How can Health Officials protect the public from drowning?
Summary: How Big is the Drowning Problem?

- # 1 cause of death for children 0-4 yrs.
- # 2 cause of death for 1-14 yrs behind car accidents
- 3900 fatal drownings/year in U.S.
  - About 102 people/year in North Carolina
- 6-7000 non-fatal drownings per year
- 60,000 documented lifeguard saves per year

TAKE HOME MESSAGE
- Drowning is preventable!
Drowning: Background on Drowning
Drowning and Submersion: Understanding the Full Scope

- Drowning is the process of experiencing respiratory impairment during submersion in liquid
  - Potential for brain injury due to lack of oxygen
    - Fatal (what most people think of)
    - Non-fatal (more common)
      - Extent of injury can cause permanent brain damage and require life-long care
Drowning by the Numbers

- #5 cause of unintentional injury deaths
  - 3900 drowning deaths/year in U.S.
    - About 102 people/year in North Carolina
    - ~7000 non-fatal drownings/year in U.S.
- Disproportionately impacts children
  - # 1 cause of death for children 0-4 yrs.
  - # 2 cause of death for 1-14 years behind car accidents
- Disproportionately impacts African-Americans and males
  - African American children 5-19 years drown in swimming pools at rates 5.5 times higher than those of whites
  - Males drown at a rate 4 times that of females
  - Drowning can happen to anyone
On 30 January 2016 in Helsinki, Finland, a 5-year-old child drowned in a public swimming pool in the city without anyone noticing. Left unattended by his mother who was in a sauna with friends, the little boy wanted to bathe in a basin where he lost his footing. Quickly, we can see him struggling to stay on the surface of the water and join the edge of the pool, without success. Unfortunately, none of the swimmers in the pool notice the child in distress who eventually loses consciousness before floating on the surface, inert. It is only after 4 minutes that a woman notices the body and finally carries him out of the water.
How Are We Doing on Drowning Prevention?
Drowning by National Region

- For all drowning:
  - Northeast 0.67
  - Midwest 0.88
  - West 1.36
  - South 1.18

- For pool drowning:
  - Northeast 0.12
  - Midwest 0.12
  - West 0.31
  - South 0.24 #2

Rate per 100,000; National Vital Statistics W65-W74; 2014-2015
Drowning by the Impact Numbers

- ~3500 lives lost/7100 non-fatal drownings in U.S. per year
  - Non-fatal drownings have a high health impact with >40% hospitalization
- Costing $6.1 billion dollars annually in medical costs/work loss (2010)
  - Fatal Drowning = $4.8 billion
    - ~3500 lives lost
    - ~$26 million medical; $4.7 billion work loss (2010)
  - Non-fatal drowning = $1.3 billion
    - 4,458 hospitalized
      - $152 million medical; $1.1 billion work loss (2010)
    - 2,646 Emergency Department treat and release
      - $4.5 million medical; $1.5 million work loss (2010)

CDC WISQARS; ICD-10 codes; All races, all ages, both sexes. National Electronic Injury Surveillance System All Injury Program, 2011-2015
Trends in Fatal Drowning

Rates decreased since 1970’s but have been almost level for more than a decade
Drowning Death Rates, by Year, United States, 2000–2016

Little Change in Drowning Rates
59,567 deaths over 16 years (average = 3,503 deaths/year
PLUS
Estimated 97,252 submersion injuries from 2001-2016

CDC WISQARS; ICD-10 codes; All races, all ages, both sexes. Total = 59,567; average = 3,503/year
Drowning Deaths, by Year, North Carolina, 2001–2016

Little Change in Drowning Rates
1,625 deaths over 16 years (average = 102 people/year
PLUS
Non-fatal drowning events for NC specifically are unknown

CDC WISQARS; ICD-10 codes; All races, all ages, both sexes. Total = 1,625; average = 102 people/year
How Can We Prevent Drowning?

How Can You as County and City Health Departments Officials Prevent Drowning?
Where Do We Start?
Drowning Prevention - EERIE

- **Educate** - become educated on fatal and non fatal drowning prevention practices and trends. Then educate others on the need for drowning prevention and education

- **Evaluate** - current trends and local practices of aquatic facilities, private & public and open bodies of water as it applies to drowning prevention practices and trends

- **Regulate** - create opportunities for regulation that are designed to prevent injury, illness and drowning

- **Implement** - enact regulations that will prevent injury, illness and drowning

- **Enforce** - enforce (complete observance of or compliance with a law or rule that will prevent injury, illness and drowning
Circle of Drowning Prevention: Layers of Protection are Essential to Help Prevent Drowning

Layers of Protection:
- Barriers to prevent access to water (e.g., enclosures, four sided fencing)
- Use of life jackets
- Learn swimming and water-safety survival skills
  - Improving swimming ability
    - Swim lessons for all children to ensure that all children have this survival life skill
      - Carolina Swims Foundation vision
- Provide close and constant attention to children you are supervising in or near water
- Lifeguards to supervise swimming areas (public pools, residential pools, open bodies of water
  - Lifeguards
    - Recognize & Reduce dangerous activities
    - Lifeguards are trained to recognize the signs of drowning
    - Respond immediately with life saving equipment and knowledge on how to save a life
    - 2011 Study (Pelletier & Gilchrist) “the risk of drowning is very low when in a lifeguarded setting.”
Circle of Drowning Prevention

Layers of protection are essential to help prevent drowning.
Plan ahead for aquatic activities:

- Always swim in a lifeguarded area
- Provide close and constant attention to children you are supervising in or near water
- Fence pools and spas with adequate barriers, including four-sided fencing
- Children, inexperienced swimmers, and all boaters should wear U.S. Coast Guard-approved life jackets
- Learn swimming and water-safety survival skills

American Red Cross
Chain of Drowning Survival

A person who is drowning has the greatest chance of survival if these steps are followed:

1. **Recognize the signs of someone in trouble and shout for help**
2. **Rescue and remove the person from the water (without putting yourself in danger)**
3. **Ask someone to call emergency medical services (EMS). If alone, give 2 minutes of care, then call EMS.**
4. **Begin rescue breathing and CPR**
5. **Use an AED if available and transfer care to advanced life support**

American Red Cross
Resources

- Center for Disease Control - Model Aquatic Health Code (MAHC)
  - https://www.cdc.gov/mahc/index.html

- Council for the Model Aquatic Health Code
  - https://cmahc.org

- American Red Cross
  - redcross.org/science
  - redcross.org/watersafety

- National Drowning Prevention Alliance
  - ndpa.org

- National Swimming Pool Foundation
  - nspf.org
The Public Expects Healthy Waters - CMAHC

- More than a billion visits to water venues per year
- More than 5,000 pool chemical related injuries treated in Emergency Departments per year
- For every drowning, it is suspected that 4-5 times the # of non fatal drownings that are treated at Emergency Departments and Medical Practices each year
- In the past 15 years, CDC and CMAHC report an increasing number of outbreaks of illness linked to water venues, more than 27,000 people
- 1-8 inspections of water venues result in immediate closures due to serious health or safety concerns
- Unknown number of incidences that were not reported or go under reported to Health Department Officials
Protecting swimmers from injury, illness and drowning: Lifeguards

CDC’s Model Aquatic Health Code (MAHC)
Adoption of the Model Aquatic Health Code (MAHC)?

- Voluntary adoption
- Federal, State and Local authorities can adopt
  - Short form - adoption by reference
  - Long form - adoption by code
- Adoption of code regulates water venues to make swimming and other water activities healthier and safer for the public
What is the Model Aquatic Health Code (MAHC)?

- States/localities can use MAHC to create/update existing pool codes
  - Reduce risk for outbreaks, drowning, and pool-chemical injuries
  - Saves resources; no need to reinvent codes in each jurisdiction
- All-inclusive and addresses design, construction, operation, maintenance, policies, and management of public aquatic facilities
MAHC - Inclusiveness

- Air quality
- Water quality, chemicals, control of pollutants, pathogen removal (feces, urine)
- Filtration systems (water and air handling filtration systems)
- Lighting (glare of listening on the water)
- Electrical & wiring guidelines, sealed conduit and paneling, exposed wiring, light switches, grounding
- Water heating
- Water features, diving features, currents, waves, features, steps, guard rails, starting platforms, rinse showers
- Acoustic design
- Drainage system
- Surveillance of water features
- Equipment room, chemical storage, diaper changing stations
MAHC Annex - Inclusiveness

- Barriers - self closure, latching, height
- Signage (first aid location, hours, rules, CPR posters, safety data sheets)
- Preventive Maintenance Plan
- First aid Room
- Food
- Water temperatures (pregnant women, swim team, young children, ethanol used and impact on body temperatures)
- Lifeguard and Safety & First aid equipment & inspection and storage
- Emergency communication equipment (hardwire phone)
Health & Safety

- Entrapment - fatalities
- Certificate of Lifeguard training - Annex pg 175 “many drowning deaths resulted from omissions of basic safety precautions
- Skill practice - shall & deep water training, facility specific training and policies
- Skill retention - “Significant CPR skill degradation within the first year after training” MAHC recommends skills refreshed every year through certification.
- Documentation to show expiration date of certification allows employers to identify current certifications. Level of training helpful determining the venues (deep water, time park)
- Renewal of certification, suspension and revocation
- Lifeguard supervisor Training
- Zones of surveillance per facility
- Rotation and retention
Certified Lifeguards

- **MAHC Ordinances that pertain to certified lifeguards**

<table>
<thead>
<tr>
<th>Ordinance</th>
<th>Title</th>
<th>Pages #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreword</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acknowledgments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3.2</td>
<td>MAHC Vision and Mission</td>
<td>2</td>
</tr>
<tr>
<td>1.4</td>
<td>Public Health and Consumer Expectations</td>
<td>3</td>
</tr>
<tr>
<td>1.7</td>
<td>MAHC Adoption at State or Local Level</td>
<td></td>
</tr>
<tr>
<td>4.8.5</td>
<td>Lifeguard- &amp; Safety-Related Equipment</td>
<td>76</td>
</tr>
<tr>
<td>4.8.5.1</td>
<td>Equipment Inspection and Maintenance [N/A] Safety Equipment Required at all Aquatic Facilities</td>
<td></td>
</tr>
<tr>
<td>4.8.6.3A</td>
<td>Gates and Doors</td>
<td>77-78</td>
</tr>
<tr>
<td>5.8.5</td>
<td>Lifeguard- and Safety-Related Equipment</td>
<td>131-132</td>
</tr>
<tr>
<td>5.8.5.2.3</td>
<td>Signage</td>
<td>132</td>
</tr>
<tr>
<td>5.8.5.3</td>
<td>Safety Equipment Required at Facilities with Lifeguards</td>
<td>132</td>
</tr>
<tr>
<td>5.8.5.3.7.1</td>
<td>Lifeguards Responsible</td>
<td>133</td>
</tr>
<tr>
<td>5.12.10.14.4</td>
<td>Illness and Injury Incident Reports</td>
<td>145-147</td>
</tr>
<tr>
<td>6.1.2.1.4.9</td>
<td>Rescue Equipment</td>
<td>156</td>
</tr>
<tr>
<td>6.1.2.1.5.4A</td>
<td>Daily Routine Operations</td>
<td>157-158</td>
</tr>
<tr>
<td>6.2A</td>
<td>Lifeguard Training</td>
<td>161-167</td>
</tr>
<tr>
<td>6.3.2</td>
<td>Aquatic Facilities Requiring Qualified Lifeguards</td>
<td>167</td>
</tr>
<tr>
<td>6.3.3A</td>
<td>Safety Plan</td>
<td>167-170</td>
</tr>
<tr>
<td>6.3.4</td>
<td>Staff Management</td>
<td>170-173</td>
</tr>
<tr>
<td>6.3.4.3</td>
<td>Lifeguard Staff</td>
<td>170-171</td>
</tr>
<tr>
<td>6.4.1.4A</td>
<td>Illness and Injury Incident Reports</td>
<td>174-176</td>
</tr>
<tr>
<td>6.4.2</td>
<td>Patron-Related Management Aspects</td>
<td>176-177</td>
</tr>
</tbody>
</table>
1. Water depth greater than 5 ft
   - Likely that an untrained adult can provide assistance
     • Average adult bather’s head above waterline
2. Unsupervised children under 14 yrs of age
   - Ability to make decisions especially when complying with rules, requires adult supervision
   - Water depth over nose/mouth for height of 50th percentile female at 14 yrs of age 63.4 inches
3. Dedicated Surveillance is the responsibility of the qualified lifeguard to actively surveil their "zone of patron surveillance"

- The responsibilities of monitoring groups and surveillance of the patron zones must be separated in order to be dedicated in the surveillance of the patron zone and not distracted with children’s group activities

- The monitoring of children in group activities is often ratios of 1:6 (chaperone to child)

- Chaperones & camp counsellors are typically not CPR/AED trained and not necessarily familiar with emergency action plans for specific water facilities

Protecting Consumers from Drowning - Rational for Certified Lifeguards MAHC
2018 MAHC Annex 6.3.2, pg 182

4. Groups of people including camps, youth and adult swim teams, exercise groups, swim lessons that use the water venue for an active need dedicated qualified lifeguards. The organizer of the group cannot manage multiple needs of the group and surveillance of the patron zone.

- “Group swim lessons are an obvious reason to have a qualified lifeguard as participants are not proficient at swimming, thus at a higher risk for drowning. Lifeguard training, sports, exercise programs, and competitive swimming involve bathers physically exerting themselves and could result in bather distress. If the instructor is focused on an individual, the risk of a different person drowning unnoticed is HIGHER than if a qualified lifeguard was assigned just to patron surveillance”

5. Large Aquatic Venues
   • Based on the idea that the typical untrained individual could throw safety equipment (30 feet) in an attempt to rescue a person in an emergency.
   • Water venues that have larger distances than 30 feet, the reasonable distance a untrained person could throw requires qualified lifeguards

6. Moving Water
   • “Greater chance for a patron to be moved by the force of the water in an unwanted manner.” Qualified lifeguards are required to rescue the person that has been moved further away from safety to prevent injury, illness or drowning.
7. Waterslides Landing Pools, Platforms and Diving Boards
   ▪ Lift pumps that provide water to lubricate water features and slides can result in currents that can move bathers away from safety
   ▪ Bathers are at an increased risk for spinal cord or head injury with the use of starting platforms and diving boards. Qualified lifeguards monitor and prevent dangerous activities and then to trained to respond in the event of an emergency

8. Alcohol Use
   ▪ Risk taking behaviors are increased with the use of alcohol that contribute to injury and drowning
   ▪ Parents/supervisors of children have lapses in surveillance with alcohol is consumed at water venues. Qualified lifeguards are required to mitigate the potential for injury and drowning where alcohol is available at water venues.
Protecting Consumers from Drowning: How Does the MAHC Help?

- MAHC Lifeguard Requirements – setting the lifeguard(s) up for success
  - Adequate training
    - Victim recognition
    - Rescue skills
    - Preventive lifeguarding
    - Pre-service and in-service continued education
  - Adequate #’s of guards for surveillance
    - Zones of patron surveillance
      - Size, shape, blind spots, response time
MAHC Zone of Patron Surveillance

6.3.3.1.1 pg 184

Zone of Patron Surveillance - NOT swimmer to lifeguard ratios

The *Safety Plan* outlines the specific zones of patron surveillance for that particular water venue/aquatic facility.

- All stakeholders are aware of the predetermined zones of patron surveillance that is specifically outlined in the *Safety Plan*.
- The water venue stakeholders understand the number of required qualified lifeguards to surveil the predetermined zones of patron surveillance.
- The zones of patron surveillance are set up by the ability of a qualified lifeguard to SEE the entire zone and then to reach the furthest point within 20 seconds (taking into account any water features & shape of the pool in the event of an emergency.
- “The lifeguard shall be positioned and provided equipment in order to reach the victim within 20 seconds of identification of a trauma or incident”
MAHC Zone of Patron Surveillance

6.3.3.1.1 pg 185

- Depending on the water venue & features in some cases the qualified lifeguard will be required to ROAM or to be ELEVATED in-order to SEE the entire zone of surveillance

- The *Safety Plan* must stipulate the expectation of the qualified lifeguard to SEE the entire zone of the patron surveillance and may include the responsibilities of monitoring objects on deck of specific water features

- An aquatic facility may have more than one water venue at the facility. The *Safety Plan* has to specifically outline the expectations for the zones of patron surveillance for all the venues including water features, shape of the venues.

- Overlap of patron surveillance zones is important to ensure that no areas are unassigned
Vigilance

- “Having a sound lifeguard rotation plan and procedures is crucial to the ability of the qualified lifeguard to be effective in patron surveillance if not done correctly. As a result, the rotation system must be practiced and evaluated to minimize the lapse of patron surveillance time.
- Heat, humidity, high bather counts are stresses for the qualified lifeguard that warrant more frequent breaks.
- Mackworth Clock Test - commissioned in 1950 by the British Royal Navy found that optimal vigilance cannot be maintained for more than 30 minutes.
- Jerison & Pickett demonstrated that low number of critical signals lessen the vigilance time to as little as 20 minutes.
- “Off duty” lifeguard needs to reset ability for vigilance and is not be assigned the responsibility of supervising additional activities.
MAHC Direct Surveillance & Distractions

6.3.4.3 pg 188

- All zones of patron surveillance must be staffed unless the aquatic facility can effectively limit access to the restricted area.

- “The factors of recognition, intrusion, and distraction have been identified as major contributor to drowning in guarded venues. Nothing should be allowed to interfere with a lifeguard’s duty to perform patron surveillance. The MAHC agreed that qualified lifeguards performing patron surveillance should NOT be doing others tasks that could distract them. When on duty, a qualified lifeguard should scan and supervise the aquatic venue with NO other distracting activities such as cleaning, water testing, and minimize unnecessary conversing with patrons.”
Yoni Gottesman 4 yr Old Drowns at Swim Camp

- 4 yr old Yoni Gottesman struggled for his life in front of distracted lifeguard for more than 8 minutes after being aggressively dunked under water in deep waters 12 times
- [https://youtu.be/38ZR9NUWvpM](https://youtu.be/38ZR9NUWvpM)
MAHC Proficiency of Skill

6.3.4.3 pg 189

- Proficiency of skills must be tested at the specific water venue
- The employer needs to verify that the qualified lifeguard maintains the ability to recognize, respond, rescue and resuscitate a victim as quickly as possible.
- Lifeguard skills tested pre-service then at in-services to keep skill fresh & practiced
- Keep documentation of pre-service and in-services on file.
- “If all these skills cannot be done consecutively, it is difficult to expect a successful rescue”
- In-service training should include all Safety Plans and in and out of the water rescue skills for lifeguards “The USLSC final report, the scientific review by the ARC and MAHC agree that lifeguarding skills need to be refreshed as often as possible”
Why Would You NOT Use Lifeguards?

- Perceived liability issue
  - Reduces the perceived litigation risk when a drowning occurs
  - Diminished risk of legal liability saves money

- Staffing
  - Budget: no employment costs for lifeguards
  - Time: spent recruiting
  - Time: Training, continuing education, certification compliance
Need for Lifeguards - Chain of Drowning Survival Case Studies

Case Studies in natural waters

- 1) FL county eliminated lifeguards in 1989. Within 1 year, five persons drowned, 20 others nearly drowned. County re-established lifeguards
  - No drownings during next 8 years.

- 2) HI county from 1985-1991 had 2 drowning deaths, 40 near drownings. Places lifeguards
  - No drownings over next 10 years

- 3) CA Beach seven drownings in 1998 after lifeguards removed (exceeded previous 6-year total) Reinststituted lifeguards
  - No drownings over next decade

Protecting Children, Protecting Communities, Protecting Lives is Good for the Nation

- $6.1 billion in medical and work loss costs nationally
  - Continued acute, subacute and chronic medical care of non-fatal drowning children
  - Caregiver burden and loss earning revenues
- Loss of community investment in our children
  - Vaccinations, education, well visits, community participation
  - Loss of life-long productivity
- Community’s emotional burden of a drowned child and non fatal drownings
- Emotional costs for the family of a drowned child or non-fatal drowning
- It just makes sense to regulate and enforce safety practices in our aquatic venues that prevent injury, illness and death
MAHC
More Information: Search on “CDC MAHC” or visit the Healthy Swimming MAHC Website: www.cdc.gov/mahc
Email: mahc@cdc.gov

CMAHC
More Information: Search on “CMAHC” or visit the CMAHC Website: www.cmahc.org
Email: info@cmahc.org