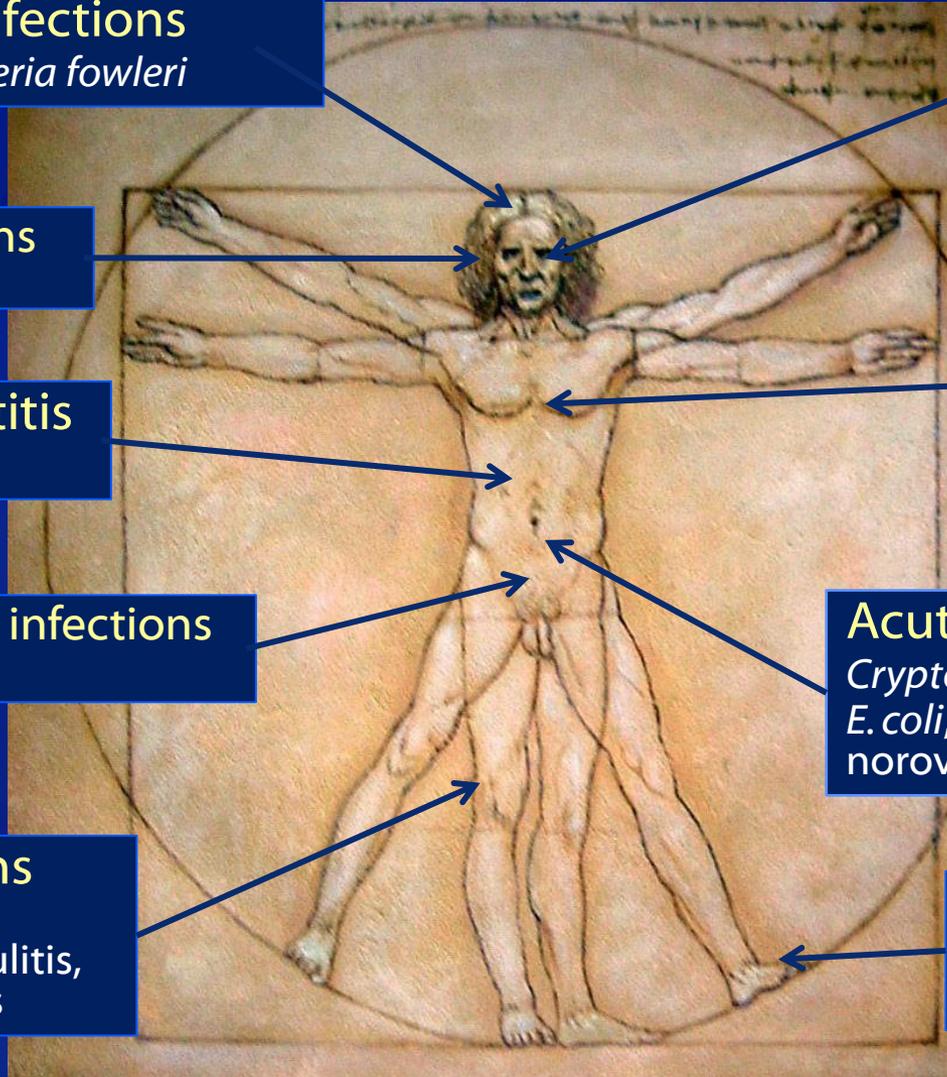
Hepatitis
HAV

Acute gastroenteritis
Cryptosporidium, toxigenic E. coli, Giardia, Shigella, norovirus, chemicals

Urinary tract infections
Pseudomonas

Skin infections
Pseudomonas dermatitis/folliculitis, fungal infections

Wound infections
Vibrio, Aeromonas, Pseudomonas



Developed World Waterborne Disease Stressors

- ❑ Industrialization and urbanization
- ❑ Increased wastewater treatment needs
- ❑ Impact of deregulation, under-regulation
- ❑ Infrastructure maintenance
- ❑ Millions of miles of pipes for biofilm growth
- ❑ Expanded water uses; medical, industrial
- ❑ Increased leisure time, recreational use
- ❑ Increased consumption/importation of fruit, vegetables using water
- ❑ Intensive farming and animal husbandry
- ❑ Loss of historical “disease memory”
- ❑ Climate change



The Developed World Paradigm for Waterborne Disease

- ❑ Increased human/animal waste and chemical contamination of water supplies
- ❑ Regulatory needs increase, support decreases
- ❑ Crumbling infrastructure, water main breaks
- ❑ Premise plumbing colonization, microbiome
- ❑ Increased swimming, pathogen transmission
- ❑ Increased water-related food contamination
- ❑ Rising temperatures expand ranges and growth of pathogens
- ❑ Severe weather events increase water supply contamination
- ❑ Reduction in use of basic hygiene practices



Surveillance Issues



- ❑ **Limited support for waterborne disease prevention**
 - **It no longer exists, not an issue**
 - **Perception that is not a large burden or severe disease**
- ❑ **Lack of public health burden data**
 - **If you don't document, no one thinks it is a problem**
 - **Limited to drinking water**
- ❑ **Fragmentation of waterborne disease into groups**
 - **Drinking, recreational, premise plumbing, etc.**
- ❑ **Many WB pathogens have multiple routes of transmission making association with water difficult**
 - **Food, Person-to-Person, Animal-to-Person**

Surveillance Issues



- ❑ Water is not a groups first thought for many of the pathogens (i.e., most think food)
- ❑ Epi can be complex (city-wide, multiple routes of transmission)
- ❑ Environmental health and water sampling not always included in investigation
 - Water testing can require large volumes, complex protocols, and is costly
- ❑ Water may be route cause but may be part of larger process and difficult to document
 - E.g., agricultural water and food process water quality issues
- ❑ Why is counting /documentation so important?

Surveillance Issues



- ❑ **Data gaps or needs?**
- ❑ **Unreported outbreaks?**
- ❑ **Adding healthcare-related outbreaks to waterborne surveillance**
- ❑ **Data collection and reporting needs?**
- ❑ **What needs to be created, developed?**

**COMMUNICATION, HEALTH
PROMOTION, PARTNERSHIP
BUILDING**

Communication and Health Promotion



- ❑ **Outbreak investigation, surveillance, data collection are foundational steps in public health**
 - **But not sufficient without translation into prevention activities and communication**
- ❑ **Identify and quantify problem**
- ❑ **Translate science and develop messages**
- ❑ **Identify audiences**
- ❑ **Optimize messages for specific audiences**
- ❑ **Combine with other groups to reduce resource use**
 - **Can customize for local situation**

Outbreaks of Acute Gastrointestinal Illness Associated with Recreational Water, United States, 1978–2010*



* n=393; Hlavsa MC *et al.* 2014. MMWR 63(1):6–10.

Increased Leisure Time and Recreational Water Use

- ❑ Swimming, water parks, hot tubs/spas
- ❑ Communal bathing
- ❑ Chlorine-tolerant pathogens
- ❑ Poor hygiene



No. 1 swimming pool problem? It's number two!

Maggie Fox, Senior Writer, NBC News

May 16, 2013 at 12:07 PM ET



Mario Tama / Getty Images /



Healthy Swimming Materials

Posters

POOL CHEMICAL SAFETY: STORAGE
PROTECT PEOPLE AND SWIMMERS FROM THE THOUSANDS OF PREVENTABLE INJURIES THAT OCCUR EACH YEAR

BEFORE YOU STORE POOL CHEMICALS

- Get trained in
- Ask for help if
- Read entire ps
- Learn your pos (for example, i

STORIN

- Follow product
- Dress for sa (goggles, ga
- Separate in
- Lock chemi
- Keep chemi chlorine po
- Keep chemi
- Keep chemi
- Store liquid chemicali o

DISPOS

- Follow product
- Contact loc chemicali i

Always expose full Reque

Pool Address: Emergency # Local Health: For more information, visit www.cdc.gov/healthyswimming

Diarrhea and Swimming
DON'T MIX
If you have diarrhea, stay out of the water. Don't share your germs with other swimmers.



Videos



Social media library

Apps

Healthy swimming information on the go!

Download the app for iPad and iPhone

Infographics

MAKE A HEALTHY SPLASH!

Swallowing water in interactive fountains, splash pads, and spray parks might make you sick.

Germs can get into the water through pools coming out or washing off our bodies. Swallowing water containing germs can make you sick with diarrhea.

Water in interactive fountains is typically recycled and might contain germs. Water treatments like chlorine don't kill germs instantly. Pee in water weakens the germ-killing power of chlorine.

Keep pee and poop OUT of the water.

DO:

- Stay out of the water if you have diarrhea.
- Take bathroom breaks every 60 minutes.
- Check diapers every 30-60 minutes and change/diapers away from the water.

DON'T:

- DON'T drink the water.**
- DON'T sit on the water jets.**

SPLASH HEALTHY!
www.cdc.gov/healthyswimming

Think Healthy. Be Healthy. Swim Healthy!

Remember, you share the pool water with everyone. If someone with diarrhea contaminates the water, swallowing that water can make you sick.

It's not drinking water.

So, you think chlorine kills germs. Yes, it does. But it doesn't work right away. It takes time to kill germs.

Without your help, even the best-maintained pools can spread illness.

Three Steps for Water Safety

PLEASE keep an eye on your child at all times. Remember, kids can drown in seconds and in silence.

PLEASE use appropriately fitted life jackets* instead of inflatable or foam toys (such as "water-wings" or "noodles"), which are not designed to keep children safe.

PLEASE use sunscreen with at least SPF 15 and both UPF and UPB protection, and be sure to reapply it often while swimming. Just a few serious sunburns can increase the risk of getting skin cancer.

FOR MORE INFORMATION VISIT www.cdc.gov/healthyswimming

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention

Healthy Swimming

Protect Yourself and Your Family Against Recreational Water Illnesses

Brochures

CLEAN IT UP, SWIMMERS

Pools are great for perfecting your backstroke or relaxing on your favorite float. But they can also spread diarrhea and other illnesses.

Germs don't jump into the water like we do. They surf in on people's bodies.

But what about chlorine?

Healthy pools don't have a strong chemical smell!

Pool chemicals kill most germs within minutes, but some live for days.

Chemicals also break down pee, poop, sweat, dirt, and other gunk from swimmers' bodies. But this uses up the chemicals, leaving less available to kill germs.

Swell that "chlorine"? It's actually chemicals that form when chlorine mixes with gunk. These chemicals—not chlorine—make your eyes red and sting, your nose run, and make you cough.

What's in your cannonball?

Microbes are tiny living organisms. Some microbes are germs that can make you sick!

Here are the microbes and gunk the average swimmer can bring into the pool:

- Hair:** 10 million microbes
- Sweat:** 8 million microbes in a single drop
- Hands:** 5 million microbes
- Poop:** 140 billion microbes
- Nose, mouth, skin:** Billions of microbes
- Skin products:** Lotions, cosmetics, soaps
- Sweat:** 1 or 2 soda cans
- Pee:** 1 cup

A hot dog weighs 30 grams of protein—the weight of 4 germs—yet 10 billion microbes.

Stories





Recreational Water Illness and Injury Prevention Week 2014



- ❑ **2000, official observance in 2005**
- ❑ **Focused on the power of free media to disseminate messages**
 - MMWR, homepage feature, promotional materials, video contests
- ❑ **2005: state/local toolkit, partnership effort**
 - **Community outreach ideas, resource list, sample press release, op-ed, proclamation**
- ❑ **What is needed over next 10 years?**
- ❑ **What direction should this effort go?**



Recreational Water
Illness and Injury Prevention
Week 2014

Contact Lens Hygiene

- ❑ ***Acanthamoeba* keratitis**
 - Multiple national outbreaks over past 10 years that are contact lens-related
 - 33 million users
 - Solution and hygiene-related, not pathogen specific

- ❑ **Transition to messages about lens hygiene and microbial keratitis vs. pathogens**



Dear contact lens wearer,

YOU ONLY HAVE ONE PAIR OF EYES SO TAKE CARE OF THEM!

When it comes to wearing contacts, healthy habits mean healthy eyes. Follow these tips to help prevent eye infections.

YOUR HABITS



Wash and dry your hands before touching your contacts.

Don't sleep in your contacts (unless your eye doctor tells you it's OK).

Avoid wearing contacts while showering, swimming, or using a hot tub.

YOUR GEAR



Contacts

Rub and rinse your contacts with solution each time you clean them. Never use water or spit!

Never store your contacts in water.

Replace your contacts as often as your eye doctor says.

Case

Rub and rinse your case every day with solution, dry with a clean tissue, and store upside down with the caps off.

Get a new case at least every three months.

Solution

Only use fresh, disinfecting solution in your case—don't mix new with old.

Use only the solution your eye doctor tells you to use.

YOUR EYE DOCTOR



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Visit your eye doctor once a year—or more often if needed.

Ask questions about how to care for your lenses and case.

Take out your contacts and call your eye doctor if you have eye pain, red eyes, or blurred vision.

ALWAYS BE PREPARED!

Carry a pair of glasses in case you need to take out your contacts.

www.cdc.gov/contactlenses



Healthy Contact Lens Effort

- ❑ Tap Water is NOT Sterile
- ❑ Observance in November
- ❑ Collecting first burden data for microbial keratitis
- ❑ Developing health promotion materials

The screenshot shows the CDC website page for 'Healthy Contact Lens Wear and Care'. At the top, the CDC logo and name are visible, along with a search bar and a 'CDC A-Z INDEX' dropdown. The main heading is 'Healthy Contact Lens Wear and Care'. Below this, there are social media sharing options for 'Recommend', 'Tweet', and 'Share'. A line graph shows two data series, one in red and one in blue, with the red series showing a sharp increase towards 50. To the right of the graph is a 'Podcast: How to Wear and Care for Your Contact Lenses' with a 'Learn More' link. Below the graph is a section for 'PUBLICATIONS, DATA, & STATISTICS' and a 'Contact Lenses Resources' section. At the bottom, there is a large image of a person's eye with a contact lens being held over it, and a caption: 'When cared for properly, contact lenses can provide a comfortable and convenient way to work, play, and live for the 30 million plus people in the U.S. who wear them. While contact lenses are usually a safe and effective form of vision correction, they are not'.

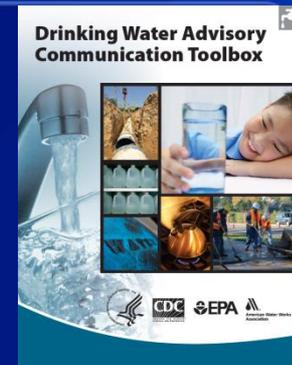
What Can We Learn?

- ❑ Are these efforts useful for partners?
- ❑ Are materials or toolkits useful?
- ❑ How do we evaluate them?
- ❑ What are critical needs for development?
 - Role of syndication
- ❑ How can we share learning lessons, materials?
 - Role of webinars, conference calls, meetings
- ❑ How can we best tie state materials together so all can learn and share?
 - Clearinghouse(s)



**IMPACTING PUBLIC HEALTH
THROUGH POLICY AND
PREVENTION, AND INTERVENTION
TOOLS**

Providing Emergency Water System Guidance to Protect Public Health

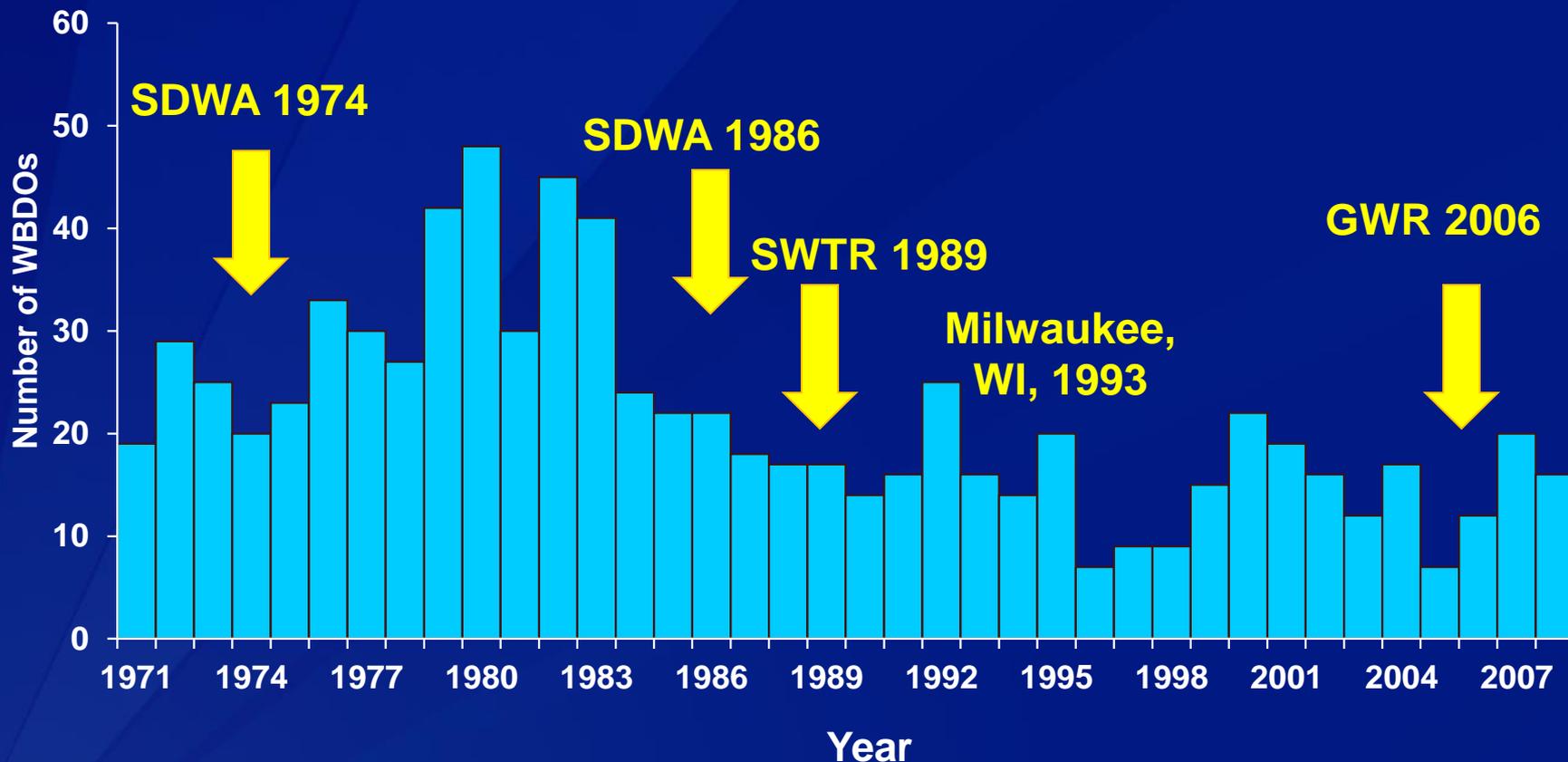


- ❑ **Clear EPA guidance on initiating a water advisory**
 - **No guidance on how to communicate with partners and the public about advisories**
 - **Local utilities re-inventing the process each time**
- ❑ **Worked with AWWA, EPA, and partners on:**
 - **Drinking Water Advisory Communication Toolbox**
 - **156 pages, guidance, templates, fact sheets, resources**
 - **Emergency Water Supply Planning Guide for Hospitals and Health Care Facilities**

www.cdc.gov/healthywater/emergency/drinkingwateradvisory.html

Watson, Miller , AWWA et al.

Number of Waterborne-Disease Outbreaks Associated with Drinking Water, United States, 1971–2008



Brunkard *et al.*, MMWR (2011) 60(SS-12):38-68.; N=818

Healthy and Safe Swimming for Everyone

- ❑ One of top sports in the US – >300 million visits a year
- ❑ Demonstrated health impact
- ❑ Documented increases in disease transmission
- ❑ Continuing issues with drowning and injuries



For more information, see http://www.cdc.gov/healthywater/swimming/health_benefits_water_exercise.html:

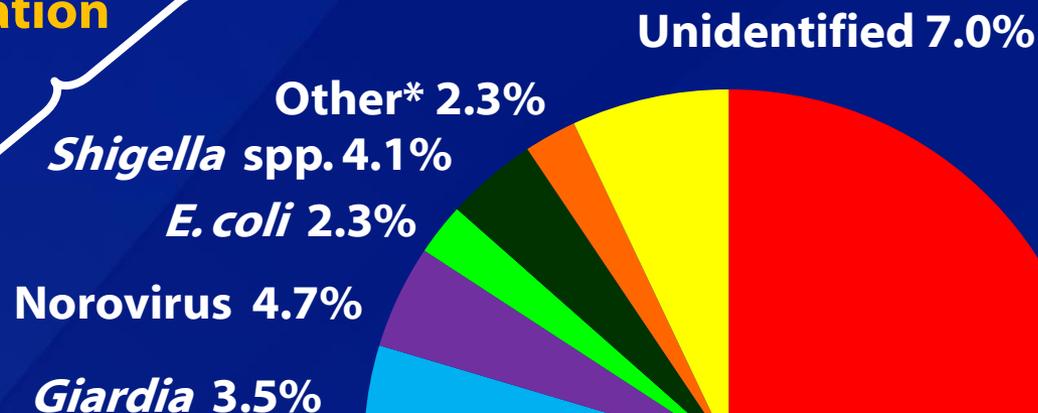
Outbreaks of Acute Gastrointestinal Illness Associated with Recreational Water, United States, 1978–2010*



* n=393; Hlavsa MC *et al.* 2014. MMWR 63(1):6–10.

Outbreaks of Acute Gastrointestinal Illness Associated with Treated Recreational Water, United States, 2001–2010*

Chlorine sensitive:
Poor pool operation
& maintenance



Extremely
chlorine
tolerant

* n=172; Other includes *Salmonella*, *Campylobacter*, *Plesiomonas*, and multiple pathogens; Hlavsa MC *et al.* 2014. MMWR 63(1):6–10.

Inadequate Pool Operation and Maintenance is NOT Uncommon



- ❑ Pool inspection data from 4 state and 11 local pool inspection programs
- ❑ Inspected >120,000 pools
- ❑ Conducted January 1–December 31, 2008
- ❑ 12.1% of routine inspections resulted in immediate closure of the pool pending correction of violation

Healthy and Safe Swimming for Everyone

- ❑ Education ongoing
- ❑ How can we have impact on engineering and enforcement issues?
- ❑ CSTE position statement led to national workshop
 - #1 recommendation to create a national model code to assist states/locals, avoid reinventing the wheel



For more information, see http://www.cdc.gov/healthywater/swimming/health_benefits_water_exercise.html:



Model Aquatic Health Code (MAHC): Vision and Mission

- ❑ **Healthy and safe aquatic experiences for everyone**
- ❑ **Provide user-friendly guidance to state and local officials to assist in transforming health department pool programs into data-driven, knowledge-based, risk reduction efforts to prevent disease and injuries and promote healthy recreational water experiences**



MAHC Genesis



- ❑ **May 2007: Organize Steering Committee**
 - **Develop organizational plan and structure**
 - **Program outline/guidance, Strawman blueprint**
 - **Develop 2 modules as guidance examples**
- ❑ **Fall 2008: Organize Technical Committees**
 - **Appoint Chairs, recruit membership**
- ❑ **Spring 2009: Initial Technical Committees start work using modular approach**

MAHC Development: Process and Timeline

1. Recirculation Systems and Filtration
2. Monitoring and Testing
3. Contamination Burden
4. Hygiene Facilities
5. Fecal/Vomit/Blood Contamination Response
6. Operator Training
7. Public Use Guidelines
8. Facility Design and Construction
9. Lifeguarding and Bather Supervision
10. Disinfection and Water Quality
11. Regulatory Program Administration
12. Facility Maintenance and Operation
13. Risk Management/Safety
14. Ventilation and Air Quality

**14
Modules**

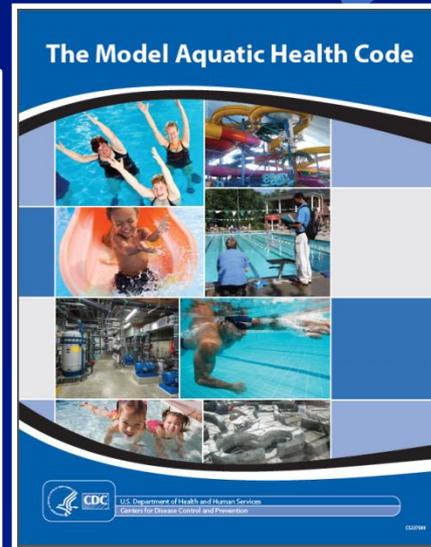
**Develop modules;
Post for 1st round of
public comment**

Completed

1. Recirculation Systems and Filtration
2. Monitoring and Testing
3. Contamination Burden
4. Hygiene Facilities
5. Fecal/Vomit/Blood Contamination Response
6. Operator Training
7. Public Use Guidelines
8. Facility Design and Construction
9. Lifeguarding and Bather Supervision
10. Disinfection and Water Quality
11. Regulatory Program Administration
12. Facility Maintenance and Operation
13. Risk Management/Safety
14. Ventilation and Air Quality

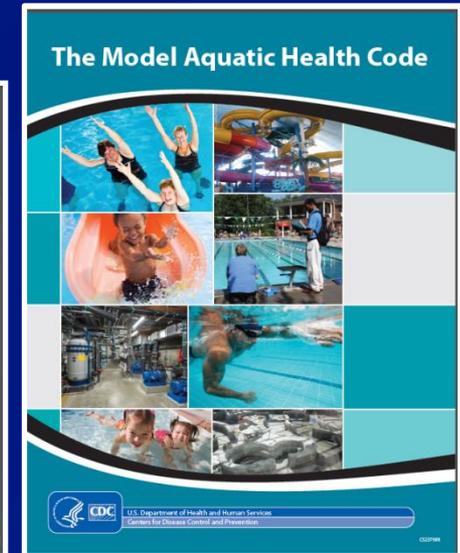
**Revise-repost all
modules.
2979 comments: 64%
accepted, 20%
denied, 16%
neutral/clarification**

Completed



**Merge all modules;
Post "Knitted"
Version for 2nd
(final) round of
public comment**

Completed



**Revise and post
MAHC 1st Edition**

Summer 2014

Short Term Outcomes: Guidelines Adopted (continued)

- ❑ Secondary disinfection for increased risk aquatic venues
- ❑ Improved filtration systems for increased risk venues (for example, kiddie pools)
- ❑ Improved ventilation (indoor pools)
- ❑ Improved chemical storage/handling
- ❑ Pool fencing
- ❑ Lifeguard staffing & equipment
- ❑ Comprehensive water quality & testing parameters



Intermediate Outcomes: System Improvements

- ❑ Fewer pool/facility closures
- ❑ Better inspection and surveillance data
- ❑ Development of a research agenda to fill gaps
- ❑ Enhanced collaboration among stakeholders



Long-Term Public Health Outcomes

- ❑ Fewer outbreaks of recreational water illnesses resulting from exposure to contaminated swimming water
- ❑ Fewer drowning incidents in aquatic venues
- ❑ Fewer injuries from pool chemicals/disinfection by-products
- ❑ Fewer emergency room visits due to swimming-related issues



Issues

- ❑ **Are these efforts worth the resources?**
- ❑ **Do partners use the materials?**
- ❑ **How do we keep it all up to date with latest science and technology?**
- ❑ **How do we spread the word so it can help reduce workloads and “reinventing the wheel”?**
- ❑ **What other projects are needed?**
- ❑ **How do we form partnerships to develop them?**

Questions?

More Information: Healthy Water Website

www.cdc.gov/healthywater;
healthywater@cdc.gov

"The findings and conclusions in this presentation have not been formally disseminated by CDC and should not be construed to represent any agency determination or policy."

The screenshot shows the CDC Healthy Water website interface. At the top, it features the CDC logo and the text 'Centers for Disease Control and Prevention, CDC 24/7: Saving Lives. Protecting People.™'. Below this is a search bar and a navigation menu with an 'A-Z Index' and letters A through Z. The main content area is titled 'Healthy Water' and includes several sections:

- For Specific Groups:** A photo of a man and a woman looking at a document, with a list of target audiences including Public Health & Medical Professionals, Aquatics, Water Utilities, and Other Water-related Industries.
- Swim Healthy, Swim Safely:** A banner image of a smiling child underwater, with text about Rec. Water Illness and Injury Prevention Week.
- A-Z Index of Water-related Topics:** A list of letters A through Z for navigating to specific topics.
- Publications, Data, & Statistics:** A section with a line graph showing data trends and a link to 'Publications, Data, & Statistics'.
- Healthy Water Topics:** A grid of links to various topics such as Drinking Water, Healthy Swimming / Recreational Water, Global Water, Sanitation, & Hygiene (WASH), Other Uses of Water, Water-related Emergencies & Outbreaks, and Water-related Hygiene.
- Top 5 Causes of Drinking and Recreational Water Outbreaks:** A list of pathogens including Giardia intestinalis, Shigella, Norovirus, Hepatitis A, and Copper.
- Top 5 Causes - Recreational Water Outbreaks:** A list of pathogens including Pseudomonas, Cryptosporidium, Shigella, Legionella, and Norovirus/Calicivirus.

 On the right side, there are utility links for 'Email page link', 'Print page', and 'Get email updates'. At the bottom of the page, there is a 'Trusted' logo.

