The Model Aquatic Health Code

The Annex

PREFACE

CS249779

1.0 Preface

1.1 Introduction

1.1.1 Rationale

With hundreds of millions of visits[1] to AQUATIC FACILITIES, waterparks, and natural recreational water sites each year, BATHERS expose themselves to many potential dangers in and around AQUATIC FACILITIES. In recent decades, public health practitioners have seen a dramatic increase in waterborne disease outbreaks associated with public disinfected AQUATIC FACILITIES *(e.g. swimming pools, water parks, etc.)*.[2] Drowning and falling, diving, chemical use, and suction injuries continue to be major public health injuries associated with AQUATIC FACILITIES, particularly for young children.[3,4,5,6,7,8,9,10] Thus, public health and SAFETY is essential to consider starting with the design, construction, operation, and maintenance of public AQUATIC FACILITIES.

1.2 Recreational Water-Associated Illness Outbreaks and Injuries

1.2.1 RWI Outbreaks

Since 1978, the number of recreational water-associated WATERBORNE DISEASE outbreaks *(WBDOs)* reported annually has increased dramatically.[11] This increase is probably due to a combination of factors including:

- The emergence of PATHOGENS, especially CHLORINE-tolerant *Cryptosporidium,*
- Increased participation in aquatic activities,
- Increases in the number of AQUATIC FACILITIES, and
- Increased recognition, investigation, and reporting of outbreaks that may have previously gone undetected.

1 US Census Bureau. Statistical Abstract of the United States: 2012. Arts, Recreation, and Travel: Participation in Selected Sports Activities 2009. . Available at http://www.census.gov/compendia/statab/2012/tables/12s1249.pdf. Accessed March 16, 2014.
2 Hlavsa MC et al. Recreational water–associated disease outbreaks — United States, 2009–2010. Morb Mortal Wkly Rep. 2014;63(1):6-10.
3 Gilchrist J, et al. Racial/ethnic disparities in fatal unintentional drowning among persons aged ≤29 Years — United States, 1999–2010. MMWR Morb Mortal Wkly Rep. 2014;63(19):421-6.
4 CDC. Drowning – United States, 2005-2009. MMWR Morb Mortal Wkly Rep. 2012;61(19):344-347.
5 CDC. Ten leading causes of injury deaths by age group highlighting unintentional injury deaths, United States – 2010.
6 Gipson K. Pool or Spa Submersion: Estimated Injuries and Reported Fatalities, 2011 Report. U.S. Consumer Product Safety Commission, May 2011. Available online at http://www.cpsc.gov/LIBRARY/FOIA/FOIA11/os/poolsub2011.pdf.
7 CDC. Pool chemical–associated health events in public and residential settings — United States, 1983–2007. MMWR Morb Mortal Wkly Rep. 2009;58(18):489-93.
8 CDC. Acute illness and injury from swimming pool disinfectants and other chemicals — United States, 2002-2008. MMWR Morb Mortal Wkly Rep. 2011:60(39):1343-1347.
9 Anderson AR, et al. The distribution and public health consequences of releases of chemicals intended for pool use in 17 states, 2001-2009. J Environ Hlth 2014;76(9):10-5.
10 Hlavsa MC, et al. Pool chemical–associated health events in public and residential settings — United States, 2003–2012, and Minnesota, 2013. MMWR Morb Mortal Wkly Rep. 2014;63(19):427-30.
11 Hlavsa MC et al. Recreational water–associated disease outbreaks — United States, 2009–2010. Morb Mortal Wkly Rep. 2014;63(1):6-10.

Over 2009-2010, a total of 81 recreational water-associated WBDOs and 1,366 cases of illness and 62 hospitalizations were reported to the CDC. CDC documented that 57 of these outbreaks and 78% of the cases were associated with disinfected water venues.[12]

Multiple challenges exist for providing adequate cleaning and disinfecting of swimming water. Sunlight, urine, exposure to air, and inorganic and organic matter *(i.e. sweat, saliva, and feces)* can quickly deplete FREE AVAILABLE CHLORINE, the primary disinfectant used in POOLS. AQUATIC FACILITIES also provide potential exposure to FECAL contamination from other swimmers. These incidents are common in AQUATIC FACILITIES, especially from diaper-aged BATHERS who are not toilet trained *(babies and toddlers)*.[13]

1.2.2 Significance of *Cryptosporidium*

One such pathogen is *Cryptosporidium*[14] *(fecal-orally spread from person to person or from contaminated objects/media like pool water)*, which can survive for days in chlorinated AQUATIC FACILITIES because it is extremely CHLORINE resistant.[15, 16, 17] *Cryptosporidium* causes a profuse watery diarrhea that contains large numbers of infectious OOCYSTS so, if the water or surfaces at AQUATIC FACILITIES get contaminated, an outbreak can occur. *Cryptosporidium* and other waterborne pathogens have a low infectious dose and can still be excreted from the body weeks after diarrhea ends. These factors increase the potential for a waterborne disease outbreak. Waterborne diseases and outbreaks can include the following:

- Gastrointestinal illness resulting from exposure to pathogens such as *Escherichia coli* O157:H7 or *Cryptosporidium*,
- Infections of the brain, skin, ear, eye, and lungs,
- Wounds, and
- Exposure to pool-related chemicals.

There were 21 treated recreational water-associated outbreaks reported in 2009-2010 that were caused by *Cryptosporidium*, a substantial increase from the eight reported for treated AQUATIC FACILITIES in 1997-1998.[18, 19] In addition, during 1999-2008 *Cryptosporidium* was identified as the cause of 74.4% of gastroenteritis outbreaks at

12 Hlavsa MC, et al. Recreational water–associated disease outbreaks — United States, 2009–2010. Morb Mortal Wkly Rep. 2014;63(1):6-10.
13 CDC. Prevalence of parasites in fecal material from chlorinated swimming pools -- United States, 1999. MMWR Morb Mortal Wkly Rep. 2001;50(20):410-412.
14 Yoder JS, et al. *Cryptosporidium* surveillance and risk factors in the United States. Exp Parasitol. 2010;124:31-9.
15 Korich DG, et al. Effects of ozone, chlorine dioxide, chlorine, and monochloramine on *Cryptosporidium parvum* oocyst viability. Appl Environ Microbiol 1990;56:1423-1428.
16 Shields JM, et al.. Inactivation of *Cryptosporidium parvum* under chlorinated recreational water conditions. J Water Health 2008;6:513-520.
17 Shields JM, et al. The effect of cyanuric acid on the chlorine inactivation of *Cryptosporidium parvum*. J Water Health 2009;7:109-114.
18 Hlavsa MC, et al. MMWR Recreational water–associated disease outbreaks — United States, 2009–2010. Morb Mortal Wkly Rep. 2014;63(1):6-10.
19 Barwick RS, et al.. Surveillance for waterborne-disease outbreaks, United States, 1997-1998. MMWR Surveill Summ, 2000;49 (4):1-35.

disinfected AQUATIC FACILITIES, making it the leading cause of diarrheal disease outbreaks at disinfected AQUATIC FACILITIES.[20]

1.2.3 Drowning and Injuries

Drowning and falling, diving, chemical use, and suction injuries continue to be major public health injuries associated with AQUATIC FACILITIES. Drowning is a leading cause of injury death for young children ages 1 to 4, and the fifth leading cause of unintentional injury death for people of all ages.[21,22] From 2008 through 2010, an average of 5,100 POOL- or SPA-related emergency department *(ED)*-treated submersion injuries occurred each year. For 2006-2008, 383 POOL- or SPA-related fatalities involved children younger than 15 years of age. Approximately 45% of the estimated injuries for 2008 through 2010 and 28% of the fatalities for 2006 through 2008 involving children younger than 15 occurred in a public setting.[23]

1.2.4 Pool Chemical-Related Injuries

For 2007-2008, 32 POOL chemical-associated health events that occurred in a public or residential setting were reported to CDC by Maryland and Michigan. These events resulted in 48 cases of illness or injury; 26 *(81.3%)* events could be attributed at least partially to chemical handling errors *(e.g., mixing incompatible chemicals)*. ATSDR's Hazardous Substance Emergency Events Surveillance System *(HSEESS)* received 92 reports of hazardous substance events that occurred at AQUATIC FACILITIES. More than half of these events *(55 [59.8%])* involved injured persons; the most frequently reported primary contributing factor was human error.[24] Estimates based on CPSC's National Electronic Injury Surveillance System *(NEISS)* data indicate that 4,876 *(95% confidence interval: 2,821--6,930)* emergency department *(ED)* visits attributable to POOL chemical--associated injuries occurred in 2012; almost half of the patients were <18 years old.[25]

1.3 Model Aquatic Health Code

1.3.1 Background

This effort stems from a CDC-sponsored workshop titled "Recreational Water Illness Prevention at Disinfected Swimming Venues" convened on February 15-17, 2005, in Atlanta, Georgia, in response to a 2004 position statement from the Council of State and Territorial Epidemiologists asking for CDC to convene such a meeting. The workshop assembled contributors from different disciplines working in state, local, and federal public health agencies and the aquatics sector to discuss ways to minimize recreational water illnesses spread at disinfected AQUATIC FACILITIES. CDC has been working with public health and industry representatives across the United States to build

20 Hlavsa MC, et al. MMWR Recreational water–associated disease outbreaks — United States, 2009–2010. Morb Mortal Wkly Rep. 2014;63(1):6-10.
21 CDC. Drowning – United States, 2005-2009. MMWR Morb Mortal Wkly Rep. 2012;61(19):344-347.
22 Gilchrist J, et al. Racial/ethnic disparities in fatal unintentional drowning among persons aged ≤29 Years — United States, 1999–2010. MMWR Morb Mortal Wkly Rep. 2014;63(19):421-6.
23 Gipson K. Pool or spa submersion: estimated injuries and reported fatalities, 2011 Report. U.S. Consumer Product Safety Commission, May 2011. Available online at http://www.cpsc.gov/LIBRARY/FOIA/FOIA11/os/poolsub2011.pdf.
24 Anderson AR, et al. The distribution and public health consequences of releases of chemicals intended for pool use in 17 states, 2001-2009. J Environ Hlth 2014;76(9):10-5.
25 Hlavsa MC, et al. Pool chemical–associated health events in public and residential settings — United States, 2003–2012, and Minnesota, 2013. MMWR Morb Mortal Wkly Rep. 2014;63(19):427-30.

this effort since 2007. Initial efforts have been focused on reducing the spread of recreational water illnesses and prevention of injuries at treated public AQUATIC FACILITIES.

1.4 Public Health and Consumer Expectations

1.5 Advantages of Uniform Guidance

1.5.1 Sector Agreement

The aquatics sector and public health officials have long recognized the advantages of well-written, scientifically sound, and up-to-date model guidance. Industry acceptance of procedures and practices is far more likely where regulatory officials "speak with one voice" about

- What is required to protect the public health,
- Why it is important, and
- Which alternatives for compliance may be accepted.

Model guidance provides

- A guide for use in establishing what is required,
- Businesses with accepted guidance STANDARDS that can be applied to training and quality assurance programs, and
- Local, state, and federal governmental bodies help with developing or updating their own CODES.

1.6 Modifications and Improvements in the MAHC 1st Edition

1.7 MAHC Adoption at State or Local Level

1.7.1 MAHC Adoption at State or Local Level

The MAHC is provided for use by governing bodies at all levels to regulate AQUATIC FACILITIES. At the state and local levels, the MAHC may be used in part or in whole to:

- Enact into statute as an act of the state legislative body;
- Promulgate as a regulation; or
- Adopt as an ordinance.

Typically, CODE adoption bodies *(federal, state, and local governments)* publish a notice of their intent to adopt a CODE, make copies available for public inspection, and provide an opportunity for public input prior to adoption. As is also outlined in the FDA Model Food Code, this is usually done in one of two ways.

- The recommended method is the "short form" or "adoption by reference" approach where a simple statement is published stating that certified copies of the proposed CODE are on file for public review. This approach may be used by governmental bodies located in states that have enabling laws authorizing the

adoption of CODES by reference. An advantage to this approach is a substantial reduction in the cost of publishing and printing.

- The alternative method is the "long form" or "section-by-section" approach where the proposed CODE is published in its entirety. Both methods of adoption allow for the modification of specific provisions to accommodate existing law, administrative procedure, or regulatory policy.

1.8 The MAHC Revision Process

1.8.1 MAHC Revisions

Throughout the creation of the MAHC, the CDC accepted concerns and recommendations for modification of the MAHC from any individual or organization through two 60-day public comment periods via the email address

1.8.2 Future Revisions

CDC realizes that the MAHC should be an evolving document that is kept up to date with the latest science, industry advances, and public health findings. As the MAHC is used and recommendations are put into practice, MAHC revisions will need to be made. As the future brings new technologies and new aquatic health issues, the Conference for the Model Aquatic Health Code *(CMAHC)*, with CDC participation, will institute a process for collecting national input that welcomes all stakeholders to participate in making recommendations to improve the MAHC so it remains comprehensive, easy to understand, and as technically sound as possible. These final recommendations will then be weighed by CDC for final incorporation into a new edition of the MAHC. Given the vision, mission, and goals of the MAHC as discussed in MAHC Section 1.3, the CDC will be especially interested in addressing any problems identified. CDC encourages interested individuals to consider raising issues and suggesting solutions through the CMAHC process.