Network for Aquatic Facility Inspection Surveillance Data on Immediate Closures and Violations: Unlocking the Potential Power of Aquatic Inspection Data

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EH2O Recreational Waters Virtual Conference
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Thank You!!!

- Arizona
  - Maricopa
  - Mohave
  - Pima
  - Yuma
- California
  - San Bernardino
  - San Diego
  - Orange
- Florida
- New York
- Texas
  - Austin
- CDC
  - Taryn Mecher
  - Sarah Collier
  - Gouthami Rao
  - Beth Dunbar
  - Michael Beach
  - Jasen Kunz
  - Katie Fullerton
Outline

- **Background**
  - Overview of swimming
  - National surveillance of recreational water–associated illness and injury

- **Methods & Results**

- **Discussion**
  - Explain implications, examine limitations, share conclusions
BACKGROUND
Swimming in the United States

- **National Sporting Goods Association (2009)**
  - Swimming: 4th most popular sports activity
  - 50,226,000 people, ages ≥7 years, swam ≥6 times*
    - At least 301,356,000 swimming instances

- **Centers for Disease Control and Prevention**
  - Preliminary data: at least 1 BILLION total annual days in recreational water

- **Pkdata (2011)**†
  - 309,000 U.S. public aquatic venues (e.g., pools)


Health Benefits of Water-based Physical Activity*

- Fight U.S. obesity epidemic
- Might be only physical activity option
  - Medical restrictions
  - Aging population
- Improve physical and mental health across lifespan
  - Manage chronic illnesses
  - Alleviate joint and muscle pain
  - Maintain bone health
  - Reduce anxiety and depression

* Source: [www.cdc.gov/healthywater/swimming/health_benefits_water_exercise.html](http://www.cdc.gov/healthywater/swimming/health_benefits_water_exercise.html)
Public Health Goal

- Maximize health benefits and minimize risk for illness and injury

- Need to do surveillance to:
  - Characterize epidemiology
    - Estimate magnitude
    - Document distribution
    - Track natural history
  - Inform and evaluate prevention efforts to optimize illness and injury prevention

Recreational Water–associated Outbreaks

- Recreational water–associated outbreak
  - Occurrence of similar illness in ≥2 persons
  - Epidemiologically linked by location and time of exposure to recreational water
Recreational Water–associated Outbreaks, by Year and Type of Exposure — United States, 1978–2012 (n=879)*

- Outbreaks associated with aquatic venues (e.g., pool)
- Outbreaks associated with untreated rec water venues (e.g., lake)

Source: Hlavsa MC et al, 2015. MMWR 64(24): 668-672
Aquatic Facility–associated Outbreaks, by Year — United States, 1978–2012 (n=650)*

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Drowning

➢ Fatal drowning*
  ▪ ~4,000 annual deaths due to drowning
  ▪ Leading cause of injury death in children ages 1–4 years
    — More than half of drownings occur in a pool

➢ Nonfatal drowning†
  ▪ ~5,800 annual emergency department (ED) visits
    — More than half of patients ages 1–4 years
  ▪ About two thirds of drownings among children ages 1–4 years occur in a pool

Pool Chemical–associated Health Events*

- ~3,000–5,000 annual U.S. ED visits
  - About half of patients ages <18 years

Patients injured when

- Handling chemicals without proper protective equipment
- Mixing incompatible chemicals
- Not securing chemicals away from children

Model Aquatic Health Code (MAHC) Timeline

- 2005: Council of State and Territorial Epidemiologists (CSTE) called on CDC to develop model code
- 2007–2014: CDC and New York State Department of Health spearheaded multi-stakeholder effort to develop model code
- August 2014: First edition of MAHC released
Preventing Aquatic Facility–associated Illness & Injury

- Problem
  - Unable to assess MAHC’s public health impact with current surveillance data for years or decades

- Solution
  - Need another surveillance system in interim
  - Inspection data as real-time assessment of
    - Operation and maintenance of public aquatic venues
    - Violations = risk for illness and injury
METHODS
National Aquatic Facility Inspection Surveillance (NAFIS)

- **Summary statistics**
  - Number of public aquatic venues and routine inspections
  - Percentage of inspections resulting in immediate closure or that identified ≥1 violations

- **15 critical risk-reduction MAHC elements**
  - Aquatic facility–associated illness
  - Drowning
  - Pool chemical–associated health events

- **Overall and stratified analysis**
  - Venue type (e.g., pool, hot tub/spa)
  - Pool category (e.g., wading pool, interactive water play venue)
NAFIS Flowchart

1. Determine Inspection Items
2. Request Data
3. Reformat & Standardize Data
4. Analyze Data
5. Report Findings to Jurisdiction & Obtain Approval
6. Aggregate Multiple Databases into One
RESULTS
Overall Pool & Spa Routine Inspection Results

- 84,187 routine inspections of 48,632 venues
- 12.3% (8,118/66,098) public pool and hot tub/spa inspections resulted in immediate closure
- 78.9% (50,974/64,580) inspections identified ≥1 violations
  - Median 2 (range: 0–21) violation(s) identified per inspection
## Preventing Aquatic Facility–associated Illness

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<th>%</th>
<th>No. Violations/No. Inspections*</th>
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<td>Proper free available chlorine or bromine concentration</td>
<td>11.9%</td>
<td>(7,662/64,580)</td>
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<tr>
<td>Proper pH</td>
<td>14.9%</td>
<td>(9,236/62,141)</td>
</tr>
<tr>
<td>Recirculation pump approved, in good repair, or operating</td>
<td>1.4%</td>
<td>(220/15,231)</td>
</tr>
<tr>
<td>Filter approved, in good repair, or operable</td>
<td>1.9%</td>
<td>(287/15,231)</td>
</tr>
<tr>
<td>Automated chemical feeder in good repair or operable</td>
<td>5.2%</td>
<td>(3,031/57,967)</td>
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## Preventing Drowning & Entrapment

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<td>Fencing, walls, gates, and doors in good repair or self-closing and self-latching gates and doors</td>
<td>5.1% (3,303/64,580)</td>
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<tr>
<td>Water clear or main drain visible</td>
<td>1.3% (420/32,105)</td>
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<tr>
<td>Main drain covers compliant with VGB Pool and Spa Safety Act or with ASME/ANSI A112.19.8 or covers/grates of suction outlets secured in place or in good repair</td>
<td>1.2% (739/64,018)</td>
</tr>
<tr>
<td>Qualified or adequately staffed lifeguards</td>
<td>0.0% (10/23,056)</td>
</tr>
<tr>
<td>Appropriate safety equipment (e.g., hook, ring) or in good repair or first aid kit present</td>
<td>12.7% (7,845/61,648)</td>
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# Preventing Pool Chemical–associated Health Events & Other Non-Drowning/Entrapment Injuries

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<tr>
<td>Chemicals labeled, stored safely, or secured</td>
<td>4.6% (471/10,264)</td>
</tr>
<tr>
<td>Hot tub/spa temperature ≤104°F (40°C)</td>
<td>7.5% (1,037/13,783)</td>
</tr>
<tr>
<td>Protected overhead electrical wires or GFCI–electrical outlets</td>
<td>0.3% (162/50,142)</td>
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### General Health & Safety

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<tr>
<td>Qualified operator or responsible supervisor on site</td>
<td>1.1% (291/25,495)</td>
</tr>
<tr>
<td>Substantial alterations or equipment replacement approved</td>
<td>0.4% (214/54,495)</td>
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Routine Inspections, by Venue Type — United States, 2013

- Pool: 66.4%
- Spa: 24.3%
- Unknown: 9.3%
Key Venue-Specific Findings

- Routine spa inspections
  - 15.1% resulted in immediate closure
  - 19.2% identified disinfection violations
  - 27.5% identified pH violations
  - 7.5% identified water temperature violations
Routine Inspections, by Pool Category — United States, 2013

- Pool: 95.8%
- Wading pool: 2.9%
- Interactive water play venue: 0.1%
- Other*: 1.3%

* Other pool type inspections include special purpose pools, water attractions, water activity, water slides, and lazy rivers.
Key Pool Category—Specific Findings

- Routine kiddie/wading pool inspections
  - 21.6% resulted in immediate closure
  - 19.2% identified disinfection violations
  - 26.0% identified pH violations
Routine Inspections, by Venue Type and Setting
United States, 2013

Pool (n=55,913)
- Unknown: 99.5%
- Known: 0.5%

Spa (n=20,449)
- Unknown: 99.1%
- Known: 0.9%
DISCUSSION
Take Home Message #1

- Environmental health practitioners play vital role in preventing aquatic facility–associated illness and injury
  - Only 68% of U.S. local public health agencies regulate, inspect, or license public aquatic venues*

Take Home Message #2

- Report=Call to all stakeholders to do better
  - Patrons and aquatic staff shouldn’t get sick or hurt at public aquatic facilities
    - Minimize risk
  - Set minimum standards and increase them over time
    - Make it harder for “bad apples” to stay in the game
Implications for Public Health

- Inspection=opportunity to educate operators about how and why to properly operate and maintain venues
  - Prevent repeat violations
  - Minimize venue-based risk for illness and injury
- Inspector training
- Increase awareness of and access to inspection results
  - Post prominently at venue and online
  - Provide inspection score or grade
Implications for Aquatics

- Inspection=opportunity to learn about how and why to properly operate and maintain venues
- Operator training
- Review 15 critical risk-reduction MAHC elements
  - Do they match your priorities?
  - Do they match your staff’s priorities?
- Increase awareness of and access to inspection results
  - Post prominently at venue and online
Implications for Public

- Bathers and parents of young bathers need to take more active role in keeping themselves and others healthy
  - Check if results of recent inspection are available
  - Conduct own abbreviated inspection
  - Identify issues and notify
    - Operator
    - State or local public health agency
Limitations

- Results might not be generalizable to U.S. public aquatic venues nationwide
  - Only 16 of 1000’s of local jurisdictions
  - But 15.7% of estimated 309,000 U.S. public aquatic venues
- Number of venues and of inspections of each venue vary across jurisdictions and some jurisdictions contributed more inspection records than others
- No overall standard across jurisdictions
In Conclusion...at Local and State Level...

- Determine magnitude of closures and violations to advocate for environmental health programs
In Conclusion...at Local and State Level...

- Characterize distribution of closures and violations by venue type, pool category, and setting
  - Direct planning and implementation of program: enforcement (e.g., risk-based inspections) and education
In Conclusion...at Local and State Level...

- Evaluate prevention efforts
In Conclusion... at National Level

- Share lessons learned with database vendors
  - Optimize data collection and storage to facilitate data analysis and interpretation
    - Analyses of 16 jurisdictions’ data took 9 months of full-time reformatting and standardizing
    - Inability of all jurisdictions to readily access, extract, and send electronic inspection data
Environmental Health Leaders

- Environmental health practitioners should lead multidisciplinary teams (e.g., including epidemiologists and IT specialists) to unlock the full potential of pool and spa inspection data.
In Conclusion...at National Level

- 2013 routine pool and spa inspection data
  - Snapshot of operation and maintenance of U.S. public aquatic venues
  - Baseline for evaluation of MAHC?
Contact Information

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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.
THANK YOU!