US Meat and Poultry Recalls: 2003-2016

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Working Paper

John Glenn College of Public Affairs

September, 2017

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Abstract

Food recalls play a vital crisis communication role helping to reduce the spread of foodborne disease. This paper examines the characteristics of US meat and poultry recalls during 2003 to 2016. Information from the US Department of Agriculture, Food Safety and Inspection Service online resource was complemented with data responding to two *Freedom of Information Act* requests for additional detail on recall sources and recovery rates. The annual number of recalls increased from 68 to 122 over the period but the amount recalled varies considerably each year. A small number (about 3% of recalls) of very large recalls accounted for a substantial share (90%) of recall volume. Particular attention is placed on Class I recalls with high risk to human health, 85% of bacterial contamination recalls were associated with two sets of pathogens - *L. monocytogenes* and *E.coli*. Trends suggest a declining share of recalls due to pathogens. The average recovery rate of recalled products was less than 30%, decreasing over the period. On average, it took firms about four months to initiate and complete recalls. These results are linked to recommendations to improve the recall process of meat and poultry in the US.

Keywords: meat and poultry, recall, foodborne disease, food safety

Introduction

Numerous outbreaks of foodborne diseases draw public attention to food safety. The Centers for Disease Control and Prevention (CDC) reports that each year about 48 million foodborne diseases are caused by major pathogens and unspecified agents, resulting in 128,000 hospitalizations and 3,000 deaths (CDC, 2011). In addition to harming human health, outbreaks can have serious economic consequences and undermine consumer confidence in the safety of the food supply. Food recalls play a vital role in stopping the spread of disease but the process needs to be effective. The Food Safety and Inspection Service (FSIS) of the US Department of Agriculture (USDA) is responsible for overseeing recalls of federally inspected meat and poultry products. FSIS may learn of unsafe product from direct company notifications, FSIS sampling or inspection programs, consumer complaints or based on reports from other agencies such as the Food and Drug Administration (FDA), CDC or state/local departments of agriculture or health.

When FSIS learns that adulterated or misbranded product is in commerce, it will conduct a preliminary inquiry. The Recall Management and Technical Analysis Division (RMTAD) collects information gathered during the preliminary inquiry and forwards relevant materials to the Recall Committee. The Recall Committee will discuss whether there is a statutory basis to recommend a recall. When a recall is recommended, FSIS will notify the firm to take action to ensure that it recovers the maximum amount of product in the shortest amount of time. If the firm refuses the Agency's recommendation and chooses not to conduct a recall, FSIS has the legal authority to detain any product found in commerce that would have been subject to the recall. FSIS conducts effectiveness checks to verify that each recalling firm has been diligent and successful in notifying and advising supply chain partners to retrieve and account for recalled product and that these consignees have responded accordingly. RMTAD will recommend that a recall case be closed after reviewing the recall termination report (FSIS, 2013). FSIS does not have the authority to mandate a recall, so all recalls are conducted by firms on a voluntary basis, even those initiated at the request of FSIS.

The US meat and poultry industry has experienced several large recalls since 2003 (Teratanavat and Hooker, 2004) (Table 1). A more recent comprehensive (1994-2015) description of recall trends suggests little evidence exists for a clear trend in the number or total

size of meat and poultry recalls (Gorton and Stasiewicz, 2017) which suggests the period studied and infrequent but very large recalls may impact the conclusions drawn. The February 2008 Hallmark recall of about 143 million pounds of beef due to the cattle not receiving complete and proper inspection became the largest meat and poultry recall in US history. In 2007 a total of 127 million pounds of bacteria contaminated meat from three large incidents were recalled. These recalls heightened public awareness. According to a survey by Hallman and Cuite (2010), most Americans pay close attention to news reports about food recalls.

Most previous studies have focused on the effect of food recalls on particular stakeholders by considering changes in the stock market, product price and consumer demand. Findings indicated firm values suffered negative valuation shocks after recalls (Pozo and Schroede, 2016). *Escherichia coli* O157:H7 recall announcements had adverse impacts on product prices, but the impacts were short-lived (Moghadam et al., 2013). Beef consumption was impacted by its own recalls (Tonsor et al., 2010). Alternatively, Canadian consumers still trusted the safety of ground beef after the biggest beef recall incident in Canadian history (Charlebois et al., 2015). In addition, research examined trends in food recalls associated with bacterial contamination. Results indicated *Salmonella* contamination accounted for the greatest number of FDA-regulated food recalls due to microbiological contamination for 2003 through 2011 (Dey et al., 2013). More than half of foodborne outbreaks reported to FSIS resulted in voluntary recalls during 2007 through 2012 (Robertson et al., 2016). Illness-related recalls due to Shiga toxin-producing *Escherichia coli* (STEC) contamination were associated with a lower percentage of product recovery (Seys et al., 2016). One of the few studies describing the performance of recalls is Teratanavat and Hooker (2004) who reported trends in US meat and poultry recalls between 1994 and 2002. Our paper updates and expands the previous literature considering: (1) the number and scale of US meat and poultry recall cases; (2) product types and reasons for recalls; (3) recall performance and effectiveness. The results obtained in this current study help update and better understand the characteristics of US meat and poultry recalls for consumers, companies and the government.

Materials and Methods

The data analyzed in this article are from the FSIS website (available at

http://www.fsis.usda.gov/wps/portal/fsis/topics/recalls-and-public-health-alerts). This information was complemented with data responding to two *Freedom of Information Act* requests for additional detail on recall sources and recovery rates. Since Teratanavat and Hooker (2004) analyzed the characteristics of US meat and poultry recalls using the data between 1994 and 2002, this paper uses the data from 2003 to 2016. Statistical analysis is used in this paper to describe recall cases and recall size, classes, product types, reasons for recall, recovery rates, discovery time and completion time.

Due to the substantial variability of recall size among cases, focusing only on an average recall size may result in misunderstanding. In order to obtain further information on recall size, this study uses five groups: small (0≤recall size < 10,000 pounds), medium (10,000 pounds≤recall size<100,000 pounds), large (100,000 pounds≤recall size<1,000,000 pounds), very large (recall size≥1,000,000 pounds), and N/A (recall size is not available). According to FSIS's classification, this study groups recalls into one of three categories; Class I, II and III. FSIS defines Class I where there is a reasonable probability that the use of the product will cause serious, adverse health consequences or even death. Class II presents a remote probability of adverse health consequences from the use of the product. Class III is a situation where the use of the product will not cause any adverse health consequences.

Recalled products are grouped into five types including pork, beef, poultry, mixed (more than one type of meat or poultry) and others (non-specified meat or poultry products such as pizza, sausage, ham, or salad). Reasons for meat and poultry recalls are grouped into five categories including: bacterial contamination, misbranding and undeclared allergen, extraneous material, processing defect and other reasons. Bacterial contamination includes *L. monocytogenes*, *E. coli*, *Salmonella* and other pathogens. Other reasons include foreign products ineligible to be exported to the US or items produced without proper inspection or without Hazard Analysis & Critical Control Points (HACCP) plan, among others.

Three performance indicators; the recovery rate, discovery time and completion time are used to assess managerial effectiveness before and during meat and poultry recalls. The recovery rate defined as the percentage of recalled products recovered. In order to reduce the influence of a few extreme recalls where the actual amount recovered exceeds the amount initially announced, the recalls are divided into two groups: group A (recovery rates≦100%)

and group B (recovery rates > 100%). In addition, this study obtains discovery and completion times from production date, opening date and closure date of the recall. Discovery time is defined as the number of days from the earliest production date until the problem is discovered and the recall initiated (opening date). Completion time is defined as the number of days from opening date to closing date of the recall. This study divides all the recalls into six groups according to the discovery or completion time: 0-30 days (less than 1 month), 31-90 days (1-3 months), 91-183 days (3-6 months), 184-365 days (6 months-1 year), ＞365 (more than 1 year) and N/A (discovery or completion time is not available).

Results

During the 14-year study period, a total of 1,081 recalls were initiated accounting for 515 million pounds of meat and poultry products. The annual number of recalls generally increased from 68 in 2003 to 122 by 2016 (Figure 1). There was also considerable variability in the total annual recall amount, ranging from about 3 million pounds to 155 million pounds, in part due to a few very large recalls. For example, in 2008 one 143 million pound recall accounted for 92% of the annual recall volume.

The size of individual recalls over the period varied from several pounds to more than 100 million pounds. More than half of all recalls involved less than 10,000 pounds of product. About 30% and 11% of all recalls are medium and large sized respectively. Although only 34 recall cases (about 3% of all recalls) were very large, these cases accounted for 90% of the total amount recalled between 2003 and 2016. Small and medium sized recalls maintained fairly constant percentages over time at about 50% and 30% respectively. The large recalls ranged from zero in 2004 to 22% in 2009, and the very large recalls ranged from zero in 2003 and 2004 to 12% in 2007. The large or very large recalls didn't appear to have any particular time trend (Figure 2).

Most recalls (70%) were identified as Class I with high risk to human health. During 2003 to 2016, the percentage of Class I declined from a peak of 91% in 2005 to 75% in 2016. Class II accounted for 23% of recalls and increased from the lowest level of 7.6% in 2005 to 21% in 2016. Class III accounted for 7% of recalls and was very variable over the period. The percentage of pounds by class was 67% Class I, 31% Class II and 2% Class III, in part due to

Class III recalls being smaller sized on average (Table 2). The results suggest that FSIS places an emphasis on the recall process of high risk products.

Meat and poultry recalls involved diverse types of products. Beef held the highest percentage of all recalls, accounting for about 30% from 2003 to 2016. Beef recalls decreased from the peak of 47% in 2006 to 22% in 2016. Poultry accounted for 28% of all recalls and increased from the lowest level of 16% in 2007 to 32% in 2016. Pork was involved in 12% of all recalls. Pork recalls were very variable ranging from 4% to 21%.. Mixed products accounted for 11% of all recalls and others was about 20%. There is no clear pattern for mixed or other products during the period (Figure 3).

Bacterial contamination, misbranding and undeclared allergen were the major reasons for meat and poultry recalls. During 2003 to 2016, there were 377 recalls due to bacterial contamination (35%), 419 recalls due to misbranding and undeclared allergen (39%). Bacterial contamination decreased from a peak of 68% in 2005 to 23% in 2016. Misbranding and undeclared allergen increased from the lowest level of about 15% in 2008 to the peak of 54% in 2014 and then decrease to 38% in 2016. Since 2011, misbranding and undeclared allergen have been the most common reasons for recalls. Food allergies are a growing public health issue impacting millions of Americans since there are 15 million Americans suffering from food allergies (Barach, 2016). Most misbranding and undeclared allergen recalls were due to a failure to declare potentially allergenic ingredients such as peanut, milk, or eggs. In addition, the cumulative percentage of extraneous material, processing defect and other was about 26% and there was no obvious time trends during 2003 to 2016 (Figure 4).

L. monocytogenes, *E. coli*, and *Salmonella* were the main types of bacterial contamination associated with meat and poultry recalls. *L. monocytogenes* was the most prevalent among the bacterial sources of contamination leading to recalls, accounting for 44%. *L. monocytogenes* contamination reached its peak of 83% in 2005 and decreased to 43% in 2016. *E. coli* is the second most common bacterial source of contamination, accounting for 41% of all such recalls. *E. coli* contamination reached its peak of 61% in 2007 and decreased to 50% in 2016. The cumulative percentage of *L. monocytogenes* and *E. coli* contaminationrecalls was 85%. *Salmonella* contamination was the third most common bacterial contaminant, accounting for 12%. *Salmonella* contamination ranged from zero in 2005 to 29% in 2011. Other pathogens

were less than 10% in all but one year (Table 3).

As presented in Table 4, there was considerable variability in the recovery rates of individual recalls, ranging from zero to 5381%. Such a large range and those recalls with a recovery rate over 100% bias the average performance of recalls upward. There were 132 recalls where recovery rates were zero accounting for 14% of all recalls in which recovery rates are available. Overall, less than 30% of the total amount recalled was recovered by establishments during 2003 to 2016. The average recovery rates decreased from 20% in 2003 to 6% in 2016. There were 875 recalls in group A accounting for more than 90% of all recalls with an average recovery rate of 23%. There are 69 recalls in group B, accounting for less than 10% of all recalls with an average recovery rate of 432%. Without the recalls in group B the average recovery rate varied from 6% to 42%. Even considering those cases where recovery rate exceeded one, the average recovery rate was under 50% in all but one year.

It took an average of 111 days to discover the problem leading to recalls during 2003 to 2016 (Table 5). The discovery time of individual recalls varied from one day to 2,378 days (more than six years). There was a distinct increase in the time to discover unsafe products from 68 days in 2003 to the peak of 162 days in 2015. It can also be seen that about 30% of recalls were initiated within one month of production, more than 30% of recalls were initiated after 3 months and 5.4% of recalls more than one year after production date. The recalls initiated less than 1 month reached a peak of 53% in 2005 then declined to 30% by 2016. The recalls initiated more than 3 months increased from 25% in 2003 to 36% in 2016. From Table 6 it can be seen that it took an average of 125 days to complete a recall during 2003 to 2015. The completion time reached a peak of 217 days in 2010 and then decreased to 121 days by 2015. Only 14% of recalls were completed within one month, 38% of recalls were completed after 3 months and 4.6% of recalls were completed after one year. The recalls completed within 1 month reached a peak of 30% in 2008 and then decreased to a low of 7% by 2015. Recalls lasting at least 3 months have no clear trend.

Discussion

The large and increasing number of recalls challenges government management of food recalls. The results showed that more than one thousand meat and poultry recalls were initiated

and the number of recalls increased during 2003 to 2016. There was a similar upward trend during 1994 to 2002 (Teratanavat and Hooker, 2004). More recently Gorton and Stasiewicz, 2017) find little evidence of an increase in the number or amount of meat and poultry recalled over a longer period (1994 to 2015). Combined, the results presented here and the earlier studies suggest the window of analysis and impact of a small number of very large recalls factor in to the conclusions drawn. Clearly, the temporal pattern of recalls remains variable. Possible reasons for the increase in food recalls are closer public and regulatory attention on the quality and safety of food (Hallman, 2013); a greater ability to detect contaminants and changing consumption patterns. Due to the large and growing number of recalls, the government may need to allocate additional resources (including manpower, materials and funds) that help ensure an effective and efficient recall process.

The increase in recalls doesn't indicate the safety of US meat and poultry supply has been getting worse. During 2003 to 2016 there was no distinct increase in the amount of meat and poultry recalled especially when eliminating the few large outlier recalls. Few recalls had reports of adverse reaction or injuries linked to consumption of the contaminated product. The results also showed that Class I recalls with high risk decreased to about three-fourths of all cases by 2016, compared to the highest level of about 90% in 2005. When jointly considering average recall size, this may indicate FSIS is focusing on Class I recalls in part by ensuring all potentially contaminated product is included in the recall. Misbranding and undeclared allergens have been the most common reason for meat and poultry recalls instead of bacterial contamination. Such recalls likely have a lower public health impact than bacterial recalls.

A small number of very large recalls played an important role in meat and poultry recalls. The results showed that 90% of the pounds of meat and poultry recalled were from very large recalls. Such recalls are news worthy and attract public attention. Further study is needed to examine the economic impacts and recall effectiveness of such cases. One of the studies investing food recall cases is Charlebois et al. (2015) who examined consumer confidence in the safety of ground beef after the biggest food recall in Canadian history. Products recalled were diverse, and complex supply chains may have a negative influence on recall effectiveness. However, it should be noted that most meat and poultry recalls are small (less than 10,000 pounds). Regardless, the recall process needs to be both effective and efficient no matter what

the size of the recall.

Recall effectiveness may have potential impacts on human health. Results showed that the recovery rate was low and occasionally zero, which implies that consumers might have consumed a substantial amount of product with potential risk to their health. At the very least, this demonstrates a significant portion of meat and poultry remains unaccounted for at the close of most recalls. Product recovery rate has associated with the number of days from production date to the recall action (Seys at al., 2016)). Compared to processed products, raw/fresh food products had lower recovery rate (Hooker et al., 2005). FSIS and firms need to do better job of accounting for product subject to a recall and take effective measures to enhance the recovery rate. Regarding the discovery and completion times, the government and companies didn't respond to food safety crises promptly in many recall cases when noting that it took firms about 4 months to initiate or complete recalls. For food recalls especially for Class I, even one day's delay to complete can result in additional serious health consequences (GAO, 2004). Internal detection (i.e., defects detected by a supplier or the recalling firm, rather than a consumer or a regulatory agency) had shorter discovery times than external detections (Johnson-Hall, 2012).Logistical factors in the distribution network affected completion time (Teratanavat et al., 2005). Since recall costs rapidly increased if the recall delayed (Velthuis et al., 2009), the best strategy for FSIS and firms is to prevent high recall costs by improving traceability and monitoring systems so that a recall can be initiated in a short time and then managed effectively, which may often means quickly.

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TABLE 1. 10 LARGEST US MEAT AND POULTRY RECALLS: 2003-2016

Year	Recall size (pounds)	Company	Product	Problem
2007	83,900,000	ConAgra Foods	Frozen pot pie	*Salmonella*
2007	21,700,000	Topps Meat Company	Frozen ground beef	*E. coli* O157:H7
2007	21,700,000	Castleberry's Food Company	Canned Meat	*C. botulinum*
2008	143,383,823	Hallmark/Westland Meat Packing Company	Raw and frozen beef	Without complete and proper inspection
2010	15,000,000	Campbell Soup Supply Company	SpaghettiOs with Meatballs	Under-processing
2011	36,000,000	Cargill Meat Solutions Corporation	Ground turkey	*Salmonella*
2013	10,500,000	Rich Products Corporation	Frozen Mini Quesadilla, Pizza, Cheese Steak and Other Snack Products	*E. coli* O121
2014	8,742,700	Rancho Feeding Corporation	Various beef	Without the benefit of full inspection
2015	9,073,384	Golden Krust Patties	Beef and Chicken	Misbranding and undeclared allergen
2016	47,112,256	Ajinomoto Windsor	meat and poultry products	*L. monocytogenes*

TABLE 2. NUMBER OF RECALL CASES AND POUNDS RECALLED BY RECALL CLASS: 2003-2016

Year	Class I				Class II				Class III			
	No.	% of cases	Pounds	% of pounds	No.	% of cases	Pounds	% of pounds	No.	% of cases	Pounds	% of pounds
2003	46	67.65	2,460,849	74.90	12	17.65	177,179	5.39	10	14.71	647,305	19.70
2004	41	83.67	2,451,995	85.15	4	8.16	153,050	5.32	4	8.16	274,410	9.53
2005	48	90.57	5,940,165	92.15	4	7.55	431,256	6.69	1	1.89	74,810	1.16
2006	26	76.47	4,785,669	80.46	6	17.65	1,136,964	19.12	2	5.88	25,300	0.43
2007	50	86.21	142,885,981	99.88	7	12.07	158,353	0.11	1	1.72	19,488	0.01
2008	42	77.78	9,816,427	6.34	12	22.22	144,910,236	93.66	0	0.00	0	0.00
2009	44	63.77	5,477,010	57.72	21	30.43	922,396	9.72	4	5.80	3,089,258	32.56
2010	43	61.43	33,016,674	96.76	23	32.86	844,834	2.48	4	5.71	260,394	0.76
2011	62	60.19	38,526,070	97.04	29	28.16	1,026,034	2.58	12	11.65	150,215	0.38
2012	46	56.10	1,013,972	29.18	24	29.27	472,392	13.59	12	14.63	1,988,751	57.23
2013	53	70.67	12,668,345	96.73	17	22.67	249,154	1.90	5	6.67	179,285	1.37
2014	63	67.02	14,261,888	76.37	23	24.47	3,817,387	20.44	8	8.51	595,827	3.19
2015	99	66.00	16,623,878	78.77	39	26.00	3,176,212	15.05	12	8.00	1,304,758	6.18
2016	91	74.59	57,495,595	97.17	26	21.31	1,063,589	1.80	5	4.10	612,296	1.03
Overall	754	69.75	347424518	67.44	247	22.85	158539036	30.77	80	7.40	9222097	1.79

TABLE 3. BACTERIAL CONTAMINTION FOR MEAT

AND POULTRY RECALL: 2003-2016

Year	*L. monocytogenes*		*E.coli*		*Salmonella*		Other pathogens	
	No. of cases	%	No. of cases	%	No. of cases	%	No. of cases	%
2003	11	37.93	15	51.72	2	6.90	1	3.45
2004	14	60.87	6	26.09	2	8.70	1	4.35
2005	30	83.33	5	13.89	0	0.00	1	2.78
2006	6	37.50	8	50.00	1	6.25	1	6.25
2007	11	30.56	22	61.11	1	2.78	2	5.56
2008	15	46.88	17	53.13	0	0.00	0	0.00
2009	8	26.67	16	53.33	6	20.00	0	0.00
2010	8	29.63	12	44.44	7	25.93	0	0.00
2011	11	31.43	13	37.14	10	28.57	1	2.86
2012	16	69.57	5	21.74	2	8.70	0	0.00
2013	10	41.67	9	37.50	4	16.67	1	4.17
2014	7	41.18	5	29.41	4	23.53	1	5.88
2015	6	28.57	8	38.10	3	14.29	4	19.05
2016	12	42.86	14	50.00	2	7.14	0	0.00
Overall	165	43.77	155	41.11	44	11.67	13	3.45

TABLE 4. RECOVERY RATES OF MEAT AND POULTRY RECALLS: 2003-2016

year	Group A (recovery rates ≦ 1)		Group B (recovery rates > 1)		Range (%)	Average (%)
	# of cases	recovery rate (%)	# of cases	Recovery rate (%)		
2003	58	16.86	7	216.00	0-778	20.01
2004	39	41.13	8	203.78	0-990.9	63.76
2005	50	41.57	2	106.32	0-107.1	41.64
2006	33	14.98	1	110.00	0-110	15.01
2007	51	23.21	7	503.84	0-521.4	34.85
2008	46	34.34	6	199.28	0-488.1	34.39
2009	62	26.80	5	263.34	0-5380.7	41.26
2010	62	19.11	5	160.34	0-992.0	19.87
2011	87	7.49	7	415.60	0-5125.1	8.69
2012	67	15.22	8	475.73	0-857.8	26.98
2013	51	31.94	2	1496.70	0-2379.3	34.12
2014	54	13.75	3	176.20	0-340.2	13.83
2015	118	6.61	3	752.94	0-1148.1	6.74
2016	97	5.94	5	438.48	0-57.5	6.00
Overall	875	22.91	69	431.93	0-5380.7	27.09

TABLE 5. THE AVERAGE DISCOVERY TIME AND PERCENTAGE OF MEAT AND POULTRY RECALLS IN DIFFERENT DISCOVERY TIME RANGES: 2003-2016

Year	Average (days)	0-30 days (less than 1 month)	31-90 days (1-3 months)	91-183 days (3-6 months)	184-365 days (6 months -1 year)	＞365 days (more than 1 year)	N/A
2003	67.76	47.06	20.59	17.65	4.41	2.94	7.35
2004	65.35	46.94	24.49	14.29	6.12	2.04	6.12
2005	110.48	52.83	22.64	13.21	3.77	5.66	1.89
2006	74.00	29.41	32.35	26.47	2.94	0.00	8.82
2007	78.76	39.66	25.86	18.97	6.90	1.72	6.90
2008	88.38	33.33	29.63	16.67	3.70	5.56	11.11
2009	102.66	31.88	30.43	7.25	14.49	4.35	11.59
2010	132.52	28.57	15.71	24.29	12.86	4.29	14.29
2011	94.08	32.04	21.36	19.42	10.68	3.88	12.62
2012	93.62	31.71	35.37	7.32	9.76	4.88	10.98
2013	92.69	25.33	37.33	12.00	13.33	1.33	10.67
2014	137.75	28.72	27.66	12.77	14.89	8.51	7.45
2015	162.14	27.33	22.00	18.67	12.67	12.67	6.67
2016	131.40	29.51	27.05	16.39	10.66	9.02	7.38
Overall	110.72	33.12	26.18	15.91	10.08	5.83	8.88

TABLE 6. THE AVERAGE COMPLETION TIME AND PERCENTAGE OF MEAT AND POULTRY RECALLS IN DIFFERENT COMPLETION TIME RANGES: 2003-2015

year	Average (days)	0-30 days (less than 1 month)	31-90 days (1-3 months)	91-183 days (3-6 months)	184-365 days (6 months -1 year)	＞365 days (more than 1 year)	N/A
2003	108.25	2.94	48.53	36.76	11.76	0.00	0.00
2004	73.17	18.37	55.10	22.45	2.04	0.00	2.04
2005	76.17	13.21	60.38	18.87	3.77	1.89	1.89
2006	69.94	29.41	41.18	20.59	5.88	0.00	2.94
2007	95.71	10.34	43.10	37.93	8.62	0.00	0.00
2008	75.22	29.63	51.85	7.41	11.11	0.00	0.00
2009	149.44	11.59	34.78	24.64	20.29	7.25	1.45
2010	216.50	8.57	25.71	24.29	22.86	18.57	0.00
2011	181.68	15.53	39.81	21.36	7.77	11.65	3.88
2012	104.83	24.39	47.56	9.76	6.10	3.66	8.54
2013	136.71	14.67	25.33	21.33	6.67	6.67	25.33
2014	125.82	8.51	31.91	8.51	12.77	4.26	34.04
2015	120.61	7.33	28.00	34.67	14.00	0.67	15.33
Overall	124.94	13.56	38.79	22.84	10.95	4.59	9.28

Note: The closing dates and then completion times are not available in 2016.

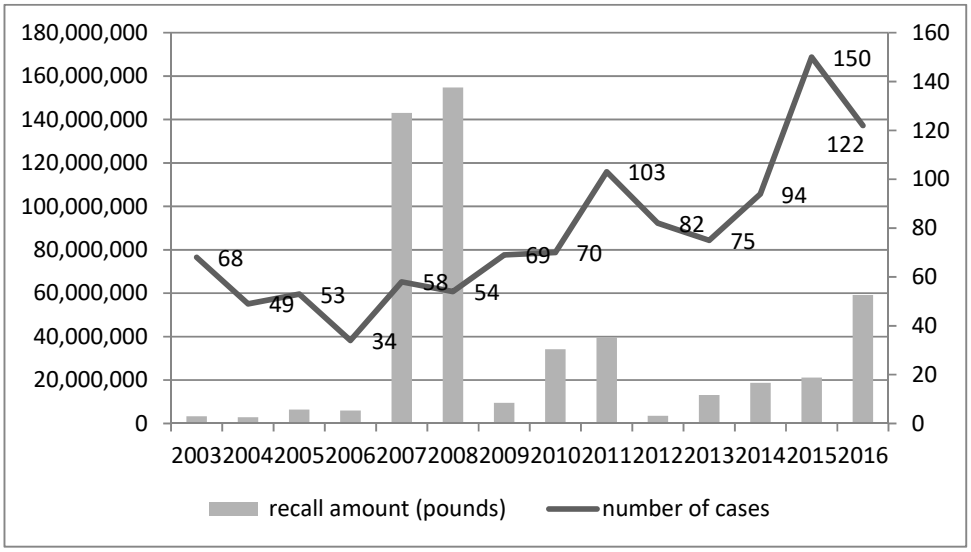

FIGURE 1. Number of recall cases and total amount in pounds: 2003-2016

Note: The total amount didn't include the recalls where the recall amounts were undetermined.

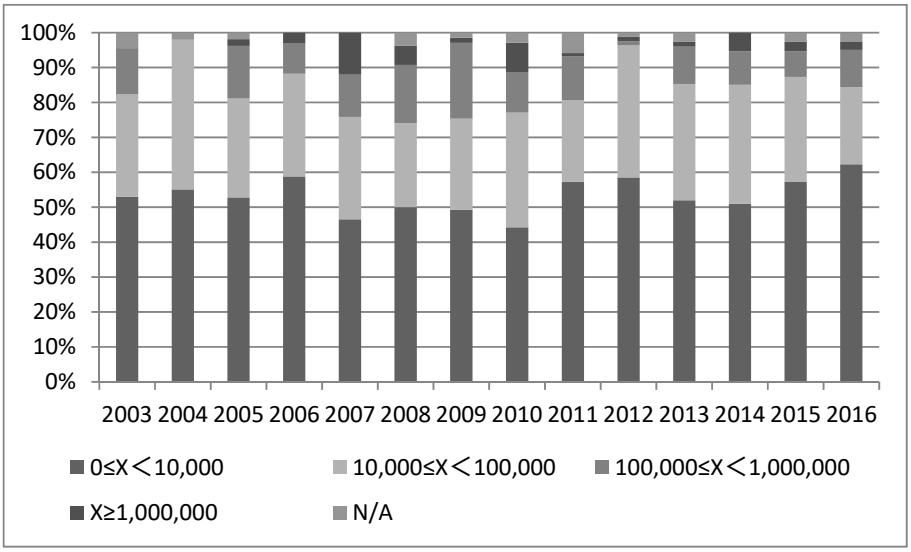

FIGURE 2. Percentage of meat and poultry recalls by recall size: 2003-2016

Note: X=recall size (pounds), N/A refers to case where recalled amount are not available.

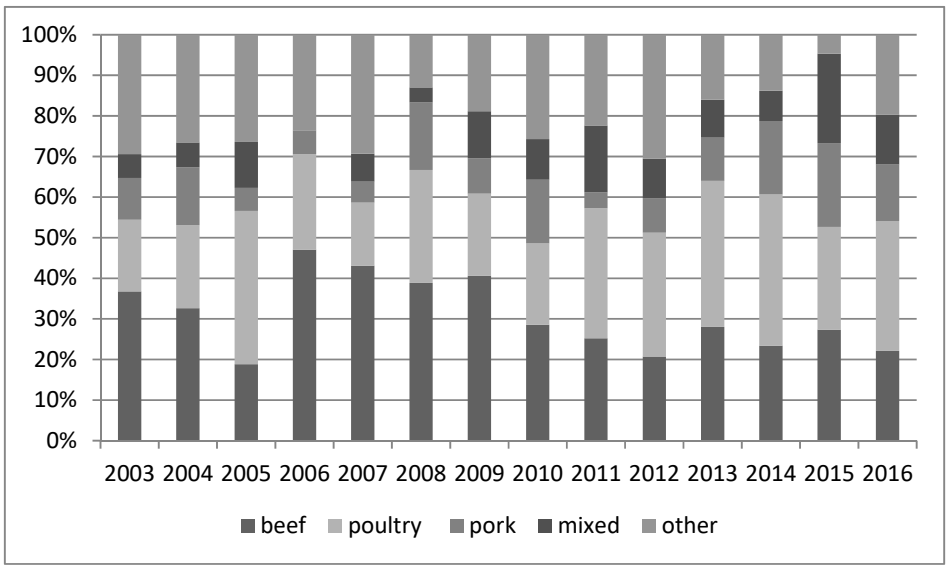

FIGURE 3. Percentage of meat and poultry recalls by product type: 2003-2016

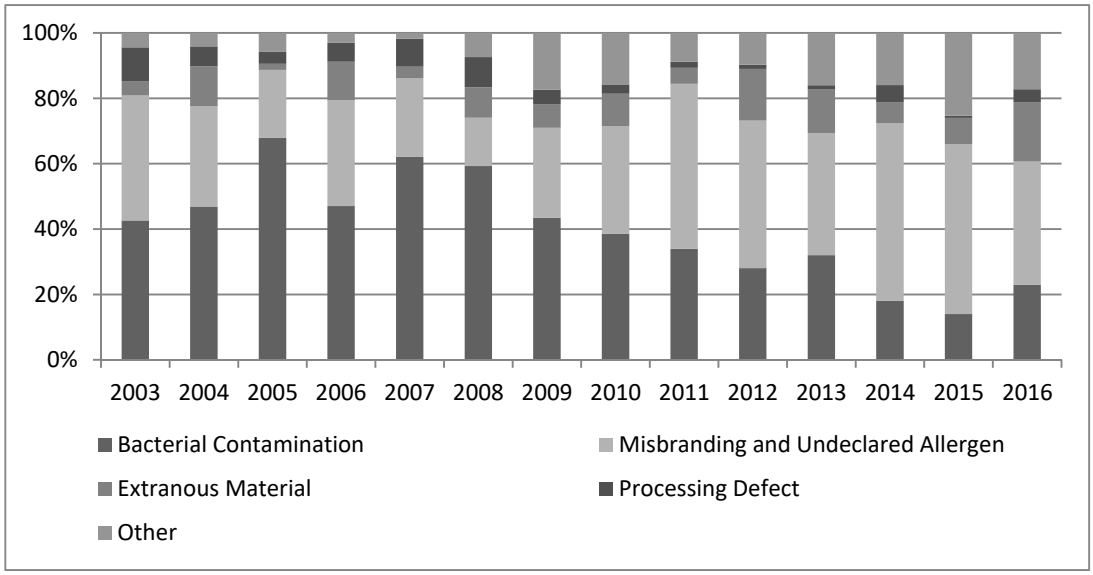

FIGURE 4. Percentage of meat and poultry recalls by reason: 2003-2016