# Recreational Water Illness: What Every Clinician Needs to Know Webinar Hosted by the Centers for Disease Control and Prevention

**Moderator:** Loretta Jackson-Brown

**Presenters: Michele Hlavsa, MPH, RN, and Sarah Collier, MPH**

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### Operator

Welcome, and thank you for standing by. At this time, all participants are in a listen only mode. After the presentation, we will conduct a question and answer session, at that time, if you would like to ask a question, the command to do so will be star and then one on your touchtone phone. This conference is being recorded. If you have any objections, you may disconnect at this time. And now I'd like to introduce your host for today's call, Ms. Loretta Jackson-Brown. Ma'am, you may begin. (00:00:50)

### Loretta Jackson-Brown

Thank you, Evan. Good afternoon, I am Loretta Jackson-Brown, and I am representing the Clinician Outreach and Communication Activity (COCA) with the Emergency Risk Communication branch at the Centers for Disease Control and Prevention. I am delighted to welcome you to today's COCA webinar: Recreational Water Illness: What Every Clinician needs to know. We are pleased to have with us today Michelle Hlavsa and Sarah Collier here to review updated recommendations related to appropriate interventions to minimize the risk of recreational water illnesses, RWIs. You may participate in today's presentation by audio only, via webinar, or you may download the slides if you are unable to access the webinar. The PowerPoint slide set and the webinar link can be found on our COCA Web page at emergency.cdc.gov/COCA. Click on COCA calls. The webinar link and slide set can be found under the call in number and call passcode. Here to provide an introduction to navigating today's webinar is Ms. Callie Campbell. (00:02:01)

### Callie Campbell

Hi, welcome to the "Recreational Water Illness: What Every Clinician Needs to Know" webinar hosted by the Centers for Disease Control and Prevention. My name is Callie and I am going to walk everyone through the procedures and tools available. This webinar should last approximately an hour. If you have a question for one of the presenters, you may use the Q&A button at the top left portion of your screen. Just type in your question and then

hit "Enter" to send the question to the presenters. If you would like to address a specific presenter, please state that in your question. Presenters will read the selected questions out loud to the group and answer them. At the top right hand side of your screen, you will see a feedback tool with a colored square next to it. If you select the drop down arrow next to the feedback, you can alert me if you are having trouble hearing or if you need help. This meeting is being recorded. If you have technical difficulties at any time during this presentation, you may call our technical support line at 1-877-283-7062. Thank you all for coming. Loretta Jackson-Brown is your host, and she will be taking over the presentation from here. (00:03:02)

**Loretta Jackson-Brown**

Thank you, Callie. At the conclusion of today's session, the participant will be able to describe the basic epidemiology of recreation water associated disease outbreaks; list common disease syndromes, and the pathogens that cause outbreaks associated with recreational water; and discuss updated recommendations designed to minimize the risk of acute otitis externa and other recreational water illnesses (RWI).

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Following the presentation, you will have an opportunity to ask our presenters questions. For audio questions, dialing star one will put you into the queue for questions, and you may submit questions via the webinar using the steps outlined by Callie.

Our first presenter, Michele Hlavsa, is chief of CDC's Healthy Swimming Program. Her areas of expertise include the transmission of pathogens that cause RWIs, in particular, *Cryptosporidium*, and development of appropriate preventions and control measures. She collaborates with state and local public health authorities on RWI prevention efforts, and investigations of RWI outbreaks.

Our second presenter, Sarah Collier, is an analytic epidemiologist with IHRC Incorporated working on the Waterborne Disease Prevention branch at CDC. Her interests include health system research and large healthcare databases. She is currently involved in a variety of data analysis projects aimed at documenting the burden of costs of waterborne disease in the United States.

Again, the PowerPoint slide set and webinar link are available from our COCA Web page at emergency. cdc.gov/COCA. At this time, please welcome Michele. (00:05:44)

**Michele Hlavsa**

Thank you, Loretta. So I'm going to start off with an outline, so we all know where we're heading for the next forty-five minutes. This talk is basically going to provide information for clinicians, and during the talk, we're going to answer the question why CDC is focusing on Recreation Water Illnesses, or RWIs. And during that time, we will also talk about recreational water-associated outbreaks or RWI outbreaks with a focus on

Cryptosporidiosis. Sarah will follow and talk about acute otitis externa, or Swimmer's Ear. (00:06:14)

So I want to start with a disclaimer here. Yes, the problem is that people can become injured or become ill after swimming; however, swimming is an all American sport, its fun, and it's a great form of physical activity. So really what we want to focus on here today is to work together on minimizing the risk of illness and injury related to swimming. We are not by any means telling the public not to swim. So what are recreational water illnesses or RWIs? So recreational water illnesses are caused when pathogens are transmitted by ingesting or inhaling aerosols of, or having contact with, contaminated water in pools, spas or hot tubs, interactive fountains, lakes, rivers, or oceans. RWIs can also be caused by chemicals and disinfection byproducts. But we're going to focus on pathogens today. So just to make sure we're all on the same page, I just want to cover a couple of definitions in addition to RWIs. Treated recreational water venues, those are venues that have a chlorine or bromine in them, they include but are not limited to pool, spas or hot tubs, interactive fountains or splash pads or spray parks; and then there are untreated recreational water venues, so that would be lakes, rivers, oceans. One more definition, for RWI outbreaks, when we're talking about outbreaks, we are talking about two or more people who are linked by time, exposure to recreational water, and they have the same types of illness. So they all have respiratory illness or GI illness. And they all are exposed to water, so the source of illness is the water. So RWIs are basically a range of illnesses. They could be diarrheal illnesses caused by *Cryptosporidium*, *Giardia*, *E. coli*, *Shigella*, or *Norovirus*. They could be skin infections caused by the bacteria Pseudomonas. They could be ear infections caused by *Pseudomonas* or *Staphylococcus*. They could be eye infections caused by *Adenovirus*. They could be respiratory infections caused by L*egionella* or *Mycobacterium*, and they could be neurologic infections caused by *Echovirus* or *Naegleria*. Urinary tract infections can also be an issue. (00:08:42)

So what is it about treated recreational water venues, or swimming venues, why are we seeing pathogens transmitted in these venues? So we see that water loving pathogens commonly cause infection and they can cause diarrhea. We know that diarrheal illness is common in the population. We know that exposure to recreational water is common. Swimming is basically communal bathing. Fecal contamination of recreational water is common. Inadequate pool operation and maintenance is not uncommon, and ingesting recreational water is common. So to touch on the first point, this graph here demonstrates the percentage of people who were previously infected. This is a national survey done, and blood samples were taken from people up to, excuse me, within a range of ages; the first category you see is less than eleven years old, and the last category you see is seventy or over, and this is the percentage of people infected. So basically, by the time you hit 51 or 70 years, you're looking at 80% of the population, or 70+ percent of the population being infected with *Cryptosporidium* recently. So diarrheal illness is common. One study shows approximately 5% of the general public has had diarrhea in the last month. This translates to about .6 episodes of diarrhea per person, per year. Another study showed that they were approximately .1 to 3.5 cases of diarrhea per person, per year and the numbers were actually higher for young children, especially those in daycare. (00:10:28)

In terms of swimming a lot, according to the U.S. Census Bureau, it is the second most popular sports activity in the United States with approximately 380 million swimming visits each year. We at CDC think that this is actually an underestimate because this estimate does not take into account people six years of age or younger and it only gives

credit to people swimming six times a year, so those swimming less than six times a year don't get any credit here and those swimming seven or more times only get credit for six swimming visits a year, and we actually—preliminary data suggests—that there are actually billions of swimming visits in the U.S. every year. (00:11:07)

Swimming is communal bathing. Basically, you share the water and the contaminates in it when you get in the water. Whatever you bring into the water is washing off and you're sharing it with everyone else in the water. So it follows that actions of the pool operator and swimmers affect others. (00:11:26)

Fecal contamination of recreational water is common as well. If you have been going to the pool the last couple weekends I think all of you have been seeing the diaper children and toddler children, they're all over at the local community pool, and in addition, we also know that there's fecal incontinence in the community as well. One Wisconsin survey found that over 2% of the population had fecal incontinence and 70% of those with fecal incontinence were less than 65 years of age, so this is not limited to the elderly. Fecal incidents are common. Back in the late 90s, the CDC did a study with pools across the country and found—and asked those pools to submit formed stool specimens or formed stool accidents to CDC so that they could be tested for pathogens. Those 47 pools that participated sent 293 formed stool specimens between Memorial Day and Labor Day, so that's almost six samples per pool, so that's a lot of fecal accidents in the pool. Also, it's what we carry into the pool on our bodies, so some unfortunate soul did some study and found the average amount of feces that we carry on the perianal area is .14 grams. The range being .01 to 10 grams. Now, in and of itself, this doesn't sound too bad, but if you think of a large waterpark that might take in a thousand children a day, which is not unbelievable for some of these water parks, 10 grams translates to about 10 grams per child would then translate to about 10 kilograms or 22 pounds of poop, so that's a lot of poop to be swimming in. (00:13:10)

Also, there's inadequate pool operation, and maintenance. Last year, CDC released a study that looked at pool inspection data from four states and 11 local health departments. We found that when we looked at over 120,000 inspection reports, which were conducted January through December 31st of the year 2000, 12% of routine inspections, that's approximately one in eight inspections, resulted in immediate closure due to violations that seriously threatened public health or safety. We also found in that study that approximately one in 10 or about 10.7% of pools had inadequate or too high disinfectant levels. (00:13:58)

So now that we're swimming in the pool and we're bringing diarrhea into the pool and feces into the pool and we're not treating the pool water appropriately, we're also ingesting the water. One study looked at the consumption of water so that it had the participants swim for at least 45 minutes actively in the pool, and the pool was laced with chlorine stabilizer and our bodies do not metabolize chlorine stabilizer, and therefore, what comes in goes out and they found that adults on average consumed 16 milliliters of water while swimming and non-adults, so those under 18 years of age, consumed 37 milliliters of water on average and as much as 154 liters in some instances, milliliters. (00:14:47)

So now I specifically want to go into outbreaks and this here, in the photo here, is a picture of a pool down in Chile which is currently the largest pool in the world. We don't know of any outbreaks associated with that pool at this point. So this graph here looks at the number of RWI outbreaks over time, starting in 1978 going through 2008. So along the horizontal access you'll see the years and along the vertical access you'll see the actual

counts, and you'll notice that after 1997, the number of outbreaks reported each year increases and again after 2002, and you'll see a big increase in 2007. We're not sure exactly what's happening in these years or after these years but the take home message here is that these are definitely increasing over time. (00:15:37)

This graph here specifically focuses on outbreaks of gastroenteritis that are associated with recreational water and again you'll see the increase after 97, 2003, and then you'll see a big jump in 2007, so basically, the outbreaks of gastroenteritis are driving the increase of recreational water illness outbreaks overall. (00:16:03)

This graph here looks at outbreaks specifically caused by cryptosporidiosis. You'll notice there are blue bars and yellow bars. The blue bars are representing outbreaks associated with treated water such as pools, water parks, interactive fountains, and the yellow bars represent untreated venues or outbreaks in untreated venues, so lakes, oceans, rivers. And you'll notice that the yellow bars are pretty much stable over time so where we're really seeing the increase in outbreaks is those in treated venues caused by *Cryptosporidium*, and again, you'll see there's an increase after 97, after 2003, and a big jump in 2007, so the overall increase is actually being driven by *Cryptosporidium*. And just to look at the distribution of outbreaks in 2007, geographically, you'll notice that basically, there were cryptosporidiosis outbreaks across the country back then. (00:16:58)

This pie chart here looks at outbreaks associated with treated recreational water and these are outbreaks of gastrointestinal illness. You'll notice that almost three quarters of them are caused by *Cryptosporidium*, and about a quarter of them are caused by other pathogens. So *Norovirus, Shigella, E. coli, Giardia, Salmonella, Campylobacter*. So that 25% of outbreaks, the *Norovirus*, the *Shigella*, the chlorine sensitive pathogens that are causing these outbreaks; when we hear outbreaks caused by these pathogens, we think there's something wrong with pool operation or maintenance, so if you're maintaining the right chlorine level, you shouldn't be seeing outbreaks caused by these pathogens. The story is a bit different with Cryptosporidium. *Cryptosporidium* is chlorine resistant, so even a well maintained pool can transmit *Cryptosporidium*. (00:17:48)

So why exactly is this? Well, *Cryptosporidium* is chlorine tolerant or extremely chlorine tolerant. This table here shows how quickly 1 milligram per liter or part per million, how quickly this amount of chlorine can or this level of chlorine can disinfect pathogens, so E. coli is disinfected in less than one minute, hepatitis approximately 15 minutes, giardia in 45 minutes, and then there's Crypto, which will disinfect in approximately 15,300 minutes or more than 10 days. So your primary barrier to transmission of pathogens in treated recreational water venues is not working.

Your other barrier is the filter and that's not going to work either. At least traditional filters, so traditionally in pool operation, we see sand filters, cartridge filters, and diatomaceous earth or DE filters, so they are removing particles roughly anywhere from two to six micrometers to 100 micrometers. Crypto is approximately 4.5-5.5 micrometers in diameter. (00:18:53)

So now I want to go through a couple of cryptosporidiosis outbreaks. One of them being an outbreak in Utah, and this was actually statewide outbreak that occurred in 2007, and what had happened is a county had noticed an increase in cases, and unfortunately had competing priorities, so they decided not to actively or proactively prevent future cases and

they dealt with other priorities at the time, and unfortunately, this outbreak got into other pools and to other counties and eventually became a statewide outbreak. There were over 1,900 laboratory confirmed cases, over 450 recreational water venues, both treated and untreated, were potentially contaminated. As you would expect, the highest case rate was among children less than five years of age, and we heard repeatedly anecdotal stories or anecdotal reports of clinicians being overwhelmed; basically moms were calling into pediatricians offices asking to make appointments and pediatricians were giving, faxing scripts to local pharmacies for Nitazoxanide, the treatment for *Cryptosporidiosis*. (00:20:05)

In response, the Public Health Department alerted, both at the local and state level, alerted the public, the pool operators and other community partners: Children less than five years of age were banned from swimming. So this here, this epicurve here shows the number of cases over time in 2007 in Utah and you'll notice that you have a few cases in late May, early June, and then the number of cases really takes off come mid- to late-July and August. So I believe it was the Thursday before Labor Day of that year, the state and local health departments decided that they were going to ban children less than five years old from swimming in public pools and then a few days later a majority of the pools, the outdoor pools, closed anyway because everyone had gone back-to-school and it was after Labor Day. We're not exactly clear what exactly brought the decrease in this outbreak or the decrease in incidents and cases, whether it was the ban or the actual pools closing anyway. (00:21:11)

This graph here looks at reported exposures of cases over time, so in early July, you'll see that the yellow line, the line that indicates the percentage of patients who are reporting recreational water exposure is at about 100% and that decreases over time whereas the yellow line is just at 20% in early July, or just above 20% and its going to increase over time and that represents patients reporting, or the percentage of patients reporting contact with ill persons. So you'll notice that the two kind of cross over and part of that is because *Cryptosporidium* can not only get from pool to pool, but it can also go into daycares. So those kids who are going swimming in the community pool on the weekends, they're then going swimming at the pool at the daycare center and bringing the *Cryptosporidium* into the daycares, and what we're seeing is, that basically, the chlorine preventing transmission in the pools, well not preventing transmission, excuse me, in the pools and across the community, are also not preventing transmission in daycares, so a lot of daycares are using dilute bleach solutions as their barrier to transmission. (00:22:29)

So I just want to take a minute to comment on the banning of less-than-5-year-olds from public pools. CDC considers this a control measure from extreme situations only. And this is mostly, or most importantly, because of the inability to evaluate the efficacy of this control measure and there's also questions about the enforceability. Utah and their local partners had a hard time notifying all pool operators of this ban. Parents were very uncooperative. They were taking their children's diapers off in the parking lots and trying to pass two-year-olds off as five- and six-year-olds. A lot of the pool managers and operators expressed a lot of concern about revenue loss and there was opposition from the public. (00:23:17)

There's also an issue of is this feasible in the long term? Basically, this ban was instituted just before the end of the swim season. What if you're looking at this ban in July? How long are you going to be able to sustain a ban like this? And then there's also possible negative public health consequences. If we ban children from swimming, are they not going to learn

swimming skills and there for possibly the instance of drowning or pediatric drowning, which could possibly increase. (00:23:44)

We also want to talk about the cryptosporidiosis outbreak in New Mexico in 2008. This one involved a competitive swimmer who practiced and competed for over a month while ill with diarrhea. He went to state championships and exposed 370 athletes. And he went to city championships and exposed 270 athletes there. All told, 92 persons were ill, 25 pools and one water park were potentially contaminated, and we found that approximately 30% of people report swimming while ill with diarrhea. (00:24:19)

So we wanted to ask this group of people why they continued to swim while ill with diarrhea, so we sent out a web-based survey and got a 57% response rate. Sixty percent of those reported that chlorine kills pathogens instantly and 25% reported that they were not sure if it was okay to swim while ill with diarrhea and this was after they had gone through the and experienced the whole outbreak. So what were some of the reasons? Common themes we found were that life guards reported that they had responsibilities that required them to enter the water and they needed to make money. Competitive swimmers told us that they didn't want to let their team or their coach down or they had to swim in a particular meet to get scholarships. Some reported being symptom free while swimming, so the thing with Crypto is that the symptoms can sometimes wax and wean, so in immunocompetent persons, *Cryptosporidiosis* can last from one to two weeks, but in that time you might have a day or two where you're not experiencing symptoms and then go back the following day to having symptoms again. Others reported that there were social events or vacations they didn't want to cancel and the vacations being an issue of money and social events being issues like "My six-year-old wants to go to the classroom birthday party and I don't want to leave her out of the social event." (00:25:46)

So what are these outbreaks telling us? What is the working premise? So most potential outbreaks are prevented by good pool operation and maintenance. There's a big misunderstanding in the public that we know maybe we should not expose ourselves to chlorine and take the chlorine out of the pools, but if we do take the chlorine out of the pools, we'll be seeing more outbreaks caused by *E.coli, Norovirus*, etc. So if the chlorine is doing its job, and the pool operator is doing their job, there should be no issues with a lot of pathogens causing outbreaks in recreational water venues. So again, there are two types of outbreaks, the short lived ones. So short chlorine inactivation, so if someone does have a fecal incident in the pool and they are infected with *E.coli*, only those immediately around them that swallow the water at that point will get sick. It's not going to be a prolonged transmission in that particular pool if it's well maintained, and you have swimmers who are continuing to swim while ill with diarrhea, so that's a contributing factor. In terms of prolonged transmission, it could be the chlorine sensitive pathogens, if there is poor maintenance of the pool if the chlorine level is not being maintained. And again, you have issues with swimmer ignorance, the swimming while ill with diarrhea, or you have prolonged transmission because of its chlorine resistance, particularly here we are talking about *Cryptosporidium*. So I don't want to make it sound like I'm picking on swimmers by saying swimmer ignorance, but what are the swimmers thinking? (00:27:14)

CDC did a parent focus group back in 1999-2000 and found that parents of young children who go swimming don't consider swimming in a pool as communal bathing or they don't consider the shared nature of the water. They don't really have a clue about the potential for disease transmission. They believe that chlorine kills everything and it kills everything instantly. They think that pool water is sterile. They think that waterborne disease

outbreaks are something that happen outside of the United States, but they are willing to contemplate changing their behavior and they do want to be educated so that they can make the best decision they can for themselves. Similarly, consumer league poll in 2004 showed that 14% of people believe that pool water is sterile. Forty percent believe that they are somewhat or very likely to get ill from swimming in a pool and 82% believe you should never swim while ill with diarrhea, so that leaves the question of well, what are the other 18% thinking? (00:28:15)

So what does every clinician need to know? So ova and parasite testing might not be included, might not include testing for *Cryptosporidium*. Clinicians need to specifically request testing for *Cryptosporidium*. The labs are not, the reason for this is that labs are not necessarily going to be reimbursed for *Cryptosporidium* testing when they do ova and parasite testing so, therefore, they don't do it unless they are specifically asked to. Nitazoxanide can be used to treat cryptosporidiosis in immunocompetent persons one year of age or older, and I'm providing here a link to the nitazoxanide page on our (inaudible) page on the CDC website, and I'm also providing a reference for treating cryptosporidiosis in immunocompromised patients. Waterborne disease outbreaks and *Cryptosporidiosis* cases are reportable in all 50 states, New York City, and District of Columbia and I can't tell you how many outbreaks we hear about here and it's because the…an astute clinician said, "Oh, I heard about this case here and I heard about—I had this patient yesterday with diarrhea who swam at this pool," that really get an investigation going and really help the Public Health Department get on top of things. (00:29:36)

What do swimmers need to know? So this is where we're asking you to help us get the message to the public. We tell swimmers that they should not swim while ill with diarrhea. And actually, avoid all recreational water activities. Specifically for crypto—if they are infected with *Cryptosporidium*, they shouldn't swim for two additional weeks because they continue shedding the oocysts, that trans— the infectious form of *Cryptosporidium*. And other waterborne disease pathogens, like your E. coli and Shigella, they probably shouldn't swim an additional week. CDC's website currently reads that you shouldn't swim while ill with diarrhea and that's because we feel that if we start saying and for additional time for this and that, the message gets too complicated and it turns off the audience, but we feel that if people are sick enough to go see a clinician, they are more open to these messages of not swimming for an additional period of time after their symptoms have ceased. (00:30:32)

Swimmers should avoid ingestion of recreational water and they should also practice good swimmer hygiene, so that means showering with soap and water before entering the water, taking bathroom breaks, checking diapers often. CDC recommends checking diapers every 30–60 minutes and bathroom breaks approximately every 60 minutes and washing hands after using the toilet or changing diapers. But we're well aware that all of you are really busy and have a lot of prevention messages to share with your patients and their families, so we've actually created a lot of documents and they're available at the healthy swimming website to help get that information out, so even just sharing this information in the waiting room with your patients, there are free brochures, there's posters, there's other sources of information that you can share. So CDC requires me to tell you that the findings and conclusion in this presentation have not been formally disseminated by the CDC and should not be construed to represent any agency, determination, or policy. I'd like to acknowledge the following for helping put these data together, and these slides together, and I will leave you with this quote of the day, as I transition to Sarah Collier. (00:31:48)

**Sarah Collier**

Thank you, Michele. It's hard to follow that quote, but I will do my best. I am excited to talk to you this afternoon about our recent work on the epidemiology of acute otitis externa. I'll start with a brief background section and then discuss the epidemiology of otitis externa in the U.S. including the burden of disease and the demographics, and then conclude by discussing some of the new prevention messages that we've developed and point you toward some resources for further information. (00:32:31)

So first a brief amount of background on acute otitis externa, which I've abbreviated as AOE on my slides. As you undoubtedly know, acute otitis externa is commonly known as swimmer's ear, and it's an inflammatory condition of the external ear canal usually caused by bacterial infection. Most commonly *Pseudomonas* or *Staphylococcus* species, and AOE is characterized by pain, itching, redness, and swelling of the external ear canal and occasionally drainage in the ear is noted and the hallmark sign of AOE is pain that worsens upon manipulation of the pinna or tragus. AOE is distinct from otitis media, of course, in that it only affects the outer ear and involvement does not extend behind the eardrum. Risk Factors for otitis externa include water exposure such as recreational water activities or bathing. Studies have shown that the risk increases the longer swimmers are in the water and the more frequently that they put their head under water. The risk is also increased in environments with high ambient temperature and humidity, and finally, extended exposure of the auditory canal to water can lead to skin maceration, making it more vulnerable to minor trauma and infection and minor trauma can be caused by anything inserted in the canal including cotton tip swabs, hearing aids, or in-ear headphones. Water exposure can wash away the protective cerumen, which serves as a water-repellant coating for the skin of the auditory canal and provides some anti-microbial protection. (00:34:04)

So that's a brief introduction to AOE, and moving on to the epidemiology, our interest was piqued when we started to do some preliminary studies of the prevalence of waterborne disease in the U.S. and cases of AOE were at least in the order of magnitude more frequent than any other illness that we looked at. Yet, the scientific literature on AOE was relatively sparse. AOE is not a reportable disease, or course, and there are no dedicated surveillance systems, so we asked ourselves how we could investigate further using existing public health resources. Without a dedicated surveillance system, it's difficult to know how many cases of AOE occur each year, but we are able to estimate the number of visits to doctor's offices and emergency departments using large ambulatory care and department, or emergency department databases. So we used several of these databases to answer some basic questions about the epidemiology of AOE in the U.S. and we also decided to use a conservative definition of AOE in hopes of having high specificity. So we defined a visit for AOE as any visit that listed an ICD9 code of acute otitis externa, without a concurrent diagnosis of otitis media, because we wanted to make sure that the high numbers for AOE weren't just a spillover from the high prevalence of otitis media. (00:35:26)

And here are our results. In 2007, we estimated that at least 2.4 million U.S. healthcare visits resulted in a diagnosis of swimmer's ear. That translates to an estimated annual rate of 8.1 million, or, excuse me, 8.1 visits per thousand population. We estimate nearly 600,000 hours of clinicians' time are spent each year on ambulatory visits for AOE, and we estimate that direct healthcare costs total as much as half a billion ambulatory just for—annually—just for ambulatory and ED visits. And that figure doesn't even take into account cost of hospitalization or indirect costs such as lost wages or school absence. Rates of ambulatory care visits during 2003–2007 were highest among children aged four—excuse

me—5–14 years; however, it's not just a problem in the pediatric population. Over half of AOE visits occurred among adults 20 years of age or older. (00:36:38)

And as you'd expect, AOE displays a pronounced seasonality. This figure demonstrates the trend in AOE visits over the course of the year with visits peaking in the summer months and reaching their lowest point during the winter; however, with more and more indoor recreational water venues opened year around, we might start seeing cases more evenly distributed throughout the year. This figure illustrates the geographic variation that we saw. The highest rates of visits for AOE were in the South and lowest rates were in the West, which made sense considering the increased risk for otitis externa with higher temperature and humidity. (00:37:17)

So after we realized the substantial burden of this preventable disease on the healthcare system, we worked together with liaisons from the American Academy of pediatrics and the American Academy of Otolaryngology to develop prevention messages and help disseminate existing treatment recommendations. So beginning with treatment, the American Academy of Otolaryngology Head and Neck Surgery Foundation issued clinical practice guidelines in 2006, and the guidelines have three primary recommendations. First, for straightforward cases of AOE that do not involve cellulitis, necrotizing otitis externa, or other complicating factors, such as a non-intact tympanic membrane, tympanostomy tubes or diabetes or other immunocompromised states. There does not appear to be any advantage to administering systemic antimicrobials. Rather, topical treatment is highly effective for AOE. Topical antimicrobials, either alone or in combination with a corticosteroid, are superior to placebo and cure rates are comparable between the topical combination drops and the topical antimicrobials alone. Patients should be instructed to use the drops for at least a week, continuing use for a few days after symptoms resolve, and most patients have resolution of symptoms by six days after starting treatment. If no improvement is noted in 48–72 hours, or as symptoms persist beyond two weeks, you can consider switching to a different medication and patients with AOE should avoid submerging their head in water for 7–10 days. But competitive swimmers might be able to return to the pool if pain has resolved and they use well-fitting earplugs. And finally, the third recommendation is that each visit involving AOE assess the patient's pain level and recommend analgesic treatment as appropriate. (00:39:18)

Moving on to the prevention messages that were developed this year. The messages emphasize keeping the auditory canals dry and avoiding maceration of the canal in order to maintain the barrier of healthy skin and cerumen. And the prevention messages that we've developed for the general public include a list of dos, don'ts, and circumstances for which patients should consult their physicians. And things that you can encourage patients to do include keeping the ears as dry as possible by using a bathing cap or earplugs and drying ears thoroughly after swimming or showering. Patients can use a towel to dry their ears well or tilt their head and maneuver the earlobe to help water drain out and if water still remains in the ear, they can consider carefully using a hair dryer to move air through the air canal, and of course they'd want to do that by holding the hair dryer far away from the ear and using the lowest setting. (00:40:19)

Our message of things for patients not to do include not putting objects in the auditory canal including cotton tip swabs and fingers, and also, not removing cerumen. And finally, use of alcohol-based ear drops after swimming or each morning and evening has been recommended to reduce moisture content in the ear canal, correct the ear PH, and reduce bacterial growth. There are commercially prepared alcohol-based ear drying solutions or

patients can make their own using a 1:1 mixture of rubbing alcohol and white vinegar and use of the drops is contraindicated in the presence of tympanostomy tubes, tympanic membrane perforation or acutis, excuse me, acute external ear infection. And then research pertaining to the use of earplugs and swimming caps is equivocal, but if any kind of earplug is going to be worn, cotton wool that's been smeared with petroleum jelly is just as effective at keeping water out as the more expensive commercially available devices. (00:41:27)

Finally, I'd like to suggest some resources for further information. In addition to the www.cdc.gov/healthyswimming website, I've included the reference and link to our recent MMWR article and a reference for an article that just appeared in the American Academy of Otolaryngology bulletin. So that concludes my slides, but before I finish, I'd like to acknowledge the participation of several CDC staff members and physician consultants from the professional academies in describing the burden of swimmer's ear and in developing the prevention messages. I'd also like to thank you for your attention and I'll turn thing back over to our moderator for the question and answer period. (00:42:07)

**Loretta Jackson-Brown**

Thank you, Michelle and Sarah. We will now open up the lines for the question and answer session. (00:42:16)

**Operator**

Yes, ma'am. If anyone would like to ask a question at this time, please press star one. You will then be prompted to unmute your phone and record your name as your name is required to introduce your question. Once again, star one if you have a question. (00:42:29)

**Loretta Jackson-Brown**

Please remember you can also submit a question via the webinar by going to the Q&A tab up in the top left corner. While we're waiting for questions from the operator, Michele, I have a question for you. For the graph on RWIs associated outbreaks and gastroenteritis, it looks like there is an increase in trend. Do you think that this is real or could it possibly be artifact? (00:43:09)

**Michele Hlavsa**

Well, we're not exactly sure. I think there's a lot of factors playing into this. So overall what we saw was an increase in the number of *Cryptosporidiosis* outbreaks driving the increase of gastro neuritis outbreaks driving the overall increase in RWI outbreaks. What we, because we now have Nitazoxanide to treat cryptosporidiosis, one of our theories is that—or hypotheses, I should say—is that their clinicians are now testing for cryptosporidiosis, and therefore, labs are reporting more cases, because there are more cases, health departments might be looking into and investigating the cases more often and picking up more outbreaks. It might be the public is more and more knowledgeable or aware of RWIs. I think traditionally when we have diarrhea, we think oh, it's what I ate last night. We don't think about where I've been swimming, but just based on the public inquiries we've been receiving at CDC over the last few years, we're getting more and more calls from the public about "I have diarrhea and I think it has to do with something where I went swimming with something with the place I went swimming." The other issue might be there is a true increase. We aren't sure yet. (00:44:27)

**Loretta Jackson-Brown**

Thank you. Evan, do we have any questions on the phone? (00:44:31)

**Operator**

We're showing no questions in queue at this time. (00:44:33)

**Loretta Jackson-Brown**

Okay. Well, I have another question for Sarah. Sarah, you said there were 2.4 million visits for AOE in 2007? Do you have any idea of how that number corresponds to the total number of cases of AOE? (00:44:50)

**Sarah Collier**

Thanks, Loretta. That's a good question. I think we would really like to know the, instead of just knowing the number of visits, we would really like to know the actual number of cases per year but there are sort of two numbers that we're missing that we would need in order to translate our estimates, so first is the percentage of people who have AOE that visit a doctor. So we think since it's acutely painful, we think that the vast majority of people do visit a doctor, but we're not sure, and then the other number that we would like to know is the average number of visits per episode of acute otitis externa. So we think preliminary numbers from one database indicate that less than 10% of people have more than one visit for AOE, so most people do not have a follow-up visit. They go to the doctor or they go to the emergency department and that's it. But there are some people that have repeat visits so it's a little bit hard for us to translate the number but I think what we could say is that 2.4 million visits is a conservative estimate and the true number of actual cases of AOE is probably higher. (00:46:05)

**Loretta Jackson-Brown**

Thank you. I have another question. This one is for Michele. What's the spread of *Cryptosporidium* in daycare centers via another swimming pool or possibly another person-to-person transfer. (00:46:18)

**Michele Hlavsa**

Well, we, or CDC investigated an outbreak involving community-wide cryptosporidiosis outbreak and preliminary data—I don't think the data have been finalized at this point—suggest that using fill-and-drain pools, so plastic pools you get at Home Depot, the ones that have no disinfection besides the tap water that go in right in the beginning, so you're not filtering the water, you're not adding any chlorine, so you deplete the chlorine and disinfectant in that fill-and-drain pool pretty quickly and then you're pretty much washing off diapered kids in there and they are all swimming in there, so it's probably the water activities and then the regular risk factors for kids putting things in their mouth that are causing these outbreaks. (00:47:05)

**Loretta Jackson-Brown**

Another part to that question, Michele, is in regards to that, many private pools utilize salt-based filtration systems rather than chlorine, would crypto outbreaks be more likely to occur in these systems? (00:47:21)

**Michele Hlavsa**

Well saltwater pools are actually chlorine pools. I think that's a marketing myth, or how the marketing people are trying to promote—because there is a push, I think, in the public not to use chlorine in pools and they are worried about chlorine exposure so what happens is instead of using granular chlorine at your residential pool, you're taking table salt and

you're running an electrical current to that table salt, so you're splitting that table salt into sodium and into the chlorine, so actually, you have chlorine in saltwater pools. The problem with those pools is that sometimes they cannot generate enough chlorine, so it's not so much the *Cryptosporidium* that you have increased risk for because I think it's the same risk anywhere, but it's more so your *E. coli*, your *Salmonella*, your *Shigella*, your chlorine-sensitive pathogens that might become an issue if you're not generating enough chlorine. (00:48:14)

**Loretta Jackson-Brown**

Thank you. Evan, do we have any questions from the phone lines? (00:48:20)

**Operator**

I'm still showing no questions from the phones. (00:48:22)

**Loretta Jackson-Brown**

Thank you. Sarah or Michelle, do you have any closing remarks? (00:48:30)

**Sarah Collier**

Nope, not on our end. We would like to thank everybody for taking time out of their busy schedules to join us today. (00:48:39)

**Michele Hlavsa**

Absolutely. Thank you. (00:48:39)

**Loretta Jackson-Brown**

On behalf of COCA, I would like to thank everyone for joining us today. With a special thank you to our presenters, Michele Hlavsa and Sarah Collier. If you have additional questions for today's presenters, please e-mail us at COCA@CDC.gov. Put the name of the presenter in the subject line of your e-mail and we will ensure that your question is forwarded to them for a response. Again, the e-mail address is COCA@CDC.gov.

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Thank you again for being a part of today's COCA webinar. Have a great day and safe swimming! (00:50:31)

**Operator**

This concludes today's conference. You may disconnect at this time. (00:50:36)