

RECREATIONAL WATER ILLNESS: WHAT EVERY CLINICIAN NEEDS TO KNOW

**Clinician Outreach and
Communication Activity (COCA)
Conference Call
June 28, 2011**



Objectives

At the conclusion of this session, the participant will be able to accomplish the following:

- ❑ Describe the basic epidemiology of recreational water–associated disease outbreaks**
- ❑ List common disease syndromes and the pathogens that cause outbreaks associated with recreational water**
- ❑ Discuss updated recommendations designed to minimize the risk of acute otitis externa and other recreational water illnesses (RWIs)**

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TODAY'S PRESENTER



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Recreational Water Illness: What Every Clinician Needs to Know

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**Waterborne Disease Prevention Branch
Centers for Disease Control and Prevention**

COCA Conference Call

Atlanta, GA

June 28, 2010

Outline

Information for clinicians

- **Why CDC is focusing on recreational water illnesses (RWIs)?**
- **Recreational water–associated outbreaks**
 - **Cryptosporidiosis**

Problem: Swimming is an all-American sport, fun, and a great physical activity, but like other activities can lead to illness and injury



Solution: Work together to minimize risk of illness and injury

Recreational Water Illness (RWI)

- **Caused by**
 - **Pathogens transmitted by ingesting, inhaling aerosols of, or having contact with contaminated water in pools, spas/hot tubs, interactive fountains, lakes, rivers, or oceans**

Definitions

- **Treated recreational water venues**
 - Include but not limited to pools, spas/hot tubs, and interactive fountains
- **Untreated recreational water venues**
 - Include but not limited to lakes, rivers, and oceans

Definitions

- **RWI Outbreaks**
 - **≥ 2 persons linked by time, exposure to recreational water, and characteristics of illness**
 - **Source of illness: Water**

RWIs: Range of Illness Associated with Using Recreational Water

- **Diarrheal illness**
- **Skin infections**
- **Ear infections**
- **Eye infections and irritation**
- **Respiratory infections and irritation**
- **Neurologic infections**
- **Urinary tract infections?**

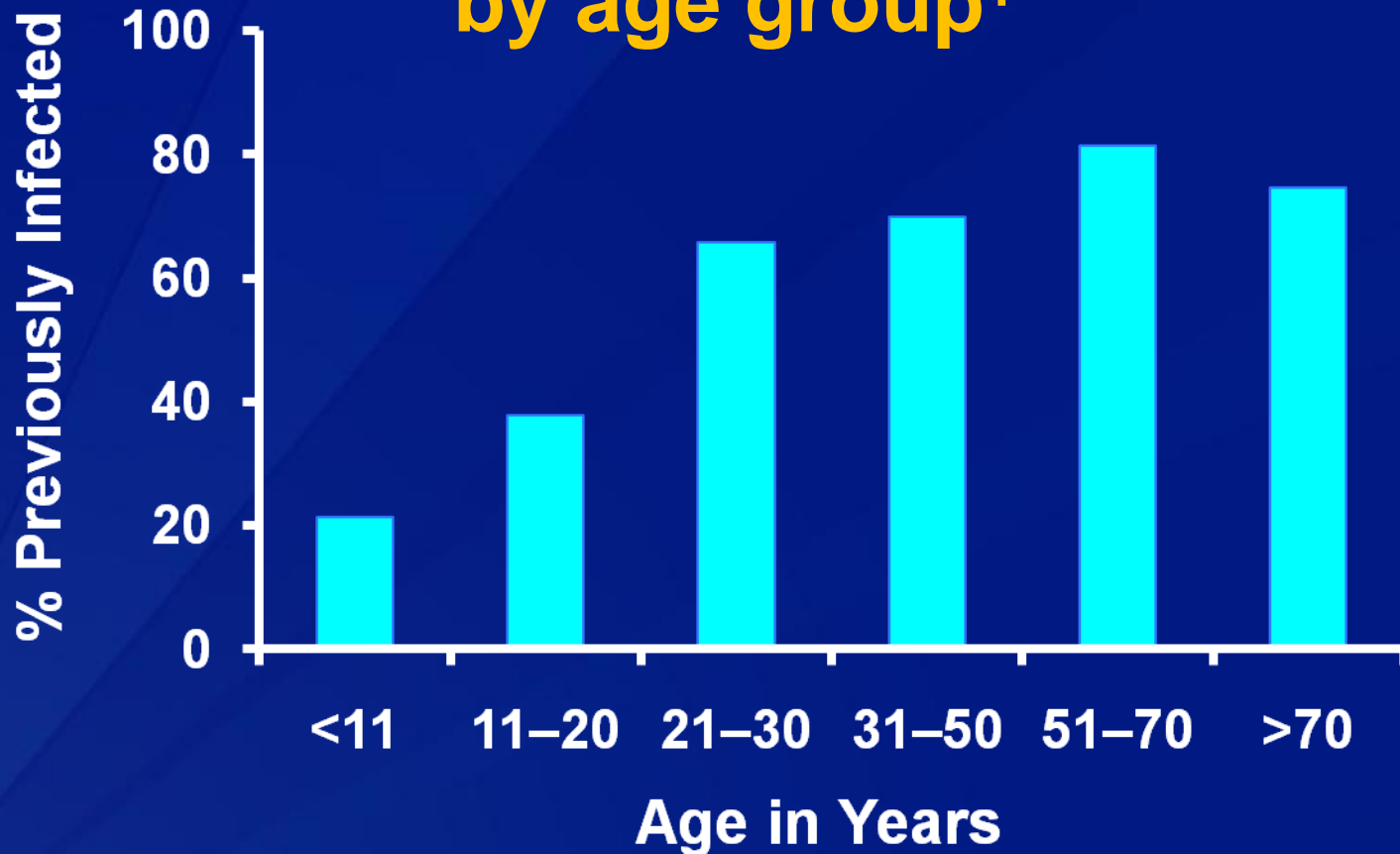


Factors Contributing to Transmission of Pathogens in Treated Swimming Venues



- Water-loving pathogens commonly cause infection and can cause diarrhea
- Diarrheal illness common
- Exposure to recreational water common
- Swimming = communal bathing
- Fecal contamination of recreational water common
- Inadequate pool operation and maintenance not uncommon
- Ingesting recreational water common

Percentage Previously Infected with *Cryptosporidium* in the United States, by age group¹



1. Frost FJ *et al.* 2004. *Ann Epidemiol* 14(7):473-8.

Diarrheal Illness is Common



- 5% of general public had diarrhea in past month¹
 - 0.6 episodes of diarrhea/person/year¹
- 0.1–3.5 cases of diarrhea/person/year (higher for young children)²

1. Jones TF *et al.* 2007. *Epidemiol Infect* 135(2):293–301.

2. Roy SL *et al.* 2006. *J Water Health* 4(Suppl 2):31–69.

Exposure to Recreational Water is Common: Americans Swim...a Lot



- Swimming is the 2rd most popular exercise activity in the United States¹
 - >380 million swimming visits each year¹
 - Underestimate
 - ≥ 7 years of age
 - Swim ≥ 6 times in last year

1. US Bureau of the Census. 2011 Statistical Abstract of the United States. Recreation and Leisure Activities: Participation in Selected Sports Activities 2008. Available at www.census.gov/compendia/statab/2011/tables/11s1248.pdf.

Swimming is Communal Bathing

- **Swimming = Sharing the water and contaminants in it**
- **Actions of pool operator and swimmers affect others**

You wouldn't drink the water you **bathe** in.



Why would you drink the water you **swim** in?

www.cdc.gov/healthyswimming



Fecal Contamination of Recreational Water is Common



- Heavy use by diapered and toddler-aged children
- >2% fecal incontinence (FI)¹
 - 70% with FI <65 years old
- Fecal incidents common
 - 293 formed stools in 47 pools, etc.²
- ~0.14g of feces on peri-anal surface/person
 - Range: 0.01g (adults)–10g (children)³

1. Nelson R *et al.* 1995. JAMA 274(7):559–61.

2. CDC. 2001. MMWR 50(20):410–2.

3. Gerba CP. 2000. Quant Microbiol 2(1):55–68



Inadequate Pool Operation and Maintenance is NOT Uncommon

- Pool inspection data from 4 state and 11 local pool inspection programs
 - Inspected >120,000 pools¹
 - Conducted January 1–December 31, 2008
- 12.1% of routine inspections resulted in immediate closure pending correction of violation

1. CDC. 2010. MMWR 59(19):582–7.

Ingesting Recreational Water is Common: Water Ingested While Swimming, by Age Group¹

Group	Average Amount of Water Ingested (mL)*	Range (mL)
Adults	16 (0.5 fluid ounces)	0–53
Non-adults	37 (1.3 fluid ounces)	0–154

* Swimmers stayed in pool and actively swam for ≥ 45 minutes.

1. Dufour AP *et al.* 2006. J Water Hlth 4(4):425–30.

Outbreaks: What's in the Water?



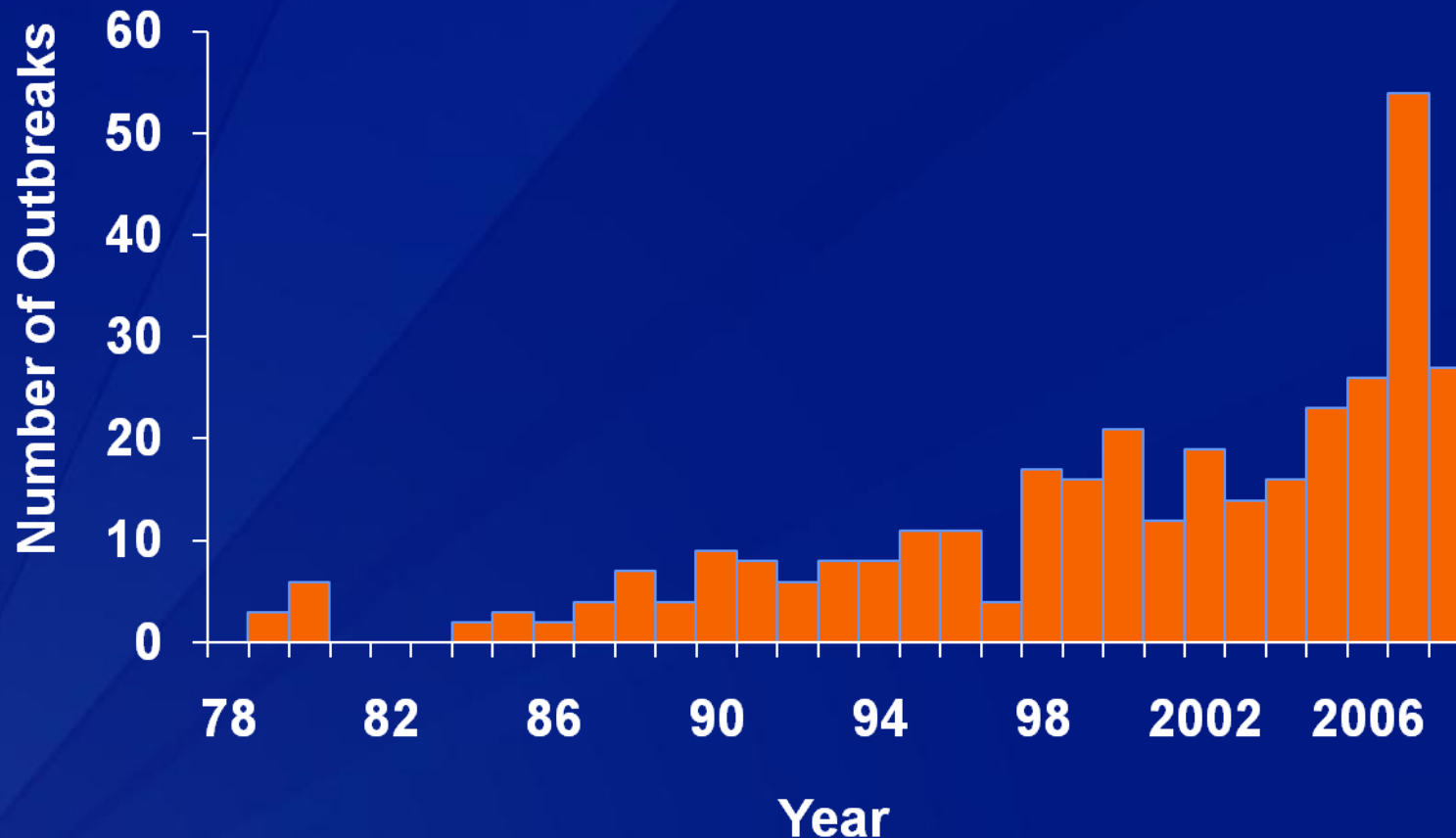
San Alfonso del Mar in Chile
Length: 3,323 ft long
Depth: 115 ft (deep end)
Volume: 66 million gallons

Outbreaks of Recreational Water Illness (RWI) — United States, 1978–2008*



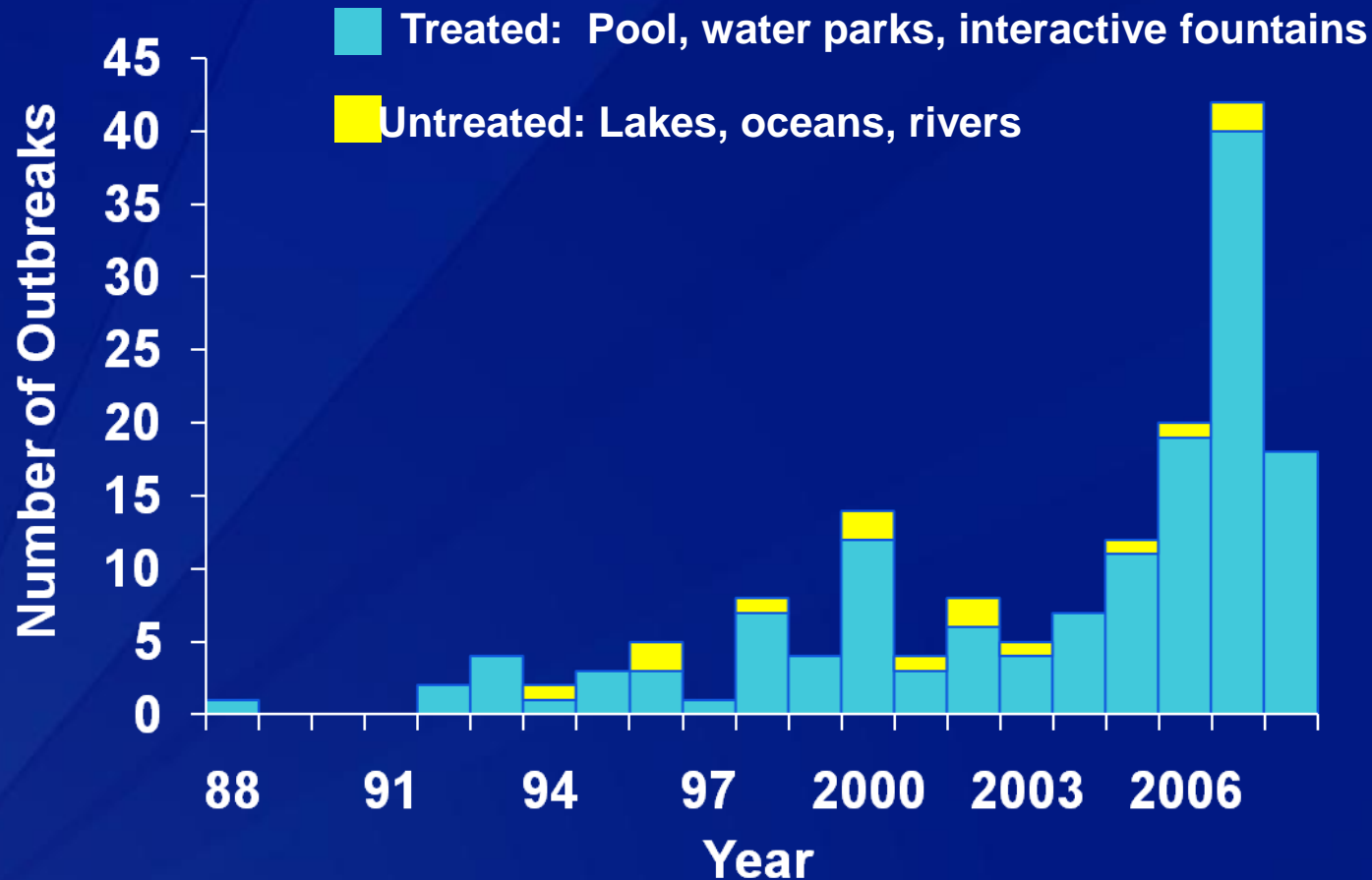
* N=696, includes preliminary 2007 and 2008 data (as of 6/28/2011), Yoder JS *et al.* 2008. MMWR 57(SS-9):1–38.

Recreational Water–associated Outbreaks of Gastroenteritis — United States 1978–2008*



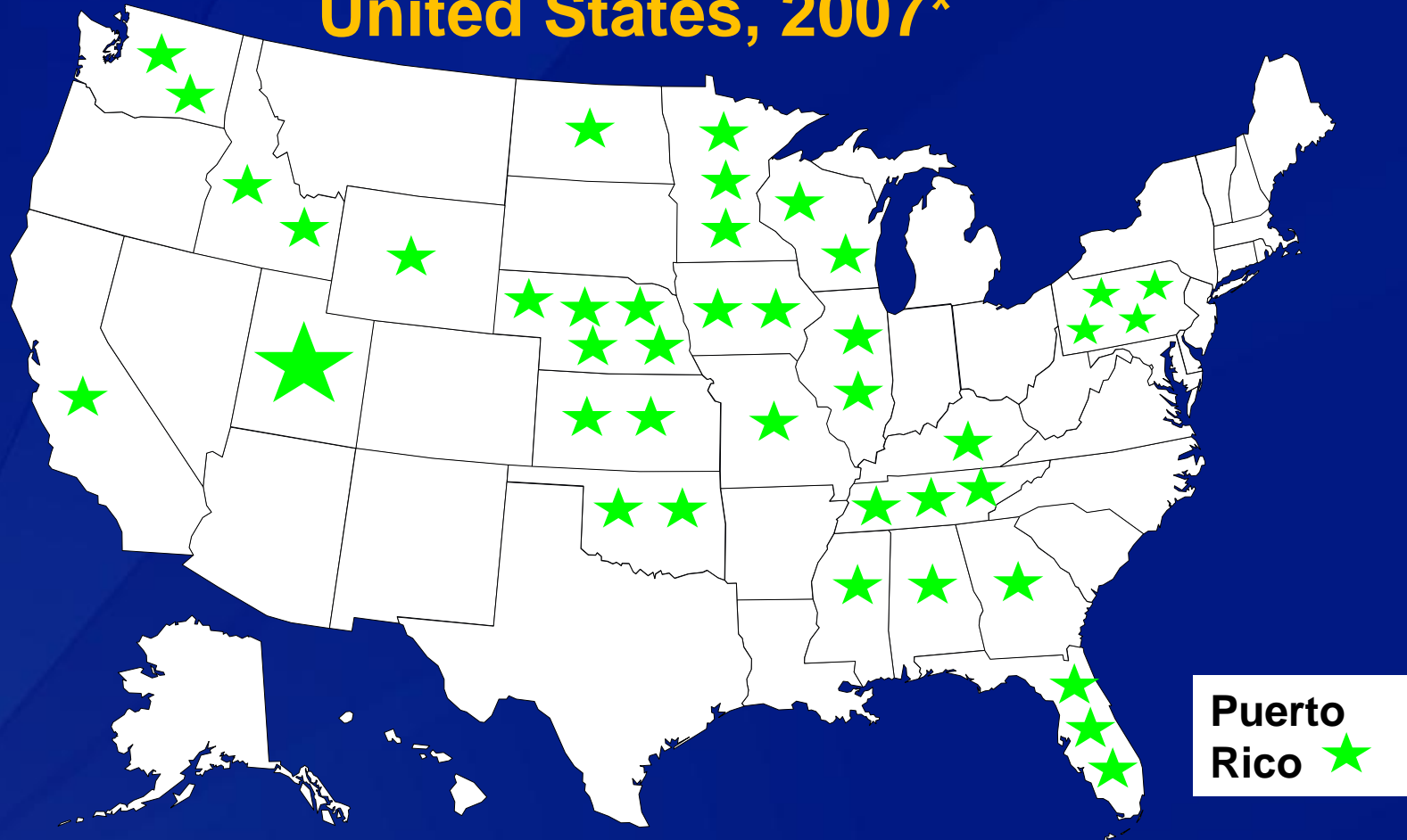
* N=341, includes preliminary 2007 and 2008 data (as of 6/28/2011), Yoder JS *et al.* 2008. *MMWR* 57(SS-9):1–38.

Recreational Water Illness Outbreaks of Cryptosporidiosis, by Water Treatment United States, 1988–2008*



* N=160, includes preliminary 2007 and 2008 data (as of 10/04/2010), Yoder JS *et al.* 2008. MMWR 57(SS-9):1–38.

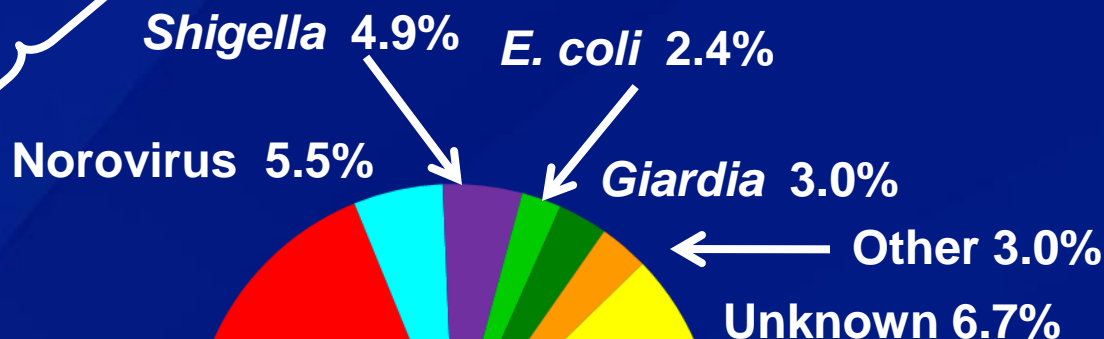
Reported Cryptosporidiosis Outbreaks Associated with Treated Recreational Water United States, 2007*



* N=42, based on preliminary 2007 reports (as of 10/29/2010)

Treated Recreational Water–Associated Outbreaks of Gastroenteritis United States, 1999–2008*

Chlorine sensitive:
Poor pool operation
& maintenance



Other includes
Campylobacter, *Salmonella*,
Plesiomonas, and multiple
pathogens

Cryptosporidium
("Crypto")
74.4%

Chlorine
resistant

* N=164, includes preliminary 2007 and 2008 data (as of 06/28/2011), Yoder JS *et al.* 2008. MMWR 57(SS-9):1–38.

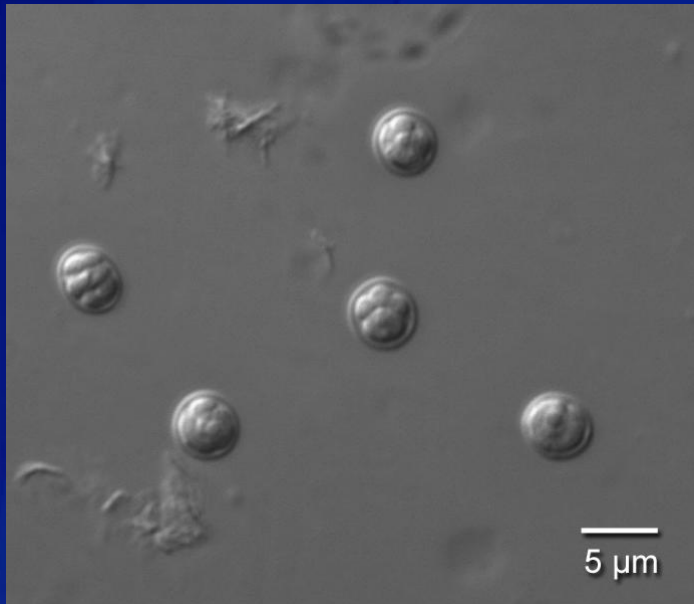
Crypto Versus Chlorine*

Etiologic Agent	Disinfection Times in Chlorinated Water*
<i>E. coli</i> O157:H7	<1 minute
Hepatitis A	16 minutes
Giardia	45 minutes
Crypto	15,300 minutes or >10.6 days

* 1 mg/L (parts per million [ppm]) free chlorine at pH 7.5 and 25°C (77°F) in the absence of chlorine stabilizers (e.g., cyanuric acid). Disinfection times would be expected to be longer in the presence of a chlorine stabilizer.

* www.cdc.gov/healthySwimming/chlorine_timetable.htm

Crypto Versus Traditional Filters



Crypto¹: 4.5 x 5.5 μm

Filter Media ²	Filtration
Sand	25–100 μm
Cartridge	10–25 μm
Diatomaceous Earth	2–6 μm

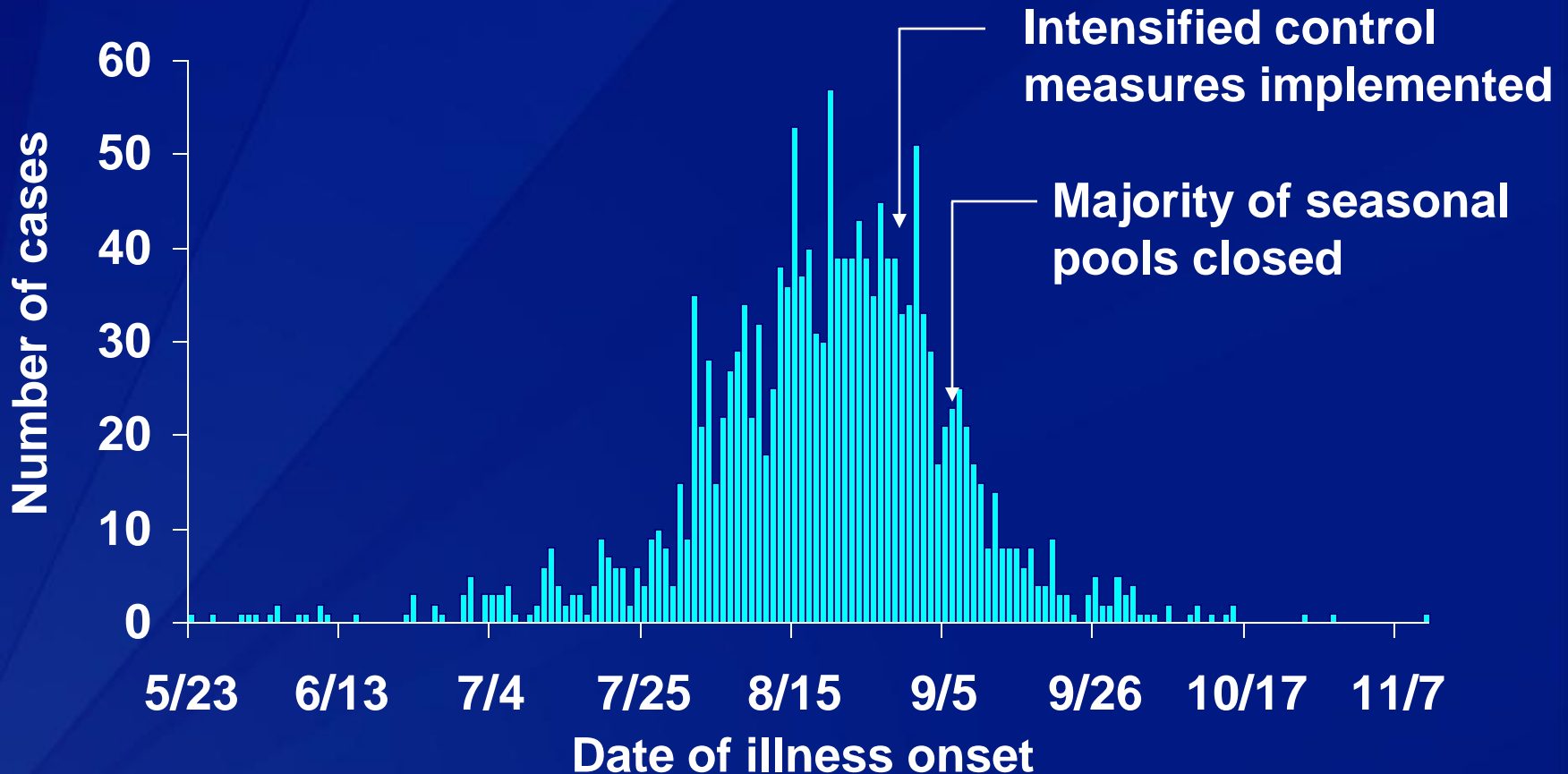
1. Photo credit: Michael Arrowood (CDC/DFWED); Source: Smith H. Diagnostics. In: Fayer R, Xiao L, eds. *Cryptosporidium* and cryptosporidiosis. 2nd ed. Boca Raton, Florida: CRC Press, 2008:173–207.
2. NSF. 2009 Pool & Spa Operator Handbook: Pool & Spa Filtration, 137–50.

Statewide Cryptosporidiosis Outbreak Utah, 2007¹

- **Context**
 - Increased reporting of cases
- **Magnitude: Statewide**
 - Multiple counties and cities
 - >1,900 laboratory–confirmed cases
 - >450 recreational water venues potentially contaminated
 - Highest case rate among children <5 years of age
 - Clinicians overwhelmed
- **Response**
 - Alerted public, pool operators, etc.
 - Banned children <5 years of age from public pools

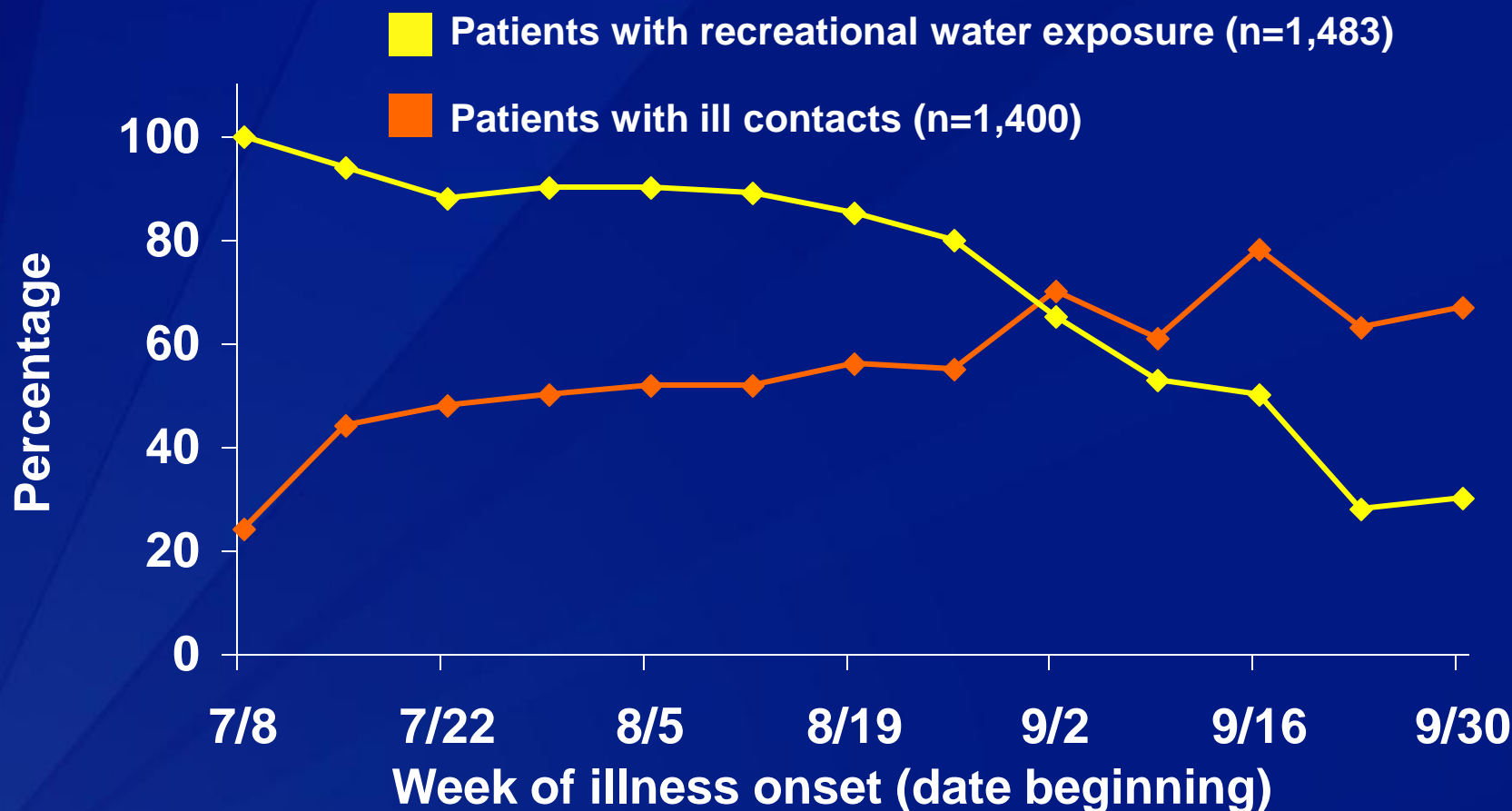
1. CDC. 2008. MMWR 57(36):989–93.

Laboratory-Confirmed Cryptosporidiosis Cases, by Date of Illness Onset Utah, May 23–November 11, 2007^{1,*}



Source: Calanan RM and Rolfs, RT. Utah Department of Health
1. CDC. 2008. MMWR 57(36):989–93. *(n=1,601)

Percentage of Patients Who Reported Ill Contacts or Recreational Water Exposure, by Illness Onset Utah, July 8–October 6, 2007^{1,*}



Source: Calanan RM and Rolfs, RT. Utah Department of Health
1. CDC. 2008. MMWR 57(36):989–93. *(n=1,601)

Banning <5 Year Olds from Public Pools

- Control measure for only extreme situations
- Inability to evaluate efficacy
- Enforceability?
 - Notification of all pool operators
 - Parents sometimes uncooperative
 - Revenue lost by pool managers/operators
 - Opposition from the public
- Feasibility long term?
- Possible negative public health consequences



Cryptosporidiosis Outbreak New Mexico, 2008



- **Context**
 - Competitive swimmer practiced and competed while ill with diarrhea
 - State championships: 370 athletes
 - City championships: 270 athletes
- **Magnitude**
 - 92 people ill
 - 25 pools, 1 waterpark potentially contaminated
- **Findings**
 - >30% reported swimming while ill with diarrhea

Source: Hlavsa MC, Balaji A, Beach MJ. CDC; Nichols M, Selvage D. NMDOH

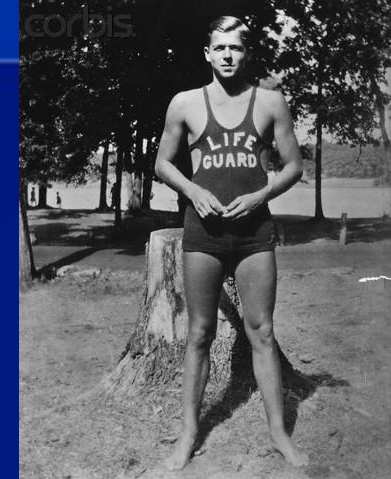
Swimming While Ill with Diarrhea New Mexico, 2008



- **57% (17/29) responded to web-based survey**
- **60% (9/15) reported chlorine instantly kills germs**
- **25% (4/16) reported unsure if OK to swim if have diarrhea**

Source: Hlavsa MC, Balaji A, Beach MJ. CDC; Nichols M, Selvage D. NMDOH

Swimming While Ill with Diarrhea New Mexico, 2008



- **Common Themes**
 - Lifeguarding responsibilities required entering water
 - Competitive swimming
 - Symptom free while swimming
 - Social event or vacation

Source: Hlavsa MC, Balaji A, Beach MJ. CDC; Nichols M, Selvage D. NMDOH

Outbreaks in the United States: Working Premise

- Most potential outbreaks prevented by good pool operation and maintenance
- Reported outbreaks fall into 2 categories
 - Short-lived
 - Short chlorine inactivation, swimmer ignorance
 - Prolonged
 - Poor maintenance, swimmer ignorance
 - Chlorine resistance (*Cryptosporidium*)

Health Communications Research

- What are swimmers thinking?



CDC Parent Focus Groups Summary



- Don't consider swimming in pool as communal bathing/shared water
- No clue about potential for disease transmission
 - “chlorine kills everything”, “pool water is sterile”
- Willing to contemplate changing behavior
- Want education to enable informed decision making

2004 USA National Consumer League Poll



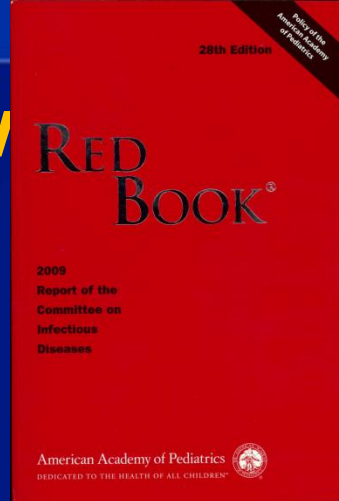
- 14% believe pool water is sterile
- 40% believe they are “somewhat” or “very” likely to get ill from swimming in a pool
- 82% believe you should never swim when ill with diarrhea
 - What are the other 18% thinking???

What Every Clinician Needs to Know

- Ova and parasite testing might not include testing for *Cryptosporidium*
 - Need name-request testing
- Nitazoxanide can be used to treat cryptosporidiosis in immunocompetent ≥ 1 years of age
 - www.cdc.gov/parasites/crypto/treatment.html
 - Treatment of immunocompromised:
Patenburg B. *et al.* Expert Rev Anti Infect Ther 2009; 7:385
- Waterborne disease outbreaks and cryptosporidiosis case reportable in 50 states, New York City, and the District of Columbia

What Every Swimmer Needs to Know

- People with diarrhea should avoid recreational water activities
 - After cessation of diarrhea
 - *Cryptosporidium*: 2 additional weeks
 - Other waterborne disease pathogens: 1 additional week
- Avoid ingestion of recreational water
- Practice good swimming hygiene
 - Shower with soap and water before entering water
 - Take bathroom breaks/check diapers often
 - Wash hands after using toilet/changing diapers





**Required Disclaimer from the
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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.

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OWCD/OSELS/PMR

- Mei Castor

New Mexico DOH

Utah DOH

Quote of the Day

Having a no-poop section in a pool is like having a no-smoking section in restaurant.

Epidemiology of Acute Otitis Externa

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Diseases**



Outline

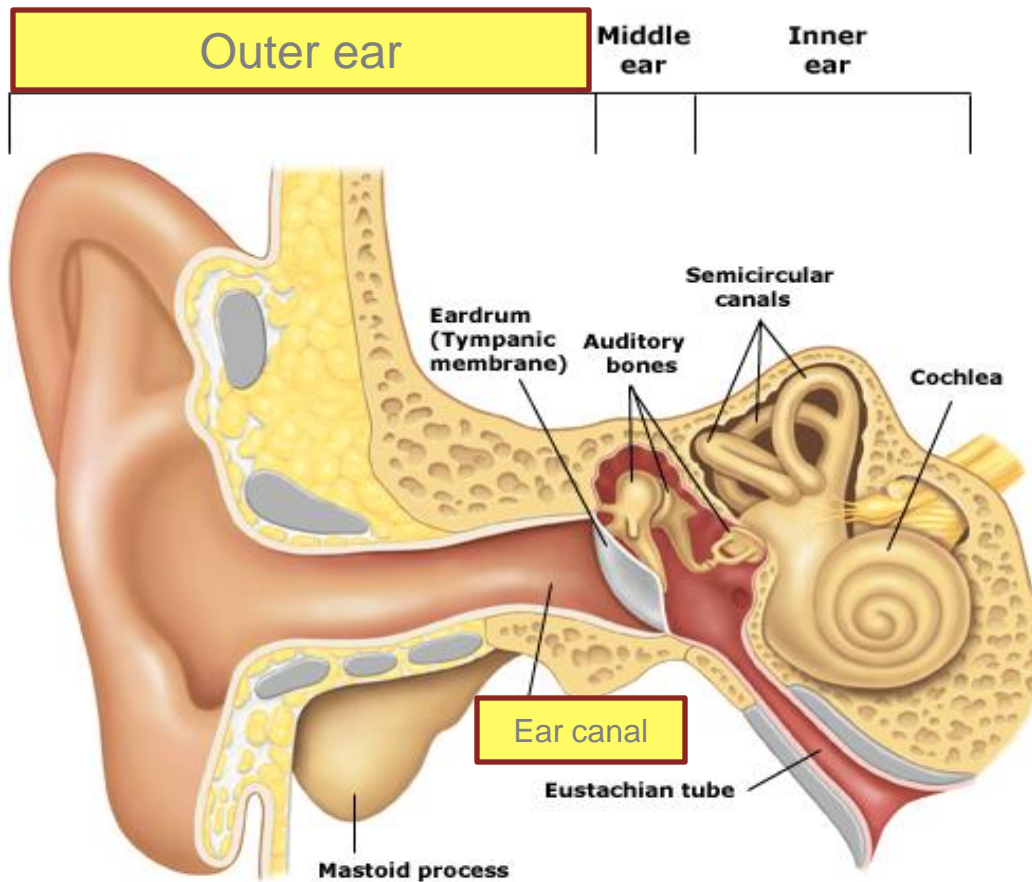
- **Background**
- **Epidemiology**
- **Prevention messages**
- **Resources**

Acute Otitis Externa (AOE)



- Also known as “Swimmer’s Ear”
- Inflammation of the outer auditory canal
- Usually caused by bacteria
 - *Pseudomonas aeruginosa*
 - *Staphylococcus* species
- Pain, pruritis, redness, edema, +/- exudate

Normal Ear Anatomy



This figure shows the normal structures of the outer, middle, and inner ear.

Risk Factors for AOE

- **Water exposure**
 - Longer duration
 - Frequent head submersion
- **High ambient temperature/ humidity**
- **Minor trauma**
- **Loss of protective cerumen**



Epidemiology of AOE

Epidemiology of AOE: Methods

- **Preliminary estimates of high AOE burden, but literature sparse**
- **AOE not reportable, no AOE surveillance system**
- **Large ambulatory and ED databases available (NAMCS, HCUP NEDS, Marketscan)**
- **Used conservative AOE definition: AOE without concurrent otitis media diagnosis**

Annual U.S. Burden of AOE



- **2007: 2.4 million U.S. visits for AOE**
 - 8.1 visits/1,000 population
- **Cost :**
 - Approx. \$0.5 billion annually
 - Approx. 600,000 hours of clinician time

<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6019a2.htm>

Demographics of AOE

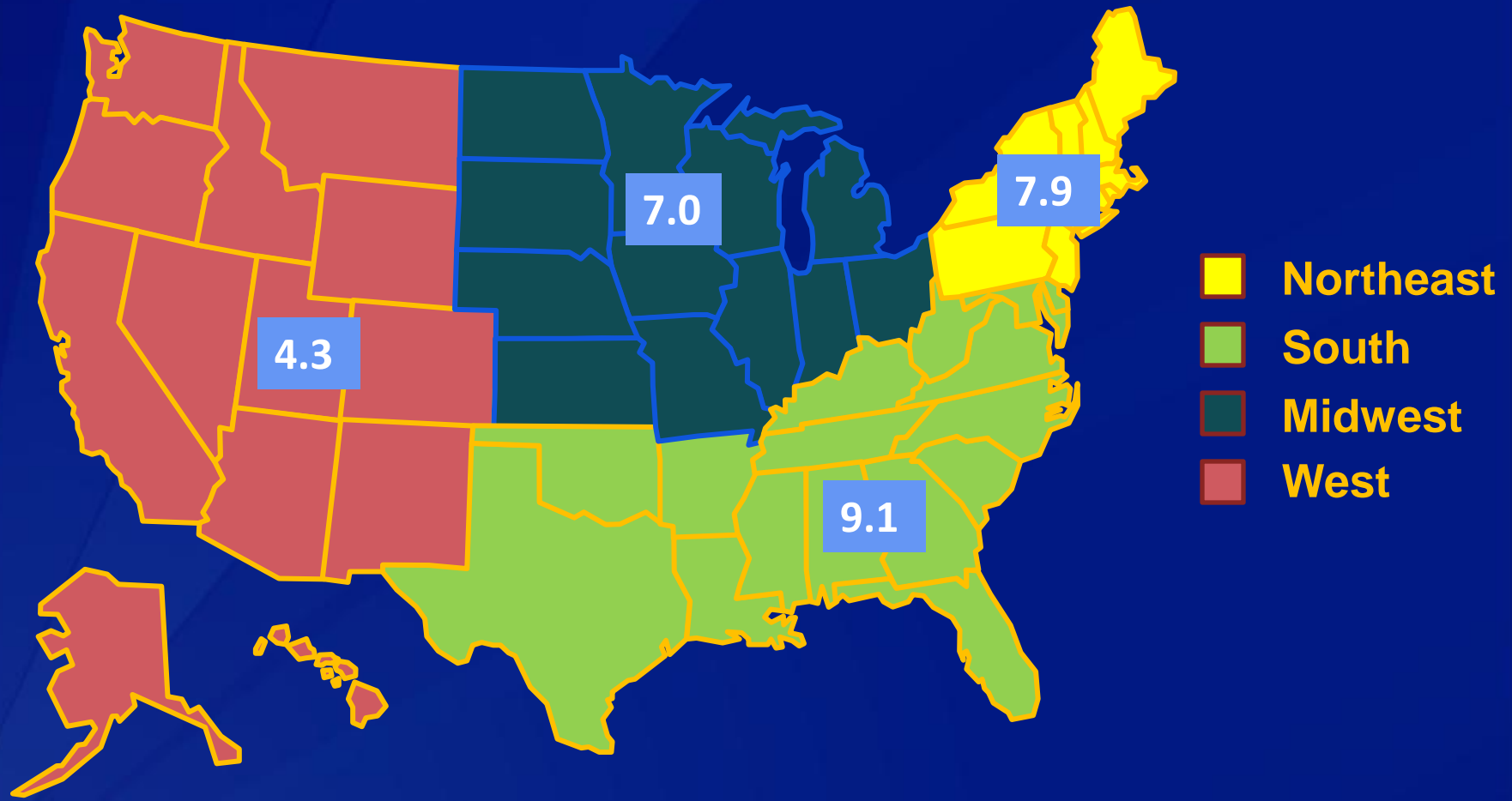
- **Highest incidence:**
 - children aged 5–14 years
 - summer months
 - Southeastern states (9.1/1,000)
- **Over half among adults aged ≥ 20 years**

Estimated number of ambulatory care visits for acute otitis externa per 1,000 population, by month — U.S., 2003–2007



*Small sample number might result in unreliable weighted estimates for January and December

Estimated number of ambulatory care visits for acute otitis externa per 1,000 population per year, by region — U.S., 2003–2007



95% Confidence intervals for regional rates: South, 7.0–11.1/1,000; Northeast, 6.1–9.8; Midwest, 4.8–9.3; West, 3.5–5.1

AOE Treatment and Prevention

Treatment of AOE: AAO Clinical practice guidelines

- **Systemic antimicrobials: no advantage for uncomplicated AOE**
 - **Complicating factors:**
 - Cellulitis, necrotizing OE
 - Non-intact tympanic membrane
 - Diabetes, immunosuppression

Rosenfeld RM, Brown L, Cannon CR, et al. Clinical practice guideline: acute otitis externa. *Otolaryngol Head Neck Surg.* 2006;134:S4-S23.

Treatment of AOE: AAO Clinical practice guidelines

- **Topical treatment highly effective**
 - Topical antimicrobials +/- corticosteroid superior to placebo
 - Comparable cure rates: topical antimicrobials alone vs. topical combination drops
 - Most patients have resolution of symptoms w/in 6 days
 - Consider switching if no improvement w/in 48-72 hours
 - Patients should avoid head submersion for 7-10 days

Rosenfeld RM, Brown L, Cannon CR, et al. Clinical practice guideline: acute otitis externa. *Otolaryngol Head Neck Surg.* 2006;134:S4-S23.

Treatment of AOE: AAO Clinical practice guidelines

- **Assess pain**
 - **Recommend analgesic treatment based on severity**

Rosenfeld RM, Brown L, Cannon CR, et al. Clinical practice guideline: acute otitis externa. *Otolaryngol Head Neck Surg.* 2006;134:S4-S23.

AOE Prevention

AOE Prevention

- Limiting water contact with ear canal
- Maintain barrier of healthy skin



Swimmer's Ear Prevention Messages: DO's

- **DO keep ears as dry as possible.**
 - Use a bathing cap, ear plugs, or custom-fitted swim molds when swimming to keep water out of ears.
- **DO dry ears thoroughly after swimming or showering.**
 - Use a towel to dry ears well.
 - Tilt head to hold each ear facing down to allow water to escape the ear canal.
 - Pull earlobe in different directions while the ear is faced down to water drain out.
 - If water remains in ear, consider using a hair dryer to move air through the ear canal.

Swimmer's Ear Prevention Messages: DONT's

- **DON'T put objects in the ear canal (including cotton-tip swabs, pencils, paperclips, or fingers).**
- **DON'T try to remove ear wax. Ear wax helps protect your ear canal from infection.**
 - If you think that the ear canal is blocked by ear wax, consult your healthcare provider rather than trying to remove it yourself.

Swimmer's Ear Prevention Messages: Advice

- **CONSULT** your healthcare provider about using commercial, alcohol-based ear drops or a 1:1 mixture of rubbing alcohol and white vinegar after swimming.
 - **Exceptions:**
 - Typanostomy tubes
 - Tympanic membrane perforation
 - Acute external ear infection

Resources

- www.cdc.gov/healthyswimming
- MMWR article: [Estimated burden of acute otitis externa—United States, 2003–2007.](http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6019a2.htm)
<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6019a2.htm>
- AAO-HNS Bulletin article: **CDC dives into swimmer's ear prevention.** June 2011.

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

A young child is sliding down a bright orange water slide. The child is shirtless, wearing dark shorts, and is smiling broadly with eyes closed, enjoying the ride. Water is splashing around the child's legs as they exit the slide. The background is a clear blue sky. The text "Thank you!" is overlaid in a large, bold, black font across the center of the image.

Thank you!



Centers for Disease Control and Prevention Atlanta, Georgia

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Recreational Water Illness: What Every Clinician Needs to Know

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Date: Tuesday, June 28, 2011

Time: 3:00 - 4:00 pm (Eastern Time)

Participate by Phone: (888)-673-9802

Passcode: 1281914

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Presenter(s):



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