

## STATISTICAL BRIEF #44

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# Gastroesophageal Reflux Disease (GERD) Hospitalizations in 1998 and 2005

Yafu Zhao, M.S. (Social & Scientific Systems), and William Encinosa, Ph.D. (AHRQ)

### Introduction

Up to 60 percent of the population at some time during the year, and 20 to 30 percent weekly, experience symptoms of gastroesophageal reflux disease (GERD), such as heartburn and acid regurgitation.<sup>1,2</sup> GERD, or acid reflux, occurs when the lower esophageal sphincter (the valve separating the esophagus and stomach) does not close properly, allowing acid to back up into the esophagus. When this reflux occurs on a regular basis, GERD may lead to esophagitis (an inflamed lining of the esophagus), narrowing of the esophagus, bleeding, or trouble swallowing. More serious complications may emerge, such as the precancerous condition known as Barrett's esophagus, as well as esophageal adenocarcinoma. These GERD complications can result in hospitalizations for anti-reflux surgery, such as Nissen fundoplication.

In this Statistical Brief we examine the trend in GERD hospitalizations between 1998 and 2005. The trend in GERD may have been influenced by two countervailing factors. First, since obesity has been linked to GERD,<sup>3</sup> the recent rise in the obesity epidemic may have led to an increase in GERD hospitalizations. In fact, a recent Healthcare Cost and Utilization Project Statistical Brief shows that the obesity epidemic has had a profound effect on hospitalizations. Between 1996 and 2004, the number of hospitalizations with obesity diagnoses increased by 112 percent while all other hospitalizations increased by only 13 percent.<sup>4</sup> Second, GERD has been treated widely with pharmaceutical medications, which may have helped to decrease GERD

<sup>1</sup> Locke GR III, Talley NJ, Fett SL, Zinsmeister AR, Melton LJ III. Prevalence and clinical spectrum of gastroesophageal reflux: a population-based study in Olmsted County, Minnesota. *Gastroenterology* 1997; 112:1448-56.

<sup>2</sup> El-Serag HB, Petersen, NJ, Carter J, et al. Gastroesophageal reflux among different racial groups in the United States. *Gastroenterology* 3004; 126:1692-9.

<sup>3</sup> Brian C. Jacobson et al. Body Mass Index and Symptoms of Gastroesophageal Reflux in Women. *The New England Journal of Medicine*. 2006, 354:22, 2340-2348.

<sup>4</sup> Elixhauser A., and Steiner, C. *Obese Patients in U.S. Hospitals, 2004*. HCUP Statistical Brief #20. December 2006. Agency for Healthcare Research and Quality, Rockville, MD. <http://www.hcup-us.ahrq.gov/reports/statbriefs/sb20.pdf>

### Highlights

- Hospitalizations with either a primary or secondary GERD diagnosis increased by 216 percent from 995,402 in 1998 to 3,141,965 in 2005.
- Adult hospitalizations with a primary GERD diagnosis decreased by 2.4 percent from 77,783 in 1998 to 75,888 in 2005. However, for pediatric GERD, stays with a primary GERD diagnosis increased by 42 percent for infants and by 84 percent for children age 2–17.
- In 2005, 9.1 percent of hospitalizations with a primary GERD diagnosis had alarm symptoms, such as anemia, vomiting, and weight loss, which are symptoms serious enough to warrant further exploration for esophageal disorders. The number of primary GERD hospitalizations with alarm symptoms increased by 39 percent since 1998.
- In 2005, 4.2 percent of hospitalizations with a GERD diagnosis had an esophageal disorder. From 1998 to 2005, dysphagia, esophageal adenocarcinoma, and esophagitis were the fastest growing esophageal disorders with a GERD diagnosis, increasing by 264 percent, 195 percent, and 94 percent, respectively.
- In 2005, there were 24,942 GERD hospital stays with Barrett's esophagus, which represents 19 percent of all esophageal disorders with GERD. Eight out of every 1,000 hospitalizations with a GERD diagnosis had Barrett's esophagus.
- Inpatient anti-reflux surgeries for GERD decreased by 27 percent from 1998 to 2005. However, anti-reflux surgeries increased for pediatric GERD, by 109 percent for infants and 108 percent for children age 2–17.

hospitalizations. In 2004, 27 percent of elderly Medicare patients used GERD medications such as antacids and antisecretory agents, spending a total of \$5.6 billion.<sup>5</sup> Thus, in the face of these two countervailing trends—obesity versus GERD medications—we examine the true, overall trend in GERD hospitalizations.

This Statistical Brief presents national estimates of GERD hospitalizations from the Healthcare Cost and Utilization Project (HCUP), for 1998 and 2005. First, national estimates of GERD-related discharges and hospital costs are provided for 1998 and 2005. GERD trend differences among age, gender, region or household income are analyzed. Next, we investigate trends in the level of severity of GERD. We examine trends in GERD hospital stays with moderate to alarming symptoms, as well as trends in severe complications associated with GERD. Finally, the trend in anti-reflux surgery for severe GERD complications is examined.

## Findings

### *GERD Discharges by Age, Sex, Region, Household Income, and GERD Cost*

The first three columns of Table 1 estimate nationwide discharges in 1998 and 2005 with a primary GERD diagnosis. From 1998 to 2005, the total number of inpatient hospital discharges with a primary GERD diagnosis increased 4.8 percent from 90,678 to 95,016. But, adjusting for the increase in the U.S. population, the number of primary GERD discharges per 100,000 people decreased by 4.5 percent.

The last three columns of Table 1 estimate nationwide GERD discharges in 1998 and 2005 with either a primary or secondary GERD diagnosis. From 1998 to 2005, the total number of inpatient hospital discharges with either a primary or secondary GERD diagnosis increased 216 percent from 995,402 to 3,141,965. Adjusting for increases in the U.S. population, the number of GERD discharges per 100,000 people increased by 187 percent.

Across age groups, the elderly accounted for roughly 30 percent of hospitalizations with a primary GERD diagnoses, and 50 percent of all GERD diagnoses in both 1998 and 2005. The largest increase in discharges with any primary or secondary GERD diagnosis between 1998 and 2005 was for patients age 18–34, increasing at a rate of 273 percent. However, this age group also had the steepest decline in primary GERD diagnoses, -16 percent. The largest increase in hospitalizations with a primary GERD diagnosis was 42 percent for infants and 84 percent for children age 2–17, compared to a 2.4 percent decrease for adults.

GERD hospital stays occurred more among women than with men. In 2005, women accounted for 62 percent of all GERD discharges, with a similar percentage in 1998. By hospital region, the number of primary GERD hospitalizations per 100,000 people was highest in the South, at 40.9 hospitalizations per 100,000 people in 1998. However, this decreased by 10 percent by 2005. The West had the lowest number of GERD hospitalizations per 100,000 people. The Midwest had the largest growth in the number of hospitalizations with any GERD per 100,000 people, growing at 224 percent from 1998 to 2005.

The GERD hospital stays were also compared by the median household income for the patient's zip code. One group was below the median household income for the U.S., the other was above the median. In 1998, families above the median income accounted for 56 percent of hospital stays with a primary GERD diagnosis. However in 2005, families below the median income accounted for 55 percent of the primary GERD hospital stays. Primary GERD hospital stays for families below the median income increased from 1998 to 2005 by 31 percent, while those for families above the median income decreased by 16 percent.

Costs related to GERD hospital stays are also presented in Table 1. Costs in 1998 are inflation-adjusted to 2005 dollars. The average cost per hospital stay with a primary GERD diagnosis was \$5,616 in 1998 and \$6,545 in 2005. The total national hospital costs for all hospitalizations with a primary GERD diagnosis increased by 22 percent from \$509 million in 1998 to \$622 million in 2005.

### *GERD with Symptoms*

In Table 2, the number of hospitalizations with both GERD as a primary diagnosis and with other GERD symptoms as secondary diagnoses is provided. Twelve specific symptoms are examined individually.

<sup>5</sup> Stagnitti, M.N. *The Top Five Therapeutic Classes of Outpatient Prescription Drugs Ranked by Total Expense for the Medicare Population Age 65 and Older in the U.S. Civilian Noninstitutionalized Population, 2004*. Statistical Brief #153. December 2006. Agency for Healthcare Research and Quality, Rockville, MD. [http://www.meps.ahrq.gov/mepsweb/data\\_files/publications/st153/stat153.pdf](http://www.meps.ahrq.gov/mepsweb/data_files/publications/st153/stat153.pdf)

In 1998 and 2005, 23 percent and 31 percent of hospitalizations with a primary GERD diagnosis had secondary GERD symptoms, respectively. Nonspecific chest pain, asthma and anemia were the top three symptoms. The fastest growing GERD symptoms from 1998 to 2005 were hoarseness/laryngitis, weight loss, and dysphagia (trouble swallowing), with an increase of 192 percent, 140 percent, and 75 percent respectively.

In 1998 and 2005, 6.9 percent and 9.1 percent of hospitalizations with a primary GERD diagnosis had alarm symptoms, such as anemia, dysphagia, and weight loss, which are symptoms serious enough to warrant further exploration for esophageal disorders. The number of primary GERD hospitalizations with alarm symptoms increased by 39 percent.

Finally, among hospital stays with a primary GERD diagnosis in 2005, we found that 69 percent were admitted from the emergency department, compared to 57 percent in 1998.

#### *GERD and Esophageal Disorders*

Table 3 examines trends in esophageal disorders that may emerge from severe, daily GERD. Hospitalizations for esophageal disorders increased from 516,895 to 646,785 from 1998 to 2005. In 2005, among esophageal disorders, 21 percent had a GERD diagnosis, compared to 13 percent in 1998. In 1998 and 2005, 6.6 percent and 4.2 percent of hospitalizations with any GERD diagnosis had an esophageal disorder, respectively (derived from Tables 1 and 3). While hospitalizations with esophageal disorders without a GERD diagnosis increased by 14 percent between 1998 and 2005, esophageal disorders with a GERD diagnosis increased by 103 percent. In 1998, esophageal ulcer, esophagitis, and esophageal stricture were the most common GERD-related complications. In 2005, dysphagia, esophagitis, and esophageal stricture were the most common complications. From 1998 to 2005, dysphagia, esophageal adenocarcinoma, and esophagitis were the fastest growing esophageal disorders with a GERD diagnosis, increasing by 264 percent, 195 percent, and 94 percent respectively. Esophageal ulcers decreased by 54 percent.

Among the disorders listed in Table 3, Barrett's esophagus has been gaining the most attention during recent years among clinicians. In 2005, there were 24,942 Barrett's esophagus hospital stays with a GERD diagnosis, and 19 percent of GERD-related complications had a Barrett's esophagus diagnosis (there was no ICD-9-CM code for Barrett's esophagus in 1998). Eight out of every 1,000 hospitalizations with a GERD diagnosis had Barrett's esophagus in 2005.

#### *GERD-related procedures*

Table 4 presents inpatient anti-reflux surgery estimates in 1998 and 2005 for patients with a primary GERD diagnosis. The most common GERD anti-reflux surgery is Nissen fundoplication, where the upper part of the stomach is wrapped, or plicated, around the inferior part of the esophagus, restoring the function of the lower esophageal sphincter. This is performed by laparoscopy.

In general, Nissen fundoplication decreased by 27 percent from 1998 to 2005 for patients with a primary GERD diagnosis, perhaps due to a shift from inpatient surgery to outpatient surgery. Recently, a more advanced technique, endoluminal treatment, uses endoscopy and is often performed on an outpatient basis. We cannot ascertain if the decline in Nissen fundoplication was due to a shift to outpatient endoluminal treatment.

We also examined GERD inpatient anti-reflux surgeries by age and sex. The surgery estimates for both men and women decreased from 1998 to 2005, with a greater rate of decline among men, at -35 percent. For adults age 18 and older, the number of surgeries decreased. Among those patients, the age group 35–44 had the steepest rate of decline, -57 percent. However, children age 2–17 had a 108 percent increase in anti-reflux surgeries, and infants (age 0–1) had a 109 percent increase.

#### **Data Source**

The estimates in this Statistical Brief are based upon data from the HCUP 1998 and 2005 Nationwide Inpatient Sample (NIS).

Supplemental sources included data from the U.S. Census Bureau, Population Division, Annual Estimates of the Population for the United States, Regions, and Divisions and U.S. Census Bureau, Current Population Reports.

## Definitions

### *Diagnoses, ICD-9-CM, and Clinical Classifications Software (CCS), and Diagnosis-Related Groups (DRGs)*

The principal diagnosis is that condition established after study to be chiefly responsible for the patient's admission to the hospital. Secondary diagnoses are concomitant conditions that coexist at the time of admission or that develop during the stay. All-listed diagnoses include the principal diagnosis plus these additional secondary conditions.

ICD-9-CM is the International Classification of Diseases, Ninth Revision, Clinical Modification, which assigns numeric codes to diagnoses. There are about 12,000 ICD-9-CM diagnosis codes.

CCS categorizes ICD-9-CM diagnoses into 260 clinically meaningful categories.<sup>6</sup> This "clinical grouper" makes it easier to quickly understand patterns of diagnoses and procedures.

In this brief, we identified GERD with the following ICD-9-CM diagnosis codes:

- 530.81 Esophageal reflux
- 530.11 Reflux esophagitis

We then excluded the cases with mental retardation or infantile cerebral palsy with the following ICD-9-CM diagnosis codes:

- 343.9 Infantile cerebral palsy, unspecified
- 343 Infantile cerebral palsy
- 343.8 Other specified infantile cerebral palsy
- 317 Mild mental retardation
- 318.0 Moderate mental retardation
- 318.0 Moderate mental retardation
- 318.1 Severe mental retardation
- 318.2 Profound mental retardation
- 319 Unspecified mental retardation
- 344.8 Other specified paralytic syndromes
- 344.89 Other specified paralytic syndrome

For esophageal disorders, we used the following ICD-9-CM diagnosis codes:

- 787.2 Dysphagia
- 530.1 Esophagitis
- 530.10 Esophagitis, unspecified
- 530.13 Eosinophilic esophagitis
- 530.19 Other esophagitis
- 530.2 Ulcer of esophagus
- 530.20 Ulcer of esophagus without bleeding
- 530.21 Ulcer of esophagus with bleeding
- 530.3 Stricture and stenosis of esophagus
- 530.85 Barrett's Esophagus
- 530.89 Other disorders of esophagus
- 151.0 Esophageal Adenocarcinoma
- 211.0 Benign neoplasm of Esophagus
- 230.1 Carcinoma in situ of Esophagus

For GERD symptoms, we used the following ICD-9-CM diagnosis codes:

- 787.1 Heartburn
- 536.8 Dyspepsia and other specified disorders of function of stomach
- 786.2 Cough
- 786.07 Wheezing
- 476.0 Chronic laryngitis
- 476.1 Chronic laryngotracheitis
- 464.00 Without mention of obstruction, Acute laryngitis
- 578.1 Blood in stool

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<sup>6</sup> HCUP CCS. Healthcare Cost and Utilization Project (HCUP). August 2006. U.S. Agency for Healthcare Research and Quality, Rockville, MD.

784.49 Other Voice disturbance  
787.2 Dysphagia  
536.2 Persistent vomiting  
787.03 Vomiting alone  
578.0 Hematemesis  
285.9 Anemia, unspecified  
281.9 Unspecified deficiency anemia  
280 Iron deficiency anemias  
280.9 Iron deficiency anemia, unspecified  
783.2 Abnormal loss of weight and underweight  
783.21 Loss of weight  
783.22 Underweight

We used the following ICD-9-CM procedure codes for anti-reflux surgery:

44.66 Other procedures for creation of esophagogastric sphincteric competence  
44.67 Laparoscopic procedures for creation of esophagogastric sphincteric competence

We used the following CCS categories for two of the GERD symptoms:

CCS 102 Nonspecific chest pain  
CCS 128 Asthma

#### *Types of hospitals included in HCUP*

HCUP is based on data from community hospitals, defined as short-term, non-Federal, general and other hospitals, excluding hospital units of other institutions (e.g., prisons). HCUP data include OB-GYN, ENT, orthopedic, cancer, pediatric, public, and academic medical hospitals. They exclude long-term care, rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals, but these types of discharges are included if they are from community hospitals.

#### *Unit of analysis*

The unit of analysis is the hospital discharge (i.e., the hospital stay), not a person or patient. This means that a person who is admitted to the hospital multiple times in one year will be counted each time as a separate "discharge" from the hospital.

#### *Costs and charges*

Total hospital charges were converted to costs using HCUP Cost-to-Charge Ratios based on hospital accounting reports from the Centers for Medicare and Medicaid Services (CMS).<sup>7</sup> Costs will tend to reflect the actual costs of production, while charges represent what the hospital billed for the case. For each hospital, a hospital-wide cost-to-charge ratio is used because detailed charges are not available across all HCUP States. Hospital charges reflect the amount the hospital charged for the entire hospital stay and does not include professional (physician) fees. For the purposes of this Statistical Brief, costs are reported to the nearest hundred.

#### *Region*

Region is one of the four regions defined by the U.S. Census Bureau:

- Northeast: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania
- Midwest: Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas
- South: Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas
- West: Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Alaska, and Hawaii

#### *Admission source*

Admission source indicates where the patient was located prior to admission to the hospital. Emergency admission indicates the patient was admitted to the hospital through the emergency department.

<sup>7</sup> HCUP Cost-to-Charge Ratio Files (CCR). Healthcare Cost and Utilization Project (HCUP). 2001–2003. U.S. Agency for Healthcare Research and Quality, Rockville, MD. [www.hcup-us.ahrq.gov/db/state/costtocharge.jsp](http://www.hcup-us.ahrq.gov/db/state/costtocharge.jsp)

Admission from another hospital indicates the patient was admitted to this hospital from another short-term, acute-care hospital. This usually signifies that the patient required the transfer in order to obtain more specialized services that the originating hospital could not provide. Admission from long-term care facility indicates the patient was admitted from a long-term facility such as a nursing home.

## About HCUP

HCUP is a family of powerful health care databases, software tools, and products for advancing research. Sponsored by the Agency for Healthcare Research and Quality (AHRQ), HCUP includes the largest all-payer encounter-level collection of longitudinal health care data (inpatient, ambulatory surgery, and emergency department) in the United States, beginning in 1988. HCUP is a Federal-State-Industry Partnership that brings together the data collection efforts of many organizations—such as State data organizations, hospital associations, private data organizations, and the Federal government—to create a national information resource.

For more information about HCUP, visit [www.hcup-us.ahrq.gov](http://www.hcup-us.ahrq.gov).

HCUP would not be possible without the contributions of the following data collection Partners from across the United States:

**Arizona** Department of Health Services  
**Arkansas** Department of Health & Human Services  
**California** Office of Statewide Health Planning & Development  
**Colorado** Health & Hospital Association  
**Connecticut** Integrated Health Information (Chime, Inc.)  
**Florida** Agency for Health Care Administration  
**Georgia** GHA: An Association of Hospitals & Health Systems  
**Hawaii** Health Information Corporation  
**Illinois** Health Care Cost Containment Council and Department of Public Health  
**Indiana** Hospital & Health Association  
**Iowa** Hospital Association  
**Kansas** Hospital Association  
**Kentucky** Cabinet for Health and Family Services  
**Maryland** Health Services Cost Review Commission  
**Massachusetts** Division of Health Care Finance and Policy  
**Michigan** Health & Hospital Association  
**Minnesota** Hospital Association  
**Missouri** Hospital Industry Data Institute  
**Nebraska** Hospital Association  
**Nevada** Division of Health Care Financing and Policy, Department of Human Resources  
**New Hampshire** Department of Health & Human Services  
**New Jersey** Department of Health & Senior Services  
**New York** State Department of Health  
**North Carolina** Department of Health and Human Services  
**Ohio** Hospital Association  
**Oklahoma** Health Care Information Center for Health Statistics  
**Oregon** Association of Hospitals and Health Systems  
**Rhode Island** Department of Health  
**South Carolina** State Budget & Control Board  
**South Dakota** Association of Healthcare Organizations  
**Tennessee** Hospital Association  
**Texas** Department of State Health Services  
**Utah** Department of Health  
**Vermont** Association of Hospitals and Health Systems  
**Virginia** Health Information  
**Washington** State Department of Health  
**West Virginia** Health Care Authority  
**Wisconsin** Department of Health & Family Services

For additional HCUP statistics, visit HCUPnet, our interactive query system, at [www.hcup.ahrq.gov](http://www.hcup.ahrq.gov).

## About the NIS

The HCUP Nationwide Inpatient Sample (NIS) is a nationwide database of hospital inpatient stays. The NIS is nationally representative of all community hospitals (i.e., short-term, non-Federal, non-rehabilitation hospitals). The NIS is a sample of hospitals and includes all patients from each hospital, regardless of payer. It is drawn from a sampling frame that contains hospitals comprising about 90 percent of all discharges in the United States. The vast size of the NIS allows the study of topics at both the national and regional levels for specific subgroups of patients. In addition, NIS data are standardized across years to facilitate ease of use.

## For More Information

For a detailed description of HCUP and more information on the design of the NIS and methods to calculate estimates, please refer to the following publications:

Steiner, C., Elixhauser, A., Schnaier, J. The Healthcare Cost and Utilization Project: An Overview. *Effective Clinical Practice* 5(3):143–51, 2002.

*Design of the HCUP Nationwide Inpatient Sample, 2005*. Online. June 13, 2007. U.S. Agency for Healthcare Research and Quality.

[http://www.hcup-us.ahrq.gov/db/nation/nis/reports/NIS\\_2005\\_Design\\_Report.pdf](http://www.hcup-us.ahrq.gov/db/nation/nis/reports/NIS_2005_Design_Report.pdf)

Houchens, R., Elixhauser, A. *Final Report on Calculating Nationwide Inpatient Sample (NIS) Variances, 2001*. HCUP Methods Series Report #2003-2. Online. June 2005 (revised June 6, 2005). U.S. Agency for Healthcare Research and Quality.

<http://www.hcup-us.ahrq.gov/reports/CalculatingNISVariances200106092005.pdf>

Houchens RL, Elixhauser A. *Using the HCUP Nationwide Inpatient Sample to Estimate Trends. (Updated for 1988-2004)*. HCUP Methods Series Report #2006-05 Online. August 18, 2006. U.S. Agency for Healthcare Research and Quality.

[http://www.hcup-us.ahrq.gov/reports/2006\\_05\\_NISTrendsReport\\_1988-2004.pdf](http://www.hcup-us.ahrq.gov/reports/2006_05_NISTrendsReport_1988-2004.pdf)

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AHRQ welcomes questions and comments from readers of this publication who are interested in obtaining more information about access, cost, use, financing, and quality of health care in the United States. We also invite you to tell us how you are using this Statistical Brief and other HCUP data and tools, and to share suggestions on how HCUP products might be enhanced to further meet your needs. Please e-mail us at [hcp@ahrq.gov](mailto:hcp@ahrq.gov) or send a letter to the address below:

Irene Fraser, Ph.D., Director  
Center for Delivery, Organization, and Markets  
Agency for Healthcare Research and Quality  
540 Gaither Road  
Rockville, MD 20850

**Table 1: National Estimates of Discharges with GERD in 1998 and 2005**

	Primary GERD Diagnosis			Any GERD Diagnosis		
	1998	2005	Percent Change	1998	2005	Percent Change
<i>Number of GERD Discharges</i>	90,678	95,016	4.8%*	995,402	3,141,965	216%*
<i>Number of GERD Discharges Per 100,000 persons</i>	33.6	32.1	-4.5%*	369	1,060	187%*
<i>By Age</i>						
<=1	11,030 ( 12%)	15,627 ( 16%)	42%*	46,782 (5%)	94,163 (3%)	101%*
2-17	1,788 ( 2%)	3,288 ( 3%)	84%*	9,525 (1%)	34,282 (1%)	260%*
18-34	5,990 ( 7%)	5,060 ( 5%)	-16%*	40,372 (4%)	150,457 (5%)	273%*
35-44	12,282 ( 14%)	10,541 ( 11%)	-14%*	84,620 (9%)	268,816 (9%)	218%*
45-54	16,354 ( 18%)	16,877 ( 18%)	3%	131,382 (13%)	469,676 (15%)	257%*
55-64	13,809 ( 15%)	15,676 ( 17%)	14%	152,326 (15%)	561,089 (18%)	268%*
>=65	29,348 ( 32%)	27,734 ( 29%)	-6%*	529,775 (53%)	1,562,833 (50%)	195%*
<i>By Sex</i>						
Female	52,900 ( 58%)	55,444 ( 59%)	5%	609,438 (61%)	1,938,836 (62%)	218%*
Male	37,772 ( 42%)	39,024 ( 41%)	3%	385,861 (39%)	1,201,690 (38%)	211%*
<i>By Hospital Region (per 100,000 persons)</i>						
Northeast	30.4	30.9	2%	375.3	1158.6	209%*
Midwest	33.1	32.0	-3%*	375.5	1214.9	224%*
South	40.9	36.7	-10%*	437.0	1131.7	159%*
West	24.8	25.5	3%*	244.0	718.0	194%*
<i>By Household Income</i>						
Below Median Income	39,462 (44%)	51,832 (55%)	31%*	428,357 (43%)	1,698,918 (54%)	297%*
Above Median Income	51,216 (56%)	43,183 (45%)	-16%*	567,045 (57%)	1,443,047 (46%)	154%*
<i>Mean Cost per Discharge</i>	\$5,616	6,545	17%*	8,486	10,457	23%*
<i>Total Hospital Costs (millions)</i>	\$509	622	22%*	8,447	32,856	289%*

Notes: Median household income in 1998 (2005) was \$37,000 (\$46,000). Costs and income are in 2005 dollars. Percentages in parentheses are the within-group distribution.

\*Statistically different from zero at the 95% level.



**Table 2: Primary GERD Diagnoses with Secondary Symptoms in 1998 and 2005**

	1998	2005	Percent Change
<i>Primary GERD with Symptoms</i>	20,543 (23%)	29,287 (31%)	43%*
Nonspecific Chest Pain	9,338 (45.5%)	14,705 (50.2%)	57%*
Coughing	266 (1.3%)	411 (1.4%)	55%
Hoarseness/Laryngitis	76 (0.4%)	222 (0.8%)	192%
Asthma	5,056 (24.6%)	7,437 (25.4%)	47%
Heartburn	171 (0.8%)	214 (0.7%)	25%
Dyspepsia	1,071 (5.2%)	1,280 (4.4%)	20%
Dysphagia <sup>a</sup>	1,206 (5.9%)	2,113 (7.2%)	75%
Vomiting <sup>a</sup>	743 (3.6%)	997 (3.4%)	34%
Anemia <sup>a</sup>	3,486 (17.0%)	4,690 (16.0%)	35%
Hematemesis <sup>a</sup>	556 (2.7%)	488 (1.7%)	-12%
Melena <sup>a</sup>	308 (1.5%)	275 (0.9%)	-11%
Weight Loss <sup>a</sup>	255 (1.2%)	611 (2.1%)	140%
<i>Primary GERD with any Alarm Symptom</i>	6,218 (6.9%)	8,635 (9.1%)	39%*
<i>Primary GERD with ER admission</i>	51,365 (57%)	65,730 (69%)	28%*

Notes: <sup>a</sup>Alarm symptoms. These alarm symptoms warrant further clinical exploration to find any of the esophageal disorders listed in Table 3. Percentages in parentheses are the within-group distribution. Note that the distribution percentages for specific symptoms may add up to more than 100% since a patient may have more than one symptom.

\*Statistically different from zero at the 95% level.

**Table 3: Esophageal Disorders in 1998 and 2005**

	<b>1998</b>	<b>2005</b>	<b>Percent Change</b>
Esophageal Disorders without GERD <sup>a</sup>	451,089 (87%)	513,394 (79%)	14%**
Esophageal Disorders with GERD <sup>a</sup>	65,806 (13%)	133,391 (21%)	103%**
<i>Total Esophageal Disorders</i>	516,895	646,785	25%**
<i>Specific Esophageal Disorders with GERD<sup>a</sup></i>			
Dysphagia	14,058 (21%)	51,123 (38%)	264%**
Esophagitis	18,181 (28%)	35,183 (26%)	94%
Esophageal Ulcer	22,098 (34%)	10,057 (8%)	-54%**
Esophageal Stricture	16,139 (25%)	21,117 (16%)	31%**
Barrett's Esophagus	--	24,942 (19%)	--
Other Disorders of Esophagus	2,810 (4%)	4,551 (3%)	62%*
Esophageal Adenocarcinoma	615 (1%)	1,816 (1%)	195%*
Cancer of the Esophagus	190 (0.3%)	286 (0.2%)	51%

Notes: <sup>a</sup>Any primary or secondary GERD diagnosis. Note that the distribution percentages for specific disorders may add up to more than 100% since a patient may have more than one disorder.

\*\*Statistically different from zero at the 95% level.

\*Statistically different from zero at the 90% level.

**Table 4: Inpatient Anti-reflux Surgeries in 1998 and 2005**

	<b>1998</b>	<b>2005</b>	<b>Percent Change</b>
Nissen Fundoplication with a Primary GERD Diagnosis	21,477	15,737	-27%**
<i>By Sex</i>			
Female	11,684 (54%)	9,074 (59%)	-22%*
Male	9,794 (46%)	6,331 (41%)	-35%**
<i>By Age</i>			
<=1	893 (4%)	1,865 (12%)	109%**
2-17	935 (4%)	1,946 (12%)	108%**
18-34	3,419 (16%)	1,854 (12%)	-46%**
35-44	5,327 (25%)	2,311 (15%)	-57%**
45-54	5,314 (25%)	3,272 (21%)	-38%*
55-64	3,182 (15%)	2,527 (16%)	-21%
>=65	2,368 (11%)	1,855 (12%)	-22%

Notes: Percentages in parentheses are the within-group distribution.

\*\*Statistically different from zero at the 95% level.

\*Statistically different from zero at the 90% level.