

# Waterborne diseases and public health implications

Elya Franciscus

Harris County Public Health

Houston-Galveston Area Council

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Chronic Disease



Food Safety



Emergency Preparedness



Environmental Health



Infectious Diseases



Injury



Social, Mental, and Emotional Wellbeing

# Epidemiology Background

- Texas has a list of reportable disease
- Reports come in from hospitals, laboratories, doctor's offices, etc.
- We investigate the reports that come in
- Provide control measures and education
- The information is submitted to the Department of State Health Services in Austin



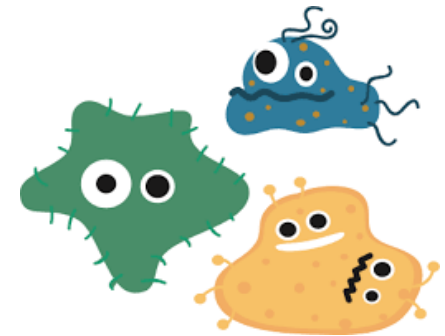
# Waterborne Diseases

- E.coli
- Salmonella
- Salmonella typhi
- Shigella
- Campylobacter
- Vibrio
- Legionella
- Norovirus
- Hepatitis A
- Cryptosporidium



# Bacterial Pathogens

- E.coli, Salmonella, Salmonella typhi, Shigella, Vibrio, **Legionella** and Campylobacter
- Cause diarrheal illness
  - Legionella causes Pneumonia or Pontiac Fever
- All can be contracted through contaminated water
- Prevention: hand hygiene, boiling water (1 min), source protection, halogenation of water
  - Legionella: maintain water systems at specific temperatures, disinfection of recreational water systems, prevent water stagnation, prevent biofilms



# Case Study: E.coli O157 in Cabool, Missouri, 1989

- 243 cases, 32 hospitalized, 4 deaths
- Contamination of municipal water supply
  - Exceptionally cold weather
  - Water meter replacements and two breaks in distribution lines
  - No practice of line disinfection
  - No sampling or disinfection after line breaks
  - Surface water run-off infiltrated system, open culverts, sewage and storm runoff found near water pipe – after storms
  - Sewage lines crossed water lines



# Case Study: E.coli O157 in Cabool, Missouri, 1989

- Mitigation efforts:
  - Boil water order
  - Chlorination program for community water supply
  - System disinfection of water supply



# Case Counts of Waterborne Bacterial Pathogens in Harris County Jurisdiction by Year

Bacterial Pathogen	2013	2014	2015	2016	2017*
Campylobacter	160	162	167	216	246
Vibrio Cholerae	0	0	1	0	0
Salmonella	459	340	375	503	337
E.Coli (STEC)	107	59	73	81	67
Shigellosis	576	99	219	390	89
Typhoid Fever	1	1	7	3	2
Vibrio non-Cholerae	13	8	8	10	21
Legionella	7	10	10	9	14

\*Data collection is still ongoing

# Viral Pathogens

- Norovirus\*\*
  - Cause: diarrheal illness
  - Prevention: source protection, disinfection
- Hepatitis A
  - Cause: Inflammation of the liver, Gastrointestinal symptoms, jaundice
  - Prevention: source protection, disinfection, resistant to combined chlorines

\*Data collection is still ongoing

\*\* Norovirus is not a reportable condition, only in outbreak situations

Case Counts of Waterborne Viral Pathogens in Harris County Jurisdiction by Year

Viral Pathogen	2013	2014	2015	2016	2017*
Hepatitis A	5	1	8	6	6



# Case Study: Norovirus in Finland, 1998-2003

- 48 outbreaks
- Norovirus caused 18 of these outbreaks
- Most caused by sewage contamination of surface water systems
  - Many plants still used surface water (lakes and rivers) as raw water
  - Inadequate disinfection was a common reason for outbreaks
  - When snow melts in spring it causes surface runoffs and flooding
  - Poor sewage disposal in private homes and rentals



# Case Study: Norovirus in Finland, 1998-2003

- Mitigation efforts:
  - Increased awareness of viral risks
  - Laboratory techniques have been improved
  - Capacity for analyzing environmental samples has increased



# Parasitic Pathogens

- Cryptosporidium
  - Parasite
  - Causes diarrheal illness
  - Can be contracted through contaminated water
  - Prevention: source protection, boil water (1 min), filtration, reverse osmosis

Case Counts of Waterborne Parasitic Pathogens in Harris County Jurisdiction by Year

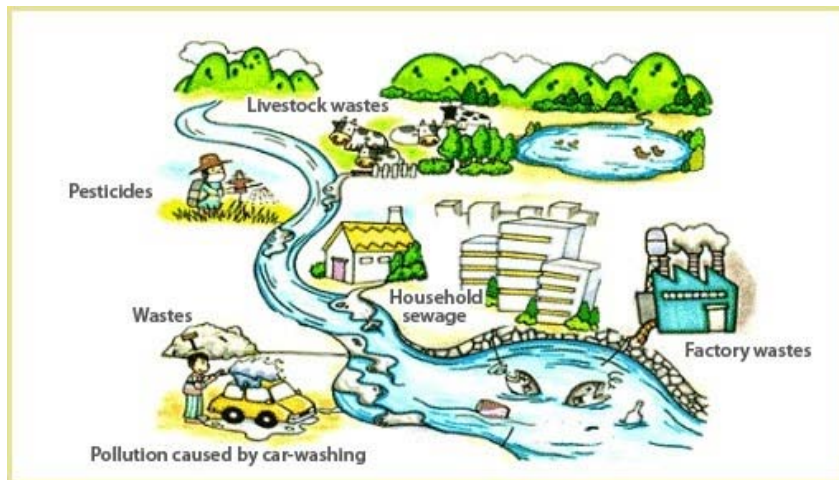
Viral Pathogen	2013	2014	2015	2016	2017*
Cryptosporidium	36	31	9	28	38

\*Data collection is still ongoing



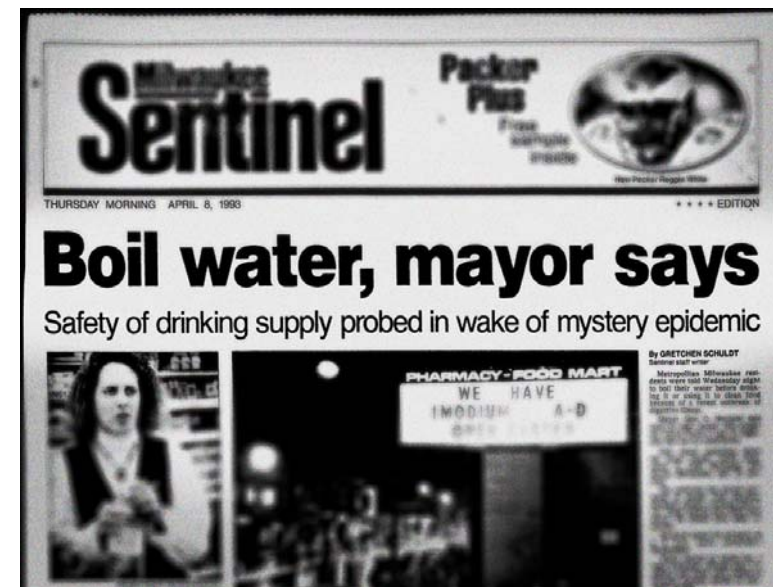
## Case Study: Cryptosporidium in Milwaukee, Wisconsin 1993

- >400,000 cases based on symptoms
- 4,400 hospitalizations
- 69 deaths (93% attributable to PLWHA)
- During heavy rains the city's filtration system was overwhelmed
- Cryptosporidium from Lake Michigan infected the water supply
- Possible sources: cattle, slaughterhouses, human sewage
- Water was frozen and stored

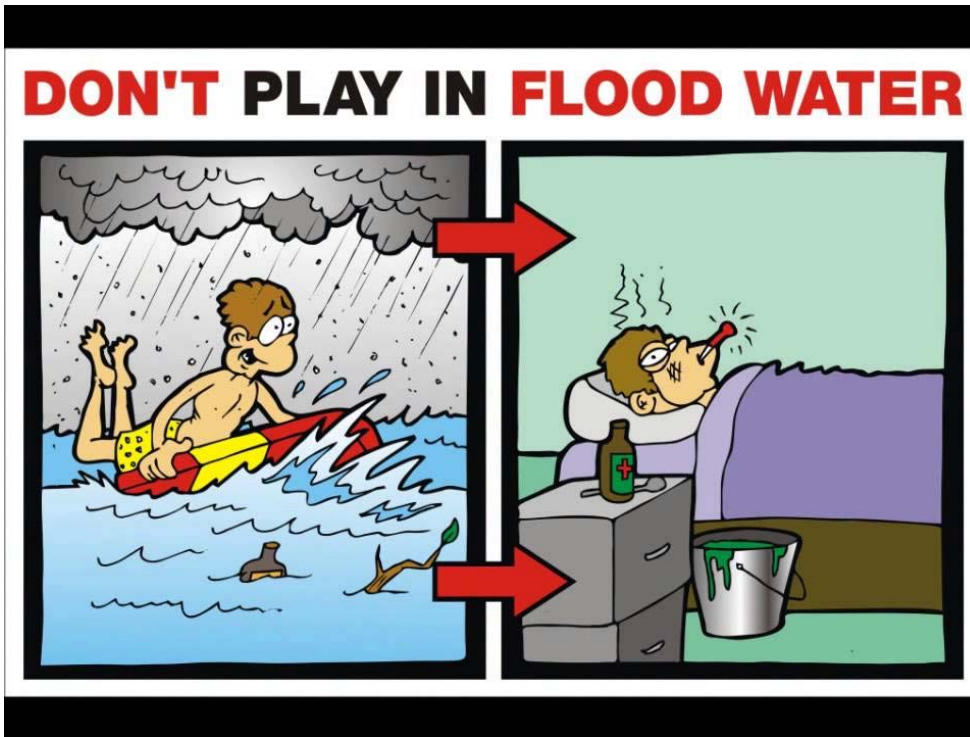


# Case Study: Cryptosporidium in Milwaukee, Wisconsin 1993

- Mitigation Efforts:
  - Boil water advisory
  - Committed \$417 million to infrastructure to ensure high quality water
  - Renovated facilities, strengthened source water protection, disinfection and filtration
  - Milwaukee is now a leader in a water quality and water testing
  - Created the Interagency Clean Water Advisory Council (Milwaukee Water Works and the Milwaukee Health Department)



# Flood Risks to Public Health- Water Contamination



- Microbial contamination (viral, parasitic and bacterial) of flood waters
  - Hand hygiene
  - Don't enter water with open cuts or wounds
  - Avoid standing water
  - Areas saturated with floodwater
  - Areas with visible debris



# Daily Community Disease Monitoring and Community Assessment after Hurricane Harvey

- Daily Situational Reports:
  - Epi department conducted daily community disease monitoring and community assessment after Hurricane Harvey
  - Harris County case counts of bacterial, viral and parasitic waterborne illnesses did not show any marked increase post Harvey. Neither did cases in the City of Houston – except Vibrio
  - In fact, we saw the number of most disease cases actually **decrease** from the same time period in years prior
  - Possible Reason:
    - Interrupted patient visits
    - Lengthy turnaround time for lab tests



# Hurricane Harvey and Vibrio Infections in Texas, 2017

- 3 reported confirmed *Vibrio* cases (1 out of jurisdiction case) linked to Hurricane Harvey, post hurricane flooding, & clean up in Texas





# Hurricane Harvey and Vibrio Infections in Texas, 2017

## ■ Case #1

- 74 year male, Aransas Co
- Search and Rescue team found him on 8/29/17
- Food injury
- Amputation of leg below knee
- Survived

## ■ Case #2

- 65 year old male, Calhoun Co
- Evacuated from RV park on 8/26/17
- Returned home on 8/31/17 and began clean up
- Injured leg and then went fishing



# Hurricane Harvey and Vibrio Infections in Texas, 2017

## ■ Case #3

- 11 year old male
- Playing in backyard, fell into stagnant water and injured knee

## ■ Case #4

- Out of Texas
- 55 year old male, MS resident
- Helped with post Harvey clean up in Galveston
- Developed severe sunburn, developed wound
- Hospitalized but survived



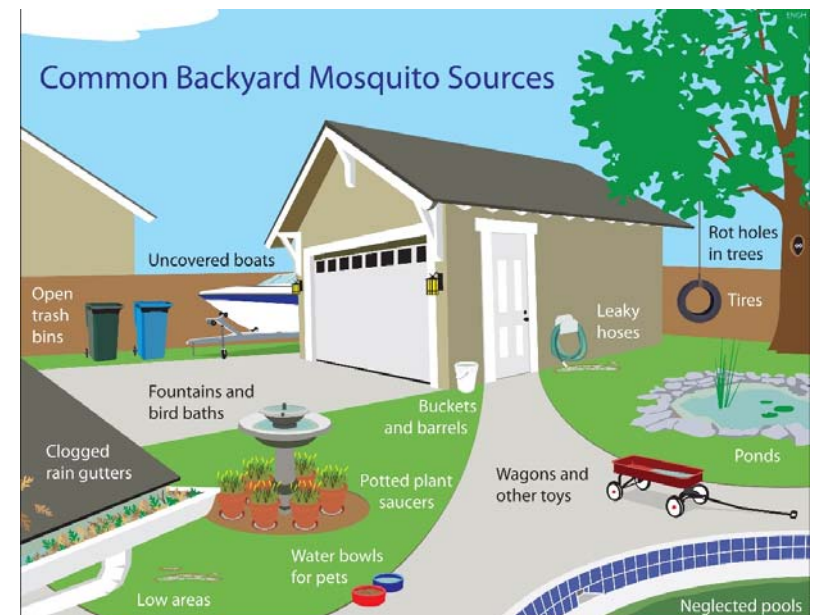
# Flood Risks to Public Health- Arbovirus



- Vector-borne illness
- WNV and Chikungunya
  - Can be neuroinvasive or non-neuroinvasive
  - Manifest as meningitis, encephalitis, AFM, etc.
  - Fever and chills
- Zika
  - Asymptomatic 80%
  - Fever, rash, conjunctivitis, arthralgia
  - Can cause congenital microcephaly or other congenital CNS abnormalities

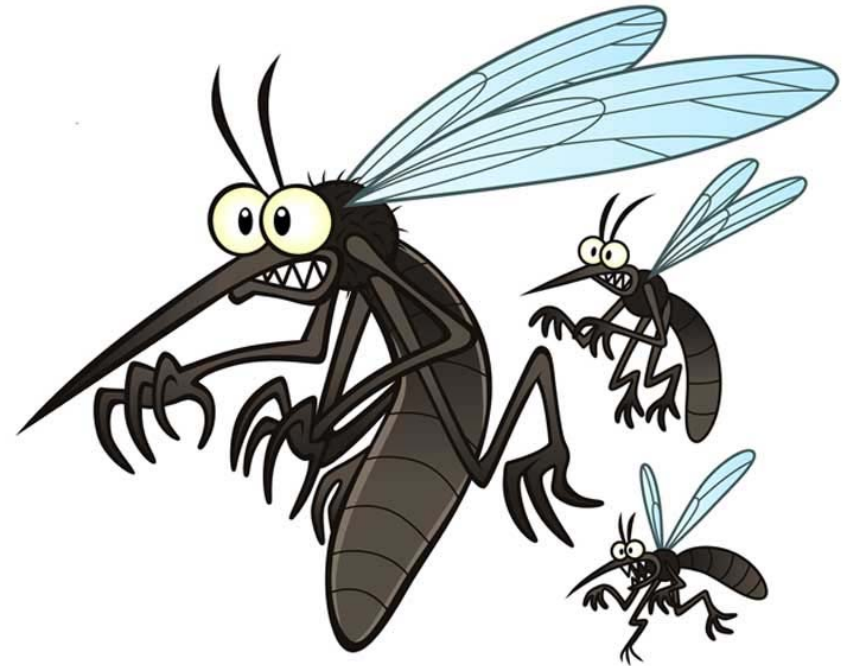
# Flood Risks to Public Health- Arbovirus

- Mosquitoes risks
  - Populations can explode after storms/flooding
  - Can carry severe diseases
    - Zika, WNV, Chikungunya
  - Prevention: remove/empty containers that can hold water (tires, flower pots, birdbaths, etc.), Install or repair screens, sweep up lawn clippings and leaves, eliminate mosquito breeding sources in the home



# Flood Risks to Public Health- arbovirus

- Ongoing questions:
  - We usually see an increase in mosquito activity after any rainfall event
  - Hard to know if mosquito increase was due to Harvey, temperature or simply seasonal
  - No significant increase in mosquito-related illness either
    - Greatest activity is usually a month after the greatest abundance of mosquitos



# Questions?





# Harris County Public Health

## { Vision }

- Healthy People,
- Healthy Communities,
- A Healthy Harris County

## { Values }

- Excellence
- Compassion
- Flexibility
- Integrity
- Accountability
- Professionalism
- Equity

## { Mission }

- Promoting a Health and Safe Community
- Preventing Injury and Illness
- Protecting You

[www.hcphtx.org](http://www.hcphtx.org)