

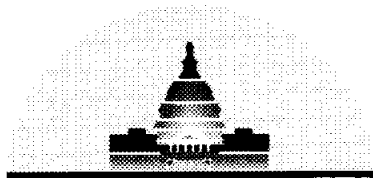
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**Foodborne Illness in the Elderly Population  
of the United States, 1987-1993**

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by  
**Thomas E. Steahr**

Food Marketing Policy Center  
Research Report No. 34  
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University of Connecticut  
Department of Agricultural and Resource Economics

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## **Abstract**

The purpose of this study is to identify the level of foodborne illness in the elderly population of the United States and to examine changes over time in these patterns. The analysis is based upon the National Hospital Discharge Survey done by the National Center for Health Statistics, Centers for Disease Control and Prevention from 1987 to 1993. A list of foodborne illness is developed using International Classification of Disease Codes, 9th Revision. Major findings are that the amount of foodborne illness for patients 65 years of age and older who were discharged from hospitals is increasing. Demographic characteristics of age, sex, marital status, and race are associated with different levels of foodborne illness. The specific diseases of Unspecified Gastroenteritis and Colitis and Intestinal Infections due to other causes accounted for the majority of illness reported on the discharge certificate. In conclusion, the data analyzed provides a conservative estimate of the magnitude of this growing health problem for the elderly in the United States.

# **Foodborne Illness in the Elderly Population of the United States, 1987-1993**

## **I. Introduction**

The impact on health that results from illness due to foodborne and waterborne pathogens is a serious public health problem. In non industrialized, developing nations, it is estimated that over ninety percent of individual cases of food/waterborne illness are not reported and do not appear in the official morbidity statistics (Adbussalam and Grossklaus, 1991). In industrialized, developed nations, the statistical systems yield more complete coverage of the incidence of foodborne illness (hereafter no distinction will be made between foodborne and waterborne pathogens and all references to foodborne illness will include waterborne pathogens) but they are far from complete. One estimate places the incidence of foodborne illness in the United States from 6 million to 80 million illnesses per year (Altekruse and Swerdlow, 1996), the large range of the estimate reflecting the degree of uncertainty. As an illustration, it is estimated that for every case of salmonellosis that is recorded in the United States, between 20 to 100 cases are not reported to official statistical systems (Tauxe, 1991)

Future prognostications of foodborne pathogens and resulting illness suggests increases may be recorded throughout the world and within the United States. Several factors have been identified as promoting the increase in foodborne illness (Altekruse and Swerdlow, 1996). To summarize the major forces, increased microbial adaptation to its host may lead to a new disease or a more virulent form resistant to treatment. In addition, increased globalization of food trade may place populations at risk of unfamiliar pathogens. The increase in international travel may result in infections from foreign nations which are unfamiliar and difficult to diagnose and treat upon return to the home country. Immigrants to the United States may bring food preparation customs which are a hazard and increase foodborne illness chances (eating pork not well cooked increases the chance of trichinosis infection). Changes in consumer food preferences may result in new food problems developing (eating more fruits and vegetables has been associated with increased salmonellosis). Changes in eating more often in restaurants where pathogens on sliced food held at room temperature increases the chances of growth and cross-contamination. A final important factor suggesting a future increase in the frequency of foodborne illness are changing demographic patterns which result in the expansion of proportions of the population with increased susceptibility

to these diseases.

In a recent definitive report on the state of foodborne illness in the United States, the Council for Agricultural Science and Technology recognized that there is an increasing percentage of the population becoming especially vulnerable to foodborne pathogens. These high risk groups includes pregnant women, cancer patients, organ transplant patients, persons with HIV/AIDS infection and impaired immune systems, and selected age groups (CAST, 1994, No. 122). In terms of age groups in the United States with the highest levels of illness, young children under 5 years of age and older persons 65 years old and over reported the most foodborne illness cases in 1990 (Steahr, 1995a, 1995b).

It is well known that the elderly population in the United States is projected to increase significantly as a sub-group of the total population, moving from about 31 million in 1990 over 80 million by 2050 (Census Bureau, 1995). In view of this projected increase, it is necessary to establish benchmark levels of foodborne illness currently present for the elderly in the nation so that future changes may be identified. The purpose of this report is to document patterns of foodborne illness in the United States from 1987 through 1993 for the elderly population 65 years old and over by selected demographic characteristics and by particular foodborne diseases.

## II. Methods

### *Ila. Procedures*

Part of the reason for lack of accurate counts of the frequency of foodborne illness is the absence of a consensus list of foodborne diseases. It is important to realize that a list of foodborne illnesses is not the same as a list of pathogens responsible for that illness. In view of the data base discussed below, it is necessary to construct of list of diseases which are most likely caused by foodborne or waterborne pathogens and to use this list as a bridge to other statistical information about the individual. The basic source of classification is the *International Classification of Diseases, 4th Edition, Clinical Modification 3* (Karaffa, 1992). An attempt to construct of working list was made based on careful reading of texts on foodborne illness (Riemann and Bryan, 1979; Doyle, 1989; Cliver, 1990) and by cross-checking the *Merck Manual of Diagnosis and Therapy* (Berkow and Fletcher, 1992) for a given disease, and by reading relevant research published in the health literature (Bean, H. N. and P. M. Griffin, 1990; Archer, D.L. and F. E. Young, 1988) It became clear that persons

diagnosed with a given ICD-9 coded disease may or may not have contracted that illness via foodborne means. Direct contamination through open skin lesions or an oral-fecal route are alternative methods. It is not possible to determine the number of cases of a given ICD-9 coded disease that are caused by a foodborne vehicle without an individual, case-by-case analysis which, of course, is not possible on the data set described below. An attempt to deal with this problem involved the construction of two lists of ICD-9 coded diseases, List A and List B.(Steahr, 1994, 1995a). List A is intended to include only those ICD-9 codes for diseases most likely to be the result of food/waterborne pathogens. List B is intended to include ICD-9 codes for diseases which may result from foodborne pathogens but which also include an unknown number of cases caused by non-foodborne pathogens. List A, as originally developed from the existing literature, includes most of the diseases caused by bacterial, parasitic and viral agents (Buzby, J. C., 1995; Helmick, 1994; CAST, Nr. 122, 1994). List B will not be used in the present analysis because of the unknown percentage of these diseases not of foodborne causes , for example, Brucellosis, Cestode infections, intestinal Helminthiases, Toxoplasmosis, and toxic effects of metals, (see Steahr, 1995a, for a complete List B). Future research should attempt to separate those cases which are caused by food vehicles.

Based on ICD-9 codes as listed in Karaffe (1992), the following list is used as a working hypothesis of diseases most likely to be caused by foodborne/waterborne pathogens:

<u>Disease Category</u>	<u>ICD-9 Code</u>
Colera	001.0-001.9
Typhoid	002.0-002.9
Salmonella	003.0-003.9
Shigellosis	004.0-004.9
Food Poisoning	005.0-005.9
Amebiasis	006.0-006.9
Protozoal Intestinal Disease	007.0-007.9
Intestinal Infections due to other Organisms	008.0-008.8
Ill-defined Intestinal Infections	009.0-009.3
Listeriosis	027.0
Viral Hepatitis A	070.0,070.1,070.9
Cysticercosis	123.1
Trichinosis	124
Unspecified Gastroenteritis and Colitis	558.9
Noxious Substances Eaten as Food	988.0-988.9

Even with this list, it is recognized that all cases of disease in every category are not caused by foodborne vehicles. For example, not all

the cases of Unspecified Gastroenteritis and Colitis are caused by foodborne pathogens, nor are all the cases of Ill-defined Intestinal infections. However, Helmick suggests that most of the conditions coded as 558.9 are probably of infectious origin (Helmick, et. al., 1994). The complexity of identification of foodborne and waterborne disease is recognized and extends beyond the purpose of this report. This list does include the list of infectious diarrhea and enteric infections developed by Helmick and extends the list to include non-diarrheal, foodborne disease, such as Trichinosis and Cysticercosis. In view of the exclusion of other non-diarrhea foodborne diseases included on List B mentioned above, this report may under-estimate the actual level of foodborne illness for the elderly population in the United States.

#### *Iib. Data Source:*

The data used in this report is derived from the National Hospital Discharge Survey, taken annually from 1987 to 1993 (the most recent year available). This data is provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. These annual surveys differ slightly in terms of sample size and information collected but are essentially comparable from year to year. The data cover discharges from non institutional hospitals located in the United States and the District of Columbia (excluding Federal, military and Veterans Administration hospitals). Only short stay hospitals (average length of stay less than 30 days) or children's general hospitals are included. The hospitals also must have six or more beds staffed for patient use to qualify for the survey. The medical information for each patient discharged from the hospital was taken from a sample of patients records. A maximum of seven diagnostic lines was assigned to each certificate. In addition, a maximum of four codes for surgical or non-surgical procedures was assigned. The coding system used is the International Classification of Diseases, 9th Revision, Clinical Modification 3. In addition to this medical information, demographic information on age, sex, race, marital status, and discharge status is recorded. Data on the hospital includes bed size of the hospital, ownership, length of stay in days, and geographic location. The estimated total number of hospital discharge certificates in the United States and the size of the sample drawn is:

Year	Total Estimated Hospital Discharge Certificates, USA	Sample Size
1993	34,404,000	235,411
1992	34,639,000	274,273
1991	34,978,000	274,311
1990	34,660,000	265,556
1989	34,800,000	233,493
1988	34,880,000	250,243
1987	37,360,000	180,982

The samples were weighted to provide an estimate of the true population parameter and therefore have relative standard errors associated with them at a given confidence level. The data reported in this analysis were the weighted observations as published in the NCHS survey tapes. These weighted estimates should not be viewed as a large number of individual observations upon which complex statistical analysis might be accomplished. Rather, they are sample estimates of a population parameter subject to sampling variability and have been weighted by NCHS to estimate to actual parameter. Using the ICD-9 codes described above, the seven lines on the discharge certificate containing disease diagnostics were examined for foodborne illness mentions. As those mentions were identified, the demographic characteristics of the patients were then recorded.

It should be mentioned that not all elderly persons suffering from foodborne illness are admitted into hospitals. Some do not seek medical treatment for mild symptoms while others seek treatment in hospital emergency rooms. Still others visit their personal physician and are treated as an outpatient. Moreover, for those who are admitted into hospitals, the number of hospital discharge certificates in a given year will not equal the number of different patients because one person may be admitted into and discharge from the hospital several times during the year. This inequality may be greater for elderly patients who have a pattern of frequent foodborne illness which gives them a greater chance of being drawn in the national sample.

### III. Results and Findings

One standard for comparison of trends in foodborne illness for the elderly population is with the population as a whole. Table 1 presents the total number of mention of foodborne illness and the elderly mentions of foodborne illness on lines 1-7 of the hospital discharge certificates in the United States from 1987 through 1993. In terms of total mentions of foodborne illness, the national pattern shows an increase from 725,000 cases in 1988 to over 855,000 cases in 1993. Only during one year period from 1990 to 1991 is there an apparent small decline. The standard errors of the estimates are relatively small throughout the time interval. When the total mentions of foodborne illness are expressed as a percentage of all the hospital discharge certificates, it is clear that the proportion has remained relatively stable at 2 percent. However, there seems to be a slow increase during the period, moving from 2.08 percent in 1987 to 2.49 percent in 1993.

When mentions of foodborne illness on lines 1-7 of the hospital discharge certificate for the elderly population 65 years of age and over are examined, a pattern of steady increase is observed, moving from 184,600 cases in 1988 to over 272,000 cases in 1993. The only year not to follow that pattern is 1987 with 202,000 mentions. While the standard errors of the estimate are larger than recorded for foodborne mentions for all age groups combined, they still produce relatively narrow upper and lower limits of the estimate at the 68 percent confidence intervals. The most important trend, however, is not in the absolute number of foodborne illness mentions for the elderly patients but rather in the proportion these mentions are of the total mentions of foodborne illness. In 1987, the 202,000 mentions of foodborne illness for the elderly comprised 26.4 percent of all foodborne illness mentions on hospital discharge certificates. By 1993, the 272,000 mentions of foodborne illness for the elderly comprised 31.8 percent of all foodborne illness mentions on discharge certificates. This large proportion was achieved by a steady increase each year during the time interval.

The impact of demographic characteristics of the patient may be seen in terms of age groups, marital status, and racial categories. Table 2 presents the number of mentions of foodborne illness for elderly patients discharged from hospitals by five year age-groups from 1987 to 1993, in terms of the numerical distribution and the percentage distribution. Several patterns appear in this table. First, the increase in the number of foodborne illness mentions for persons 65 years of age and older (reaching 272,000 in 1993) is the result of increases in *each* five year age group from 1987 to 1993. It is not caused by a

Table 1. Total Mentions and Elderly Mentions of Foodborne Illness on Hospital Discharge Certificates, United States, 1987-1993

Year	Total Mentions of FBI <sup>1</sup> on All HDC:		Elderly Mentions of FBI on HDC:	
	Total Number	RSE <sup>2</sup>	Elderly Number	RSE
1993	855,508	5.4	272,072	4.9
1992	813,091	3.9	235,474	5.6
1991	791,197	4.1	221,993	10.7
1990	805,733	5.5	220,422	4.9
1989	759,228	5.9	195,616	8.2
1988	724,942	4.6	184,618	6.1
1987	766,956	4.1	202,596	5.1

Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Hospital Discharge Survey for each year.

Note: Mentions are counted from lines 1-7 on the hospital discharge certificate (HDC) and elderly is defined at persons 65 years of age and over.

<sup>1</sup> See text for working definition of foodborne illness (FBI)

<sup>2</sup> RSE is the relative standard error of the number of mentions expressed as a percent, i.e. the RSE times the number of mentions gives the upper and lower limits of the estimate at the 68 percent confidence intervals.

<sup>3</sup> Percent is FBI mentions divided by all hospital discharge certificates times 100.

<sup>4</sup> Percent is the number of elderly FBI mentions divided by the total number of FBI mentions times 100.

Table 2. Mentions of Foodborne Illness on Hospital Discharge Certificates for Elderly Patients by Age Groups, United States, 1987-1993.

Year	Age of Patient						
	Elderly Total	65-69	70-74	75-79	80-84	85-89	90 & Over
Numerical Distribution:							
1993	272,072	55,480	59,710	55,394	47,143	37,726	16,619
1992	235,474	47,380	51,658	49,564	45,329	27,006	14,537
1991	221,993	40,058	48,215	48,834	42,447	28,476	13,963
1990	220,422	36,654	51,966	48,209	41,974	30,966	10,653
1989	195,616	44,868	43,429	37,369	39,208	21,767	8,975
1988	184,618	36,041	39,652	40,084	37,625	21,884	9,332
1987	202,596	42,902	46,954	43,853	35,522	20,531	12,834
Percentage Distribution:							
1993	100	20.4	21.9	20.4	17.3	13.9	6.1
1992	100	20.1	21.9	21.0	19.3	11.5	6.2
1991	100	18.0	21.7	22.0	19.1	12.8	6.3
1990	100	16.6	23.6	21.9	19.0	14.0	4.8
1989	100	22.9	22.2	19.1	20.0	11.1	4.6
1988	100	19.5	21.5	21.7	20.4	11.9	5.1
1987	100	21.2	23.2	21.6	17.5	10.1	6.3

Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Hospital Discharge Survey for each year.

concentration of increases in a single age category. Secondly, there is a rather even distribution of foodborne illness mentions for persons 65-69 years old, 70-74 years old, 75-79 years old, and 80-84 years old. Each of these age groups account for about 20 percent of all mentions of foodborne illness each year. This indicates no pattern of concentration of foodborne illness mentions in either the early years of 65-69 nor in the later years of 80-84 during the period under examination. In other words, as the patients discharged from hospitals become older, there is not an increase in mentions of foodborne illness on the certificate.

The percentage of all hospital discharge certificates which are female and the percentage of certificates with mention of foodborne illness which are female by five year age groups for the United States from 1987 to 1993 is presented in Table 3. During the entire period, the percentage of all hospital discharge certificates for persons 65 years of age and over that were female remained steady at about 56 percent. This compares with the 59.8 percent of the population 65 years of age and older who are female in the United States in 1990 (Census, 1990). Following the pattern one observes in the total population of more female survivors compared to males with increasing age, the percentage of hospital discharge certificates that are female increases from 50.6 percent for the 65-69 year olds to 73.4 percent for the 90 years of age and over.

Table 3 also shows that the percentage of hospital discharge certificates with mention of foodborne illness which are female is higher than one would expect based on the numerical advantage of women in the total population in each age group. Throughout the entire time interval, from 1987 to 1993, women accounted for 66 to 69 percent of all hospital discharge certificates with mention of foodborne illness. That proportion is well above the proportion of females 65 years of age and older in the population and is well above the proportion found for all hospital discharge certificates combined, as discussed above. While here is some variation in the percent female in each of the five year age groups, the general pattern seems to be one of about 66-70 percent of certificates with mention of foodborne illness are women in each age interval. The exception is for the older ages of 85-89 years of age and 90 years of age and over where females exceeds 75 percent.

Trends in hospital discharge certificates by single years of age for men and women were analyzed (these data are not contained in this report) and extended the patterns mentioned above. When all hospital discharge certificates for patients 65 years of age and over are examined, the patterns are; a) female certificates outnumber male



Table 3. Percent Female of Total Hospital Discharge Certificates and Percent Female of Hospital Discharge Certificates with Mention of Foodborne Illness, by Age Groups, United States, 1987-1993.

Year	Elderly Percent Female	Age of Patient					
		65-69	70-74	75-79	80-84	85-89	90 & over
Percent of hospital discharge certificates that are female by age:							
1993	57.4	50.6	53.5	57.1	60.8	66.1	73.4
1992	56.7	50.3	52.2	56.4	61.2	66.7	69.6
1991	56.3	50.5	52.1	55.5	60.6	65.2	70.2
1990	56.3	50.7	52.5	55.2	61.6	66.9	69.1
1989	56.1	49.6	53.1	55.6	60.1	65.8	68.7
1988	56.1	49.3	52.7	57.3	59.4	65.5	69.6
1987	55.6	51.6	51.6	54.9	59.2	66.1	69.5
Percent of hospital discharge certificates with mention of Foodborne Illness that are female by age:							
1993	67.6	65.6	66.4	68.3	68.1	67.1	76.1
1992	66.5	59.9	61.9	65.1	71.3	76.1	76.4
1991	67.8	59.7	60.4	77.4	66.1	74.7	75.1
1990	69.3	63.4	72.3	62.8	70.9	77.8	74.1
1989	65.4	58.7	58.8	71.1	70.6	76.4	57.4
1988	67.6	55.7	59.4	69.3	78.4	74.4	82.1
1987	68.9	61.2	66.8	72.5	69.7	78.9	71.9

Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Hospital Discharge Survey for each year.

certificates at each age and this differential increases with age, as expected with the numerical advantage of women in the general population, b) the *rate* of hospital discharge certificates for men expressed as per 1,000 males in the United States population is higher than the rate per 1,000 females for women and the higher male rate is observed for every single year of age, and c) for both men and women, there is a strong, regular increase in the rate of hospital discharge certificates with each increase in single years of age (in 1993 for example, women rates moved from 202 per thousand aged 65 to 456 per thousand aged 85 in a smooth fashion).

Table 4 presents the number and percentage distribution of mentions of foodborne illness on hospital discharge certificates for the elderly in the United States from 1987 to 1993 by marital status. For those patients reporting marital status, there is a numerical trend of increases in married patients with mention of foodborne illness, moving from about 41,000 in 1987 to over 72,000 in 1993. The percentage trends for married patients shows a similar pattern of moving from about 22 percent of all certificates with mention of foodborne illness in 1987 to almost 27 percent in 1993. However, the most frequently category is for widowed patients. In 1993, over 75,000 patients discharged from hospitals with mention of foodborne illness were widowed and accounted for almost 28 percent of all certificates. This proportion for the widowed group has remained at these high levels throughout the entire time interval. Finally, data on marital status must be interpreted with caution because of the large number and high proportion of patients not reporting their marital status. For example, in 1988 there were 46.2 percent of the certificates not reporting marital status - the highest percentage during the time interval. In 1992 there were 98,668 certificates not reporting marital status - the highest number during the time interval.

Table 5 contains data on the mentions of foodborne illness on hospital discharge certificates for the elderly patients in the United States from 1987 to 1993 by racial category. As might be expected, the largest number of patients were in the white racial group, with 205,286 of the 272,072 (75.5 percent) elderly patients in 1993. However, the trend during the time period is one of declining proportions in the white racial category, moving from 85.6 percent in 1988 to 75.5 percent in 1993. In conjunction with this pattern, the number and percent of patients in the black racial category have been increasing. In 1988, only 7,467 certificates with mention of foodborne illness (4.0 percent) identified black as the racial category. By 1993, 20,390 certificates fell into the black racial group, which was 7.5 percent of all certificates. Similar to the data for marital status, racial

Table 4. Mentions of Foodborne Illness on Hospital Discharge Certificates for Elderly Patients by Marital Status, United States, 1987-1993.

Year	Elderly Total	Marital Status:				Not Reported
		Married	Single	Widowed	All Other <sup>1</sup>	
Numerical Distribution:						
1993	272,072	72,653	17,189	75,373	26,501	80,356
1992	235,474	62,326	11,672	57,284	5,524	98,668
1991	221,993	58,963	17,212	69,007	6,010	70,801
1990	220,422	57,348	9,734	59,408	4,021	89,911
1989	195,616	46,607	10,326	50,799	2,607	85,277
1988	184,618	40,966	6,437	48,730	3,105	85,380
1987	202,596	71,343	11,594	65,163	4,920	49,576
Percentage Distribution:						
1993	100	26.7	6.3	27.7	9.7	29.5
1992	100	26.5	5.0	24.3	2.3	41.9
1991	100	26.6	7.8	31.1	2.7	31.9
1990	100	26.0	4.4	27.0	1.8	40.8
1989	100	23.8	5.3	26.0	1.3	43.6
1988	100	22.2	3.5	26.4	1.7	46.2
1987	100	35.2	5.7	32.2	2.4	24.5

Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Hospital Discharge Survey for each year.

<sup>1</sup> Contains divorced and separated.

Table 5. Mentions of Foodborne Illness on Hospital Discharge Certificates for Elderly Patients, by Racial Category, United States, 1987-1993.

Year	Elderly Total	Racial Category:			
		White	Black	All Other	Not Reported
Numerical Distribution:					
1993	272072	205286	20390	3685	42711
1992	235474	174501	16932	4822	39219
1991	221993	176890	14438	2167	28498
1990	220422	178131	12449	2901	26941
1989	195616	157643	12358	2397	23218
1988	184618	158017	7467	3868	15266
1987	202596	164117	12914	5106	20459
Percentage Distribution:					
1993	100	75.5	7.5	1.4	15.7
1992	100	74.1	7.2	2.0	16.7
1991	100	79.7	6.5	1.0	12.8
1990	100	80.8	5.6	1.3	12.2
1989	100	80.6	6.3	1.2	11.9
1988	100	85.6	4.0	2.1	8.3
1987	100	81.0	6.4	2.5	10.1

Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Hospital Discharge Survey for each year.

<sup>1</sup> Includes American Indian, Eskimo, Aleut, Asian, Pacific Islander, and other.

patterns must be judged with caution because of the relative high proportion not reporting racial identification, about 15 percent of all certificates in 1993.

The above data shows that demographic characteristics divide the hospital patient population into groups with different levels of reporting foodborne illness. It is also important to identify trends in the type of foodborne illness reported on hospital discharge certificates during the time interval. Table 6 shows the percent distribution of foodborne illness mentions on hospital discharge certificates for the elderly population in the United States from 1987 to 1993. The individual foodborne diseases listed in this table were taken from the working list described previously. For any given disease by ICD-9 code, the number of cases may be estimated by multiplying the percentage reported in Table 6 with the total number for that year. For example in 1993, .31 percent of all cases were reported as Food Poisoning, ICD-9 codes 005.0 to 005.9, and that percent times 276,085 total number of mentions gives an estimated 85,586 certificates for the

Table 6. Hospital Discharge Certificates with Mention of Foodborne Illness for Elderly Patients by Type of Foodborne Disease, United States, 1987 to 1993.

Foodborne Disease	(ICD-9 code)	Percent Distribution of Foodborne Illness by Year of Discharge:						
		1993	1992	1991	1990	1989	1988	1987
Colera	(001.1-001.9)	0.06	0	0	0.04	0	0.03	0
Typhoid	(002.0-002.9)	0.12	0	0	0.49	0	0	0.09
Salmonella Infection	(003.0-003.9)	0.49	0.68	0.94	1.11	1.45	1.43	0.96
Shigellosis	(004.0-004.9)	0.06	0.02	0.33	0.04	0.21	0.06	0.24
Food Poisoning	(005.0-005.9)	0.31	0.22	0.13	0.88	1.06	0.42	0.89
Amebiasis	(006.0-006.9)	0.21	0.02	0	0.11	0	0.43	0.12
Protozoal Intestinal Disease	(007.0-007.9)	0.28	0.18	0.36	0.02	0.76	0.57	0.41
Intestinal Infections Due to Other Organisms	(008.0-008.8)	30.28	29.23	25.59	25.11	17.13	19.55	14.89
Ill-Defined Intestinal Infections	(009.0-009.3)	1.59	2.27	2.92	1.62	3.89	2.56	3.19
Listeriosis	(027.0)	0.07	0.56	0.11	0.28	0.64	0.05	0.37
Viral Hepatitis A	(070.0, 070.1, 070.9)	0.59	0	0	0.66	0.81	1.62	0.33
Cysticercosis	(123.1)	0	0	0	0	0.01	0	0
Trichinosis	(124)	0	0	0	0	0	0	0
Unspecified Gastroenteritis and Colitis	(558.9)	65.79	66.27	69.23	69.64	73.89	73.16	78.51
Noxious Substances	(988.0-988.9)	0.16	0.55	0.39	0	0.15	0.12	0
Total Percent		100	100	100	100	100	100	100
Number of Mentions		276,085	236,940	223,298	223,408	198,338	186,004	203,783

Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Hospital Discharge Survey  
 Note: The number of mentions by year may differ from those in other tables due to some sample observations having multiple foodborne illness.

elderly with mention of that illness.

Data in Table 6 shows that the majority of illness fall into two categories: Unspecified gastroenteritis and colitis (988.0-988.9) and Intestinal infections due to other organisms (008.0-008.8). Of all hospital discharge certificates with mention of foodborne illness for the elderly in 1993, 65.8 percent of the illnesses fell into the Unspecified gastroenteritis and colitis category. In terms of trends during the time interval, that represents a decline from the high of 78.5 percent of all illnesses in 1987. This decline was achieved by a gradual lowering of the percentage each year, rather than an abrupt change in a given brief period. The reverse of this pattern is seen for Intestinal infections due to other organisms (008.0-008.8). The 30.3 percent of the mentions on discharge certificates in 1993 for the elderly is a significant increase over the 14.8 percent in 1987. However, this increase occurred primarily during the 1989 to 1993 period. The reasons for these two major patterns are not clear from this data set. It could represent an actual shift in the distribution of foodborne illness or it could represent a shift in physician diagnosis practices in hospitals around the nation. In either case, these two categories accounted for a total of 95 percent of all foodborne illness mentions on hospital discharge certificates for the elderly in the United States in 1993.

The remaining cases of illness are distributed over the other categories. In terms of ranking in 1993, Ill-defined intestinal infections (009.0-009.3) ranked third followed by Viral hepatitis A (070.0, 070.1, and 070.9), Salmonella infection (003.0-003.9), Food poisoning (006.0-006.9), Protozoal intestinal disease (007.0-007.9), and Amebiasis (006.0-006.9). There does not appear to be any major patterns of change during the time interval for these disease categories.

#### IV. Discussion

Based on the working list of foodborne illness as identified by ICD-9 codes, the frequency of mention of these illness on hospital discharge certificates for elderly patients 65 years of age and over in the United States from 1987 to 1993 is increasing in absolute numbers and as a percent of all foodborne illness mentions. Given the projected increase in the older population of the nation, future increases may be anticipated if present trends continue. It was also noted that the increase was achieved across all age groups and that there is only a weak relationship between increasing age of the patient discharged and frequency of mention of foodborne illness. Women were found to predominate in the certificates with foodborne illness, more that was

the case for all hospital discharge certificates and more than might be expected on the basis of population ratios of males to females by age. Patients who were widowed exhibited the largest volume of mentions as did patients who were in the white racial category. During the entire time interval, foodborne illness in the categories of Unspecified Gastroenteritis and Colitis and Intestinal infections due to other organisms accounted for the majority of cases.

The data analyzed in this report from the National Hospital Discharge Survey of each of the years by the National Center for Health Statistics, Centers for Disease Control and Prevention are one of several existing sources of which might be examined for foodborne illness patterns. The traditional source of statistics is the foodborne disease outbreak surveillance system conducted by the Centers for Disease Control and Prevention which provides information on the etiology of the outbreak, the types of foods involved in the transmission of the pathogen, and other information. However, under-reporting of outbreaks is thought to be a serious percentage of all occurrences (Altekruse and Swerdlow, 1996). Actual incidence of foodborne illness begins with the occurrence of an individual case with mild, temporary symptoms that is not reported to officials, to cases in which persons seek the assistance of friends, to more severe cases in which persons seek help from the health system, moving from emergency room treatment to physician office visits, and to hospital admission (Steahr, 1993; Roberts and Foegeding, 1991). The most severe case results in death from foodborne pathogens. Each level requires different data and no single data source provides a complete picture. However, the national hospital discharge survey analyzed here provides a conservative, underestimate of a health problem for the elderly in the nation now and suggests future increases as the nation's population ages.

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