

Outbreak Alert!

Analyzing Foodborne
Outbreaks
1998 to 2007

Closing the Gaps in Our
Federal Food-Safety Net



CENTER FOR
Science in the
Public Interest

2009

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About CSPI

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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Executive Summary

In the United States, foodborne illness has been estimated to cause 5,000 deaths and 76 million illnesses per year. Responsibility for food safety is divided among at least a dozen federal agencies involved in monitoring, surveillance, inspection, enforcement, outbreak management, research, and education. Despite recent improvements and increased funding for the Food and Drug Administration (FDA) significant gaps in the federal food-safety structure continue to put consumers at risk. To help fill one of these gaps, the Center for Science in the Public Interest (CSPI) maintains a database of foodborne illness outbreaks that have been linked to specific foods, starting with outbreaks reported in 1990. This report analyzes a subset of that data.

FINDINGS

Using data available from the Centers for Disease Control and Prevention (CDC), CSPI identified a total of 4,638 outbreaks of illness linked to specific foods, involving 117,136 individual illnesses that occurred between 1998 and 2007. An outbreak involves two or more people sickened by the same food. The food categories most commonly linked to outbreaks during this ten-year period were:

- **Seafood: 838 outbreaks involving 7,298 cases of illness**
- **Produce: 684 outbreaks involving 26,735 cases of illness**
- **Poultry: 538 outbreaks involving 13,498 cases of illness**
- **Beef: 428 outbreaks involving 9,824 cases of illness**
- **Pork: 200 outbreaks involving 4,934 cases of illness**

Overall, fewer outbreaks identified by state officials were investigated fully in 2007 to identify both a food and a pathogen than in previous years, which are the only outbreaks described in this report. As a portion of overall outbreak reports, fully-investigated outbreaks declined to 34 percent in 2007 from a high of 44 percent in 2001.

RECOMMENDATIONS

Congress should pass, and the Obama Administration should implement, legislation that will help to modernize our nation's food safety program. Legislation currently before Congress would greatly enhance outbreak surveillance-systems and coordination between the CDC and the states to improve the collection, analysis, reporting, and usefulness of information on foodborne illness. The legislation would also modernized FDA's food safety program (responsible for seafood, produce, and most processed foods) to implement an integrated, system-wide approach to preventing foodborne illnesses and outbreaks. The new program assigns clear responsibilities to food producers and processors, oversight by federal food safety agencies, and effective tools and resources for detecting and removing unsafe food from the market. It would increase food inspections for FDA-regulated products; requires companies to identify hazards specific to the foods they produce and implement written food safety plans to control those hazards. The bills also would give FDA the authority to issue mandatory recalls of contaminated foods and would authorize tougher penalties for negligent processors. While the legislation will provide useful new tools, it is vital that the agencies request and Congress support adequate funding for food safety programs at both FDA and USDA.

Introduction

In recent decades, changes in food production and consumption have impacted the safety of food. The food industry has evolved from being local to global, where production and processing for many foods are centralized in different parts of the country and even in different parts of the globe. Large-scale food production operations use ingredients from all over the world, which can allow pathogens to become widely dispersed through fast-paced slaughterhouses and processing plants. Large-scale processing can easily spread pathogens throughout the nation, as evidenced by the January 2009 outbreak caused by *Salmonella* in peanut butter and peanut paste, which sickened over seven hundred people, nine fatally. Furthermore, the U.S. population is aging and, to make matters worse, foodborne pathogens are becoming more virulent.¹

Contaminated foods cause an estimated 76 million illnesses and 5,000 deaths each year in the United States.² Although anyone can develop a foodborne illness, those who are most at risk include the elderly, young children, pregnant women and their fetuses, and the immuno-compromised. While most illnesses occur as isolated cases, outbreaks of foodborne illness are clusters of cases that result from ingestion of a common contaminated food. A single outbreak can affect as few as two or as many as thousands of people.

Outbreaks are primarily identified by state and local health departments. These local officials sometimes call on the federal Centers for Disease Control and Prevention (CDC) to help investigate large or multi-state outbreaks. The CDC is also responsible for nationwide compilation of outbreak reports and for tracking new and emerging pathogens. But many, perhaps most, outbreaks fall through the cracks because the states do not identify them, and states are not required to report foodborne illnesses and outbreaks to the CDC.

Attributing outbreaks to specific foods is difficult for many reasons. The majority of outbreak investigations at the local and state level do not identify both the food and the pathogen responsible. The outbreaks also provide researchers with very little information on the specific characteristics of foods that caused the outbreak. For example, such facts as whether the foods are imported or domestic, organic or not, are rarely reported.

Furthermore, the foodborne illness outbreaks are organized by CDC by pathogen, rather than by the food responsible for the outbreak. Attributing illnesses to specific foods can help health officials and regulatory bodies to recognize the reoccurring problems in the production of those foods. It also helps identify which federal agency has regulatory oversight responsibility.

The CDC's system for reporting outbreaks does not synchronize easily with the nation's regulatory system. The primary agencies that inspect and regulate food are the United States Department of

Agriculture (USDA), which oversees meat, poultry, and processed egg products, and the Food and Drug Administration (FDA), which has regulatory responsibility for all other foods. Although FDA-regulated foods are linked to two-thirds of the outbreaks with known causes, the FDA's budget is just 43 percent of the federal budget for food safety in Fiscal Year 2010.³ And while meat-processing plants are inspected by USDA daily, companies producing many high-risk foods such as seafood, eggs, lettuce, or processed foods containing less than two percent meat are inspected by FDA on average just once every ten years.⁴

When foodborne illness outbreaks do occur, neither the USDA nor the FDA has the power to order recalls of the contaminated food. They must ask companies to *voluntarily* remove foods from the market. The current system of voluntary recalls can delay the recall and increase the number of illnesses in an outbreak. Also, lawsuits brought by the meat industry have curbed USDA's ability to close down plants producing contaminated meat. The all-too-frequent occurrence of foodborne illness outbreaks in the United States today is evidence that the current food-safety system needs to be improved.

SPOTLIGHT: DISPARITIES IN FUNDING

- Outbreaks from FDA-regulated foods accounted for 66 percent of those in CSPT's database between 1998-2007
- FDA-regulated foods include produce, seafood, dairy, eggs, game, bakery, and multi-ingredient foods made exclusively with FDA-regulated products.
- USDA-regulated foods include beef, poultry, pork, and luncheon and other meats.
- Foods with multiple ingredients regulated by FDA and USDA are categorized as "Both."
- While FDA-regulated foods were linked to two-thirds of outbreaks, the FDA budget has accounted for less than half of federal food safety expenditures.

Figure 1. Outbreaks Linked to FDA- and USDA-Regulated Foods 1998-2007

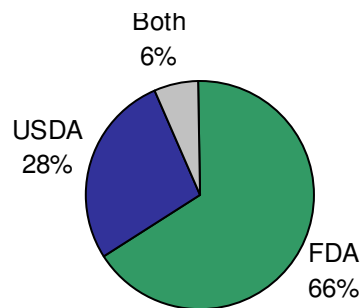
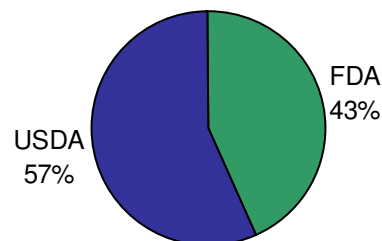


Figure 2. Food safety Budgeted FY 2010 (\$ Millions)



A Database of Foodborne Illness Outbreaks

The Center for Science in the Public Interest (CSPI) has identified and categorized outbreaks linked to specific foods, using data compiled by CDC based on reports from state health departments. Such data alert consumers to food-safety hazards, allow consumers to make informed risk decisions about the foods they eat, and provide better information to the government for setting priorities for food-safety resource allocation. Food attribution also enables identification of the food-pathogen combinations that are causing the most illnesses.

Data Collection

CSPI maintains a database of foodborne illness outbreaks that occurred between 1990 and 2007. The database covers 6,148 outbreaks of illness linked to specific foods, involving 177,417 individual illnesses. Countless other outbreaks undoubtedly occurred, but were not identified or their causes were not identified. The database was compiled largely from the CDC's annual outbreak line listings. A small portion of the data collected in the earlier years was obtained from state health departments' reports, reports by the CDC's Foodborne Outbreak Response and Surveillance Unit, and peer-reviewed journal articles.⁵ Data from non-CDC sources constitute about 5 percent of the total database and just 2 percent of the data between 1998 and 2007.⁶ For this report, CSPI analyzed a total of 4,638 outbreaks involving 117,136 illnesses that occurred between 1998 and 2007.

Incidents of foodborne illness are only included in the CSPI database if they meet the CDC's definition of an outbreak: when two or more people have consumed the same contaminated food and come down with the same illness.⁷ Also, each outbreak must have an identified etiology and food vehicle. Outbreak reports that meet CSPI's inclusion criteria are further evaluated to determine whether they are already listed in the database or whether they represent new outbreaks.⁸ Excluded from the CSPI database are sporadic cases of foodborne illness (individual illnesses not linked to an outbreak), outbreaks with no identifiable etiology or food vehicle, and waterborne outbreaks.

The outbreaks included in the CSPI database represent only a small proportion of the actual foodborne illness outbreaks that occurred between 1990 and 2007. Many foodborne illness outbreaks go unidentified due to their:

- ◆ small size
- ◆ long incubation period
- ◆ geographic dispersion
- ◆ inability to identify the pathogen
- ◆ mild cases of illness that do not prompt individuals to seek medical care.⁹

Furthermore, the majority of reported foodborne illness outbreaks do not have complete outbreak information.¹⁰ Those "unattributed" outbreaks are not included in CSPI's database.

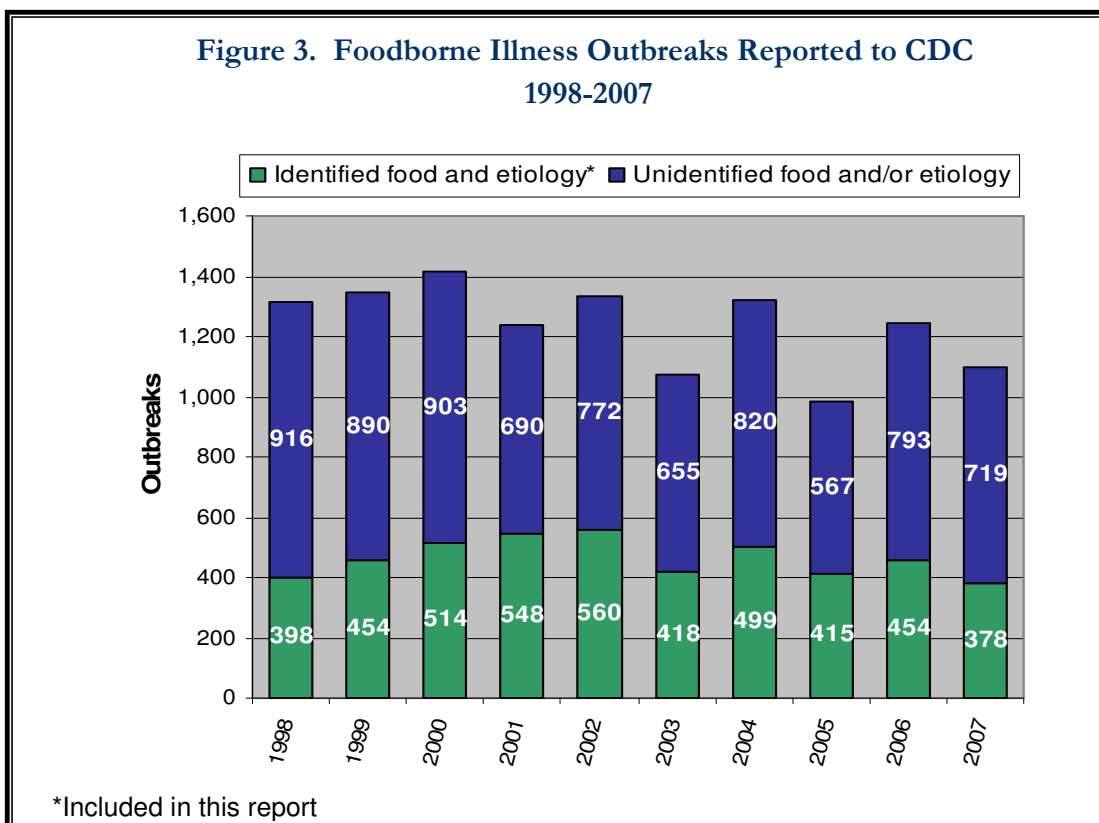
Food Categorization

Once an outbreak is selected for inclusion in the CSPI database, it is categorized by the implicated food and the regulatory agency with primary responsibility for that particular food item. Outbreaks with meat and poultry are assigned to the USDA, while outbreaks linked to other foods are assigned to the FDA.¹¹ Outbreaks involving foods with meat and non-meat items are placed in a separate category entitled “Both.” CSPI divides food into 13 categories, and some of those are subdivided (Appendix A).

Results

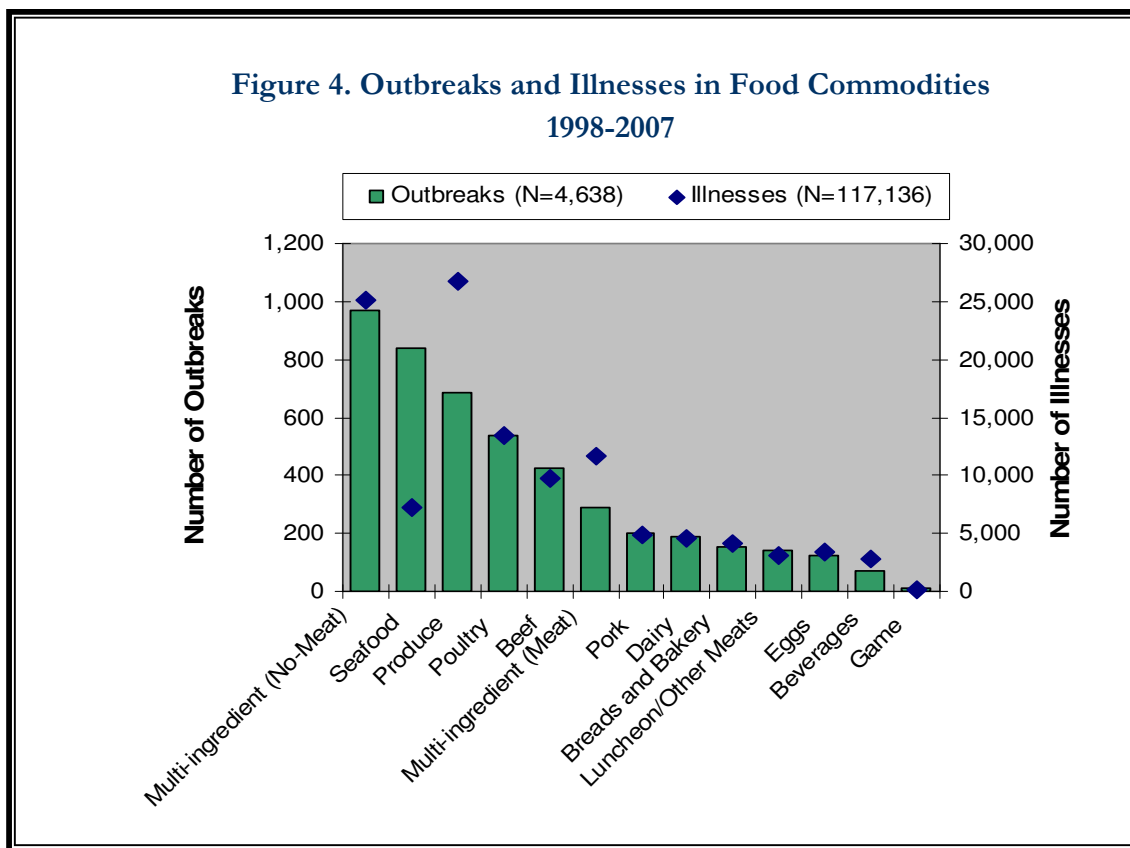
Overall Findings

This report describes 4,638 outbreaks, involving 117,136 cases of illness that occurred between 1998 and 2007. This represents a minority of the outbreaks reported to the CDC. Over the 10-year period, 56 percent to 70 percent of all outbreaks reported to CDC had no known etiology or food vehicle (Figure 3). In the early years, the number of completed outbreak investigations improved and reached a high of 44 percent in 2001. Unfortunately, the percentage has gradually declined from 44 percent to 34 percent in 2007, the lowest percentage of fully investigated outbreaks in any year since 1999. That suggests that states may have been devoting fewer resources to tracking down the causes of outbreaks.



The five food categories, excluding multi-ingredient foods, linked to the most foodborne illness outbreaks were seafood, produce, poultry, beef, and pork (Figure 4). Those five categories were responsible for 58 percent of all outbreaks and 53 percent of the illnesses. The produce category was linked to the largest number of foodborne illnesses associated with outbreaks, constituting 23 percent of all illnesses in CSPI's database between 1998 and 2007 (Appendix B).

In the years 1998-2007, FDA-regulated foods were linked to 3,039 outbreaks (66 percent of all outbreaks) with 74,177 illnesses, while USDA-regulated foods were linked to 1,309 outbreaks (28 percent of all outbreaks) with 31,336 illnesses. The 290 outbreaks with 11,623 illnesses due to multiple-ingredient foods that included both meat or poultry (USDA-regulated) and other ingredients (FDA-regulated) comprised 6 percent of all outbreaks.



Major Pathogens

In the years analyzed (1998-2007), bacterial pathogens were responsible for 56 percent of all outbreaks, while viruses caused 30 percent, chemicals/toxins caused 13 percent, and parasites caused 1 percent. The most frequently identified and reported bacterial pathogens were *Salmonella*, which accounted for 18 percent of all outbreaks, *Clostridium* (11 percent), and *Staphylococcus* (8 percent). *Bacillus* caused 6 percent, *E. coli* caused 5 percent, and *Campylobacter* caused 3 percent of all outbreaks,

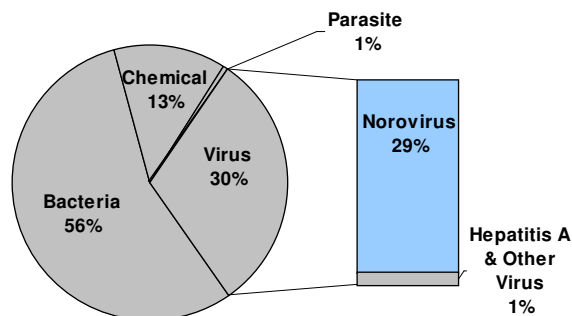
respectively. Norovirus, which is rarely fatal, caused 94 percent of all virus outbreaks, accounting for 29 percent of all outbreaks.

Bacterial pathogens caused more than three-fourths of outbreaks linked to eggs (97 percent), beef (87 percent), pork (83 percent), poultry (79 percent), and dairy (75 percent). Half of the outbreaks linked to multi-ingredient foods were caused by bacteria (54 percent), and 43 percent by viruses. Outbreaks linked to game were predominantly caused by parasites, whereas chemicals and toxins were the most common cause of seafood and beverage-related outbreaks.

SPOTLIGHT: VIRAL OUTBREAKS

The vast majority of viral outbreaks were caused by Norovirus. Aside from a small number of outbreaks that were linked to Hepatitis A and sporadic outbreaks due to Calicivirus, Rotavirus, and Sapovirus, the remaining 4 percent of viral outbreaks were unspecified. Between 1990 and 1997, viral outbreaks were responsible for 7 percent of all foodborne illness outbreaks. The percentage of viral outbreaks more than tripled in later years, with viruses causing 30 percent of reported outbreaks between 1998 and 2007. This increase- mostly due to Norovirus outbreaks- likely results from improvements in Norovirus laboratory detection methods starting in 1998. The emergence of new, more virulent, Norovirus strains may result in a continued growth in reported outbreaks in the coming years.

Figure 5: Viruses in Foodborne Illness Outbreaks 1998-2007



FDA-Regulated Foods

BEVERAGES. A total of 71 outbreaks and 2,780 illnesses were linked to beverages. The average number of illnesses per outbreak linked to beverage was 39. Juices were associated with 20

outbreaks and 1,252 illnesses, and almost a third of the outbreaks were linked to unpasteurized juices. Other beverages, such as punch, tea, and soda, were linked to 51 outbreaks with 1,528 illnesses. Contamination from chemicals and Norovirus were the most common hazards in beverages. In April 2005, unpasteurized orange juice sickened 157 restaurant patrons with *Salmonella* in a multi-state outbreak.

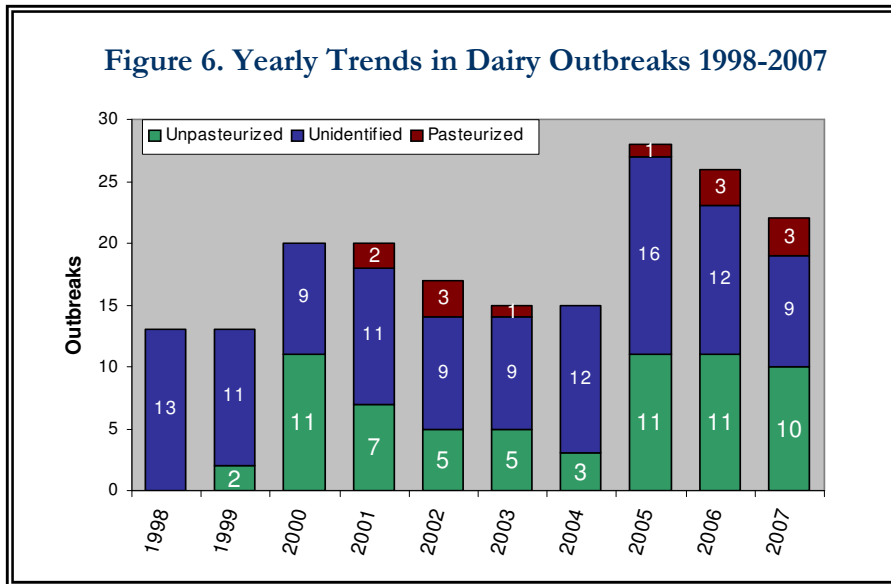
BREADS AND BAKERY. A total of 151 outbreaks with 4,200 illnesses were linked to breads and other bakery items. The average number of illnesses per outbreak linked to breads and bakery items was 28. Breads, including rolls and buns, were associated with 30 outbreaks and 706 illnesses, while such bakery items as cake, pie, and cheesecake were linked to 121 outbreaks and 3,494 illnesses. *Salmonella* and Norovirus were the most common hazards in bread and bakery items. In one of the most surprising outbreaks in this category, 69 people were infected with *E. coli* O157:H7 in 29 states in 2009. Most of those affected reported eating uncooked, refrigerated, Nestle Toll House cookie dough products.

DAIRY. A total of 190 outbreaks and 4,565 illnesses were linked to dairy products such as cheese, milk, and ice cream. The average number of illnesses per dairy-related outbreak was 24. Milk was the vehicle in 64 outbreaks with 1,605 illnesses, cheese was identified in 57 outbreaks with 1,436 illnesses, and ice cream was identified in 38 outbreaks with 702 illnesses. Dairy products identified as unpasteurized were associated with 34 percent of the dairy outbreaks, including about 80 percent of milk outbreaks. In outbreaks associated with dairy items, *Campylobacter*, *Salmonella*, and Norovirus were the most common hazards. The largest dairy outbreaks have occurred in prisons and jails: In 2007, 135 people became ill due to *E. coli*-contaminated cheesecake at a prison/jail in Colorado; and in 2005, 200 people became ill due to *Campylobacter jejuni* in milk at a jail in Virginia.

SPOTLIGHT: UNPASTEURIZED DAIRY

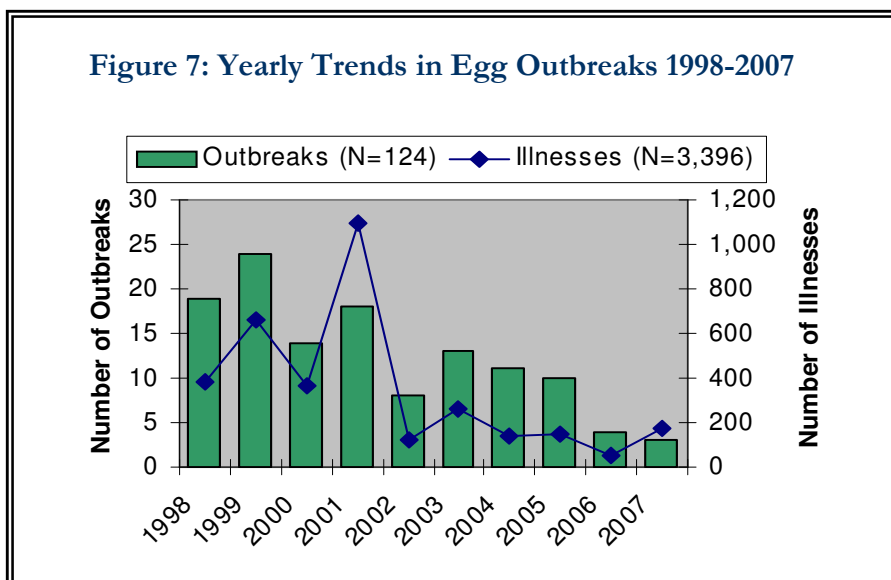
Dairy outbreaks increased dramatically after 2004, in large part due to a rise in outbreaks from unpasteurized dairy products. Figure 6 shows the contribution of *unpasteurized* dairy products to all dairy outbreaks. The *pasteurized* category includes dairy products that were identified as pasteurized, and *unidentified* includes dairy outbreaks where pasteurization was not specified (Figure 6).

Unpasteurized, or “raw,” dairy products have gained popularity with people who believe that “healing qualities,” flavor and nutrients are lost during pasteurization. However, forgoing pasteurization leaves consumers vulnerable to deadly pathogens, such as *Campylobacter*, *E. coli* O157:H7, and *Salmonella*, that would normally be killed off.



EGGS AND EGG DISHES. A total of 124 outbreaks with 3,396 illnesses were linked to eggs and egg dishes. The average number of illnesses per egg-related outbreak was 27. Egg-based dishes such as French toast and egg salad were linked to 78 outbreaks with 2,469 illnesses, and eggs themselves were linked to 46 outbreaks with 927 illnesses. *Salmonella enteritidis* was the most common hazard, accounting for 70 percent of the egg outbreaks.

Although eggs and egg dishes caused a large number of outbreaks throughout the early 1990's, the situation has greatly improved in recent years. In summer 2009, FDA finalized a regulation to increase on-farm egg safety, including ensuring that chicken flocks are tested for *S. enteritidis*, providing increased immunization of flocks, and ensuring that eggs from *S. enteritidis*-contaminated flocks are pasteurized prior to sale. In the meantime, consumers can protect themselves by fully cooking eggs and egg dishes; by avoiding foods containing raw eggs, such as Hollandaise sauce and raw cookie dough; or by using pasteurized eggs.



GAME. A total of 14 foodborne illness outbreaks with 99 illnesses were linked to game. The average number of illnesses per game-related outbreak was seven. This category includes walrus, bear, moose, venison, and cougar meats. In game outbreaks, the parasite *Trichinella* was the most common hazard, causing half of the outbreaks.

MULTI-INGREDIENT (NO-MEAT) FOODS. A total of 967 outbreaks with 25,104 illnesses were linked to multi-ingredient foods that did not involve meat or poultry. The average number of illnesses per dairy-related outbreak was 26. Foods including rice, beans, stuffing, and pasta dishes were linked to 191 outbreaks and 3,254 illnesses. Multi-ingredient salads, such as potato salad and coleslaw, were linked to 209 outbreaks with 8,858 illnesses, while multi-ingredient sandwiches were linked to 158 outbreaks and 3,515 illnesses. Sauces, dressings, and oils caused 60 outbreaks with 2,278 illnesses. Multi-ingredient ethnic foods, including pizza, spaghetti, tortellini, chili, lasagna, tacos, burritos, lo mein, and chow mein, were associated with 258 outbreaks with 5,062 illnesses. Another 91 outbreaks and 2,137 illnesses were linked to other foods, such as soups, puddings, and dips. *Salmonella* and Norovirus were the most common hazards associated with multi-ingredient (no-meat) foods. In one of the most serious outbreaks in a decade, between September 2008 and February 2009, a total of 714 people became ill, and 9 people died after eating *Salmonella* - contaminated peanut paste ingredients that were produced at a single Georgia facility.

Multi-ingredient foods, which include such common foods as pizza, salads, and sandwiches, caused a surprisingly large number of outbreaks. Practices in home and restaurant kitchens can make multi-ingredient foods hazardous, including cross-contamination, under-cooking, inadequate cooling and storage, and worker contamination. Some states and counties have adopted grading systems to inform consumers about restaurants' compliance with health codes and to encourage restaurants to improve their practices. At home, consumers can protect themselves by cleaning all cutting boards, utensils, hands, and other surfaces that touch raw meat or seafood before using them to prepare or serve other foods; by cooking foods thoroughly; and by refrigerating leftovers promptly.

PRODUCE AND PRODUCE DISHES. A total of 684 foodborne illness outbreaks involving 26,735 illnesses were linked to produce and produce dishes. The produce category had an average of 39 illnesses per outbreak. Vegetables were linked to 228 outbreaks with 11,197 illnesses, while fruits were identified as the vehicle in 111 outbreaks with 3,871 illnesses. Produce dishes, including salads, were implicated in 345 outbreaks involving 11,667 illnesses.

More than 50 percent of produce outbreaks were attributed to food from restaurants and other food establishments, while private homes accounted for 11 percent of outbreaks. Norovirus was the major cause of produce outbreaks, accounting for 51 percent of all outbreaks, *Salmonella* for 17 percent, and *E. coli* for 7 percent.

SPOTLIGHT: PRODUCE OUTBREAKS

In light of the frequency and size of produce outbreaks, on-farm controls should be mandated for all growers, both domestic and foreign. Identifying the food/pathogen combinations responsible for produce outbreaks is the first step to identifying appropriate solutions. The hazard analysis on produce identifies the most common food/pathogen combinations in outbreaks and ranked their risk based on number of outbreaks (Figure 8). Using this type of hazard analysis, regulatory programs can set priorities for which foods and pathogens need the most rapid risk management responses.

**Figure 8. Produce-Pathogen Combinations in Outbreaks
Caused by Produce 1998-2007**

Rank	Food	Pathogen	Outbreaks	Associated Illnesses	Illnesses per Outbreak
1	Greens-Based Salad	Norovirus	196	6,722	34
2	"Fruit" & "Fruit Salad"	Norovirus	38	1,810	48
3	Lettuce	Norovirus	32	1,106	35
4	"Vegetables" & "Vegetable Salad"	Norovirus	27	895	33
5	Sprouts	<i>Salmonella</i>	19	724	38
6	Tomato	<i>Salmonella</i>	17	1,694	100
7	Melon	<i>Salmonella</i>	15	474	32
8	Greens-Based Salad	<i>E. coli</i>	13	291	22
9	Greens-Based Salad	<i>Salmonella</i>	12	521	43
10	Lettuce	<i>E. coli</i>	12	361	30

As a general rule, outbreaks from produce were larger than those in other categories. In September 2006, tainted pre-packaged spinach triggered an *E. coli* O157:H7 outbreak that resulted in five deaths and 205 illnesses. November and December 2006 featured two additional outbreaks with leafy greens, this time involving iceberg lettuce served in Taco John and Taco Bell restaurants in the Midwest and Northeast states, respectively. Though the restaurants used lettuce from different suppliers, both outbreaks were caused by *E. coli* O157:H7 and sickened a combined total of over 150 patrons. In May 2009, *Salmonella*-contaminated alfalfa, onion, and gourmet sprouts, produced by SunSprout Enterprises, Inc., of Omaha, Nebraska, were recalled after being linked to 235 confirmed illnesses in 14 states.

Imports also need to be monitored carefully. Starting in April 2008, first tomatoes, and then hot peppers (Serrano and jalapeño), were linked to an outbreak of *Salmonella* Saintpaul that infected 1,438 persons. The same genetic fingerprint of that bacterium was identified in patients in 43 states, the District of Columbia, and Canada.

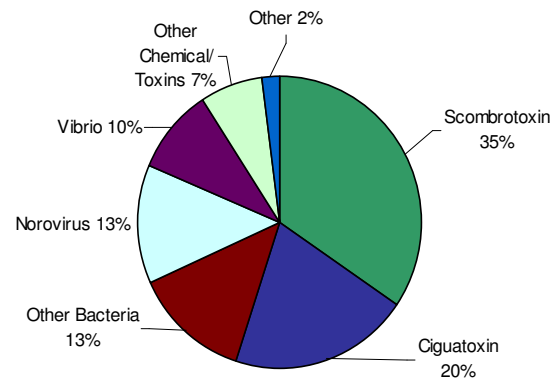
Produce contamination is very difficult for consumers to combat at home, because produce is often served raw and does not have a “kill step” to eliminate pathogens. Pathogens can be hard to eliminate as they hide in the cracks of the skin and can be transferred to the interior flesh of the fruit during cutting. For other items, such as tomatoes, pathogens can enter and spread through the fruit through the stem scar. Bagged, “triple-washed” leafy greens—such as those implicated in the 2006 spinach outbreak—are best eaten without additional washing, since they have been washed thoroughly and may be at risk of cross-contamination in the consumer’s kitchen. But heads of lettuce should be thoroughly washed after removing the external leaves.

SEAFOOD AND SEAFOOD DISHES. A total of 838 foodborne illness outbreaks with 7,298 illnesses were linked to seafood and seafood dishes. The seafood category had an average of 9 illnesses per outbreak. Of the outbreaks associated with seafood, finfish, such as tuna and grouper, were linked to 503 outbreaks and 2,179 illnesses, and molluscan shellfish, including oysters, clams, and mussels, were linked to 125 outbreaks with 1,964 illnesses. Seafood dishes like crab cakes and tuna burgers were linked to 154 outbreaks with 2,481 illnesses. Other seafood, such as shrimp and lobster, were linked to 56 outbreaks with 674 illnesses.

SPOTLIGHT: SEAFOOD PATHOGENS AND TOXINS

Seafood is a leading cause of foodborne illness outbreaks in the U.S. In finfish, such as swordfish and grouper, improper handling after harvest can cause toxins to form. Once formed, the toxins are not destroyed by cooking.¹² Shellfish can become contaminated with bacteria and viruses in harvesting beds. If not refrigerated shortly after harvest, levels of pathogens can increase dramatically to dangerous levels.

Figure 9. Pathogens in Seafood 1998-2007



Hazards in seafood included chemical toxins such as scombrototoxin and ciguatoxin in finfish such as tuna and grouper, and *Vibrio* spp. and Norovirus in shellfish (Figure 9). The majority of seafood outbreaks were caused by natural toxins, rather than by bacteria or viruses.

*To help keep seafood safe, the FDA should increase its inspection of processors and implement testing programs to verify that firms are controlling the hazards in their products. Consumers can help protect themselves by taking certain steps to avoid hazardous seafood. First, consumers should avoid tropical or subtropical reef fish like barracuda. Second, consumers should inspect seafood carefully for signs of decay, which can indicate the presence of scombrototoxin. Fish should be kept at ice cold temperatures, have clear eyes, but not a strong fishy odor. FDA is currently considering new requirements for raw oysters harvested from warm waters—which can carry dangerous *Vibrio* bacteria that have caused at least 135 deaths since 2000. Until these new rules are in place, consumers should eat only cooked oysters or raw oysters that have been harvested from colder waters or have been treated to eliminate hazardous bacteria.*

USDA-Regulated Foods

BEEF AND BEEF DISHES. A total of 428 outbreaks with 9,824 illnesses were linked to beef. The beef category had an average of 23 illnesses per outbreak. Ground beef was linked to 153 outbreaks with 2,124 illnesses, while other types of beef, such as roast beef, veal, and beef jerky, were linked to 147 outbreaks with 4,258 illnesses. Beef dishes including casseroles, gravies, and stews caused 128 outbreaks with 3,442 illnesses.

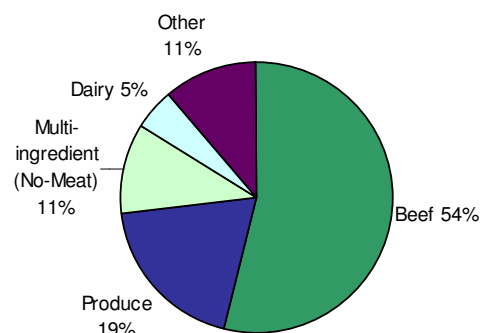
SPOTLIGHT:

E. coli O157:H7 in Beef

Outbreaks from *E. coli* O157:H7 were most commonly linked to beef (Figure 10). While the beef industry has made progress in food safety in the last decade, beef recalls due to *E. coli* O157:H7 contamination are surprisingly common:

- In 2007, over 30 million pounds of beef were recalled because of *E. coli* O157:H7 contamination, by 20 different companies.
- In 2008, over 7 million pounds of beef were recalled because of *E. coli* O157:H7 contamination, by as many as a dozen different companies.
- In 2009, over 1.3 million pounds of beef products were recalled because of *E. coli* O157:H7 contamination, by 16 different companies.

Figure 10. *E. coli* O157:H7 in Food 1998-2007

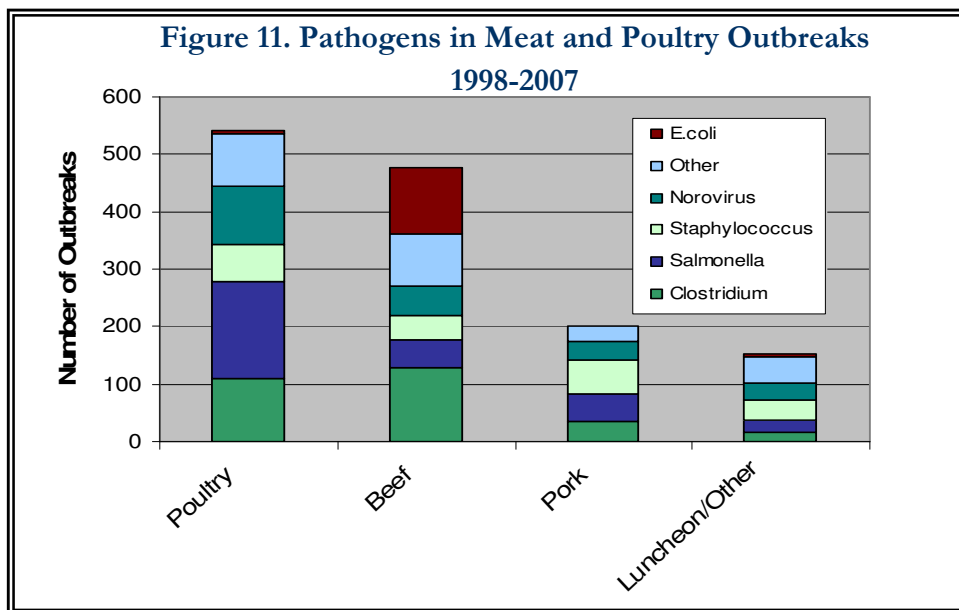


In beef outbreaks, the most common hazards were *E. coli* O157:H7, *Clostridium perfringens*, and Norovirus (Figure 11). *E. coli* O157:H7 lives harmlessly in the intestines of animals, but can cause diarrhea, vomiting, painful abdominal cramps, and sometimes kidney failure and death if ingested by humans. In most instances, improper handling of prepared foods is the actual cause of poisoning by *Clostridium perfringens*. Small numbers of the organisms are often present after cooking and multiply to hazardous levels during cool down and storage of prepared foods.¹³

Many beef outbreaks might have been avoided if the government and the beef industry were more vigilant about keeping hazards out of meat, and increased their testing of beef products. Consumers can help protect themselves by cooking all beef to an internal temperature of 160°F, using a meat thermometer to verify temperature, to ensure that all bacteria are killed.

LUNCHEON AND OTHER MEATS. A total of 143 foodborne illness outbreaks with 3,080 illnesses were linked to luncheon and other meats. This category had an average of 22 illnesses per outbreak. Fifty outbreaks with a total of 1,495 illnesses were attributed to luncheon meats, which includes fully processed meats such as hot dogs and deli meats. Forty outbreaks with 807 illnesses were linked to other meats such as lamb, goat, and sausage. Meat dishes, such as pizzas and gravy made with unspecified meats, were linked to 53 outbreaks with 778 illnesses. *Clostridium perfringens* was the most common hazard for outbreaks linked to other meats (Figure 11).

PORK AND PORK DISHES. A total of 200 foodborne illness outbreaks with 4,934 illnesses were linked to pork. Ham was the culprit in 36 outbreaks with 996 illnesses. Other types of pork were linked to 131 outbreaks with 3,092 illnesses. Pork dishes were linked to 33 outbreaks with 846 illnesses. The pork category had an average of 25 illnesses per outbreak. The most common hazard in pork was *Staphylococcus aureus* (Figure 11). In the largest pork outbreak of 2007, 75 people became ill with *Staphylococcus* after eating pork barbecue at a picnic in Illinois.



POULTRY AND POULTRY DISHES. A total of 538 outbreaks with 13,498 illnesses were linked to poultry. The poultry category had an average of 25 illnesses per outbreak. Chicken was linked to 198 outbreaks with 3,971 illnesses, while turkey was identified as the vehicle in 82 outbreaks with 3,122 illnesses. Five outbreaks with 25 illnesses were linked to other types of poultry, such as duck, game hen, and goose. Poultry dishes were linked to an additional 253 outbreaks with 6,380 illnesses. The most common pathogens in the poultry category were *Salmonella*, *Clostridium perfringens*, *Staphylococcus aureus*, and Norovirus (Figure 11). *Campylobacter jejuni* is frequently found in raw poultry, but virtually all illnesses occur as sporadic illnesses and not as part of large outbreaks. Thus, the harmfulness of that pathogen is not captured in outbreak data.

In October 2007, ConAgra recalled nationally distributed chicken pot pies and turkey pot pies after a CDC investigation linked the product to illnesses. The CDC worked with state public health officials to examine more than 100 similar *Salmonella* illnesses that occurred between January and October 2007 and found a strong association with Banquet brand pot pies.¹⁴ Overall, at least 272 illnesses were reported once the company announced the product recall. The outbreak may have been aggravated by undercooking of the finished product by consumers, but that just underscores the importance of industry diligence in keeping products pathogen-free and labeling packages with proper cooking instructions. The problems have not been completely resolved. In March 2008 and again in October 2008, frozen raw-chicken entrees caused *Salmonella* outbreaks.

Consumers should be cautious when microwave-cooking pot pies and other frozen poultry products—many of which appear to be ready-to-eat, but may in fact be only partially cooked. Consumers should follow cooking instructions exactly, including any “stand” or “hold” time to allow the product to reach proper internal temperatures to destroy pathogens.

Farm practices, such as crowding and the use of antibiotics, can also contribute to Salmonella and Campylobacter problems in poultry flocks. Farmers and processors must recognize the critical role they play in maintaining a safe food supply. Government food-safety programs should be expanded to improve conditions on farms, as well as in the slaughter plants.

Foods Regulated by Both FDA and USDA

A total of 290 foodborne illness outbreaks with 11,623 illnesses were linked to meals containing foods regulated by both FDA and USDA. These foods included such meals as chicken served with salad, pork with coleslaw, and ground beef with potatoes. This category had an average of 40 illnesses per outbreak. In foods regulated by both the FDA and USDA, *Salmonella* and Norovirus were the most common hazards.

Recommendations

The Peanut Corporation of America (PCA) outbreak followed closely by the discovery of *E. coli* O157:H7 in cookie dough highlighted failures in the food safety system and fed a trend begun in 2006 of heightened public concern about the safety of our food supply. Surveys show public confidence in the safety of the food we eat has plummeted. The Food Industry Center tracking poll reported consumer confidence in the food supply fell from 42 percent to 22.5 percent in the aftermath of the PCA recall.¹⁵ Meanwhile, polling by The Pew Charitable Trusts in July found a majority see the situation worsening, and 89 percent support new government measures to improve oversight of the food industry.¹⁶

With the continuing occurrence of foodborne illnesses together with concerns about food safety and security and emerging antibiotic resistant strains of foodborne pathogens, changes are urgently needed to increase public health protections. Each year, *Outbreak Alert* has made recommendations that would help close holes in the federal food-safety net and, ultimately, decrease the number of illnesses and deaths caused by contaminated food. This year many of those recommendations are closer to fulfillment with passage in the House of Representatives of legislation to improve the safety of FDA-regulated foods, H.R. 2749, the Food Safety Enhancement Act. The Senate is working to pass similar legislation, S. 510, the FDA Food Safety Modernization Act. In a departure from the past practice of recommending changes, *Outbreak Alert 2009* looks at how this legislation, if adopted, would improve our food safety system.

Improve CDC and State Outbreak Reporting and Surveillance

Outbreak information serves several important functions. It can alert consumers to food safety hazards and help policymakers and public health officials to (1) identify emerging problems, (2) evaluate existing programs, and (3) set goals and priorities for food safety. Having a timely and comprehensive inventory of foodborne illness outbreaks helps food regulators monitor trends, issue consumer alerts, and improve production practices.

States play the principal role in both identifying that outbreaks have occurred and conducting the investigation that determines the food item and the pathogen involved. If states don't have adequate public health staff or resources, outbreaks can be missed entirely. Even outbreaks that are identified may not be adequately investigated to identify the pathogens and foods, information that is essential for long-term analysis of outbreak trends and preventions of future outbreaks. States should be funded to track the outbreak sources and test for pathogens.

After years of recommendations by congressional leaders, FDA officials, the Government Accountability Office (GAO), and others, for improving CDC's foodborne illness outbreak

reporting and surveillance programs, both bills feature provisions that would make profound changes to the Federal/State programs that are the cornerstone of outbreak detection.

Outbreak Alert identified three areas where CDC needed to place additional emphasis: (1) Improved reporting by states, (2) real-time reporting of outbreaks, and (3) organization of outbreaks by food hazard to increase the utility of CDC information. The House and Senate bills have nearly identical sections on CDC surveillance that address these recommendations.

1. The legislation enhances surveillance systems to improve collection, analysis, reporting, and usefulness of information on foodborne illness. This includes a requirement for better coordination of federal, state, and local surveillance systems and increasing participation in national networks.
2. More timely reporting is an area targeted for attention in the bills. Under the bills' surveillance provisions, findings from outbreak investigations are to be shared among federal and state agencies and with the public on a more timely basis. The legislation calls for building capacity to quickly detect foodborne infections, and identify new or rarely documented causes of foodborne illness.
3. To aid in making information gathered during outbreak investigations more useful, the legislation calls for augmenting surveillance systems to improve attribution data. This will improve prevention by identifying the sources of outbreaks and providing food safety planners with a better understanding of the potential hazards and their likely occurrence in a food. Improving attribution would be faster if CDC standardized the outbreak inspection form used by all states, and included more specific product characteristics, such as level of processing and the farm, state, or country of origin.

While better monitoring and reporting of foodborne illness outbreaks would be important improvements, the most important goal would be the development of a preventive system that reduces the toll of foodborne disease.

Create a Food-Safety System Focused on Prevention

Our food safety laws are grounded in laws that are over 100 years old. Two laws set the framework for our principle regulatory agencies, but utilize very different approaches. Meat and poultry products are visually inspected for safety by federal inspectors employed by the U.S. Department of Agriculture so that each product can be stamped as “inspected and passed” by the government. FDA is responsible for the rest of the food supply, but lacks the resources and authority to do effective monitoring or oversight. In past years, that agency has mainly responded to food crises as they occur, with few resources devoted to preventing problems before they become outbreaks. At

least ten other federal agencies operating under 35 different statutes play additional roles in food research and regulation.

A unified agency focused on protecting the public from preventable foodborne disease would more effectively address the problems inherent in our fractured and sometimes dysfunctional system. Gaps in consumer protections and inefficiencies caused by inadequate coordination, conflicting public health standards, regulatory redundancies, and slow approvals of new technologies place the public at risk and waste resources that could be better directed toward preventing outbreaks. A strengthened food-safety net should help decrease the numbers of foodborne illnesses and provide better protection against outbreaks that have become all too common. A 1998 Institute of Medicine (IOM) report on food safety called for the consolidation of food-safety responsibilities under a single statute, with a single budget and a single leader. The IOM report concluded that the “current fragmented regulatory structure is not well equipped to meet the current challenges.”¹⁷ In October 2001, the General Accounting Office reported that:

A single food-safety agency responsible for administering a uniform set of laws is needed to resolve the long-standing problems with the current system; deal with emerging food-safety issues, such as the safety of genetically modified foods or deliberate acts of contamination; and ensure a safe food supply.¹⁸

The transition to a new and more effective federal structure offering more comprehensive protections to public health would require both organizational and statutory changes. While neither the House nor Senate bill proposes a single agency, both make progress on restructuring the system. The legislation clearly puts the FDA on a track to modernizing its food safety program and could allow for consolidation at a later time.

Modernize the Food Safety System at FDA

The widespread food safety problems of recent years, from spinach and lettuce, to peanut butter and ground beef, have spurred Congress to focus a great deal of attention on food safety in the last two years. More than 20 oversight and legislative hearings on food safety in numerous committees examined problems – largely related to FDA regulated foods – and sought solutions to address gaps and problems.

Congress identified a range of approaches, from funding improved FDA oversight of imported food, to creating a new Food Safety Administration (FSA) at Health and Human Services (with a separate agency that just regulates drugs and medical devices), to creating a fully unified and independent agency. Each approach has merit, and also problems. But the heart of any legislative reform lies in putting prevention in the forefront. CSPI has been focusing on correcting critical shortcomings in way FDA manages food safety as an interim step to fixing the full range of problems that arise from the antiquated regulatory laws and tools available to food-safety regulators.

Safety lapses during production, processing, shipping, or handling of food can result in outbreaks of illness, recalls, and loss of public confidence in the safety of our food supply. These problems are exacerbated for FDA-regulated foods by a legal structure locked in a 1930s era enforcement model, a model that is targeted for change by the legislation now working its way through Congress. Clearly, modernization of this system is urgently needed.

While in-plant and border inspections form the core of the government's food safety program today, the infrequent inspections conducted by FDA and state personnel provide little more than a spot check on performance. The reality is that the food industry itself, with effective government monitoring, holds the key to addressing and preventing food contamination.

The heart of a modern food safety system lies in preventing – not merely responding – to food safety problems. Mandatory process controls, coupled with government-enforced performance standards, should be the central features of a new system. These systems can be used from farm-to-table and with both domestic and imported foods. Other core elements of an improved system would include inspection reform, better oversight of food imports and on-farm food safety, research, education, and enforcement. A full discussion of these is contained in CSPI's *Building a Modern Food Safety System for FDA-Regulated Foods*.¹⁹

The pending legislation proposes an integrated, system-wide approach to preventing foodborne illness, with clear responsibilities assigned to food producers and processors, oversight by federal food safety agencies, and effective tools for detecting and removing unsafe food from the market. Food processors would be obligated to prevent food contamination using programs similar to the industry-developed program known as Hazard Analysis and Critical Control Points (HACCP). These programs, developed by each individual company, are already widely used in food production at all levels.

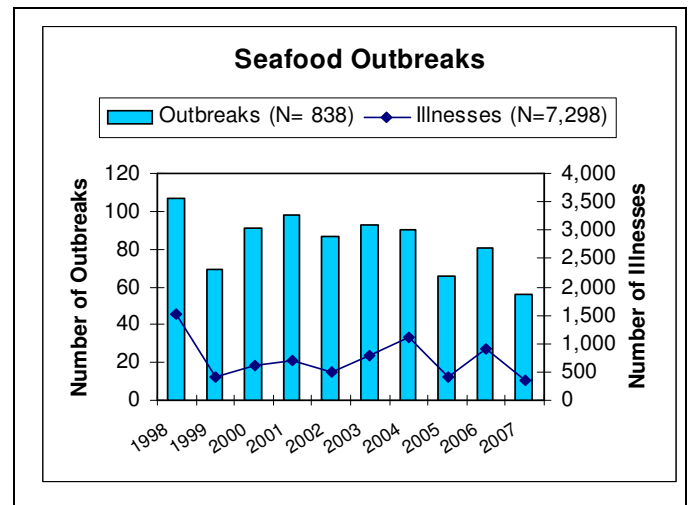
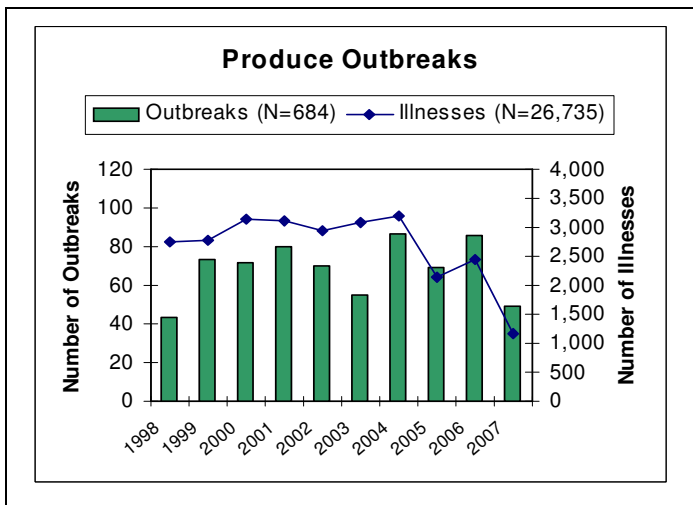
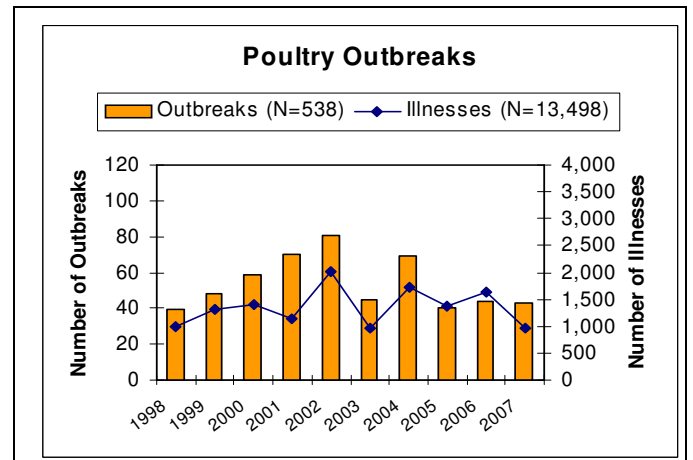
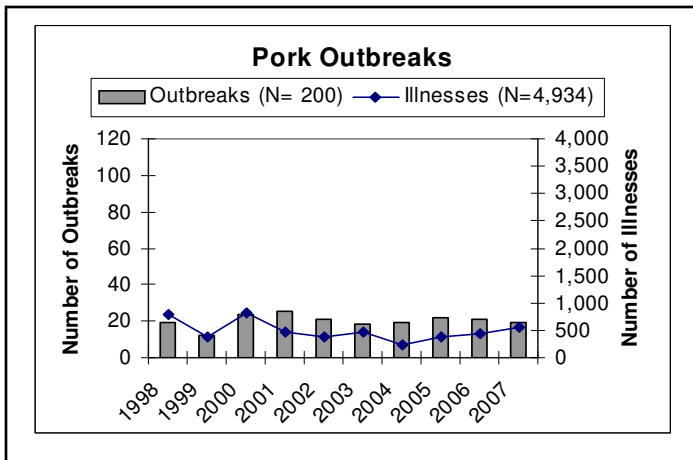
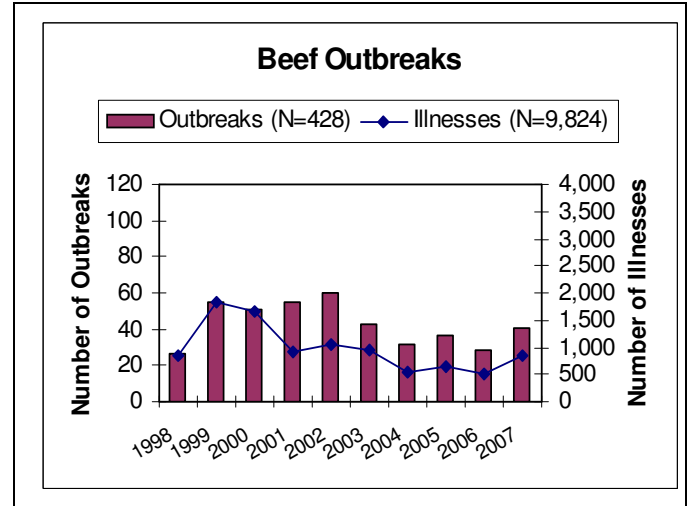
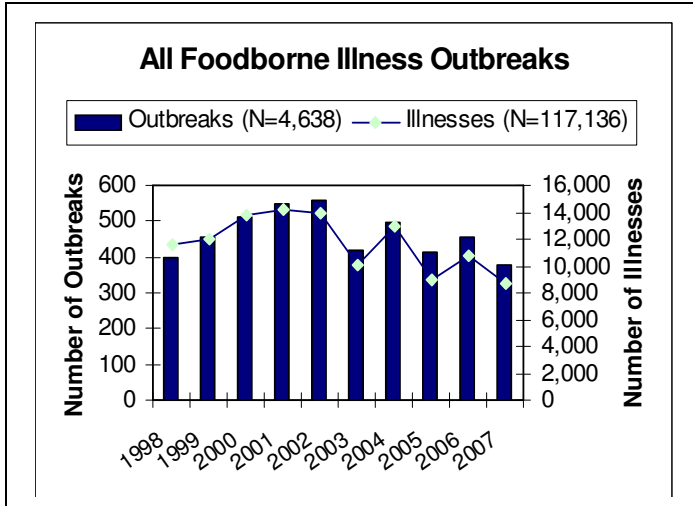
HACCP systems have been mandated in some segments of the food supply, including seafood, juice, and all types of meat and poultry products – both raw and processed – for more than a decade. The legislation would direct the remainder of the food industry to implement HACCP-like systems as well. That would not only build safety into the production of food, but, additionally, would create the recordkeeping and verification steps that are crucial to providing FDA with the means for auditing safety performance over time. Such a system would be an important advance over current inspections that today give FDA only a snapshot of conditions in the plant. These industry-derived programs would be coupled with performance standards, such as limits on the incidence or levels of contamination, or reductions in pathogen levels, that would be established by the government. Monitoring and enforcement of these standards, including laboratory testing, are included as these elements help ensure that each company has implemented an effective program.

Reforms are also needed at the USDA to modernize meat inspection, as evidenced by the spike in *E. coli* outbreaks linked to beef products in 2007.

While the creation of a modern law and new agency structures is challenging, it must not be delayed. Gaps in the current system are leaving consumers vulnerable to outbreaks of foodborne illness from natural contaminants and even intentional contamination, like melamine in pet food or infant formula. Consumers cannot afford to wait years or decades for the agencies to resolve their competing agendas. Fortunately, enactment of reforms for FDA regulated foods promises greater safety for consumers. The pending legislation also would enhance CDC programs and create a modern legal framework to improve the effectiveness of our nation's food-safety systems.

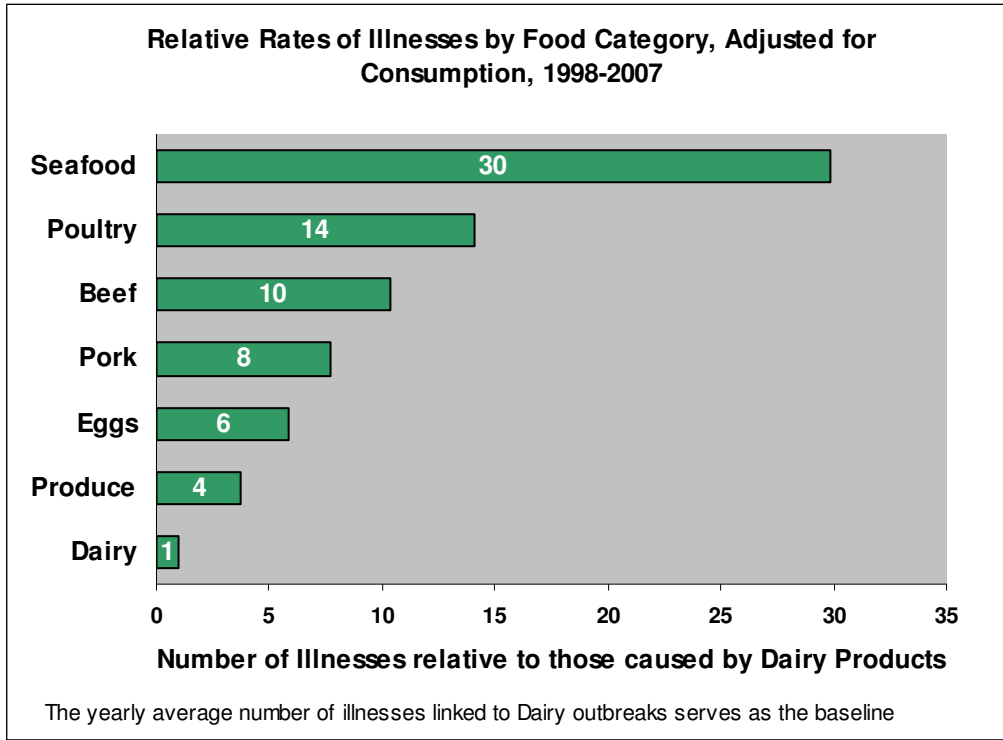
Appendix B: Trends in Foodborne Illness Outbreaks 1998-2007

Outbreaks
 Illnesses



Appendix C: Relative Rates of Illnesses by Food Category, Adjusted for Consumption 1998-2007

This chart shows the relative rates of illnesses linked to outbreaks among the food categories when adjusted for consumption during the period of 1998 to 2007. Since Dairy is the lowest risk food category per serving consumed, we set its rate of illness as “1” in order to facilitate a comparison between categories.



Note:

The data source of “lb/year per capita consumption adjusted for loss” was from the USDA/Economic Research Service website, which was updated on February 27, 2009. <http://www.ers.usda.gov/Data/FoodConsumption/FoodGuideIndex.htm>

The annual estimated population data was from the US Census Bureau website, which was released on December 22, 2008. <http://www.census.gov/popest/states/NST-ann-est.html>

The source of illnesses data was from the “Outbreak Alert” database maintained by the Center of Science in the Public Interest (CSPI), which includes foodborne outbreaks and related illnesses categorized by linked foods from 1998 to 2007. <http://www.cspinet.org/foodsafety/outbreak/pathogen.php>

Endnotes

¹ The terms “food poisoning” and “foodborne disease” are often used interchangeably. However, the term “foodborne disease” reflects three kinds of causes: foodborne intoxications (from ingestion of foodborne poisons); foodborne infections (caused by foodborne pathogenic microorganisms such as *Salmonella* that, when ingested, cause infections); and foodborne toxicoinfections (from foodborne pathogens such as *E. coli* O157:H7 that, once ingested, produce harmful toxins). Satin M. “Food Alert! The Ultimate Sourcebook for Food Safety.” *New York: Checkmark Books*; 1999. p.16-17.

² Mead PS, Slutsker L, Dietz V, McCaig LF, Bresee JS, Shapiro C, Griffin PM, Tauxe RV. “Food-related illness and death in the United States.” *Emerg Infect Dis* 1999; 5(5): 607-625.

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⁴ United States General Accountability Office. “Overseeing the U.S. food supply: steps should be taken to reduce overlapping inspections and related activities.” Statement of Robert A. Robinson, Managing Director, Natural Resources and Environment. Testimony before the Subcommittee on the Federal Workforce and Agency Organization, Committee on Government Reform, House of Representatives. *GAO-05-549T*. Tuesday, May 17, 2005. p.4.

⁵ Since 2001, CDC outbreak data have been available as yearly line listings on the Internet. Centers for Disease Control and Prevention. “U.S. foodborne disease outbreaks.” http://www.cdc.gov/foodborneoutbreaks/outbreak_data.htm.

⁶ Prior to 2001, the CDC data were unpublished, and obtained by CSPI via Freedom of Information Act requests, or identified from scientific articles, federal government publications, state health department postings, and newspaper reports verified by public health officials.

⁷ Centers for Disease Control and Prevention. “Foodborne illness: general information.” http://www.cdc.gov/ncidod/dbmd/diseaseinfo/foodborneinfections_g.htm#whatoutbreak. Before 1992, the exception to this rule was botulism where one illness was considered an outbreak. After 1992, the CDC started omitting outbreaks of botulism with only one case from its line listings. CSPI’s database reflects these changes.

⁸ Outbreak reports from different sources may contain slightly different information about the same outbreak. When such discrepancies are discovered, a public health official at the state, local, or federal level is contacted to verify the information.

⁹ Olsen SJ, MacKinon LC, Goulding JS, Bean NH, Slutsker L. “Surveillance for foodborne disease outbreaks – United States, 1993-1997.” *MMWR* 2000; 49 (SS01): 1-51.

¹⁰ Jones TF, Imhoff B, Samuel M, Mshar P, Gibbs McCombs K, Hawkins M, Deneen V, Cambridge M, Olsen SJ, for the Emerging Infections Program FoodNet Working Group. “Limitations to successful investigation and reporting of foodborne outbreaks: an analysis of foodborne disease outbreaks in FoodNet catchment areas, 1998-1999.” *Clin Infect Dis* 2004; 38 (Suppl 3): S297-S302.

¹¹ United States General Accountability Office. “Oversight of food safety activities: federal agencies should pursue opportunities to reduce overlap and better leverage resources. Report to Congressional Requesters.” *GAO-05-213*. March 2005.

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<http://www.fda.gov/Food/FoodSafety/Foodborneillness/FoodborneillnessFoodbornePathogensNaturalToxins/BadBugBook/ucm070483.htm>.

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¹⁶ Hart Research/Public Opinion Strategies. "Americans' Attitudes On Food Safety." *released by The Pew Charitable Trusts*, Sept. 8, 2009.

¹⁷ Institute of Medicine National Research Council. "Ensuring Safe Food from Production to Consumption: Committee to Ensure Safe Food from Production to Consumption." *Washington, DC: National Academy Press*; 1998. p. 12, 97.

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¹⁹ CSPI White Paper: "Building a Modern Food safety System for FDA-Regulated Foods." <http://www.cspinet.org/new/pdf/fswhitepaper.pdf>.