

What do recent data tell us about reducing foodborne illness?

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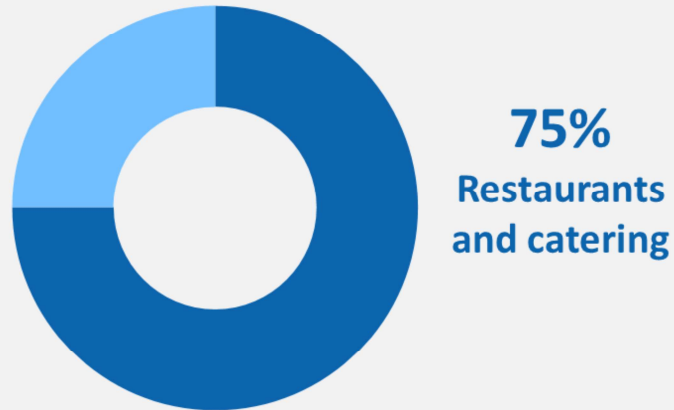
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National Center for Environmental Health



Today I'm going to talk about recent data that informs the topic of foodborne illness and outbreak prevention. But I will be talking about the data at a high level. But I have copies of the presentation with me that include all the references, if you want to dig deeper on your own.

Most common single-setting outbreak location



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First, I'll start with the obvious- Most of the data I present today is focused on retail food establishments, because most U.S. foodborne disease outbreaks are linked with these types of establishments.

Centers for Disease Control and Prevention (CDC). Surveillance for Foodborne Disease Outbreaks, United States, 2016, Annual Report. Atlanta, Georgia: U.S. Department of Health and Human Services, CDC, 2018.

https://www.cdc.gov/fdoss/pdf/2016_FoodBorneOutbreaks_508.pdf



So now, I'll dive right into the research findings. We'll start with food safety management systems.

Food safety management system (FSMS)

Procedures	A set of actions adopted by management for accomplishing tasks in a way that minimizes food safety risks
Training	The process of management teaching employees food safety procedures
Monitoring	Routine observations and measurements conducted to determine if food safety procedures are being followed

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Many of you are likely aware of the recent FDA Risk Factor Study findings showing links between strong food safety management systems and food safety. For this study, food safety was measured by compliance with provisions of the FDA Food Code.

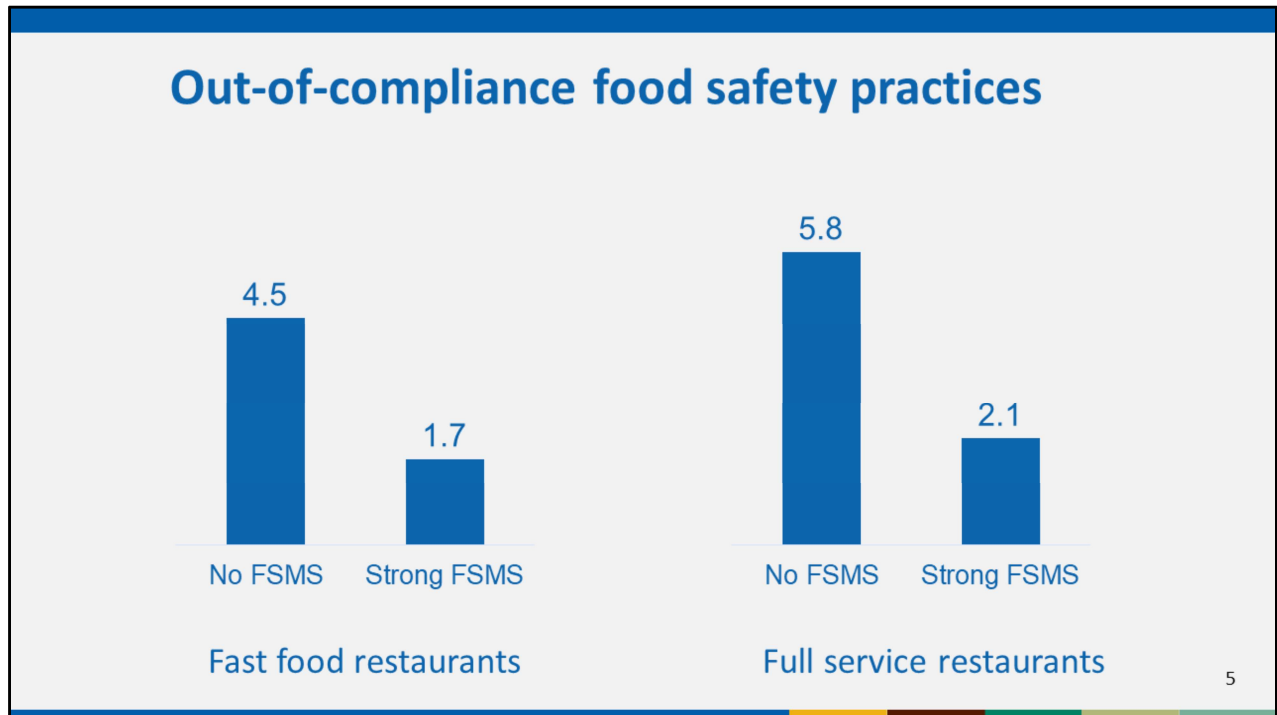
A restaurant has a strong food safety management system if it has procedures, training, and monitoring that help the restaurant achieve active managerial control over food safety. Procedures refers to a set of actions adopted by management that minimize food safety risks. Training refers to management ensuring that employees are taught the food safety procedures. And Monitoring refers to observations and measurements to ensure that food safety procedures are being followed.

In the Risk Factor Study, the FDA measured food safety management systems through interviews with managers.

Reference

Food and Drug Administration (2018). FDA Report on the Occurrence of Foodborne Illness Risk Factors in Fast Food and Full-service Restaurants, 2013-2014.

<https://www.fda.gov/media/117509/download>



The FDA found that retail establishments with well-developed food safety management systems had fewer out-of-compliance food safety practices than did those with less developed food safety management systems.

You can see examples here. In fast food restaurants in the FDA study, restaurants rated as having a strong food safety management system had 1.7 out-of-compliance food safety practices while restaurants rated as having no food safety management system had 4.5 out-of-compliance items. You see similar results for full service restaurants.

These data point to the importance of strong food safety management systems to food safety.

Reference

Food and Drug Administration (2018). FDA Report on the Occurrence of Foodborne Illness Risk Factors in Fast Food and Full-service Restaurants, 2013-2014.
<https://www.fda.gov/media/117509/download>

Procedures

Written slicer cleaning policy	→	Slicers cleaned more frequently
Staffing plans for absent workers		
Policy requiring workers to tell managers when they are ill	→	Workers less likely to work while ill
Policy or schedule for cleaning	→	Smaller outbreaks

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Recent data from CDC studies, conducted by Division of Environmental Health Science and Practice in the National Center for Environmental Health, support this relationship as well. These studies have found relationships between food safety and the management system components of procedures, training, and monitoring.

Here you see a summary of findings showing a link between procedures—policies and plans—and various measures of food safety.

- Starting with the first row in the table—the presence of written slicer cleaning policies in delis is associated with more frequent deli slicer cleaning.
- Then- food workers in restaurants that have staffing plans for when workers aren't able to come to work, and have a policy requiring workers to tell managers when they are ill-- are less likely to report that they had worked while ill with foodborne illness symptoms.
- And restaurants that had a policy or schedule for cleaning had smaller norovirus outbreaks than restaurants that did not have such a policy or schedule.

References

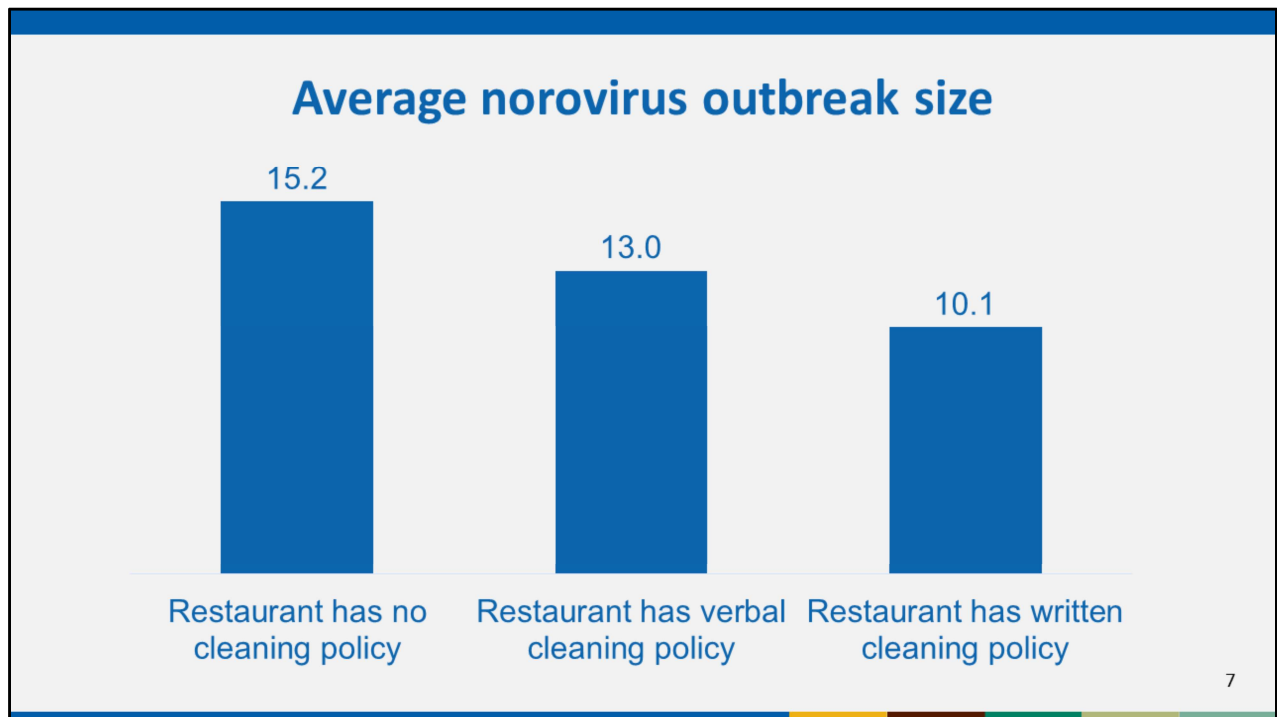
Brown, Hoover, Ripley, Matis, Nicholas, Hedeem, Faw. 2016. Retail deli slicer cleaning frequency — Six selected sites, United States, 2012. *MMWR*. 65(12): 306-310.

https://www.cdc.gov/mmwr/volumes/65/wr/mm6512a2.htm?s_cid=mm6512a2_w

Sumner, Brown, Frick, Stone, Carpenter, Bushnell, Nicholas, Mack, Blade, Tobin-D'Angelo, Everstine, the EHS-Net Working Group. 2011. Factors associated with food workers working while experiencing vomiting or diarrhea. *Journal of Food Protection*. 74(2): 215–220.

https://www.cdc.gov/nceh/ehs/ehsnet/docs/JFP_ill_food_workers.pdf

Hoover. Unpublished data from CDC's National Environmental Assessment Reporting System (NEARS); manuscript in preparation. Norovirus outbreak mitigation analysis.



These graphs show the data from the last study discussed on the previous slide. You see that norovirus restaurant outbreaks are largest—average outbreak size of 15.2-- when restaurants have no cleaning policy. Outbreak size is smallest—5 cases smaller-- when restaurants have written cleaning policies.

Reference

Hoover. Unpublished data from CDC's National Environmental Assessment Reporting System (NEARS); manuscript in preparation. Norovirus outbreak mitigation analysis.



Training and certification

Certified kitchen manager	→	More likely to have proper refrigerator temperatures
Certified kitchen manager	→	Fewer critical violations on inspections
Kitchen manager food safety training	→	More likely to use recommended food cooling methods
Food worker food safety training	→	Workers more likely to wash hands when needed
Food worker food safety training	→	Smaller outbreaks

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CDC data also show a link between training and certification and food safety, as measured by practices, inspection scores, and outbreak risk.

- Delis with a certified kitchen manager were more likely to have proper refrigerator temperatures.
- Restaurants with a certified kitchen manager had fewer critical violations on their inspections.
- Restaurants in which managers had food safety training were more likely to use recommended food cooling methods.
- Workers in restaurants with food-safety-trained workers were more likely to wash their hands when they needed to.
- Restaurants with food-safety-trained food workers had smaller norovirus outbreaks than restaurants without trained workers.

References, in order of listing on slide

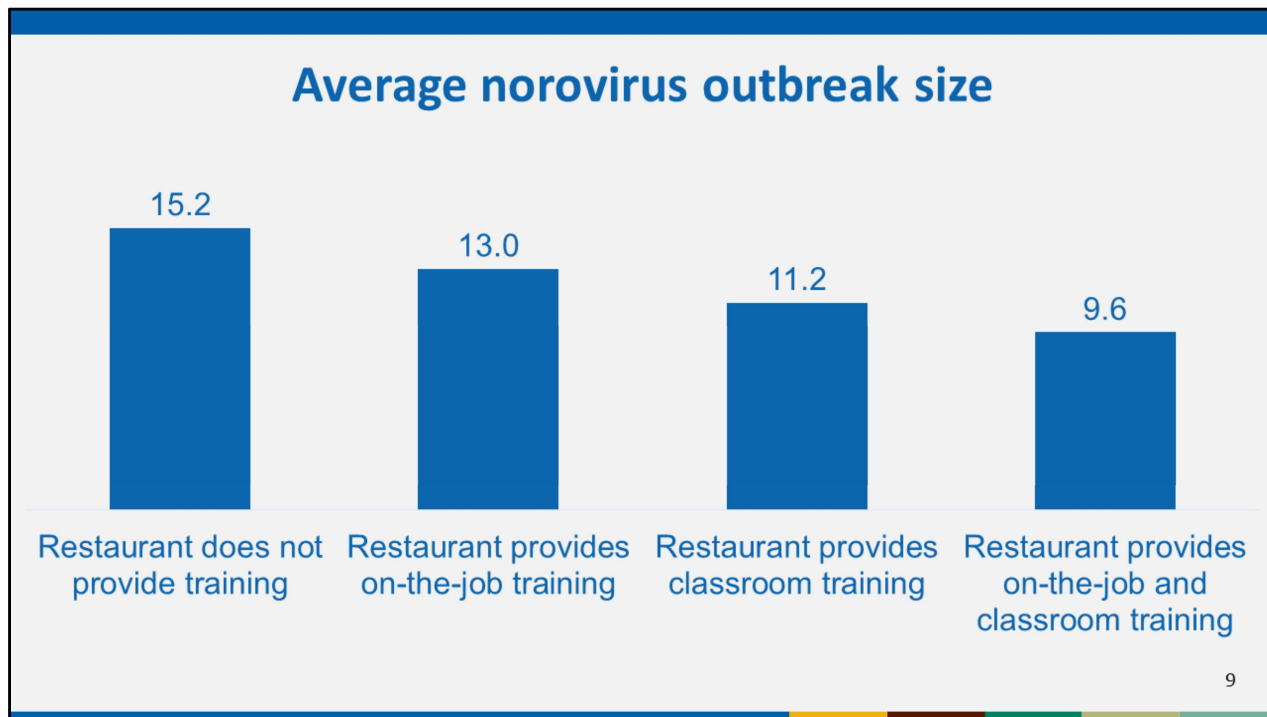
Brown, Hoover, Faw, Hedeem, Nicholas, Wong, Shepherd, Gallagher, Kause. 2018. Food safety practices linked with proper refrigerator temperatures in retail delis. *Foodborne Pathogens and Disease*. 15(3): 1-9. <https://www.liebertpub.com/doi/10.1089/fpd.2017.2358>

Cates, Muth, Karns, Penne, Stone, Harrison, Radke. 2009. Certified kitchen managers: Do they improve restaurant inspection outcomes? *Journal of Food Protection*. 72 (2): 384-391. https://www.cdc.gov/nceh/ehs/ehsnet/docs/JFP_Certified_Kitchen_MGRs.pdf

Reed, Ripley, Hedeem, Nicholas, Faw, Bushnell, Nair, Wickam, Brown. Under review. Restaurant characteristics associated with the use of specific food cooling methods, *Journal of Food Protection*.

Green, Radke, Mason, Bushnell, Reimann, Mack, Motsinger, Stigger, Selman. 2007. Factors related to food worker hand hygiene practices. *Journal of Food Protection*. 70(3): 661–666. https://www.cdc.gov/nceh/ehs/ehsnet/docs/JFP_Food_Worker_Hand_Hygiene.pdf

Hoover. Unpublished data from CDC's National Environmental Assessment Reporting System (NEARS); manuscript in preparation. Norovirus outbreak mitigation analysis.



These graphs show the data from the last study discussed on the previous slide. Norovirus restaurant outbreaks are largest—average outbreak size of 15.2-- when no food safety training is provided to food workers. Outbreak size is smallest—more than 5 cases smaller-- when both on-the-job and classroom training are provided to workers.

Reference

Hoover. Unpublished data from CDC's National Environmental Assessment Reporting System (NEARS); manuscript in preparation. Norovirus outbreak mitigation analysis.

Monitoring

Food workers actively monitor cooling food temperatures

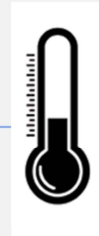


Foods more likely to cool within recommended timeframe

Workers record refrigerator temperatures



Refrigerators more likely at appropriate temperatures



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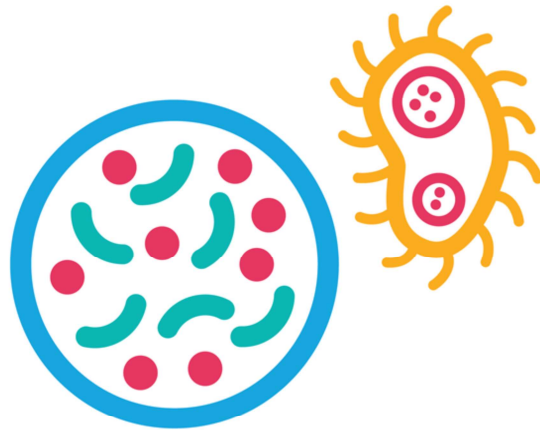
Finally, CDC studies support a link between monitoring and safer practices. In restaurants in which food workers monitor or record temperatures, food and equipment are more likely to be at appropriate temperatures.

References

Schaffner, Brown, Ripley, Reimann, Kockavy, Blade, Nicholas. 2015. Quantitative data analysis to determine best food cooling practices in U.S. restaurants. *Journal of Food Protection*. 78(4): 778–783.

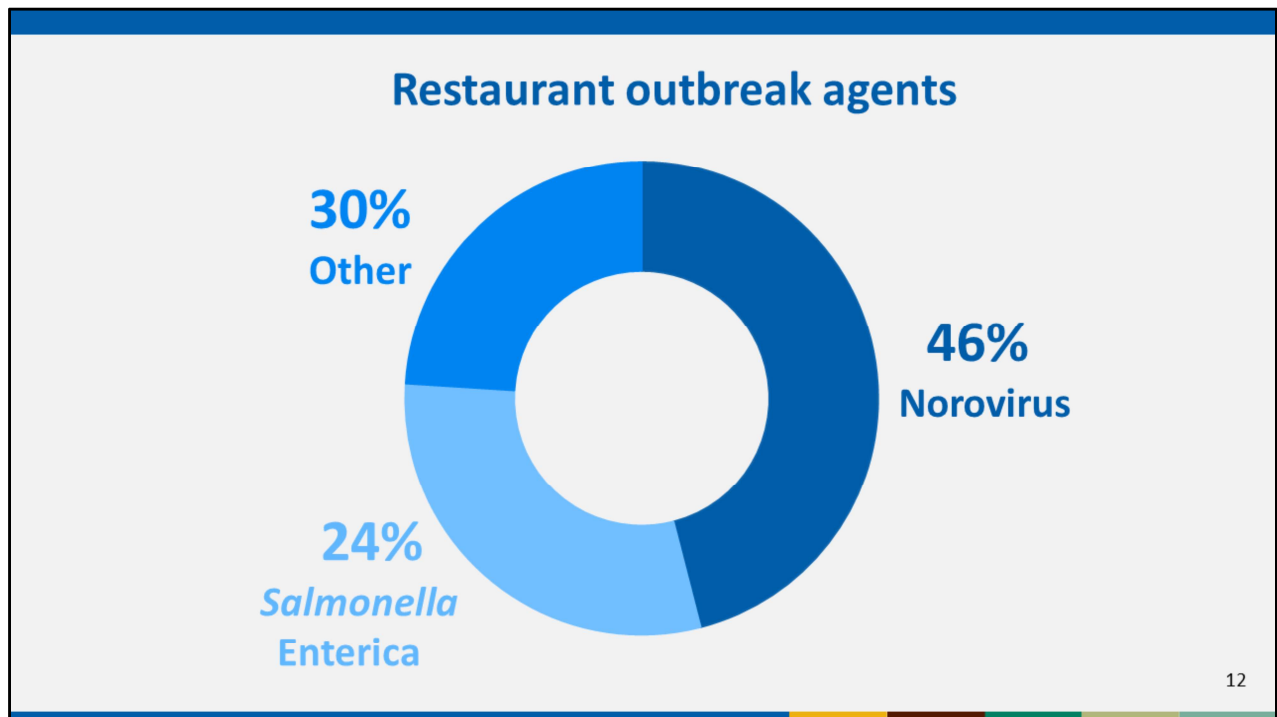
Brown, Hoover, Faw, Hedeem, Nicholas, Wong, Shepherd, Gallagher, Kauser. 2018. Food safety practices linked with proper refrigerator temperatures in retail delis. *Foodborne Pathogens and Disease*. 15(5): 1-9.

<https://www.liebertpub.com/doi/10.1089/fpd.2017.2358>



OUTBREAK AGENTS AND CONTRIBUTING FACTORS

Let's move from food safety management systems to findings from outbreak investigations. Data on outbreak agents and contributing factors can help us think about where to prioritize our resources.



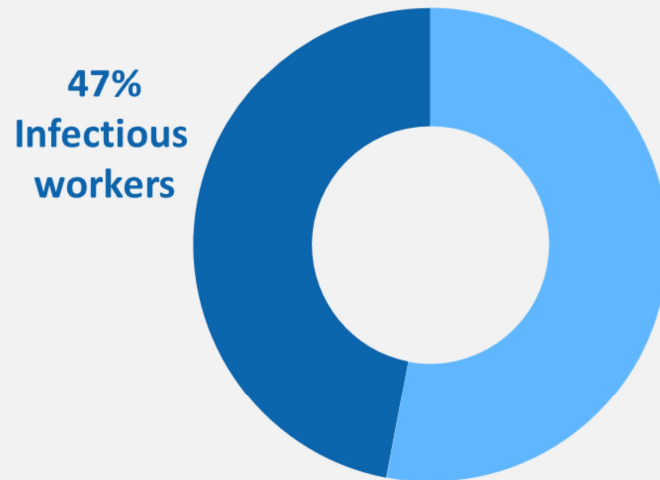
Among restaurant outbreaks with a single confirmed etiology, norovirus causes the most outbreaks (1425, 46%) and illnesses (52630, 42%), followed by *Salmonella enterica* (728 outbreaks, 24%). Others include scombroid toxin (238 outbreaks, 8%), *C. perfringens* (123 outbreaks, 4%), and Shiga toxin-producing *E. coli* (117 outbreaks, 4%).

These kinds of data can help us focus our resources where they are needed.

Reference

Angelo, Nisler, Hall, Brown, Gould. 2016. Epidemiology of restaurant-associated foodborne disease outbreaks, United States, 1998–2013. *Epidemiology of Infection*. 145(3): 1-12. https://www.researchgate.net/publication/309273583_Epidemiology_of_restaurant_associated_foodborne_disease_outbreaks_United_States_1998-2013.

Restaurant outbreak contributing factors



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CDC also has data from outbreak investigations that tell us the most common factors that contribute to outbreaks in restaurants. Almost half of outbreaks with identified contributing factors are associated with a worker who is determined or suspected to be infectious.

Again, these data show us where we can focus our prevention efforts.

Reference

Angelo, Nisler, Hall, Brown, Gould. 2016. Epidemiology of restaurant-associated foodborne disease outbreaks, United States, 1998–2013. *Epidemiology of Infection*. 145(3) 1-12. https://www.researchgate.net/publication/309273583_Epidemiology_of_restaurant_associated_foodborne_disease_outbreaks_United_States_1998-2013

Restaurant outbreak contributing factors

32%
**Improper use of
time as a public
health control**



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The next most common factors contributing to outbreaks in restaurants is associated with temperature control. For example, a third of outbreaks with identified contributing factors are linked with improper use of time, instead of temperature, to prevent pathogen proliferation in potentially hazardous foods.

Again, these data show us where we should focus our prevention efforts.

Reference

Angelo, Nisler, Hall, Brown, Gould. 2016. Epidemiology of restaurant-associated foodborne disease outbreaks, United States, 1998–2013. *Epidemiology of Infection*. 145(3) 1-12.
https://www.researchgate.net/publication/309273583_Epidemiology_of_restaurant_associated_foodborne_disease_outbreaks_United_States_1998-2013



REGULATIONS

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Our last category of data focuses on regulations.

Regulations

Provisions

- Prohibiting bare-hand contact
 - Requiring a certified kitchen manager
-
- Fewer
norovirus
outbreaks**

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CDC research conducted by the National Center for Immunization and Respiratory Diseases has found that states that adopted FDA Food Code provisions prohibiting bare-hand contact and requiring a certified kitchen manager reported fewer foodborne norovirus outbreaks per million person-years than did states without these provisions.

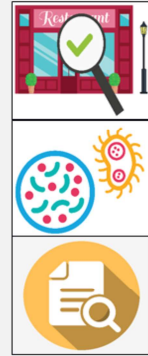
These data suggest that regulations can reduce foodborne illness.

Reference

Kambhampati, Shioda, Gould, Sharp, Brown, Parashare, Hall. 2016. A state-by-state assessment of food service regulations for prevention of norovirus outbreaks. *Journal of Food Protection*. 79(9):1527–1536. doi:10.4315/0362-028X.JFP-16-088

What can food officials do?

- **Support strong food safety management systems in restaurants**
 - Procedures
 - Training and certification
 - Monitoring
- **Focus prevention efforts on**
 - Norovirus and ill workers
 - *Salmonella* and temperature control
- **Work to identify agents and contributing factors during outbreaks**
- **Adopt and enforce food safety regulations**



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To summarize in broad strokes, current research shows that we need to support strong food safety management systems in restaurants. This includes food safety policies and procedures, worker and manager training and certification, and monitoring to ensure food safety procedures are followed.

Data from outbreak investigations show us that prevention of norovirus and *Salmonella* should be a priority and that we should focus on preventing workers from working while ill and on improving temperature control. These data also show us the importance of continuing to identify outbreak agents and contributing factors during investigations.

Finally, we need to adopt and enforce food safety regulations.

Thank you

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For more information, contact NCEH
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TTY: 1-888-232-6348 www.cdc.gov
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