



OUTBREAK ALERT! 2001-2010

A REVIEW OF FOODBORNE ILLNESS IN AMERICA

CENTER FOR SCIENCE IN THE PUBLIC INTEREST

MARCH 2013

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OUTBREAK ALERT! 2001-2010

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Center for Science in the Public Interest (CSPI) is a non-profit organization based in Washington, DC. Since 1971, CSPI has been working to improve the public's health, largely through its work on nutrition and food-safety issues. CSPI is supported primarily by the 900,000 subscribers to its Nutrition Action Healthletter and by foundation grants.



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Introduction

This report aims to help public health officials, policy makers, and consumers better understand the causes and the burden of foodborne disease in the United States. Every year, one in six Americans – 48 million people – contract a foodborne illness from contaminated food. Of these, 128,000 are hospitalized and 3,000 die.ⁱ While the vast majority of foodborne illnesses are isolated cases, this report analyzes outbreaks – clusters of two or more illnesses resulting from the same contaminated food source – because outbreaks provide the most complete foodborne illness data.ⁱⁱ This report analyzes the most recent ten years of outbreak data available from the Centers for Disease Control and Prevention (CDC), covering 2001-2010. This analysis can be used to identify food safety trends that point to needed improvements in food safety control programs at the industry, government, and consumer levels.

State and local health departments are the front-line investigators of foodborne outbreaks. These public health professionals report information on outbreaks in their states to the CDC, the federal agency responsible for tracking and reporting foodborne and emerging diseases. This reporting system, however, is far from perfect. Many, perhaps most, outbreaks are never reported or fully investigated for a number of reasons. Often, foodborne illnesses do not require a physician's assistance to treat, and are therefore never reported.ⁱⁱⁱ Many state and local health departments are understaffed and underfunded, which leaves them unable to fully investigate all reported outbreaks. Finally, in many cases, states are not required to report foodborne outbreaks to CDC.

For this report, the Center for Science in the Public Interest (CSPI) has analyzed 4,229 foodborne disease outbreaks occurring between 2001 and 2010 that were identified by the CDC and other sources. These outbreaks were responsible for 106,635 cases of foodborne illness. Although the CDC collects and publishes outbreaks with incomplete investigation data, for this report CSPI only analyzed those outbreaks with investigations in which both the contaminated food and the foodborne contaminant were identified.

The Worst Outbreaks of the Decade

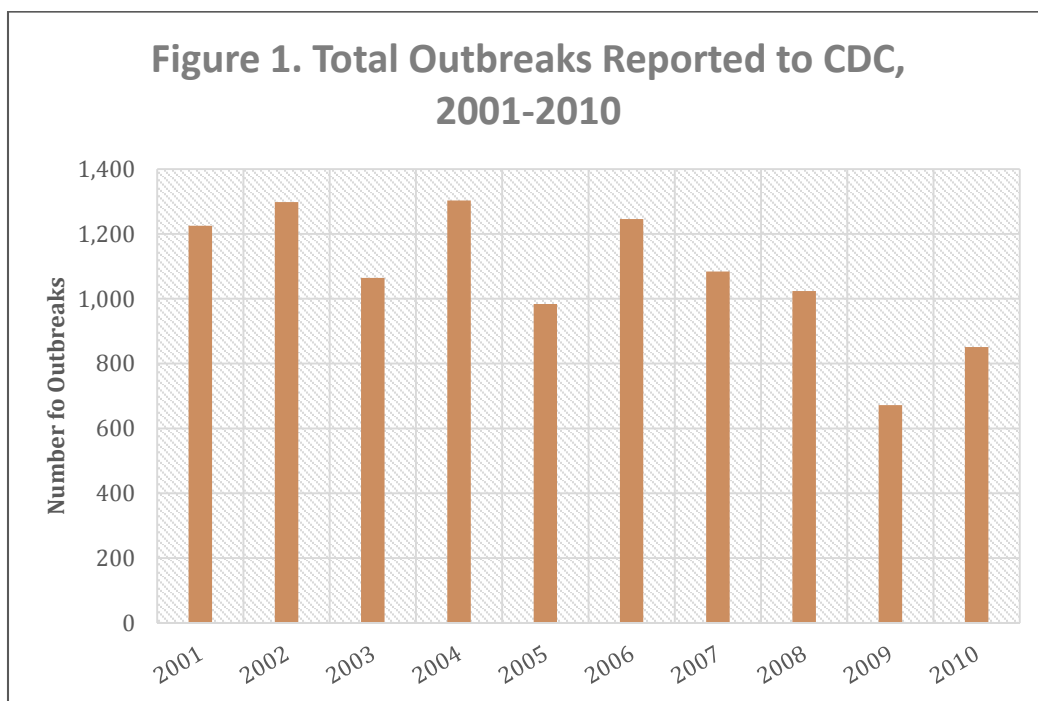
- In May 2006, California State Prisons served *Campylobacter*-contaminated pasteurized milk to inmates. As a consequence, 1,644 inmates contracted clinical gastroenteritis in the decade's **largest single-source outbreak**.
- In April 2008, *Salmonella* Typhimurium-contaminated jalapeño and serrano peppers and pepper products (e.g. salsa) sickened 1,535 people in 42 states. Of those, 308 people required hospitalization and 2 died in the decade's **largest multi-state outbreak**.
- In September 2008, Peanut Corporation of America produced peanuts and peanut products contaminated with *Salmonella* Typhimurium, which caused the decade's **deadliest outbreak**. In 42 states, 716 people became ill, 166 were hospitalized, and 9 died – the most of any outbreak.
- In July 2002, Pilgrim's Pride brand deli turkey meat tainted with *Listeria* was responsible for the decade's **outbreak with the highest death rate**. In 7 states, 54 people were sickened, and 8 died – a death rate of 15 percent, the decade's highest.

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Findings

FINDING I – OUTBREAK REPORTING HAS DECREASED THROUGHOUT THE DECADE

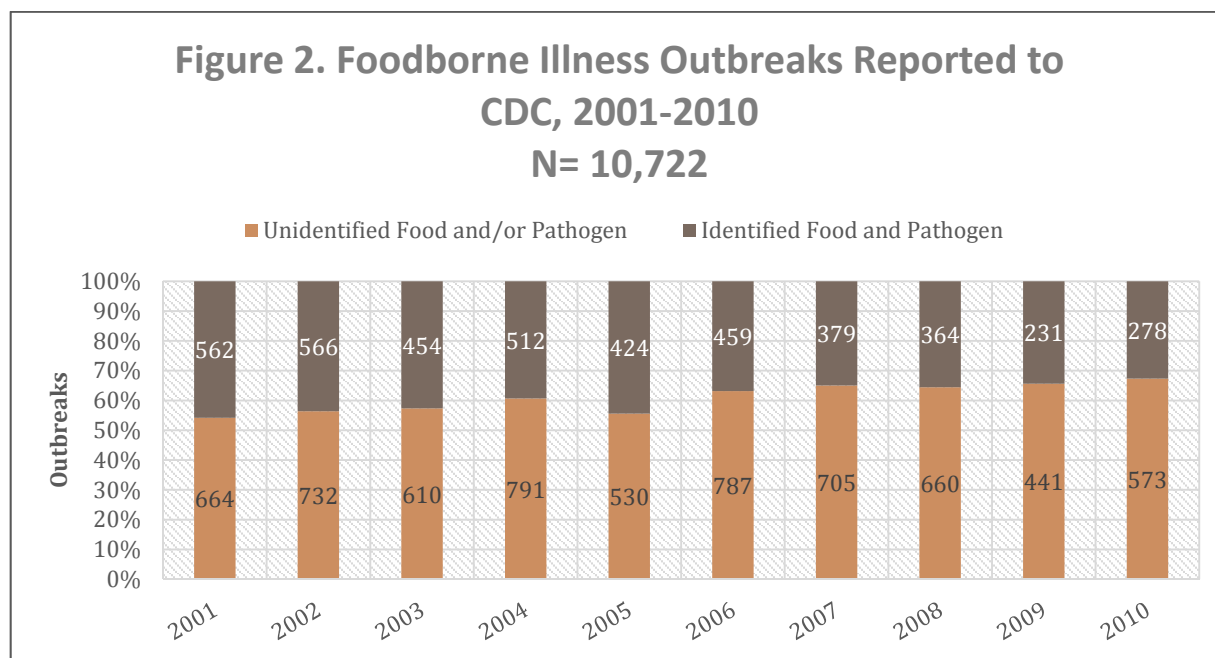
Foodborne outbreaks and illnesses, as reported by CDC, appear to have decreased more than 40 percent from the early to the later years of the decade; nonetheless, they remain a pressing public health concern (Figure 1). This data includes all reported outbreaks by CDC, including those without identified etiology or food vehicle. Outbreaks with incomplete data provide only limited insight into the state of foodborne illness. For this report, CSPI analyzed those outbreaks with both an identified food vehicle and contaminant (Finding II).



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FINDING II – INADEQUATE INVESTIGATIONS CONTRIBUTED TO DECLINES IN THE REPORTING OF FULLY-INVESTIGATED OUTBREAKS

To develop risk-based interventions and design the most effective and efficient food safety hazard controls, robust outbreak data are critically important. The best outbreak data come from fully-investigated outbreaks, where both the contaminated food and pathogen are identified. Unfortunately, a majority of outbreaks reported to and published by the CDC between the years 2001 and 2010 were not fully investigated. During this timeframe, between 54 and 68 percent of all outbreaks reported annually to CDC lacked necessary information, such as the contaminated food or contaminant (Figure 2). The decline in complete reporting between 2001 and 2010 may be due to falling budgets for public health departments in the latter half of the study period.^{iv,v} Many health departments are underfunded, understaffed, and overwhelmed by the volume of illness reports, foodborne and otherwise. The recession at the end of the decade can be blamed for many states cutting funding, while influenza pandemics and post-9/11 bioterrorism investments also impacted public health agencies' budgets and may have diverted attention away from foodborne illness investigations. Outbreak reporting rates may also be down due to the increased use of culture independent diagnostic testing by healthcare providers. These tests, used to quickly diagnose foodborne illness in patients, do not culture the live bacteria. Without live bacteria to study and compare, it is difficult for health departments to identify if illnesses are linked, a necessary step to identifying outbreaks.^{vi}



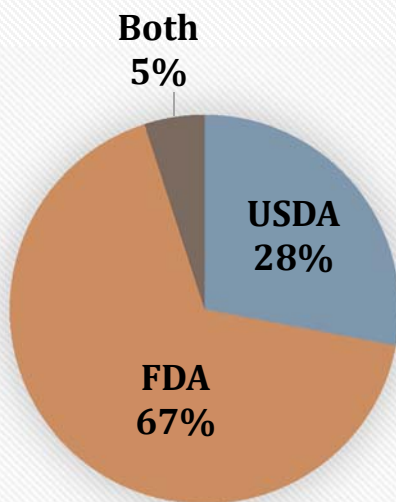
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FINDING III – FDA-REGULATED FOODS WERE RESPONSIBLE FOR MORE THAN TWICE AS MANY FULLY-INVESTIGATED OUTBREAKS AS USDA-REGULATED FOODS

CSPI's database classifies the foods that caused each fully-investigated outbreak into one of 13 consumer-focused categories and 37 sub-categories (Appendix). The classification system is designed to group foods in a way that is recognizable by consumers, as well as useful to researchers and public health professionals. Categories are further sorted by the regulatory agency responsible for each category's food safety oversight: either the United States Department of Agriculture (USDA) for meat and poultry, or the Food and Drug Administration (FDA) for produce, seafood, and many processed foods. An outbreak caused by foods regulated by both the FDA and USDA is categorized as "Both." Between 2001 and 2010, FDA-regulated foods were responsible for 67 percent of outbreaks analyzed by CSPI, USDA-regulated foods were responsible for 28 percent of outbreaks, and 5 percent of outbreaks were caused by multiple foods regulated by both USDA and FDA (Figure 3).

CSPI's 13 categories include produce, seafood, dairy, breads and bakery, eggs, beverages, game, luncheon and other meats, beef, poultry, pork, and multi-ingredient foods with and without meat. Multi-ingredient foods include salads, sandwiches, sauces and dressing, rice and beans, pasta dishes, ethnic foods, and dried spices.

Figure 3. Outbreaks Linked to FDA- and USDA-Regulated Food, 2001-2010



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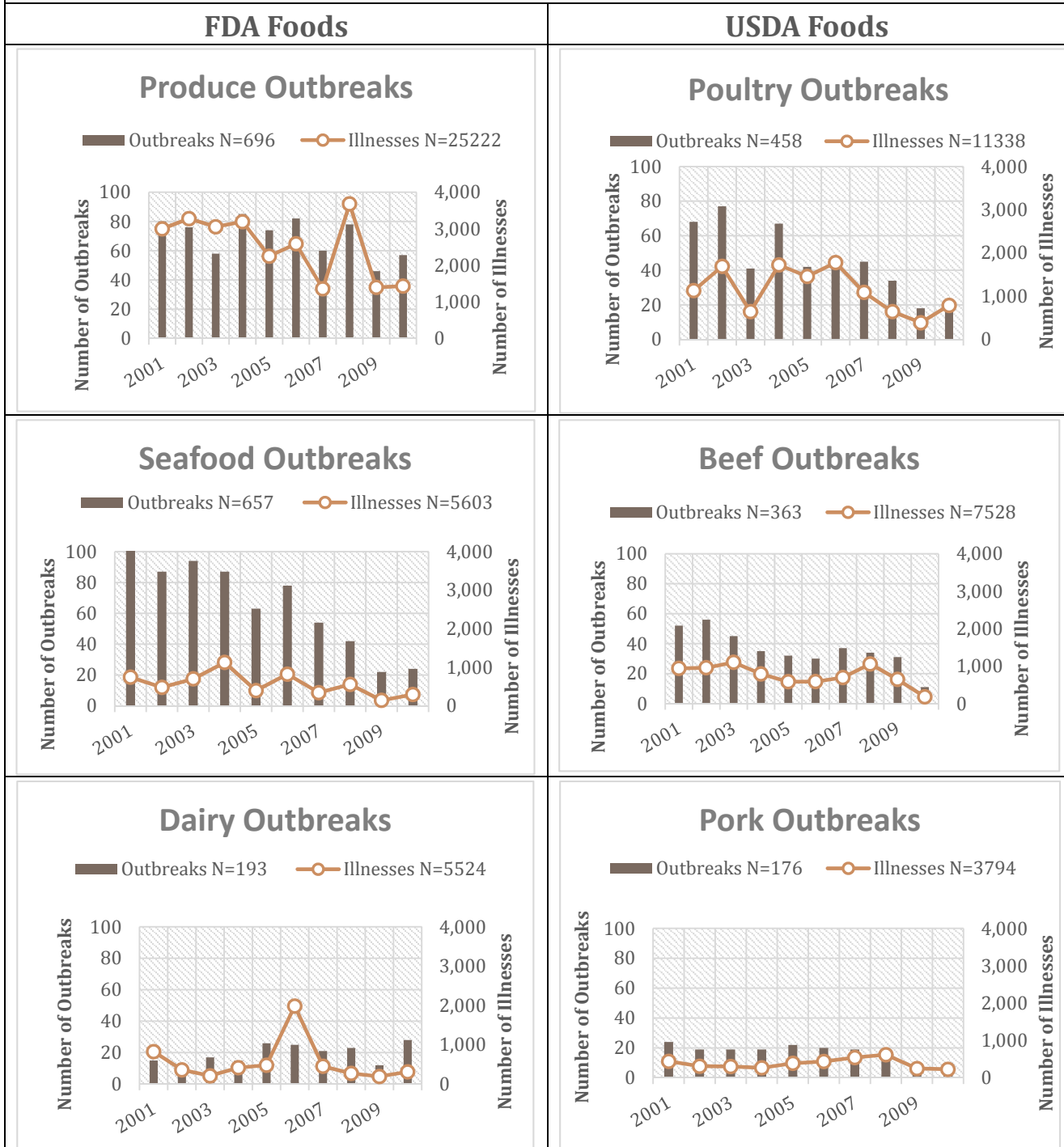
FINDING IV – OUTBREAKS IN SEAFOOD, BEEF, PORK, AND POULTRY DECLINED STEADILY; DAIRY AND PRODUCE OUTBREAK LEVELS RELATIVELY UNCHANGED

Excluding multi-ingredient foods, the seafood, produce, poultry, and beef categories were responsible for the largest number of fully-investigated foodborne illnesses during the past decade (Figure 4). These four categories were together linked to 51 percent of all attributed outbreaks analyzed by CSPI, and a quarter of the illnesses. The produce category was the top category, with 696 outbreaks (17% of total outbreaks) and 25,222 illnesses (24% of total illnesses). Seafood was responsible for the second-most outbreaks (657 outbreaks), but relatively few illnesses due to the small size of an average seafood outbreak (5,603 illnesses, 8.5 illnesses per outbreak). Outbreaks associated with meat categories include poultry (458 outbreaks and 11,338 illnesses), beef (363 outbreaks and 7,528 illnesses), pork (176 outbreaks and 3,794 illnesses), and luncheon and other meats (134 outbreaks and 4,151 illnesses) (Figure 4).

The 2001-2010 results also show changes in outbreak reporting in several food categories. Outbreaks in seafood, beef, pork, and poultry declined steadily, while the number of outbreaks in produce remained relatively stable, declining only slightly (Figure 4). The number of dairy outbreaks, though small, also remained relatively stable, but appear to have increased slightly in the latter half of the decade. This is possibly due to the increased popularity of unpasteurized dairy products, like queso fresco and raw milk.^v The spike in produce illnesses in 2008 was due to one large multi-state outbreak in jalapeño and serrano peppers that sickened over 1,500 people. The spike in dairy illnesses in 2006 was due to a *Campylobacter* outbreak in pasteurized milk served in prisons that sickened 1,644 inmates.

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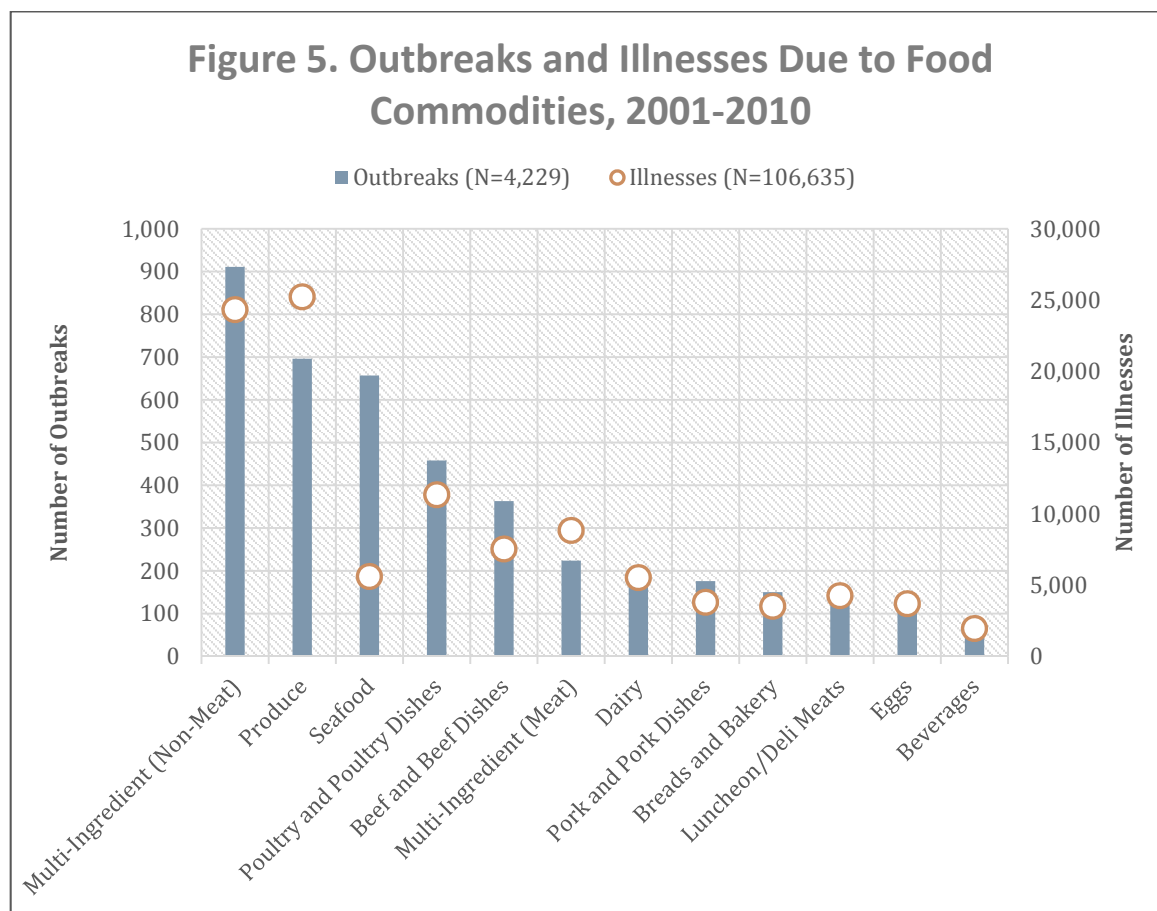
Figure 4. Foodborne Illness Outbreaks in Different Commodities, 2001-2010



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FINDING V – OVER THE DECADE, PRODUCE SICKENED MORE PEOPLE THAN ANY OTHER SINGLE-INGREDIENT CATEGORY

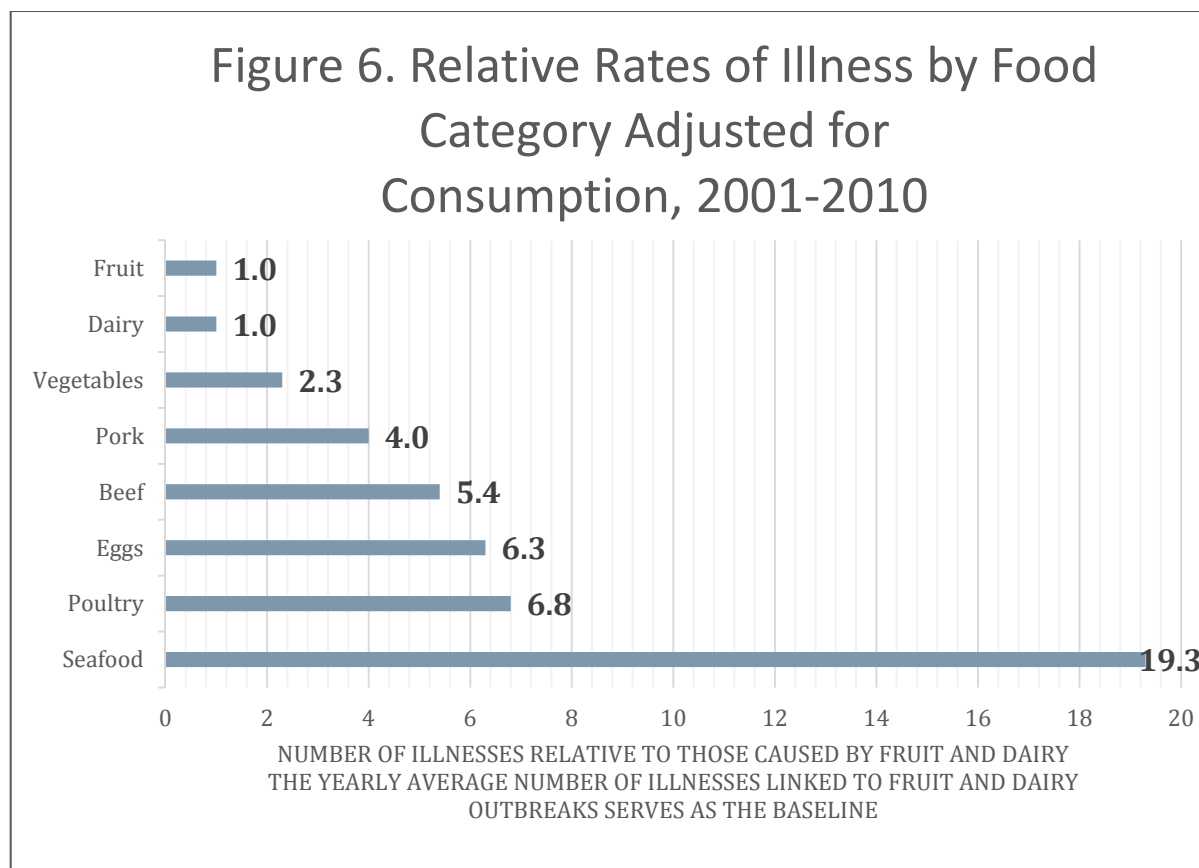
Among identified food categories, produce was linked to the greatest number of outbreaks, followed closely by seafood. Produce was also responsible for the greatest number of illnesses, more than double those attributed to poultry (Figure 5).



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FINDING VI – POUND-FOR-POUND, SEAFOOD IS THE MOST RISKY FOOD, FOLLOWED BY POULTRY; PRODUCE AND DAIRY ARE THE SAFEST

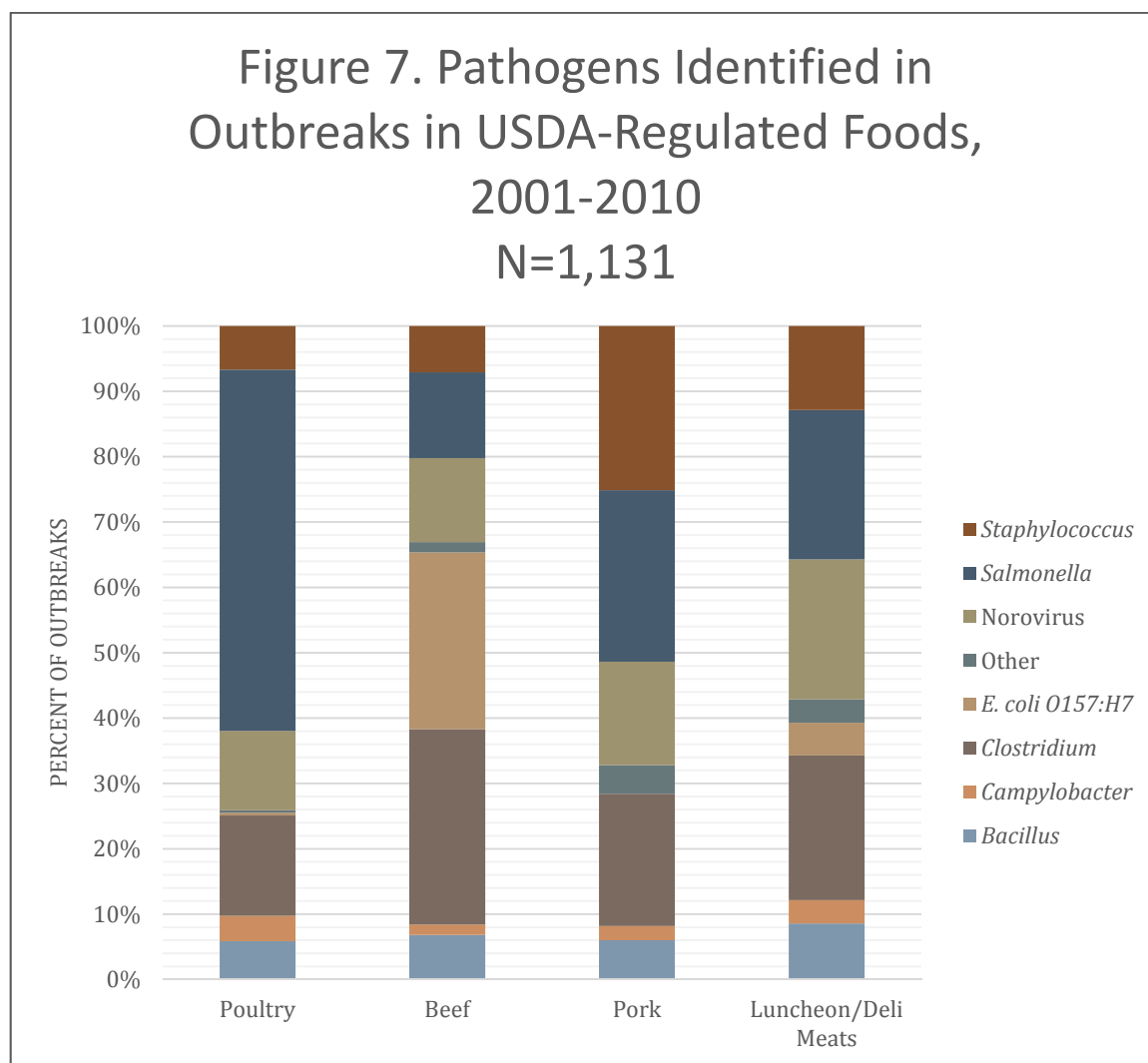
Although produce is responsible for the greatest overall numbers of outbreaks and illnesses, pound-for-pound, fruits and vegetables are among the safest foods to eat. When illnesses are considered together with consumption rates, meats, poultry, and seafood are far more likely to cause illness than produce. When the risk of illness-per-pound consumed was analyzed, poultry products topped beef and pork, and seafood was the most hazardous food (Figure 6).^{vii} Note, however, that the rate of seafood outbreak reporting has steadily fallen throughout the decade (Figure 4).



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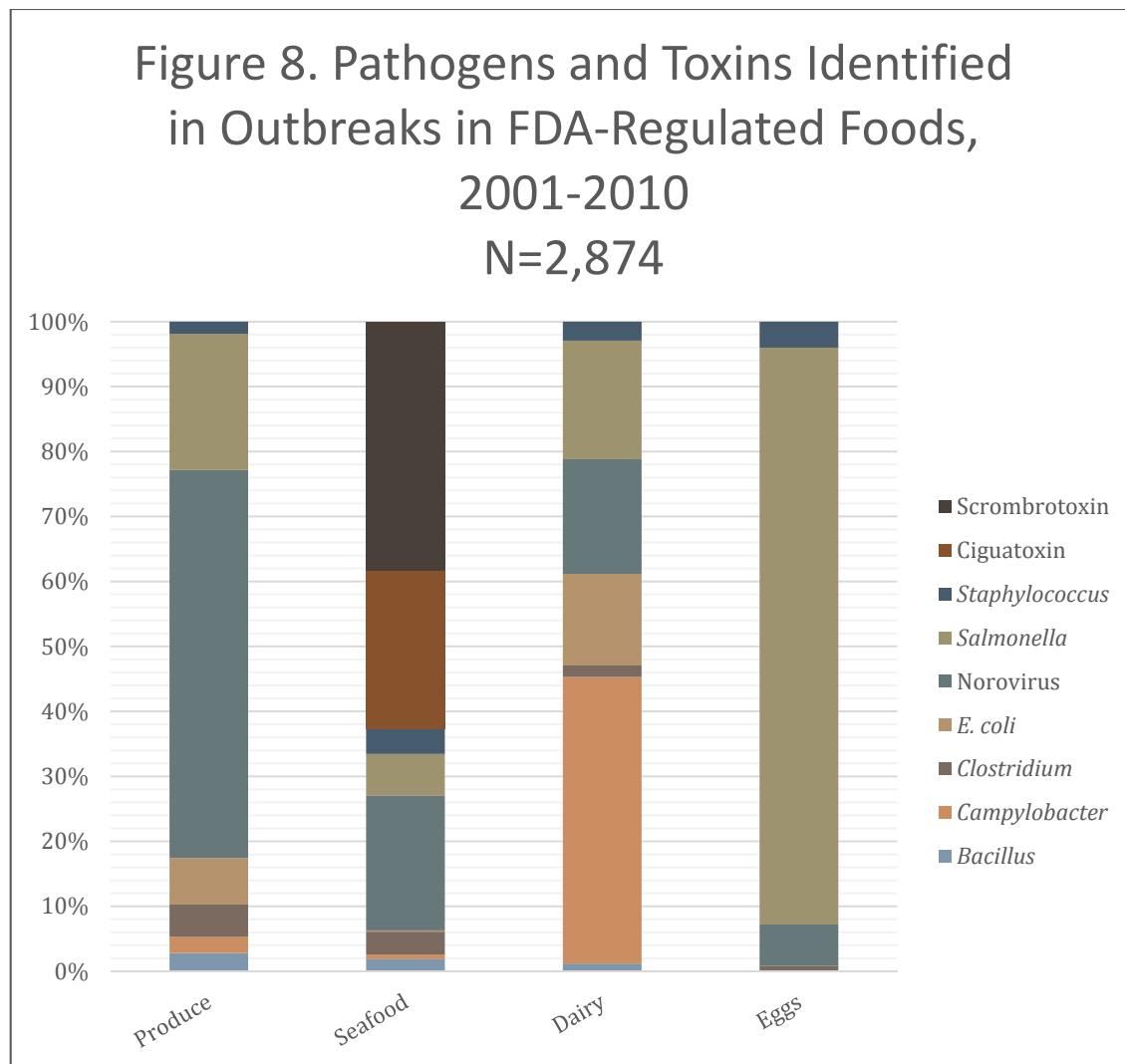
FINDING VII – THE MOST COMMON CONTAMINANTS ARE...

The most common identified pathogens in meat products were *Salmonella* species (spp.) in poultry; *Clostridium perfringens* and *E. coli* O157:H7 in beef; *Staphylococcus aureus* and *Salmonella* spp. in pork; and *Salmonella* spp., *Clostridium perfringens*, and Norovirus in luncheon and other meats (Figure 7).



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The most commonly identified causes of foodborne illness in FDA-regulated foods were Norovirus and *Salmonella* spp. in produce; Scrombrotoxin and Ciguatoxin in seafood; *Campylobacter* in dairy; and *Salmonella* spp. in eggs (Figure 8).



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FINDING VIII – OUTBREAKS HAPPENED IN MANY DIFFERENT LOCATIONS

Outbreaks were analyzed based on the location where outbreak-associated contaminated foods were eaten. Outbreaks with the largest average number of illnesses were attributed to foodborne outbreaks in group settings, such as prisons, catered events, schools, elderly care centers, and religious organization-sponsored meals. Outbreaks with the smallest average numbers of illnesses were associated with foods eaten in private homes and restaurants; restaurants and private homes were also the most common locations for foodborne illness outbreaks (Table 1).

TABLE 1

LOCATION	OUTBREAKS	ILLNESSES	AVERAGE OUTBREAK SIZE
Restaurant	1,786	32,919	18
Private Home	922	12,666	14
Workplace	328	7,823	24
Multiple Locations/Unknown	247	8,518	34
School	157	6,943	44
Banquet Hall/ Catered Event	144	6,492	45
Other	138	4,591	33
Camping/Picnic/Farm	128	4,348	34
Prison or Jail	77	10,660	138
Sick/Elderly/Youth Service	71	2,946	41
Religious/Social Club	16	640	40

Methodology

CSPI maintains a database of foodborne illness outbreaks from 1990-2010, which documents 7,194 unique and fully-investigated outbreaks responsible for 205,867 cases of illness. The outbreaks in CSPI's database - those that were reported by public health officials with both an identified pathogen and contaminated food - are only a small fraction of total foodborne illnesses, but represent those outbreaks that provide the most useful information for attribution analysis. The database is compiled largely from the CDC's Foodborne Outbreak Online Database (FOOD), which CDC first made publicly available in 2001. FOOD currently provides CDC's outbreak data from 1998 to 2010 to the public.^{viii} Prior to FOOD's launch in 2001, CSPI obtained CDC outbreak data through Freedom of Information Act requests, and supplemented its database with data from state health department reports, CDC's Foodborne Outbreak Response and Surveillance Unit reports, and peer-reviewed journal articles. Today, data from those non-CDC sources constitute four percent of the total CSPI database and less than one percent (0.7%) of the data analyzed for this report.^{ix} For this report, CSPI analyzed the most recent 10 years of data: 4,229 outbreaks and 106,635 illnesses that occurred between 2001 and 2010.

CSPI categorized outbreaks by the contaminated food or ingredient, and by the federal agency responsible for regulatory oversight of that contaminated food. Outbreaks attributed to meats and poultry were assigned to the USDA, while outbreaks attributed to produce, seafood, and meat-free multi-ingredient dishes were assigned to the FDA. CSPI also used a 'Both' category for outbreaks attributed to meat-containing multi-ingredient dishes, or other situations where an outbreak was linked to multiple foods under the jurisdiction of both the USDA and FDA. CSPI's categorization approach is unique in its ability to be easily utilized by both consumers and regulatory agencies, and has been used by the Food Safety Research Consortium and University of Florida's Emerging Pathogens Institute.^x CSPI regularly provides its outbreak analysis to the World Health Organization for risk assessment purposes.

DATA COLLECTION

CDC's Foodborne Outbreak Online Database (FOOD) is the end result of a large and dynamic network of nationwide outbreak surveillance systems. State agencies can modify their past outbreak reports at any time as new information becomes available, even years after an outbreak has occurred.^{xi} Because of this, previously published CDC data is subject to change. This report includes two years (2009 - 2010) of new data and reports on observed trends compared to our previous *Outbreak Alert! 1998-2008* whitepaper published in January 2012.^{xii} The data used in this report was downloaded from FOOD on July 9, 2012.

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ANALYSIS

Incidents of foodborne illness are only included in the CSPI database if they meet CDC's definition of an outbreak and have an identified pathogen and contaminated food. Outbreak reports that meet CSPI's inclusion criteria are further evaluated to determine whether they represent new outbreaks, or updates to previously published outbreaks. The CSPI database excludes sporadic cases of foodborne illness (individual illnesses not linked to an outbreak), outbreaks with no identified pathogen, outbreaks with no identified contaminated food, and outbreaks linked to water or ice.^{xiii} Relative rates of foodborne illnesses were calculated using loss-adjusted per-capita consumption data from the USDA Economic Research Service for each food group, and population data from the U.S. Census Bureau.

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Appendix: Summary of Fully-Investigated Foodborne Outbreaks and Illnesses by Food Categories, 2001-2010

FDA-Regulated Foods		
Category	Outbreaks	Illnesses
Produce	696	25,222
Fruits	100	3,629
Vegetables	235	11,839
Produce Dishes	361	9,754
Seafood	657	5,603
Finfish	396	2,289
Molluscan Shellfish	113	1,542
Seafood Dishes	106	1,246
Other Seafood	42	526
Dairy	193	5,524
Cheese	61	1,161
Ice Cream	25	396
Milk	90	3,408
Other Dairy	17	559
Breads & Bakery	150	3,506
Bakery	126	3,058
Breads & Bakery	24	448
Eggs	125	3,684
Eggs	35	752
Egg Dishes	90	2,932
Beverages	59	1,953
Juices	14	628
Other Beverages	45	1,325
Game	12	104
Multi-Ingredient	982	25,393
Salads	175	6,680
Sandwiches	149	3,068
Sauces/Dressing/Oils	48	1,415
Rice/Beans/Stuffing/ Pasta Dishes	171	3,276
Ethnic Foods	285	5,447
Nuts/Dried Spices	14	2,039
Other Foods	140	3,468

FDA Total	2,874	70,989
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USDA-Regulated Foods		
Category	Outbreaks	Illnesses
Poultry	458	11,338
Chicken	178	3,964
Turkey	73	2,709
Poultry Dishes	203	4,651
Other Poultry	4	14
Beef	363	7,528
Ground Beef	140	2,342
Beef Dishes	77	2,035
Other Beef	146	3,151
Pork	176	3,794
Ham	22	545
Pork Dishes	27	626
Other Pork	127	2,623
Luncheon & Other Meats	134	4,151
Luncheon	37	1,263
Meat Dishes	18	556
Other Meats	79	2,332

USDA Total	1,131	26,811
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Multi-Ingredient (Meat)		
Category	Outbreaks	Illnesses
Both (FDA & USDA)	228	8,872

Percent of Total Outbreaks	
Both	5%
FDA	67%
USDA	28%
Total	100%

Total Outbreaks	4,229
Total Illnesses	106,635

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- ^{vii} Calculations for the relative rates of illness used the following data sources:
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- ^{viii} Centers for Disease Control and Prevention. Foodborne Outbreak Online Database (FOOD). <http://www.cdc.gov/foodborneoutbreaks/>. Downloaded 7/9/2012
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- ^{xi} Centers for Disease Control and Prevention. Foodborne Illness: Frequently Asked Questions. <http://www.cdc.gov/foodborneburden/questions-and-answers.html>. Accessed March 22, 2013.
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