

## CHAPTER 2

## Gastrointestinal Infections

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Most GI infections are self-limited and do not come to medical attention, although they are both extremely common and disruptive of daily activities, including school and work. GI infections are caused by viral and bacterial pathogens, but the minority that are most severe and for which causative agents are found are typically bacterial. The ICD-9 and ICD-10 codes match well, except for nonspecified organisms. The most significant differences are that Intestinal Infections Due to Other Organisms (008) and Ill-Defined Intestinal Infections (009) in ICD-9 were replaced by Other Bacterial Intestinal Infections (A04), Other Bacterial Foodborne Intoxications (A05), and Viral and Other Specified Intestinal Infections (A08) in ICD-10. Here is a breakdown of the codes for GI infections:

	ICD-9	ICD-10
Cholera	001	A00
Typhoid and Paratyphoid	002	A01
Other Salmonella	003	A02
Shigellosis	004	A03
Other Food Poisoning	005	—
Other Bacterial Intestinal Infections	—	A04
Other Bacterial Foodborne Intoxications	—	A05
Amebiasis	006	A06
Other Protozoal Intestinal Diseases	007	A07
Intestinal Infections Due to Other Organisms	008	—
Viral and Other Specified Intestinal Infections	—	A08
Ill-Defined Intestinal Infections	009	—
Diarrhea and Gastroenteritis of Presumed Infectious Origin	—	A09
All GI Infections	001–009	A00–A09

As shown in Table 1, in 2004, more than half of ambulatory care visits for GI infections occurred in those under the age of 15 years. When first-listed, the rate in this age group (1,930 per 100,000 population), was at least 4 times that of any other age group. Age-

adjusted rates were 45.7 percent higher among whites than blacks and 18.1 percent higher among females than males. Relative to the frequency of ambulatory care visits, hospitalizations were uncommon. In contrast to those in ambulatory care, persons over age 65 years had both the highest number and rate of hospitalizations, and blacks had rates similar to those of whites. GI infections were considerably more often a secondary diagnosis (272,000) than first-listed diagnosis (178,000). The rate of age-adjusted hospitalizations with a diagnosis of GI infections increased by 92.8 percent between 1979 (76.1 per 100,000) and 2004 (146.7 per 100,000) and by 43.3 percent between 1992 (102.4 per 100,000) and 2004 (Figure 1).

In 2004, there were 4,396 deaths with a GI infection listed as the underlying cause (Table 2). The large majority of these deaths occurred among persons age 65 years and older. The death rate among whites was 50 percent higher than that among blacks, and the rates were similar among females and males. Similar patterns were seen for GI infections as either underlying or contributing cause. Because the majority of deaths occurred in the elderly, the YPLL prior to age 75 years was small, less than 3 years per death. In recent years, there has been a remarkable increase in deaths from GI infections (Figure 2). Over the 20-year period between 1979 and 1999, the age-adjusted underlying cause mortality rate doubled from 0.21 per 100,000 to 0.42 per 100,000. But in the 5 years from 1999 to 2004, the rate more than tripled to 1.44 per 100,000. About two-thirds of the more recent increase is due to one bacterial cause, *Clostridium difficile*, which is coded under Other Bacterial Intestinal Infections as A04.7.

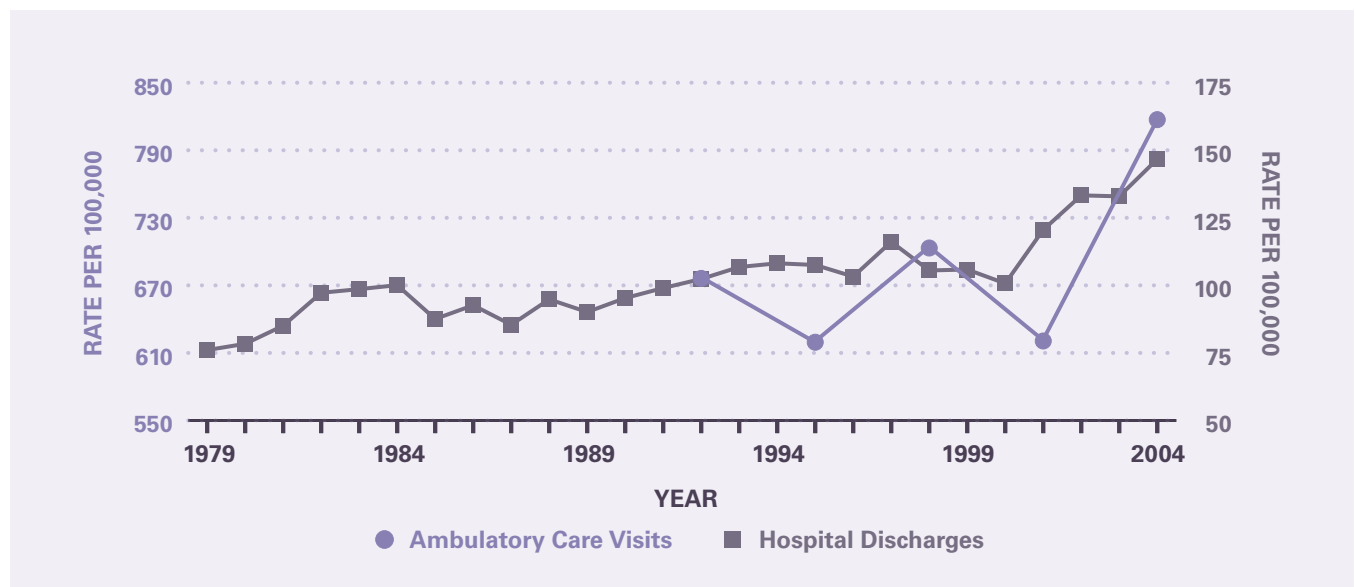
**MEDICATIONS** The costliest prescriptions filled at retail pharmacies for GI infections in 2004, according to the Verispan database (Appendix 2), are shown in Table 3. Most were antimicrobial agents, such as ciprofloxacin, or they affected GI motility, such as promethazine. An estimated 938,000 outpatient prescriptions were filled.

**Table 1.** Gastrointestinal Infections: Number and Age-Adjusted Rates of Ambulatory Care Visits and Hospital Discharges With First-Listed and All-Listed Diagnoses by Age, Race, and Sex in the United States, 2004

DEMOGRAPHIC CHARACTERISTICS	AMBULATORY CARE VISITS				HOSPITAL DISCHARGES				
	First-Listed Diagnosis		All-Listed Diagnoses		First-Listed Diagnosis		All-Listed Diagnoses		
	Number in Thousands	Rate per 100,000	Number in Thousands	Rate per 100,000	Number in Thousands	Rate per 100,000	Number in Thousands	Rate per 100,000	
<b>AGE (Years)</b>	Under 15	1,174	1,930	1,222	2,010	47	77	83	137
	15–44	579	460	672	534	31	25	65	51
	45–64	266	377	311	440	34	47	86	122
	65+	109	301	159	439	66	183	215	593
<b>RACE</b>	White	1,800	785	1,994	867	140	57	359	144
	Black	225	529	253	595	16	46	48	151
<b>SEX</b>	Female	1,142	796	1,279	888	107	67	261	160
	Male	986	684	1,085	752	71	52	188	142
<b>TOTAL</b>		2,128	725	2,365	805	178	61	450	153

SOURCE: National Ambulatory Medical Care Survey (NAMCS) and National Hospital Ambulatory Medical Care Survey (NHAMCS) (3-year average, 2003–2005), and Healthcare Cost and Utilization Project Nationwide Inpatient Sample (HCUP NIS)

**Figure 1.** Gastrointestinal Infections: Age-Adjusted Rates of Ambulatory Care Visits and Hospital Discharges With All-Listed Diagnoses in the United States, 1979–2004



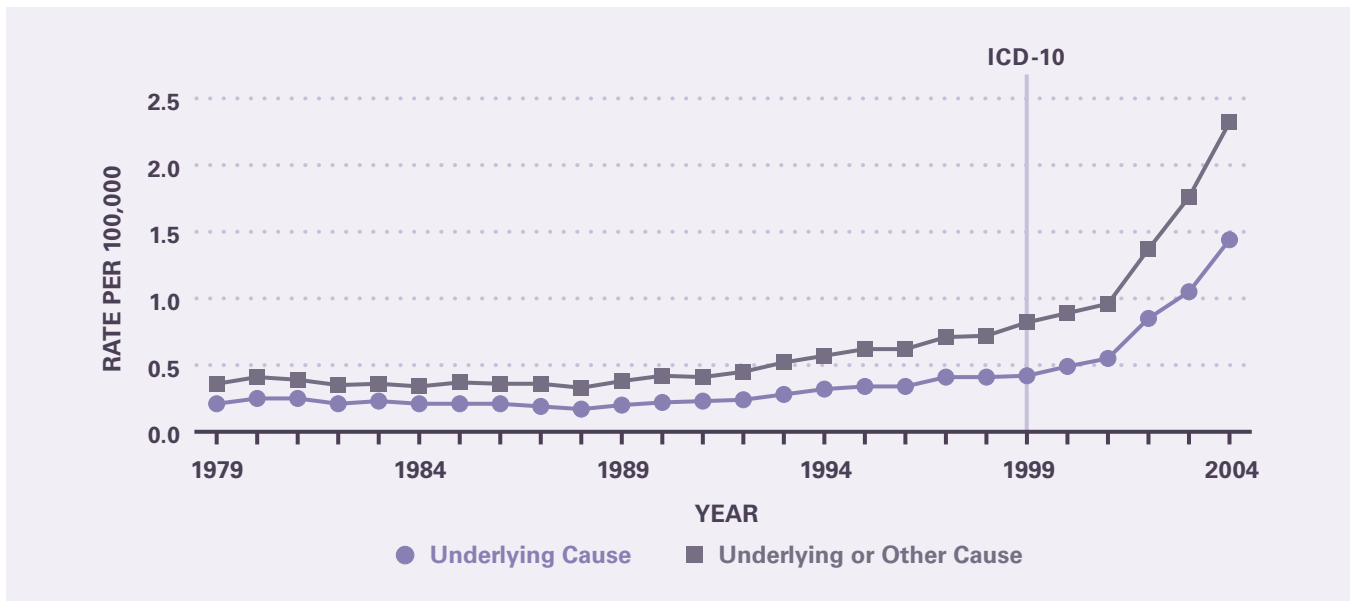
SOURCE: National Ambulatory Medical Care Survey (NAMCS) and National Hospital Ambulatory Medical Care Survey (NHAMCS) (averages 1992–1993, 1994–1996, 1997–1999, 2000–2002, 2003–2005), and National Hospital Discharge Survey (NHDS)

**Table 2.** Gastrointestinal Infections: Number and Age-Adjusted Rates of Deaths and Years of Potential Life Lost (to Age 75) by Age, Race, and Sex in the United States, 2004

DEMOGRAPHIC CHARACTERISTICS	UNDERLYING CAUSE			UNDERLYING OR OTHER CAUSE	
	Number of Deaths	Rate per 100,000	Years of Potential Life Lost in Thousands	Number of Deaths	Rate per 100,000
<b>AGE (Years)</b>	Under 15	32	0.1	2.3	0.1
	15–44	49	0.0	1.9	0.1
	45–64	353	0.5	6.0	0.8
	65+	3,962	10.9	2.6	17.5
<b>RACE</b>	White	4,104	1.5	10.7	2.5
	Black	241	1.0	1.6	1.6
<b>SEX</b>	Female	2,746	1.5	6.4	2.3
	Male	1,650	1.4	6.4	2.4
<b>TOTAL</b>		4,396	1.5	12.8	2.4

SOURCE: Vital Statistics of the United States

**Figure 2.** Gastrointestinal Infections: Age-Adjusted Rates of Death in the United States, 1979–2004



SOURCE: Vital Statistics of the United States

**Table 3.** Gastrointestinal Infections: Costliest Prescriptions

DRUG	Prescription (#)	Prescription	Retail Cost	Cost
Vancomycin	14,507	1.5%	\$28,375,011	62.9%
Promethazine	346,794	37.0	5,985,173	13.3
Ciprofloxacin	126,523	13.4	5,132,893	11.4
Metronidazole	184,090	19.6	2,986,288	6.6
Loperamide	112,285	12.0	865,924	1.9
Diphenoxylate	122,042	13.0	832,096	1.8
Levofloxacin	7,325	0.8	483,046	1.1
Acidophilus/Bulgaricus	20,432	2.2	275,062	0.6
Ciprofloxacin-Betaine Combination	1,215	0.1	109,988	0.2
Prochlorperazine	2,927	0.3	26,326	0.1
Other	67	0.0	5,788	0.0
<b>TOTAL</b>	<b>938,207</b>	<b>100.0%</b>	<b>\$45,077,595</b>	<b>100.0%</b>

SOURCE: Verispan