

# **Reported Foodborne Outbreaks in Colorado**

## **2000-2009**



---

**Colorado Department  
of Public Health  
and Environment**

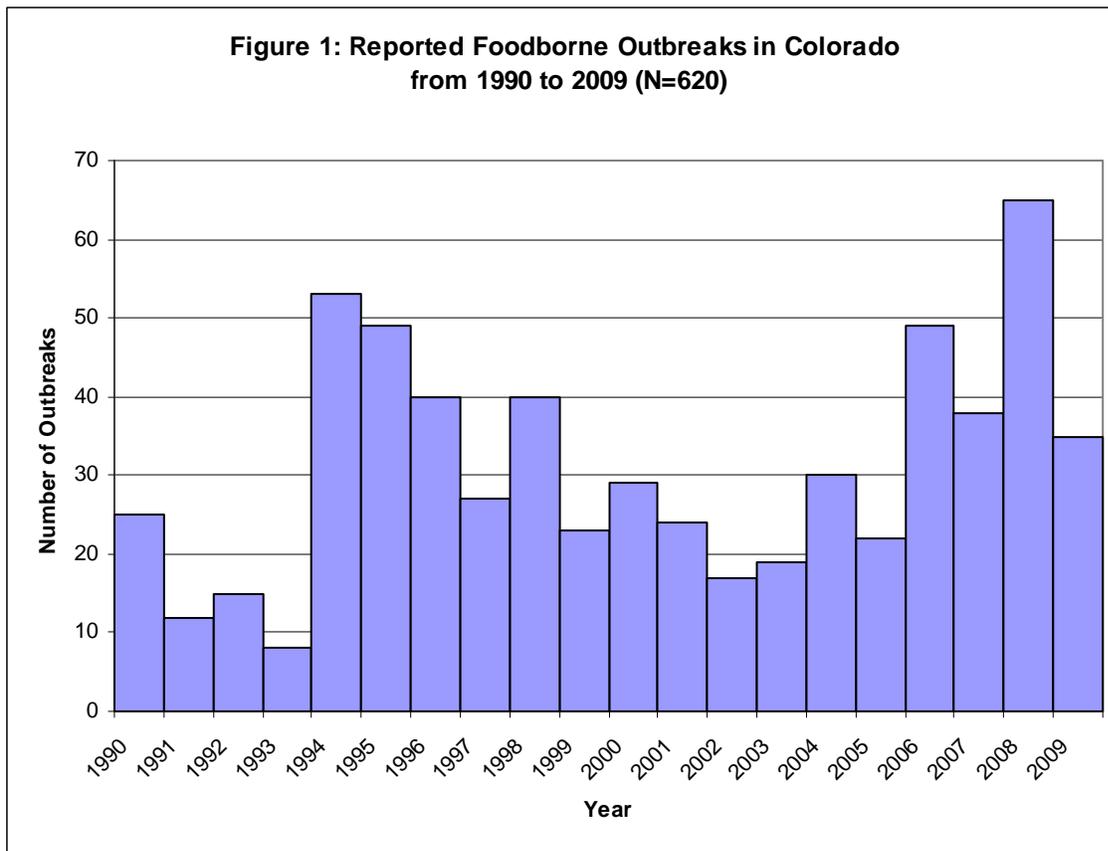
Communicable Disease Epidemiology Program  
4300 Cherry Creek Drive South  
Denver, CO 80246  
303-692-2700

**December 2010**

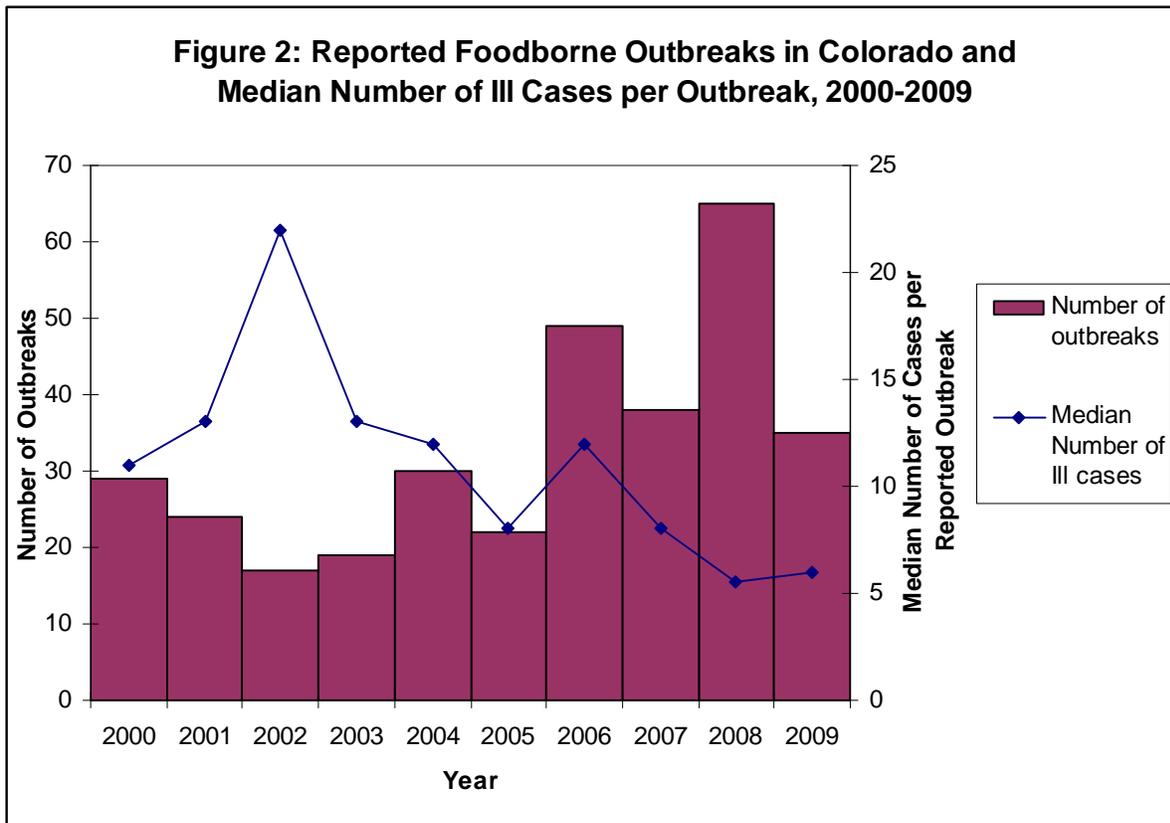
## INTRODUCTION

Foodborne outbreaks are a notifiable condition in Colorado and, when identified, must be reported to the state or local public health department. The majority of foodborne outbreaks are investigated by local public health agencies, which supply summary reports to the Colorado Department of Public Health and Environment (CDPHE). CDPHE has collected basic information about all reported foodborne outbreaks since the late 1980's. In 2005, these data were migrated to a new database, allowing for entry and analysis of more detailed outbreak data. This report summarizes reported foodborne outbreaks during 2000 – 2009. These data were tabulated as part of an MPH student practicum project for the Colorado School of Public Health.

The Centers for Disease Control and Prevention (CDC) define a foodborne disease outbreak as the occurrence of two or more similar illnesses resulting from ingestion of a common food. CDPHE uses this definition for outbreak surveillance and reporting in Colorado.



The number of reported foodborne outbreaks in Colorado fluctuates from year to year. The median number of outbreaks per year during 1990-1999 was 26 (with a range of 8-53) and the median for 2000-2009 was 29.5 (with a range of 17-65).



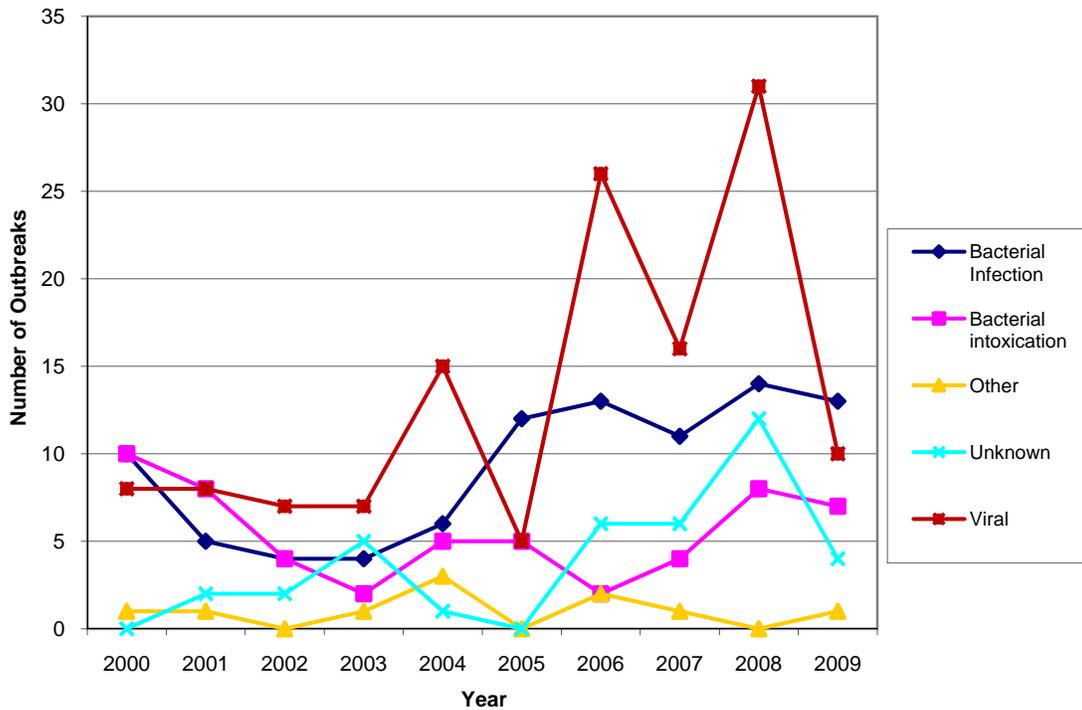
This median number of ill persons (cases) per outbreak declined during 2000-2009, while the total number of reported outbreaks increased.

The increase in reported foodborne outbreaks, particularly since 2002, and the decline in the median number of ill persons per outbreak might be due to improvements in surveillance. There are several factors that might have influenced the number of reported foodborne outbreaks during 2000-2009. Some of these include:

- Colorado joined FoodNet (the Foodborne Disease Active Surveillance Network) in 2000. FoodNet is the principal foodborne disease component of CDC's Emerging Infections Program (EIP). The main activity of the FoodNet project is active surveillance for individual cases infected with foodborne pathogens, however, there is also an emphasis on outbreak detection and reporting. FoodNet surveillance began in 5 Denver metropolitan area counties in 2000 and was expanded to 7 counties in 2002.
- As part of emergency preparedness activities, 12-14 regional epidemiologist positions were funded in counties across Colorado, starting in 2002.
- During this time the foodborne outbreak group at CDC encouraged enhanced outbreak reporting and began a data 'closeout' process to ensure more timely and complete outbreak reporting to CDC.
- Implementation of routine pulsed-field gel electrophoresis (PFGE) for enteric pathogens and data sharing via PulseNet has increased the number of PFGE-matched clusters, including multi-state clusters, that are detected and investigated. PulseNet is a national network of public health and food regulatory agency laboratories that use standardized protocols for PFGE and submit results electronically to a shared CDC database.

Each of these factors, alone or in combination, could have resulted in an increased number of outbreaks being detected, investigated, and/or reported to CDPHE. In addition, it is possible that the ‘true’ number of outbreaks occurring has also increased.

**Figure 3: Reported Foodborne Outbreaks In Colorado by Agent and Year, 2000-2009**

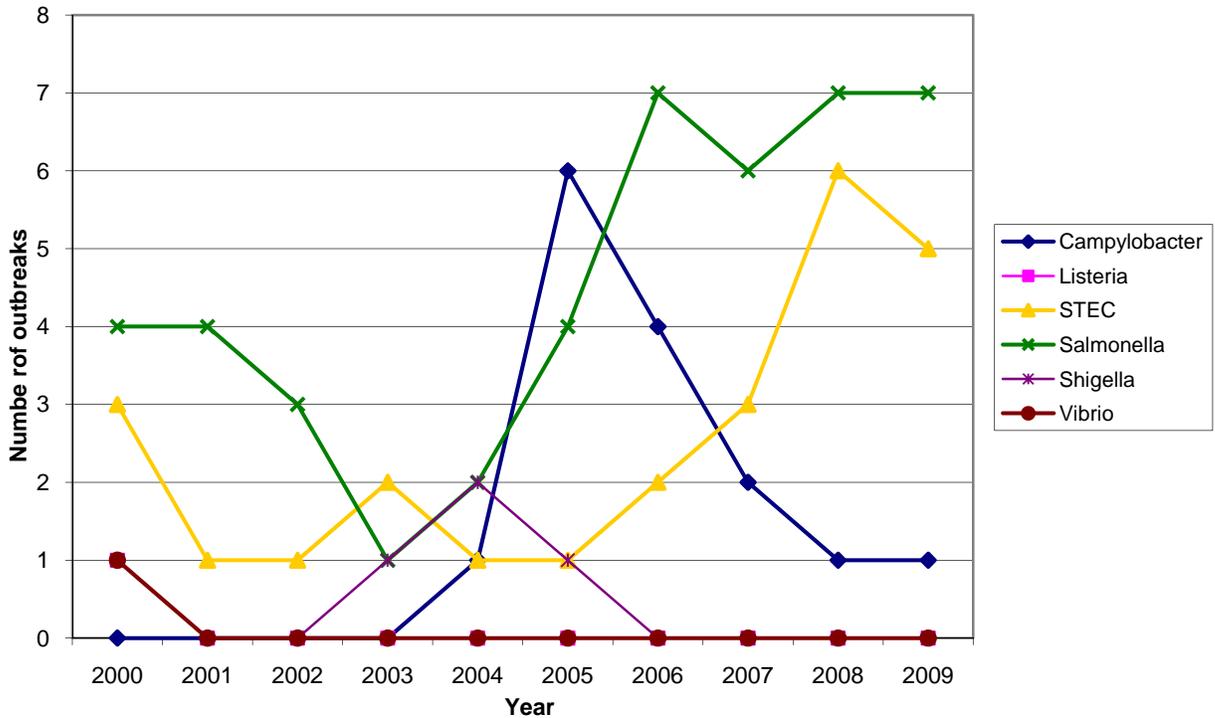


To examine trends in etiologic agents, we classified outbreaks as follows:

- **Bacterial infections**-Campylobacter, Listeria, Shiga toxin-producing E. coli (STEC), Salmonella, Shigella, and Vibrio
- **Bacterial intoxication**- B. cereus, C. botulinum, C. perfringens, S. aureus, and outbreaks in which a bacterial toxin was suspected, but investigators were unable to distinguish which one because laboratory testing not performed or inconclusive
- **Other**- Chemical, chlorine, ciguatera, escolar fish oil, mold, scombrototoxin, toxic mushrooms, and soap
- **Viral**- Hepatitis A, norovirus, and viral gastroenteritis (unspecified)

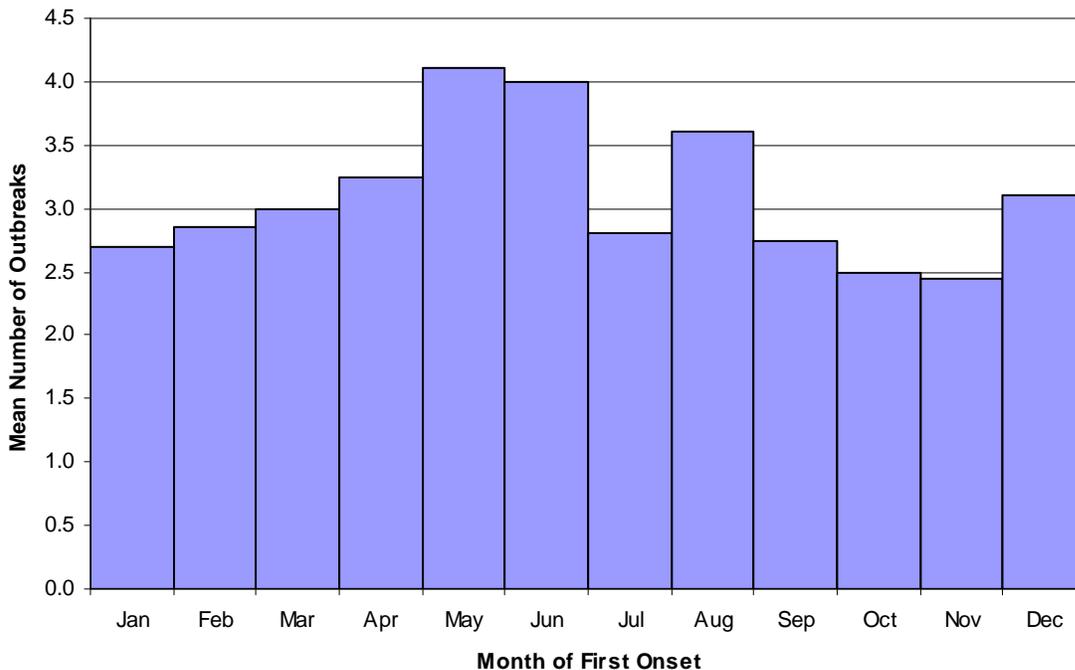
There has been an increase in the number of reported foodborne outbreaks due to viruses and bacterial infections during 2000-2009.

**Figure 4: Foodborne Outbreaks by Pathogen, Colorado, 2000-2009  
(Bacterial Infections Only)**



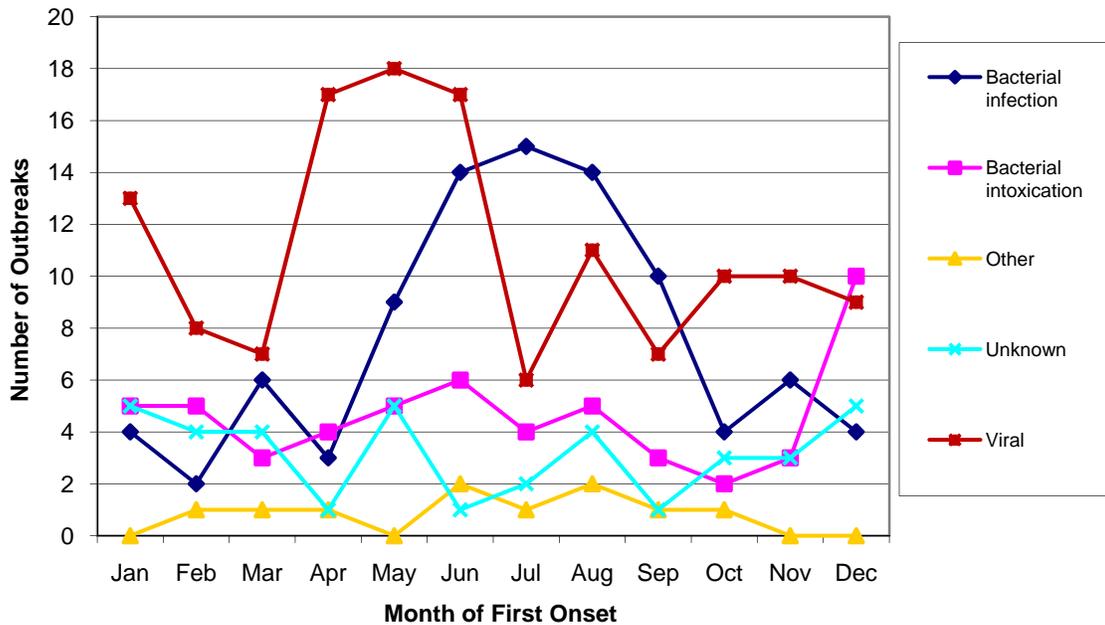
During the last 10 years in Colorado there has been an increase in reported foodborne outbreaks due to Salmonella and Shiga toxin-producing E. coli (STEC), which appears to be driving the increase in bacterial infections as a whole (see Figure 3). However, it is unclear whether this increase is due to better outbreak detection through use of PulseNet or if there has actually been an increase in outbreaks due to the specific pathogens. Among reported STEC outbreaks, all outbreaks are STEC O157 except for one outbreak of STEC O26 and O121 in 2007 and one outbreak in 2000 that was non-O157 with an unknown O antigen.

**Figure 5: Mean Number of Reported Foodborne Outbreaks in Colorado by Month, 2000-2009 (N=327)**



Foodborne outbreaks in Colorado have somewhat of a seasonal distribution, with the spring (May and June) and summer (August) months having the highest numbers of reported outbreaks.

**Figure 6: Foodborne Outbreaks In Colorado by Month and Agent Category, 2000-2009**



To examine trends in etiologic agents, we classified outbreaks as follows:

- **Bacterial infections**-Campylobacter, Listeria, STEC, Salmonella, Shigella, and Vibrio
- **Bacterial intoxication**- B. cereus, C. botulinum, C. perfringens, S. aureus and outbreaks in which a bacterial toxin was suspected, but investigators were unable to distinguish which one because laboratory testing not performed or inconclusive
- **Other**- Chemical, chlorine, ciguatera, escolar fish oil, mold, scombrototoxin, toxic mushrooms, and soap
- **Viral**- Hepatitis A, norovirus, and viral gastroenteritis (unspecified)

The seasonality of foodborne outbreaks by etiology is seen here. Reported outbreaks due to viruses peak during April, May and June. The spring/summer seasonality of bacterial outbreaks is quite striking. Reported bacterial outbreaks start to increase in May, peak in July, and by October seem to return to baseline. It is also interesting to note that bacterial intoxications are highest in December, which might be related to holiday gatherings.

Table 1: Number of Reported Individuals who were Ill, Hospitalized, and Died due to Foodborne Outbreaks in Colorado per Year, 2005-2009

Year	Number of Outbreaks	Number Ill	Percent of Cases Hospitalized	Percent of Cases Died
2005	22	534	2.6%	0.37%
2006	49	982	1.8%	0.00%
2007	38	691	4.2%	0.14%
2008	65	764	2.5%	0.00%
2009	35	639	5.3%	0.00%
All years	209	3610	3.2%	0.08%

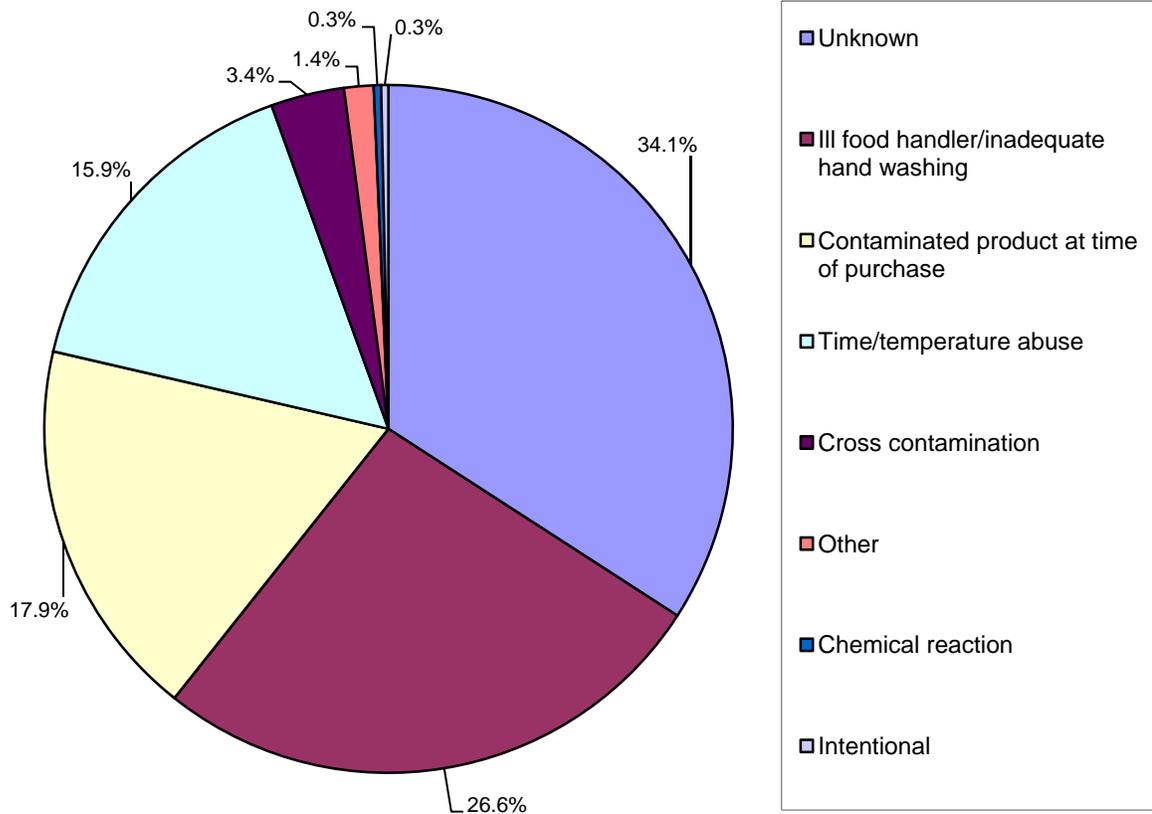
Table 2: Reported Foodborne Outbreaks in Colorado by Pathogen, 2005-2009

Pathogen	Number of Outbreaks (Percent)	Number of Ill Individuals	Median Size of Outbreaks (range)	Number of Individuals Hospitalized (Percent)	Number of Deaths (Percent)
Campylobacter	14 (6.7%)	395	5 (2-200)	7 (1.8%)	1 (0.25%)
Salmonella	31 (14.8%)	459	11 (1-100)	59 (12.9%)	1 (0.22%)
Shigella	1 (0.5%)	2	2 (2-2)	0 (0%)	0 (0%)
STEC	17 (8.1%)	266	3 (1-178)	31 (11.7%)	0 (0%)
Bacterial toxin, unsure which	10 (4.8%)	235	3.5 (2-198)	0 (0%)	0 (0%)
C. botulinum	1 (0.5%)	4	4 (4-4)	3 (75.0%)	1 (25.00%)
C. perfringens	10 (4.8%)	347	10 (2-125)	0 (0%)	0 (0%)
S. aureus	5 (2.4%)	25	4 (4-8)	0 (0%)	0 (0%)
Norovirus	87 (41.6%)	1610	14 (2-125)	9 (0.6%)	0 (0%)
Viral gastroenteritis (unspecified)	1 (0.5%)	28	28 (28-28)	1 (3.6%)	0 (0%)
Scombrototoxin	3 (1.4%)	13	5 (3-5)	0 (0%)	0 (0%)
Other*	1 (0.5%)	6	6(6-6)	1 (16.7%)	0 (0%)
Unknown	28 (13.4%)	220	5 (2-36)	3 (1.4%)	0 (0%)
<b>Overall</b>	<b>209</b>	<b>3610</b>	<b>8 (1-200)</b>	<b>114 (3.2%)</b>	<b>3 (0.08%)</b>

\*Other= Toxic mushrooms

This table describes the size and severity of reported foodborne outbreaks by pathogen. The size and severity of outbreaks can vary greatly. C. botulinum only had one outbreak with four individuals ill but there was a 75% hospitalization rate and a 25% case fatality rate. On the other hand, there were 87 outbreaks of norovirus with 1610 individuals who were ill; 0.6% of the cases were hospitalized and there were no deaths. The greatest numbers of hospitalizations were seen in Salmonella and STEC outbreaks, with 59 and 31 hospitalizations, respectively.

**Figure 7: Main Reported Food Safety Problem that Resulted in Foodborne Outbreaks, 2000-2009**



The food safety problem associated with foodborne outbreaks was unknown for 34% of the outbreaks, indicating that it is often difficult to determine this. However, of the known problems, food handlers being ill or not washing hands properly was the most frequently reported issue. This indicates that there is a need for enforcement of sick worker policies and a need to educate food handlers and supervisors on proper hand hygiene and the importance of not handling food while ill. Time and temperature abuse also indicates need for increased education, training, and enforcement.

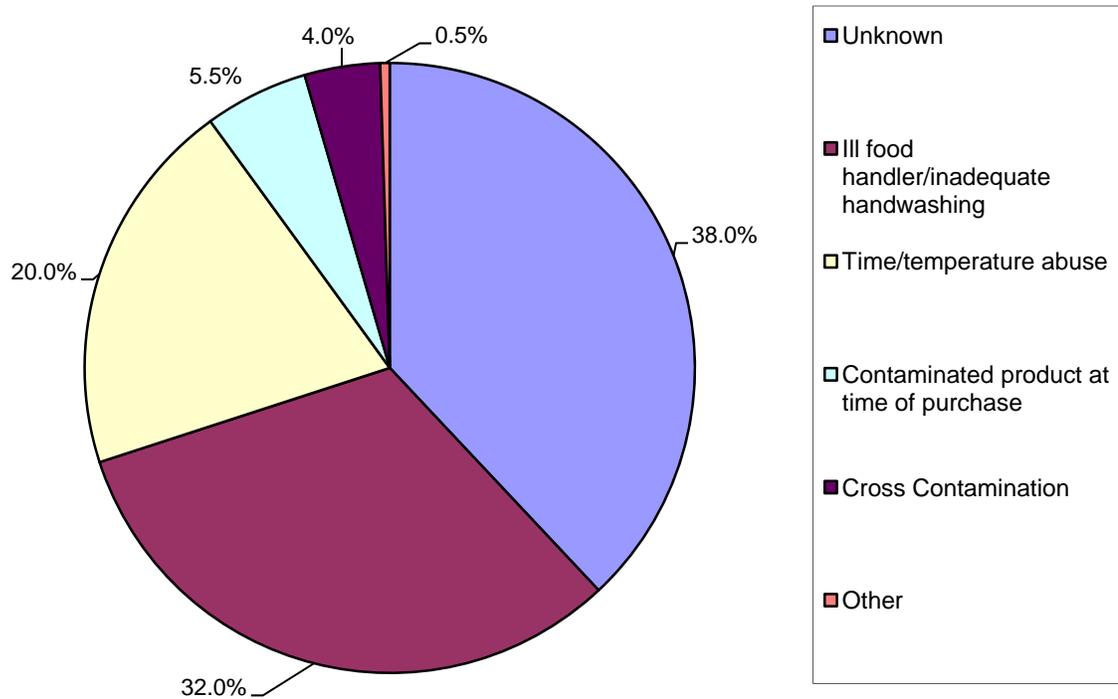
Table 3: Reported Foodborne Outbreaks in Colorado by Setting Where Outbreak Occurred, 2000-2009

Setting	Number of outbreaks from 2000-2009	Percent of total outbreaks
Restaurant	164	50.0%
Caterer	44	13.4%
Community*	34	10.4%
Home	21	6.4%
Other	17	5.2%
Prison/jail	10	3.1%
Hotel	7	2.1%
School	7	2.1%
Workplace	7	2.1%
Unknown	5	1.5%
Long-term care facility	4	1.2%
Camp	3	0.9%
Grocery deli	3	0.9%
Child care center	1	0.3%
Street vendor	1	0.3%

\*Most of these are commercially distributed products that were widely available for purchase so no specific setting is applicable.

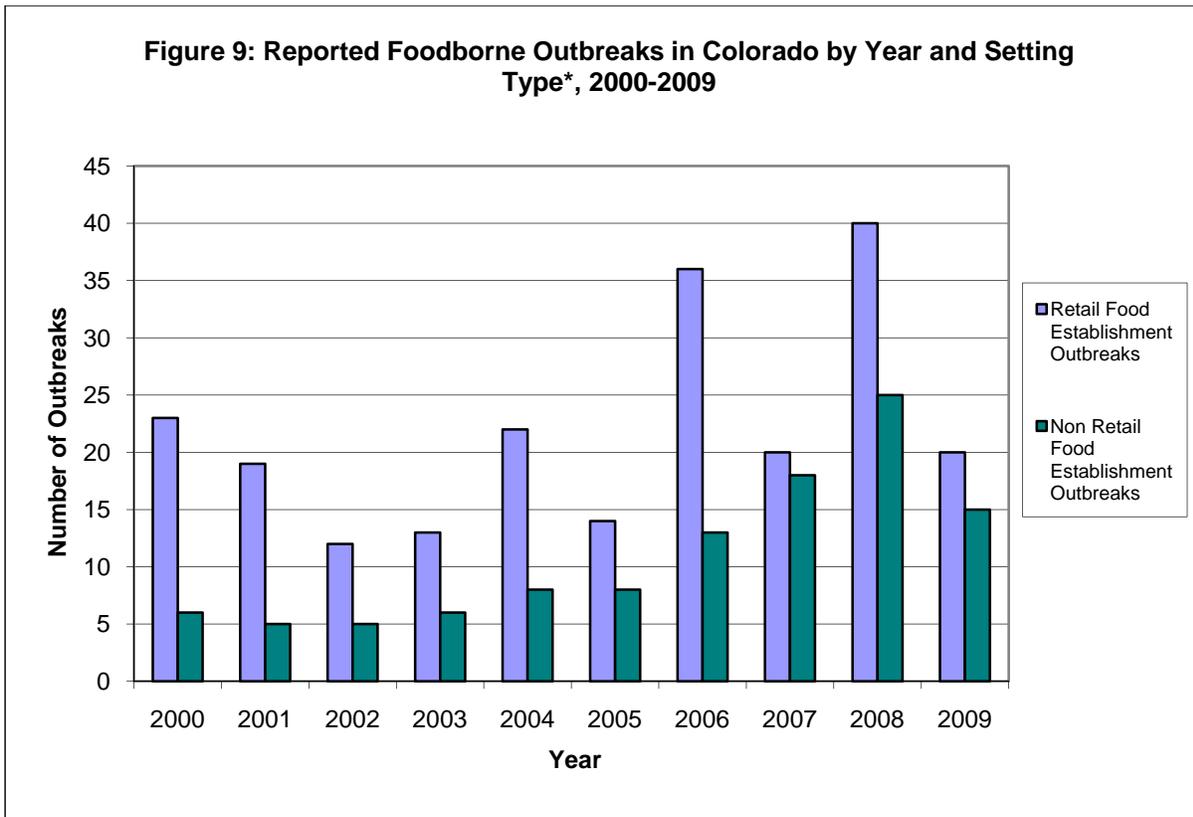
The setting in which there were the most foodborne outbreaks in Colorado was in restaurants, which was responsible for 50% of the outbreaks. Caterer was the second highest with 13%.

**Figure 8: Main Reported Food Safety Problem that Resulted in Foodborne Outbreaks in Retail Food Establishments\* in Colorado, 2000-2009**



\*Retail food establishments (RFE)- casino, caterer, grocery deli, hotel, restaurant, and street vendor

When looking specifically at retail food establishments, it is again seen that determining the food safety problem associated with the outbreaks is difficult in many cases. Inadequate hand washing or ill food handler was the most frequently reported issue for foodborne outbreaks occurring in retail food establishments, and this was more commonly reported than for all foodborne outbreaks.



\*Retail food establishments (RFE)- casino, caterer, grocery deli, hotel, restaurant, and street vendor

There has been an increase in the number of reported non-retail food establishment outbreaks, which have steadily increased since 2002, whereas, the annual number of reported outbreaks in RFE appears to be more variable, with no clear trend.

Table 4: Reported Foodborne Outbreaks Associated with Retail Food Establishments in Colorado by Pathogen, 2000-2009

Pathogen associated with RFE Outbreaks	Number of Outbreaks	Percent of Outbreaks due to pathogen
Norovirus	101	46.1%
Unknown	33	15.1%
C. perfringens	24	11.0%
Salmonella	12	5.5%
Bacterial toxin, unsure which	11	5.0%
S. aureus	9	4.1%
STEC	6	2.7%
Campylobacter	6	2.7%
Scombrototoxin	5	2.3%
B. cereus	3	1.4%
Shigella	3	1.4%
Viral gastroenteritis (unspecified)	3	1.4%
Hepatitis A	1	0.5%
Listeria	1	0.5%
Vibrio	1	0.5%

When looking at foodborne outbreaks that occur in retail food establishments, the pathogen that is responsible the most often is norovirus, with 46% of all outbreaks due to it. Undetermined pathogens were responsible for 15% of outbreaks.

Table 5: Reported Foodborne STEC Outbreaks in Colorado, 2000-2009

Year	Number of outbreaks	Number Ill	Number Hospitalized	Percentage Hospitalized
2000	3	64	11	17.2
2001	1	14	0	0
2002	1	22	12	54.5
2003	2	15	3	20.0
2004	1	4	1	25.0
2005	1	14	4	28.6
2006	2	21	4	19.0
2007	3	182	11	6.0
2008	6	32	7	21.9
2009	5	17	5	29.4
All Years	25	385	58	15.1

The number of reported foodborne outbreaks that were due to STEC over the last 10 years has been increasing.

Table 6: Reported Foodborne STEC Outbreaks in Colorado by Food Responsible for Illness, 2000-2009

Vehicle	Number of outbreaks	Number of ill individuals
Fruit or Vegetable	6	42
Meat	14	95
Cookie Dough	1	6
Cheese or Margarine	1	178
Unknown	2	61
Sushi	1	3

The foodborne STEC outbreaks from 2000-2009 by the food vehicle responsible for illness. The greatest number of outbreaks was due to meat products, followed by a fruit or vegetable. However, it should be observed that the greatest number of individuals who were ill was associated with consumption of sliced cheese and/or margarine during a non-O157 outbreak at a prison. The source of contamination was unknown. Among the 14 outbreaks associated with meat, 12 were ground beef and 2 were needle or blade tenderized steaks. Of the 6 outbreaks associated with a fruit or a vegetable, 2 were alfalfa sprouts, 2 were lettuce, 1 was cantaloupe, and 1 was spinach.

Table 7: Reported Foodborne Salmonella Outbreaks in Colorado, 2000-2009

Year	Number of Outbreaks	Number Ill	Number Hospitalized (Percent)
2000	4	85	Not Available
2001	4	33	Not Available
2002	3	67	Not Available
2003	1	2	Not Available
2004	2	8	Not Available
2005	4	153	8 (5.2%)
2006	7	69	10 (14.5%)
2007	6	39	9 (23.1%)
2008	7	55	10(18.2%)
2009	7	143	22 (15.4%)
<b>Total</b>	<b>45</b>	<b>654</b>	<b>59(9.0%)</b>

The number of reported foodborne outbreaks that were due to Salmonella over the last 10 years has been increasing.

Table 8: Reported Foodborne Salmonella Outbreaks in Colorado by Serotype, 2000-2009

Serotype	Number of Outbreaks (Percent)
Newport	11 (24.4%)
Typhimurium	8 (17.8%)
Enteritidis	4 (8.9%)
Heidelberg	3 (6.7%)
Montevideo	3 (6.7%)
Unknown	3 (6.7%)
Poona	2 (4.4%)
Java	2 (4.4%)
Antum	1 (2.2%)
Berta	1 (2.2%)
Carrau	1 (2.2%)
Litchfield	1 (2.2%)
Senftenberg	1 (2.2%)
Saintpaul	1 (2.2%)
Tennessee	1 (2.2%)
Wandsworth	1 (2.2%)
Kiambu	1 (2.2%)

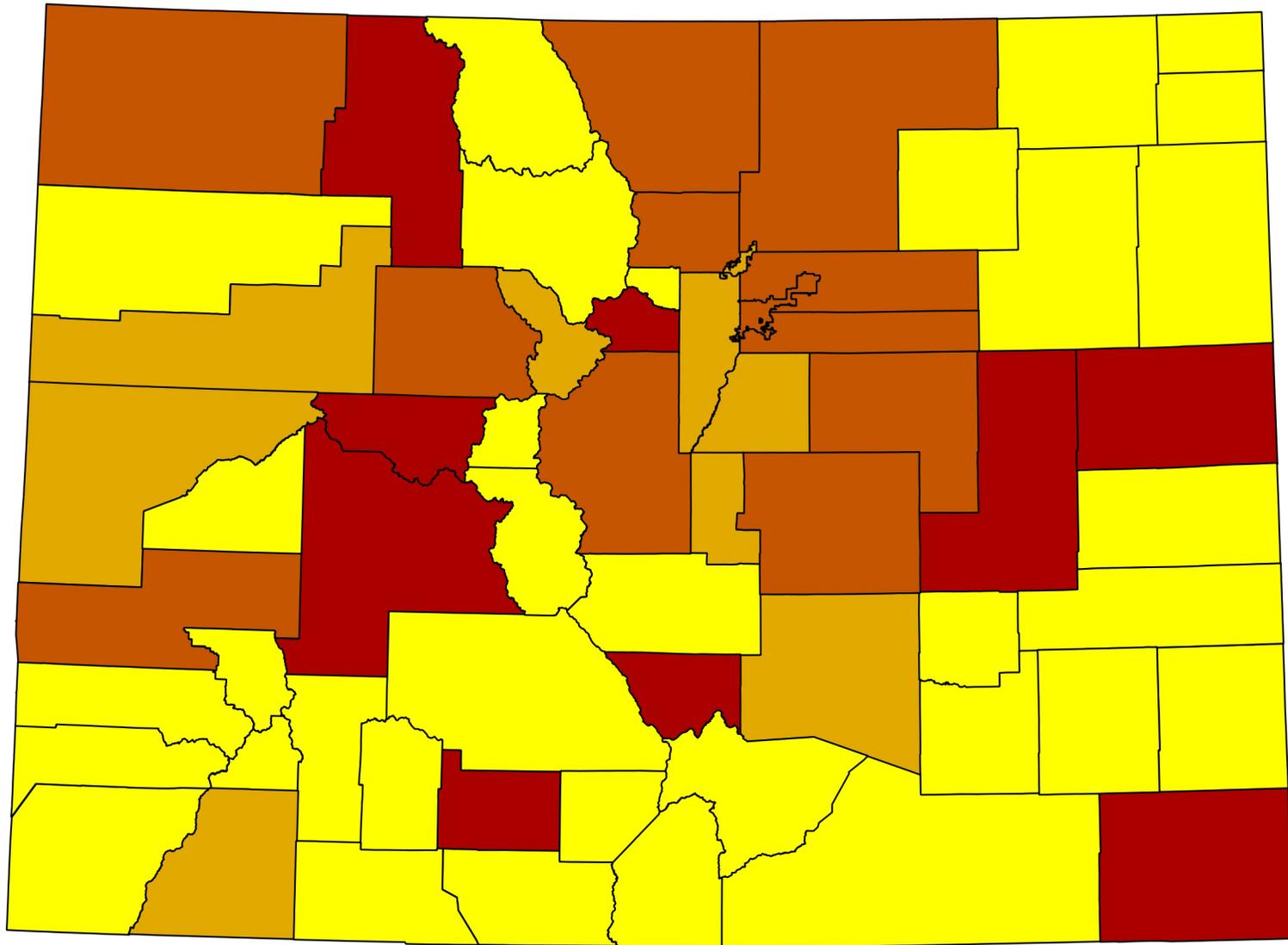
Newport and Typhimurium are the serotypes most commonly seen in reported foodborne outbreaks in Colorado over the last 10 years, 24% and 18% respectively.

Table 9: Reported Foodborne Salmonella Outbreaks in Colorado by Food Responsible for Illness, 2000-2009

Vehicle	Number of Outbreaks (Percent)
Fruit	10 (22.7%)
Meat	9 (20.0%)
Vegetable	5 (11.4%)
Packaged Foods	4 (8.9%)
Fish	3 (6.7%)
Other	3 (6.7%)
Dairy	2 (4.4%)
Unknown	9 (20.0%)

The food vehicle that was most often associated with reported Salmonella outbreaks in Colorado was fruit (24%). Of those, 6 were from melons, 1 from tomatoes, 1 from orange juice, 1 from grapes, and 1 from fruit salad. Of the 9 meat-associated outbreaks, 4 were from ground beef, 2 were from chicken, 1 from salami, 1 from beef jerky and 1 from ground turkey.

# Average Number of Reported Foodborne Outbreaks in Colorado per 100,000 Individuals Each Year, 2000-2009



**Legend**

Avg # of Outbreaks per 100,000 each yr.

- No Outbreaks
- .1 to .50
- .51 to 1.0
- 1.01 to 5.0

Trisha Hostetter  
CDPHE DCEED  
November 23rd, 2010



UTM 13N WGS 84