

Norovirus Epidemiology and Surveillance

Sara Mirza, PhD, MPH

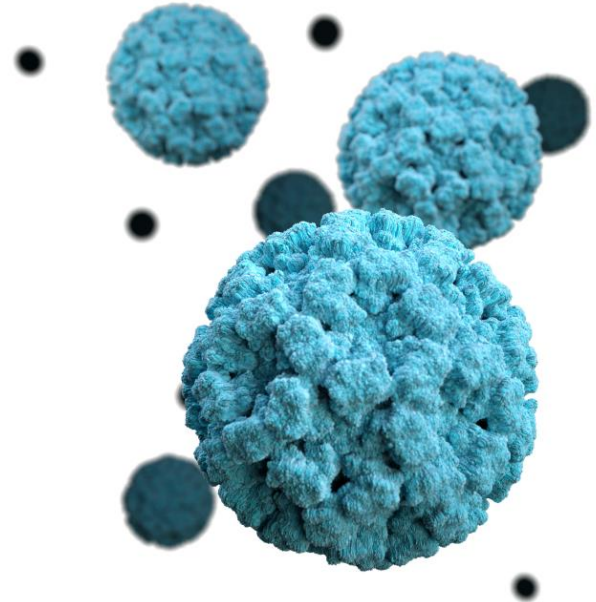
Anita Kambhampati, MPH

Viral Gastroenteritis Epidemiology Team

Division of Viral Diseases, NCIRD, CDC

AFDO Webinar

November 8, 2021



Norovirus Headlines

The Salt Lake Tribune

‘We haven’t had anything like this before’: Norovirus has spread to at least 10 schools in

Norovirus Contributed To NH Restaurant Patron Death, Health Officials Say

THE NEW YORK POST

Chipotle says sick staffer spread norovirus, causing \$1 billion market cap loss

Published: July 26, 2017 8:11 a.m. ET



Positive test result for norovirus spurs



TIME

CORONAVIRUS BRIEF

YOUR QUESTIONS ANSWERED

WEARING MASKS

SHOPPING SAFELY



NEWSLETTER SUBSCRIBE

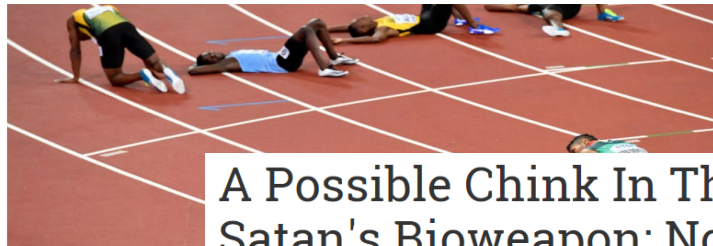


BUSINESS • FOOD & DRINK

Chipotle Paying Record \$25 Million Fine Over Tainted Food, Norovirus Outbreaks



Norway norovirus outbreaks linked to seaweed salad from China

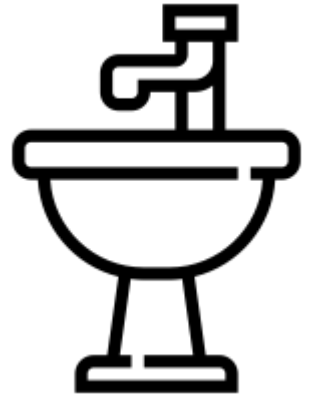


A Possible Chink In The Armor Of Satan's Bioweapon: Norovirus



By Joe Whitworth on September 3, 2019

Norovirus Transmission



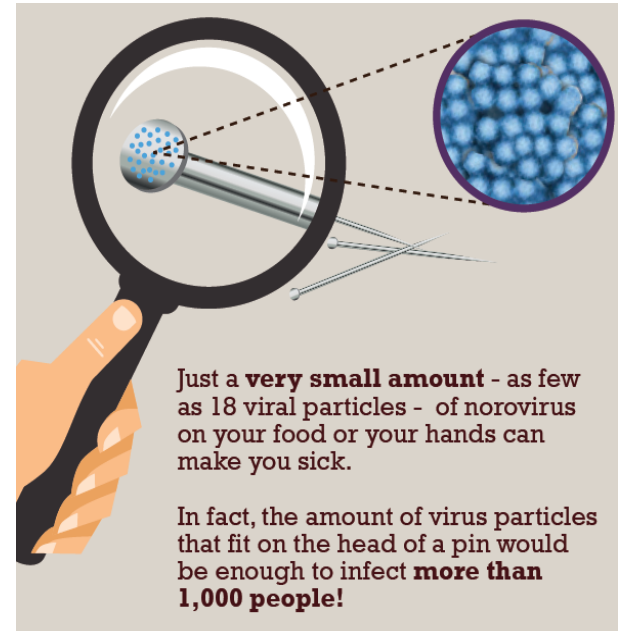
Norovirus Illness

- Incubation period: 12–48 hours
- Acute-onset vomiting and/or diarrhea
 - Watery, non-bloody stools
 - Abdominal cramps, nausea, low-grade fever
- Most recover after 12–72 hours
 - 10–12% seek medical attention; some require hospitalization and fluid therapy
 - More severe illness and death mostly in young children, elderly, and immunocompromised
- 30% of infections are subclinical



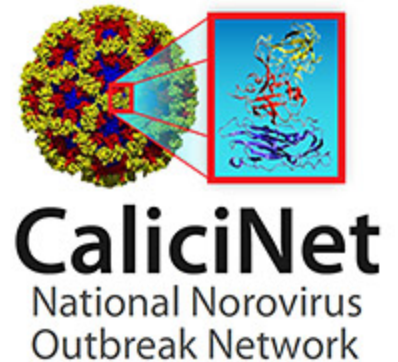
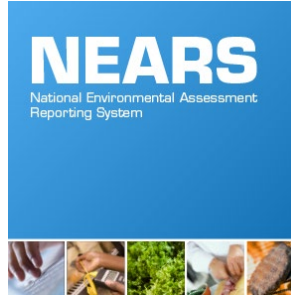
Viral Shedding

- Primarily in stool, but also vomitus
 - 10^5 – 10^{11} viral copies/gram feces
- Peaks 4 days after exposure
 - May continue after resolution of symptoms
- Virus persists on surfaces
- Infectious dose: 18–2,800 viral particles
- Infectivity of prolonged viral shedding and role in transmission is unclear



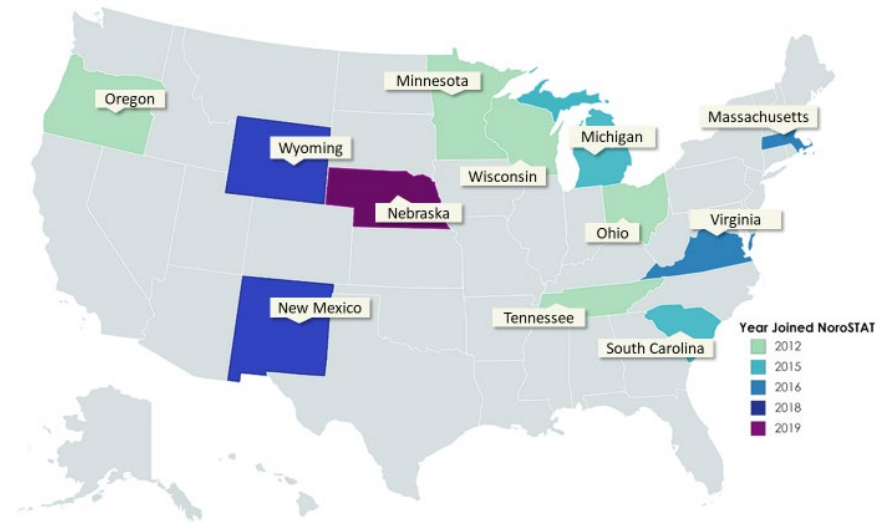
Atmar 2008 EID
Aoki 2010 J Hosp Infect
Teunis 2008 J Med Virol
Atmar 2014 JID

U.S. Norovirus Outbreak Surveillance



Norovirus Sentinel Testing and Tracking (NoroSTAT)

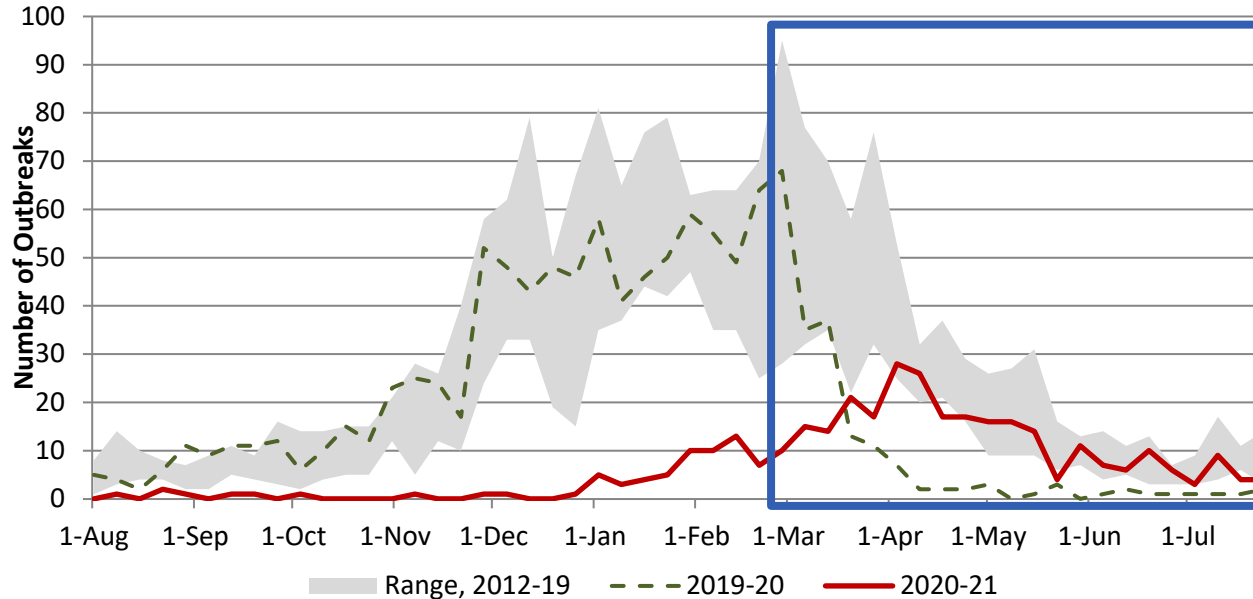
- Near-real time reporting of norovirus outbreaks by network of 12 sentinel states
 - Selected sites provide broad national coverage
 - Rapidly assess the impact of emergent strains
 - Improved timeliness, completeness, and linking of outbreak reports in NORS and CaliciNet



Norovirus Outbreak Reporting, 2019-20

Impacts of COVID-19

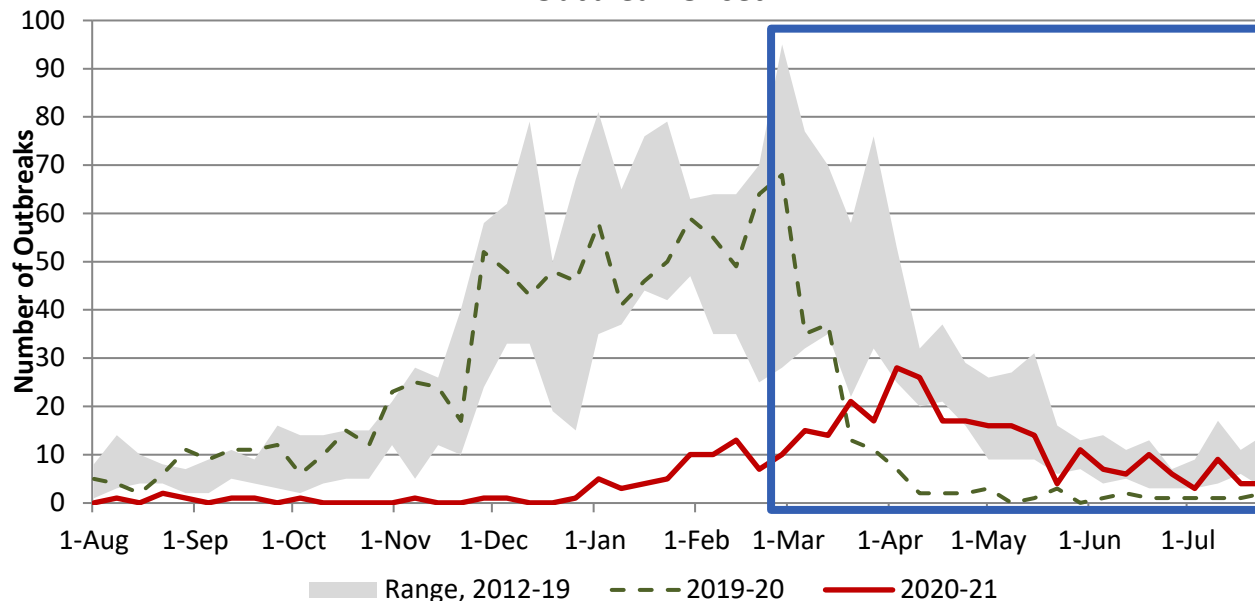
Number of Norovirus Outbreaks Reported to NORS by Month of Outbreak Onset



Norovirus Outbreak Reporting, 2019-20

Impacts of COVID-19

Number of Norovirus Outbreaks Reported to NORS by Month of Outbreak Onset



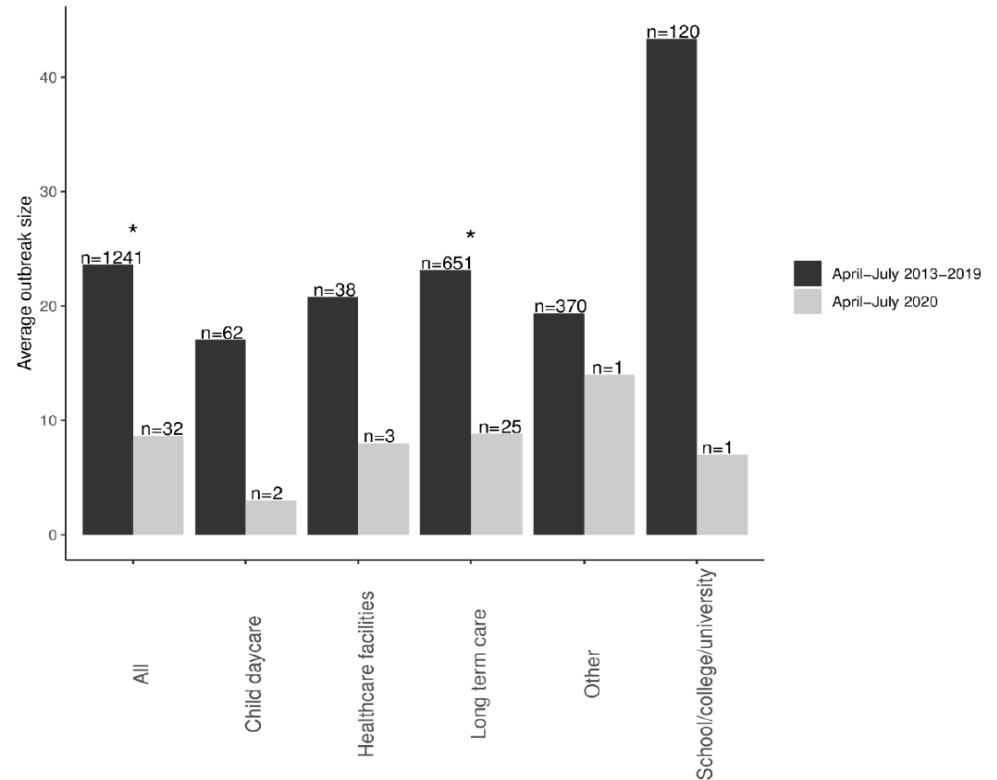
Possibilities for decrease in reporting:

- Underreporting
- Non-pharmaceutical interventions (NPIs) for COVID19
 - Handwashing
 - Social distancing
 - Facility closures

Impact of Non-Pharmaceutical Interventions for SARS-CoV-2 on Norovirus Outbreaks

NPI implementation during April–July 2020 significantly associated with:

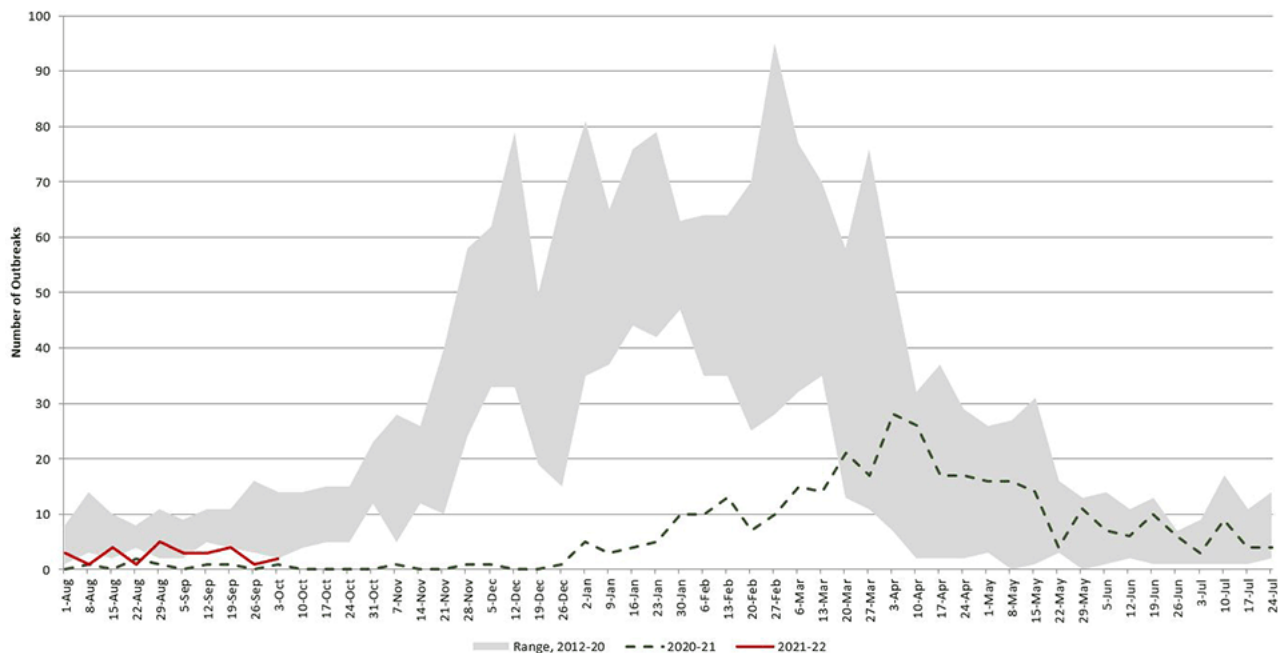
- Reduced number of reported norovirus outbreaks
- Reduced median outbreak size in all settings



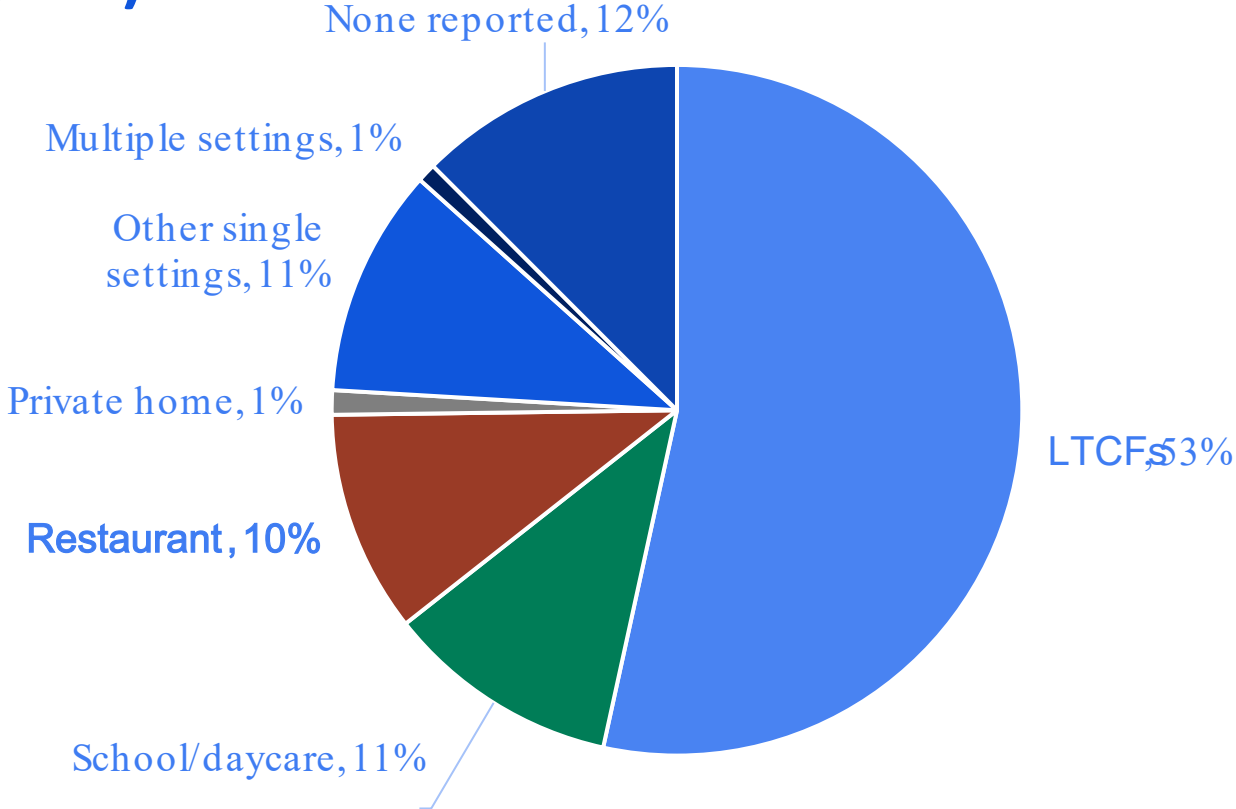
Norovirus Outbreaks Reported to NORS by NoroSTAT, August 2012–October 2021

www.cdc.gov/norovirus/reporting/norostat/data.html

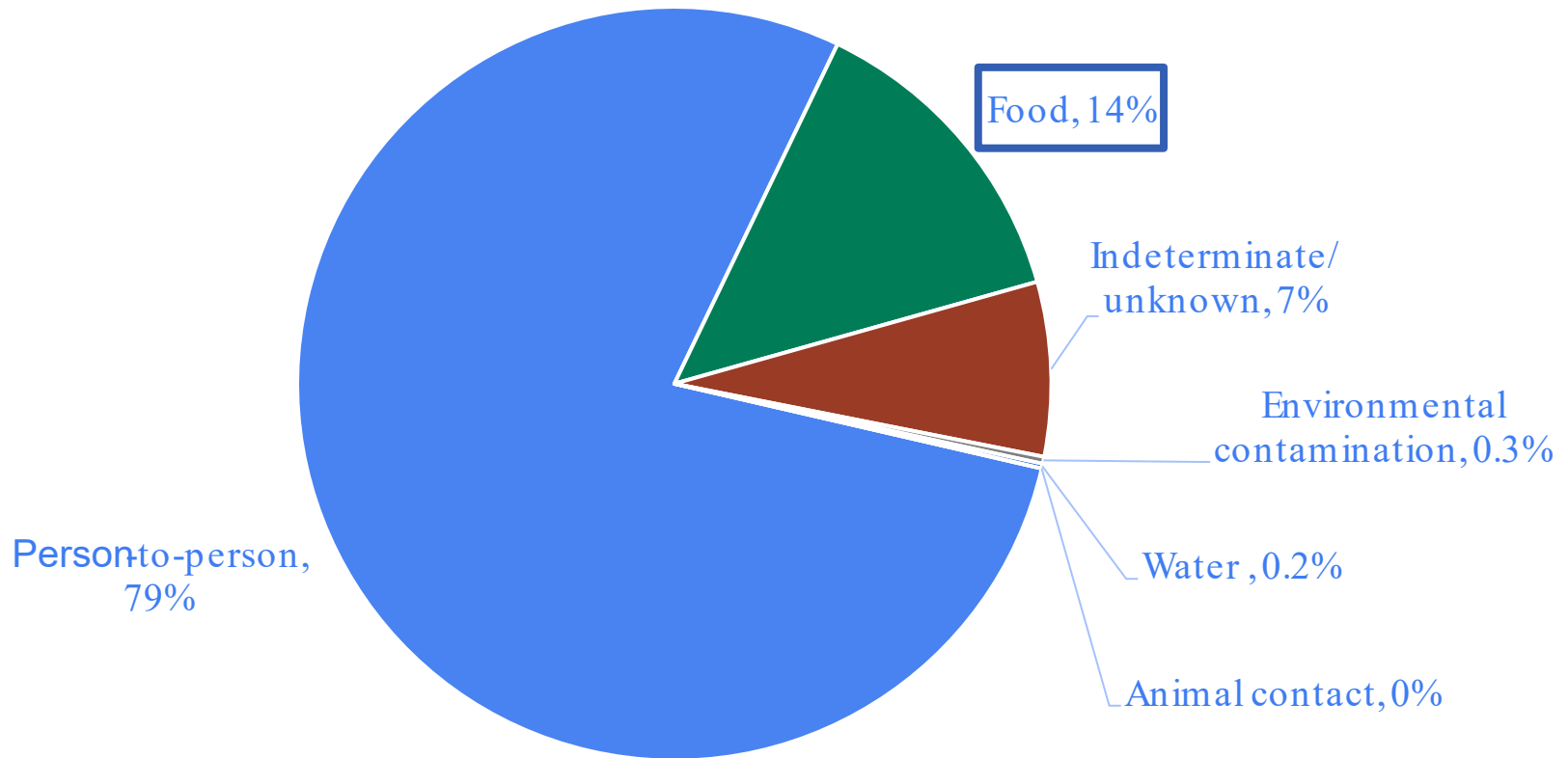
Number of Suspected or Confirmed Norovirus Outbreaks Reported by NoroSTAT-Participating States Per Week, 2012–2022



Settings of Norovirus Outbreaks, NORS, 2009–2019 (N=22,820)

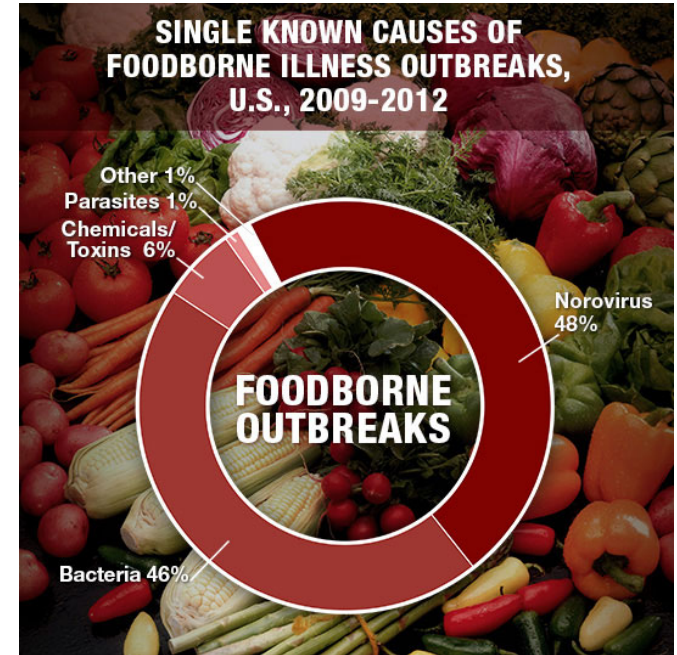


Modes of Transmission in Norovirus Outbreaks, NORs, 2009-2019 (N=22,820)



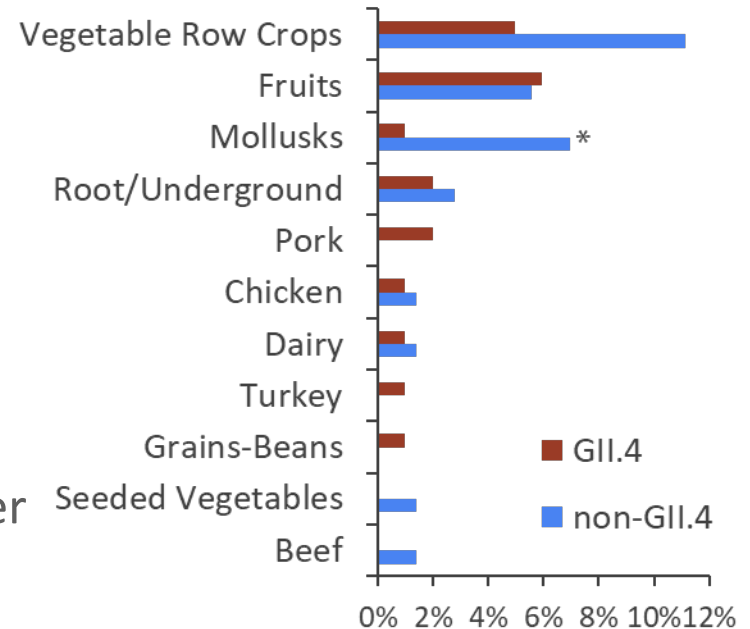
Foodborne Norovirus in the United States

- #1 cause of foodborne disease outbreaks
- #1 cause of foodborne illnesses
- #4 cause of foodborne hospitalizations
- #5 cause of foodborne deaths
- Costs \$2 billion annually in healthcare expenses and productivity losses



Epidemiology of Foodborne Norovirus Outbreaks, NORS and CaliciNet, 2009–2015

- Food product implicated in 173 (35%) outbreaks
- 240 (49%) outbreaks with known contributing factor
 - Food workers implicated as source of contamination in 182 (76%) outbreaks
 - Bare hand contact with ready-to-eat food implicated in 99 (54%) food worker outbreaks



Proportion of implicated single food commodities among 101 GII.4 and 72 non-GII.4 foodborne norovirus outbreaks.

*Significantly different ($p=0.04$).

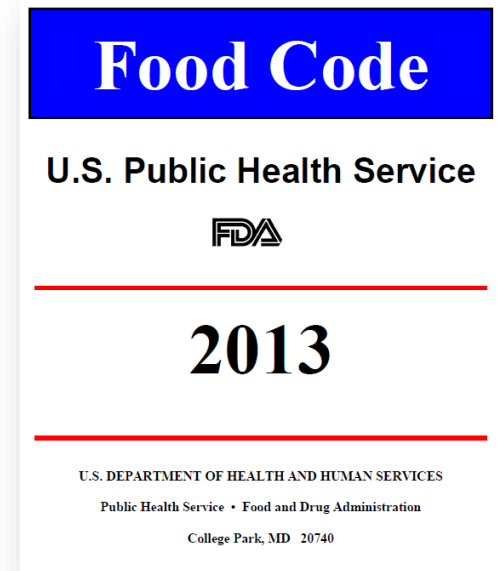
Key Recommendations for the Food Service Industry

- Practicing proper hand washing and using utensils and single-use disposable gloves to avoid touching ready-to-eat foods with bare hands
- Certifying kitchen managers and training food service workers in food safety practices
- Establishing policies that require food service workers to stay home when sick with vomiting and diarrhea and for at least 48 hours after symptoms stop



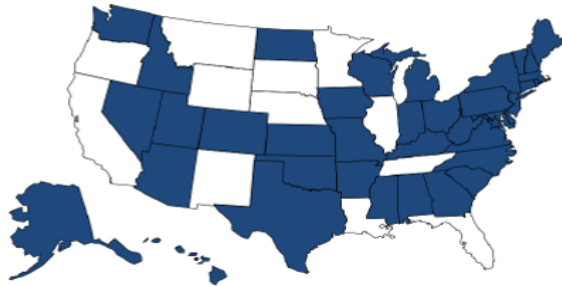
Assessment of State Food Safety Regulations for Norovirus Prevention

- Food Code provides model food safety regulations for preventing transmission of foodborne illness in food service facilities
 - Adoption of specific provisions at discretion of state and local governments
- Analyzed food codes of 50 states and DC for 5 specific provisions:
 1. Require hand washing
 2. Prohibit bare-hand contact with RTE food
 3. Exclude ill staff until ≥ 24 hours after asymptomatic
 4. Require certified food protection manager
 5. Response plan to contamination events

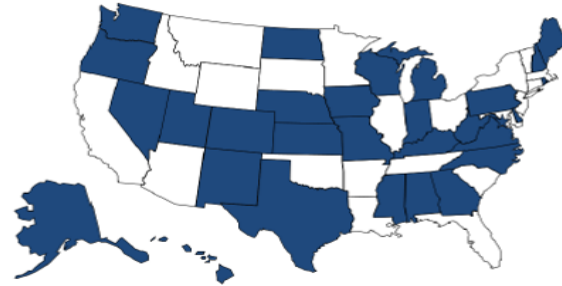


State-by-state Adoption of Food Safety Regulations

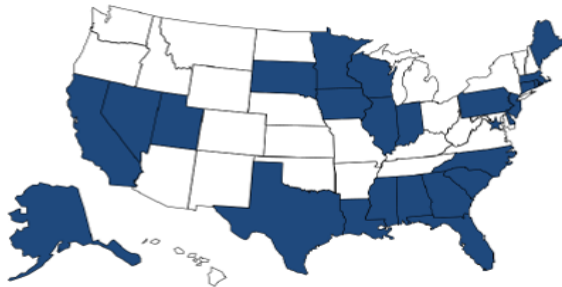
Prohibition of bare-hand contact



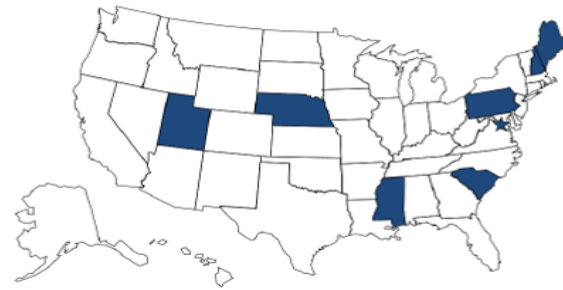
Exclusion of food workers with vomiting/diarrhea



Certified Food Protection Manager

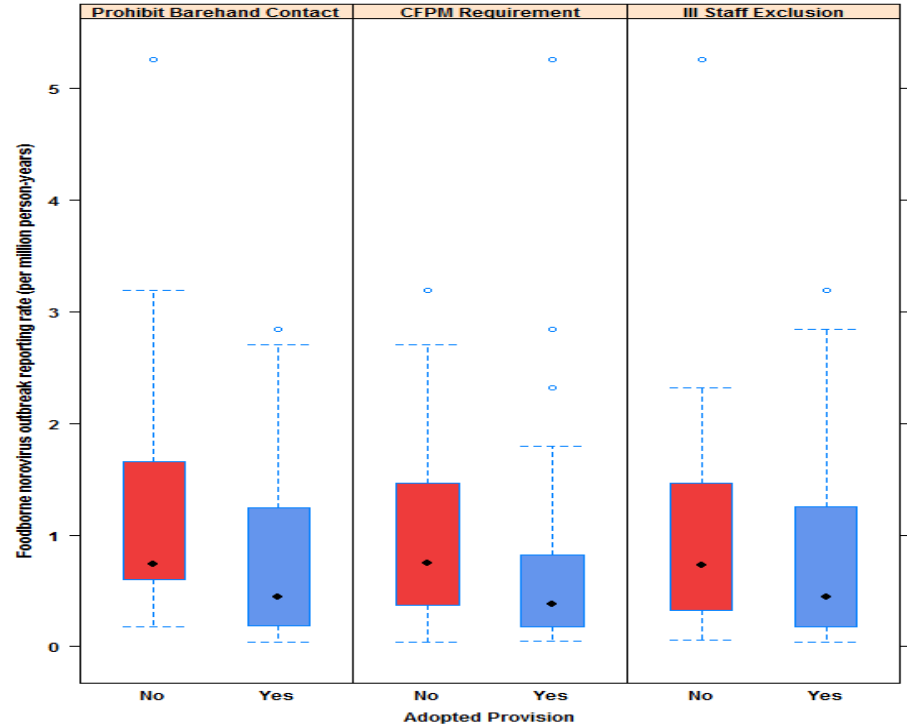


Contamination event response plan



Rate of Reported Foodborne Norovirus Outbreaks Among States Adopting Provisions

- Lower rates of reported outbreaks in states that adopted these provisions
- Suggests potential impact of adoption on reducing incidence of foodborne norovirus
- Many potential confounders and limitations of outbreak surveillance data



Conclusions

- Noroviruses are the leading cause of AGE outbreaks and foodborne disease in the United States
 - Pose substantial morbidity, mortality, and public health burden
 - Infected food workers are the most common source of foodborne norovirus outbreaks, often by touching ready-to-eat foods with bare hands
- Further research needed to understand the impacts of COVID-19 measures on norovirus
- Continued need for adherence to norovirus prevention guidelines and coordination between epidemiology, laboratory, and environmental health
 - Guide development, prioritization, and targeting of interventions, including future vaccines

Acknowledgments

- Viral Gastroenteritis Epidemiology Team, CDC
- Norovirus Laboratory Team, CDC
- Food Safety Team, National Center for Environmental Health, CDC
- Collaborating CDC Programs
- State, Local, Regulatory Partners

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348
www.cdc.gov/norovirus

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.

HOT ZONE

by Ryan Maddox



The new norovirus-inspired toilet