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Outbreak of *Salmonella* Serotype Typhimurium Infection Associated with Eating Raw Ground Beef — Wisconsin, 1994

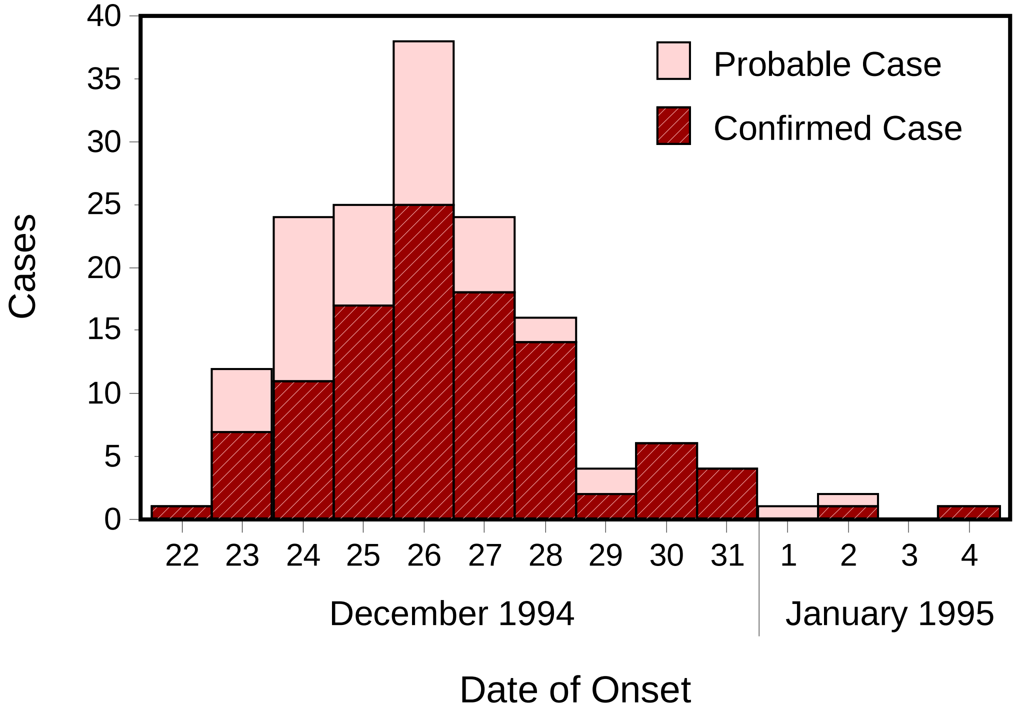
Despite previously publicized outbreaks of illness associated with and recommendations to avoid eating undercooked meat, some persons continue to eat undercooked or raw meat. This report summarizes the investigation of an outbreak of *Salmonella* serotype Typhimurium gastrointestinal illness in Wisconsin associated with eating contaminated raw ground beef during the 1994 winter holiday season.

On December 29, 1994, physicians in a group medical practice in Dodge County (1994 estimated population: 79,360), Wisconsin, reported to the Public Health Unit of the Dodge County Human Services and Health Department (DCHSHD) that during December 27–29 they had treated 17 patients with acute gastrointestinal illness characterized by diarrhea and abdominal cramps. At least 14 patients reported having eaten raw ground beef that was either plain or seasoned with onions and an herb mix during the 72 hours before illness onset. Stool samples for culture were obtained from 11 patients; *Salmonella* serotype Typhimurium that did not ferment tartrate was isolated from seven specimens. Based on these reports and findings, the DCHSHD issued a physician alert and press release that encouraged affected residents to report their illnesses and physicians to obtain stool cultures from case-patients. In addition, DCHSHD and the Bureau of Public Health, Wisconsin Division of Health (WDOH), initiated an investigation of this outbreak. A probable case of *Salmonella* infection was defined as diarrhea or abdominal cramps with onset during December 22, 1994–January 4, 1995, in a resident of or a visitor to Dodge County or any of the four contiguous counties. A confirmed case was defined as a stool culture positive for tartrate-negative *Salmonella* Typhimurium.

DCHSHD and WDOH identified 107 confirmed and 51 probable case-patients (Figure 1); of these, 17 (16%) were hospitalized. Predominant manifestations of illness included diarrhea (98%), abdominal cramps (88%), chills (77%), body aches (71%), fever (65%), nausea (60%), and bloody stools (43%). The ages of ill persons ranged from 2 years to 90 years; 62% were male.

To assess potential risk factors for illness, DCHSHD and WDOH conducted a case-control study including 40 case-patients who were randomly selected from the persons with a stool specimen culture positive for tartrate-negative *Salmonella* Typhimurium and 40 controls who were identified by random telephone digit dialing. The mean ages of cases and controls were similar (43 years for cases; 47 years for

FIGURE 1. Number of probable* and confirmed† cases of *Salmonella* serotype Typhimurium infection, by date of onset — Wisconsin, December 22, 1994–January 4, 1995



*Diarrhea or abdominal cramps with onset during December 22, 1994–January 4, 1995, in a resident or a visitor to Dodge County or any of the four contiguous counties.
†Stool culture positive for tartrate-negative *Salmonella* Typhimurium.

controls). Of 40 case-patients, 35 (88%) reported having eaten raw ground beef during December 22–January 4, compared with eight (20%) of 40 controls (odds ratio [OR]=28; 95% confidence interval [CI]=7–117). Among the 35 who ate raw ground beef, 34 (97%) had purchased the beef from one butcher shop, compared with three (37%) of the eight controls (OR=56; 95% CI=4–1881). Knowledge of previous reports of outbreaks related to eating raw or undercooked beef was less among ill persons than among controls (26 [65%] of 40 case-patients compared with 30 [75%] of 40 controls [OR=0.6; 95% CI=0.2–1.8]). However, 22 (85%) of the 26 case-patients who reported being aware of previous outbreaks associated with consumption of raw ground beef continued this behavior compared with seven (23%) of the 30 controls with knowledge of previous outbreaks (OR=18.1; 95% CI=4.0–92.0).

DCHSHD and WDOH obtained from case-patients six leftover samples of raw ground beef that had been purchased at the butcher shop on five dates during December 21–29 and served in different homes. These samples were cultured for *Salmonella* sp.; all grew tartrate-negative *Salmonella* Typhimurium. On December 30, 1994, staff of the Meat Safety and Inspection Bureau (MSIB), Wisconsin Department of Agriculture, Trade, and Consumer Protection (WDATCP), informed the proprietor of the butcher shop of a potential problem with consumption of raw ground beef from the shop and the need to properly label meat products. During the winter holiday season, the butcher shop sold both seasoned and unseasoned raw ground beef that had a warning label regarding safe handling of poultry. On January 2, 1995, inspectors from MSIB examined sanitary conditions in the butcher shop, obtained invoices indicating the origin and the quantity of the meat used to prepare the ground beef, and inspected the raw ground beef production method and selling practice in the butcher shop.

Meat from approximately 35 carcasses obtained from three different suppliers had been ground in the shop from December 21 through January 4. Leftover product was reported to have been discarded each day and not carried over for sale the next day. All parts of the meat grinder except for the auger housing were disassembled and individually cleaned and sanitized at the end of each day. This type of grinder allowed easy disassembly of the auger and other smaller parts; the auger housing was attached to the grinder with nuts and bolts and required a wrench for removal. However, the cleaning staff had not received instructions regarding removal of the auger housing and had cleaned only surfaces of the tunnel-like space for the auger with a brush.

Meat remnants were present in the auger housing when the grinder was disassembled. Twenty environmental swabs of the equipment and the areas related to the production of the ground beef were obtained for bacterial culture; all were negative for *Salmonella* sp. Stool specimens obtained from all five butchers at the shop were cultured; one was positive for tartrate-negative *Salmonella* Typhimurium. Although this butcher denied illness, he had eaten raw ground beef at the shop during the outbreak interval.

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Editorial Note: The investigation of this outbreak implicated consumption of contaminated raw ground beef as the source of *Salmonella* infection. Inadequate cleaning and sanitization of the meat grinder probably resulted in ongoing contamination of ground beef over many production days. The outbreak occurred during the winter holiday season, and some patients reported that consumption of raw ground beef during these holidays was a practice brought from Europe by their ancestors. The decline of cases after the holidays may have occurred because ground beef from the implicated butcher shop was no longer consumed raw or because the grinder was cleaned more thoroughly after WDATCP personnel spoke with the proprietor of the butcher shop on December 30. The five persons who became ill but did not report eating raw ground beef may not have remembered eating the raw ground beef, may have eaten undercooked ground beef or food that was contaminated from the raw ground beef, or may have become ill through person-to-person transmission.

Raw ground beef previously has been implicated as a vehicle for transmission of *Salmonella* (*1,2*), and undercooked ground beef is the most frequently recognized vehicle for *Escherichia coli* O157:H7 infection (*3*). The prevalence of *Salmonella* in beef ranges from 1% for raw beef carcasses (*4*) to 5%–7% for ground beef (U.S. Department of Agriculture, Food Safety and Inspection Service, unpublished data, 1994). Prevention measures include warning consumers of the health risks associated with eating raw ground beef and encouraging them to thoroughly cook ground beef and to adhere to safe foodhandling guidelines. Safe cooking and handling labels on raw or partially cooked meat and poultry are now required by the U.S. Department of

Salmonella — *Continued*

Agriculture (USDA). However, the presence of safe foodhandling labels does not ensure adherence to safe practices. For example, an investigation of risk factors for sporadic *E. coli* O157:H7 infection indicated that of 43 food preparers who reported reading the safe foodhandling label on meat packages, 33 (77%) admitted to practices specifically discouraged on the label (*5*).

The investigation in Dodge County underscores that knowledge of health risks is not consistently associated with desirable changes in behavior. Despite public health warnings and publicity about related outbreaks, some consumers in Dodge County and elsewhere have continued to eat raw or undercooked foods of animal origin. For example, a telephone survey of a national sample of adults conducted by the Center for Food Safety and Applied Nutrition, Food and Drug Administration (FDA), during December 1992–February 1993 indicated that 53% consumed raw eggs; 23%, undercooked hamburgers; 17%, raw clams or oysters; 8%, raw sushi or ceviche; and 5%, steak tartare (raw hamburger meat) (*6*). Consumer advisories can be more effective if targeted to specific cultural or ethnic groups with such high-risk dietary practices, and WDATCP is planning two press releases this winter holiday period to warn consumers of the risks associated with eating raw ground beef.

In addition to consumer advisories, interventions to reduce the risks associated with the consumption of ground beef include the needs for 1) producers of ground beef to emphasize employee education and training on the recommended methods of cleaning and sanitizing meat-grinding equipment; 2) manufacturers to design meat-grinding equipment that is easily accessible for cleaning and sanitization; and 3) state regulatory and inspection authorities to adopt and enforce FDA's Food Code model requirements, which offer specific recommendations for handling, cooking, and storing raw meat; cleaning and sanitizing equipment and utensils; designing and constructing equipment; and advising consumers about the risks associated with consumption of raw or undercooked food of animal origin (*7*). The USDA's Food Safety and Inspection Service also has proposed changes in the meat and poultry inspection system to improve assessment and control of microbial pathogens in raw meat and poultry (*8*). Consumers can obtain more information on safe meat handling from the USDA's Meat and Poultry Hotline (telephone [800] 535-4555).

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BB and Pellet Gun-Related Injuries — United States, June 1992–May 1994

Each year in the United States, approximately 30,000 persons with BB and pellet gun*-related injuries are treated in hospital emergency departments (EDs) (*1*). Most (95%) injuries are BB or pellet gunshot wounds (GSWs); 5% are other types of injuries (e.g., lacerations sustained inadvertently while cleaning or shooting a gun or contusions resulting from being struck with the butt of a gun) (*1*). Most (81%) persons treated for BB and pellet GSWs are children and teenagers (aged ≤19 years). To assist in developing strategies for preventing these injuries, CDC analyzed data from an ongoing special study of nonfatal gun-related injuries conducted using the National Electronic Injury Surveillance System (NEISS) of the U.S. Consumer Product Safety Commission; this study has characterized the epidemiology of BB and pellet GSWs among children and teenagers in the United States during June 1992–May 1994 (*2*). This report summarizes the circumstances of six cases of BB and pellet gun-related injuries identified through NEISS and presents the findings of the analysis of NEISS data.

NEISS includes a probability sample of 91 hospitals selected from all hospitals with at least six beds and that provide 24-hour emergency service (*2*). Data were weighted to provide national estimates of injuries treated in hospital EDs in the United States and its territories (*1*).

Case Reports

- A 9-year-old boy was struck by a BB beneath his lower left eyelid after he stepped from behind a board at which other children were shooting. The children had been left unsupervised following a youth club target practice session.
- A 16-year-old boy sustained a severe midbrain injury from a self-inflicted combination BB/pellet gun GSW through the roof of his mouth.
- A 9-year-old girl incurred a pellet injury to the back of her right ankle after four boys fired a pellet gun at her from a passing car while she was walking on a sidewalk.
- A 10-year-old boy sustained injuries to his neck and trachea after being struck by a BB from a gun that had been fired unintentionally by an unspecified person.
- A 13-year-old boy was shot in the neck with a BB gun while he and a friend were playing in a house. The friend, who believed the gun was unloaded, had aimed the gun at the 13-year-old and pulled the trigger.
- A 16-year-old boy sustained a penetrating injury to his right eye after being struck by a BB that ricocheted from a gun fired by a friend.

*In this report, the terms BB gun and pellet gun refer to nonpowder guns that use compressed air or gas to propel lead pellets or steel BBs.

Gun-Related Injuries — Continued

Summary of NEISS Data

During June 1992–May 1994, a total of 959 BB and pellet GSWs among children and teenagers were reported through NEISS. Based on these reports, an estimated 47,137 (95% confidence interval [CI]=39,746–54,528) children and teenagers were treated for BB or pellet GSWs in hospital EDs during this period (an average of 23,600 per year or 65 per day) (Table 1). The incidence of BB or pellet gun-related injuries was highest for males (53.5 per 100,000 population) and children aged 10–14 years (66.6 per 100,000 population) (Table 1), and the sex- and age group-specific rate was highest for males aged 10–14 years (114.3 per 100,000 population [95% CI=94.1–134.5]).

Although most (64%) persons with GSWs were transported to EDs by private vehicles, 8% of those treated were taken to EDs by emergency medical services (Table 2). Injuries to the eye, face, and head and neck accounted for 31% of all injuries. Hospitalization was required for 5% of cases; of these, 37% were associated with severe injury to the eye.

Data on victim-shooter relationship were complete for 71% of cases (Table 2). Based on these data, 31% of injuries were self-inflicted, and 33% were caused by friends, acquaintances, or relatives. Data on 76% of the incidents indicated the type of injury: although most (66%) resulted from unintentional shootings, approximately 10% were assaults; suicide attempts were rare (0.1%). Locale of the injury incident was known for approximately 55% of cases; approximately 45% of injuries occurred in and around a home, apartment, or condominium.

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Editorial Note: An estimated 3.2 million nonpowder guns are sold in the United States each year; 80% of these have muzzle velocities >350 feet per second (fps) and 50% have velocities from 500 fps to 930 fps (AC Homan, US Consumer Product Safety Commission, unpublished data, 1994). Most of these guns are intended for use by persons aged 8–18 years. At close range, projectiles from many BB and pellet guns,

TABLE 1. Characteristics of children and teenagers aged ≤19 years treated in hospital emergency departments for BB and pellet gun-related injuries — United States, June 1992–May 1994

Characteristic	No.*	(%)	Rate†	(95% CI§)
Sex				
Male	40,605	(86.1)	53.5	(45.1–61.9)
Female	6,532	(13.9)	9.0	(6.7–11.3)
Age (yrs)				
0– 4¶	1,040	(2.2)	—	
5– 9	8,033	(17.0)	21.6	(16.5–26.7)
10–14	24,400	(51.8)	66.6	(54.9–78.3)
15–19	13,664	(29.0)	39.6	(31.8–47.4)
Total	**47,137**	**(100.0)**	**31.8**	**(26.8–36.8)**

*Based on weighted data from 959 BB and pellet gunshot injuries reported through the National Electronic Injury Surveillance System.
†Annualized rate per 100,000 population.
§Confidence interval.
¶Rate was not calculated because of the small number (21) of cases in this age group; interpret estimate with caution.

Gun-Related Injuries — Continued

especially those with velocities >350 fps, can cause tissue damage similar to that inflicted by powder-charged bullets fired from low-velocity conventional firearms (*3*). Injuries associated with use of these guns can result in permanent disability or death (*4*); injuries from BBs or pellets projected from air guns involving the eye particularly are severe (*5*). For example, based on data from the National Eye Trauma System and the United States Eye Injury Registry—a system of voluntary reporting by ophthalmologists—projectiles from air guns account for 63% of reported perforating eye injuries that occur in recreational settings (*6*).

Despite the large number of BB and pellet gun-related injuries treated in hospital EDs each year (*1*), there are no nationally specified safety standards for nonpowder guns. Although voluntary industry standards were established in 1978 and revised in 1992 (*7*), the effectiveness of these standards for preventing injuries has not been determined. These voluntary standards specify two types of warning labels, including one on the gun itself ("WARNING: Before using read Owner's Manual available free from [company name]"), and one on the packaging ("WARNING: Not a toy. Adult supervision required. Misuse or careless use may cause serious injury or death. May be dangerous up to [specific distance][†] yards ([specific distance] meters).") (*7*). The voluntary standards also specify that the owner's manual should provide instructions about handling and operating the gun safely, selecting safe and proper targets, caring for and maintaining the gun properly, storing of the gun in an unloaded state and in a

[†]Distance is dependent on the type of gun and muzzle velocity.

TABLE 2. BB and pellet gun-related injuries treated in hospital emergency departments (EDs) for children and teenagers aged ≤19 years, by selected characteristics — United States, June 1992–May 1994

Characteristic	No.*	(%)
Mode of transport to ED		
Private vehicle	30,298	(64.3)
Walked in	7,788	(16.5)
Emergency medical service/Fire rescue/Ambulance	3,742	(8.0)
Police vehicle	468	(1.0)
Other/Not stated	4,841	(10.2)
Primary body part injured		
Extremity	25,453	(54.0)
Trunk	7,276	(15.4)
Face	6,788	(14.4)
Head/Neck	4,747	(10.1)
Eye	2,839	(6.0)
Other	34	(0.1)
ED discharge disposition		
Not hospitalized	44,759	(95.0)
Hospitalized	2,378	(5.0)

Characteristic	No.*	(%)
Victim-shooter relationship		
Self	14,636	(31.0)
Friend/Acquaintance	9,280	(19.7)
Relative	6,445	(13.7)
Stranger	1,260	(2.7)
Other/Shooter not seen	1,821	(3.9)
Not stated	13,695	(29.1)
Type of injury		
Unintentional	30,960	(65.7)
Assault	4,903	(10.4)
Suicide attempt	34	(0.1)
Not stated	11,240	(23.8)
Locale of injury incident		
Home/Apartment/Condominium	21,413	(45.4)
Street/Highway	1,821	(3.9)
Other property	1,389	(2.9)
School/Recreation area	1,104	(2.3)
Farm	90	(0.2)
Not stated	21,320	(45.2)
Total	**47,137**	**(100.0)**

*Based on weighted data from 959 BB and pellet gunshot injuries reported through the National Electronic Injury Surveillance System.

Gun-Related Injuries — Continued

safe and proper manner, and always confirming that the gun is unloaded when removed from storage or received from another person (*7*). However, these standards do not include specifications regarding other important injury-prevention measures pertinent to minors (e.g., limits on maximum velocity and impact force of BBs and pellets or design modifications to clearly indicate when a gun is loaded) (*8*).

In the United States, 14 states have enacted laws to regulate the sale or possession of nonpowder guns. Although most of these states restrict the purchase, possession, or use of these guns by minors aged <16 years or aged <18 years, such age restrictions on the purchase of these guns are void in most of these states when a minor has obtained permission from a parent or guardian.

Analysis of the NEISS data indicate that BB and pellet GSWs treated in hospital EDs typically result from an unintentional shooting of a young or adolescent male who either shot himself or was shot by a friend, acquaintance, or relative. Many of these shootings occur when using or playing with a gun in or around the home. These findings suggest that ready access to a BB or pellet gun and ammunition stored in the home and/or the lack of supervision during use of the gun may contribute substantially to the risk for injury among children and adolescents, especially for boys aged 10–14 years. Although most BB and pellet gun injuries are unintentional, the findings from this analysis and from a statewide ED-based surveillance system in Massachusetts (*9*) also indicate that BB and pellet guns sometimes have been used to purposefully inflict harm.

Unintentional BB and pellet gun-related injuries that occur during unsupervised activities are preventable. Parents considering the purchase of a BB or pellet gun for their children should be aware of the potential hazards of these guns, and should help to ensure the safety of their children in the presence of a BB or pellet gun. Children and teenaged users should recognize that these guns are not toys but are designed and intended specifically for recreational and competitive sport use. Parents or other adults should provide direct supervision at all times for each child who is using or observing the use of these guns. Each user should be educated about the potential danger of these guns, the importance of gun-safety practices, and how to safely handle and fire the gun. The use of protective eyewear should be enforced during shooting activities. When not in use, all guns in the home should be kept locked up and unloaded. Subsequent efforts to reduce the severity and frequency of injuries associated with BB and pellet guns should include determination of the effectiveness of a variety of interventions (e.g., technological, regulatory, environmental, and behavioral).

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Lead Toxicity Among Bridge Workers, 1994

Following publication of blood lead level (BLL) surveillance results from the Connecticut Road Industry Surveillance Project (CRISP)* (*1*) in February 1995, CRISP staff were contacted by a primary-care physician in another state who monitors BLLs in bridge painters. After noting that some bridge workers with elevated BLLs had been evaluated in his clinic, the physician established a medical program to monitor lead-exposed bridge workers; all blood lead determinations were performed by an Occupational Safety and Health Administration (OSHA)-certified medical laboratory. This report summarizes BLL results from the physician's medical monitoring for March–December 1994, compares these findings with CRISP data, and indicates that the prevalence of elevated BLLs in bridge workers remains substantial.

During March–December 1994, the physician's monitoring database recorded BLLs from 373 bridge workers employed by 35 painting contractors in eight states†. Of the 225 bridge workers for whom information about specific occupation was available, 146 (65%) were employed as painters/sandblasters. Most (369 [99%]) of the 373 monitored workers were men. Of the 269 (72%) workers for whom age data were available, mean age was 35.7 years (range: 17–64 years). During this period, 168 (45%) of the workers had one BLL recorded, 84 (23%) had two, 65 (17%) had three, and 56 (15%) had four or more. The mean of the most recent BLL for these 373 workers was 27.2 µg/dL (standard deviation: 16.1 µg/dL; range: <2–72 µg/dL). More than half (194 [52%]) of the workers had a BLL >25 µg/dL, and 35 (9%) had a level ≥50 µg/dL (Table 1, page 919).

One of the national health objectives for the year 2000 is the elimination of occupational lead exposures associated with BLLs >25 µg/dL (objective 10.8) (*2*). The OSHA Interim Final Standard for Lead in Construction requires medical removal from further exposure of any employee with a BLL ≥50 µg/dL (*3*); the most recent BLL of 35 workers equaled or exceeded this level. The physician reported these levels to the respective employers and recommended medical removal of these workers.

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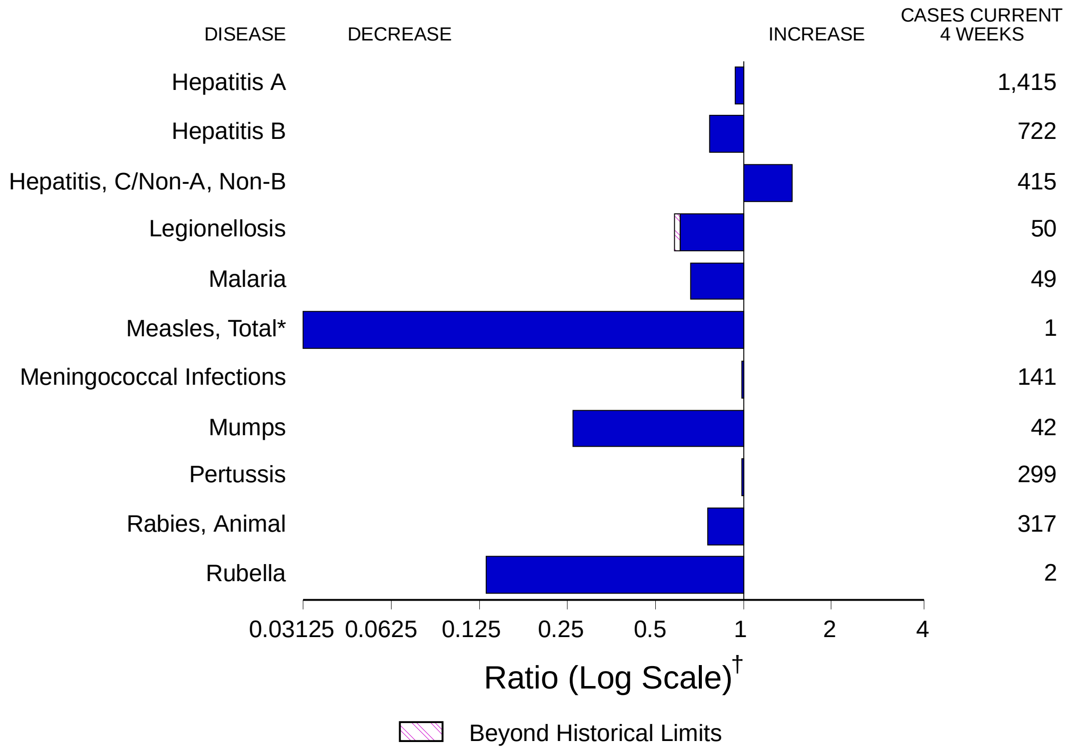
(Continued on page 919)

*CRISP is an ongoing statewide medical surveillance system in Connecticut, which is funded by CDC's National Institute for Occupational Safety and Health (NIOSH) and designed to prevent lead toxicity in bridge workers.

†Arkansas, Florida, Georgia, Kentucky, New Jersey, New York, Ohio, and Tennessee.

FIGURE I. Notifiable disease reports, comparison of 4-week totals ending December 9, 1995, with historical data — United States



*The large apparent decrease in the number of reported cases of measles (total) reflects dramatic fluctuations in the historical baseline.

†Ratio of current 4-week total to mean of 15 4-week totals (from previous, comparable, and subsequent 4-week periods for the past 5 years). The point where the hatched area begins is based on the mean and two standard deviations of these 4-week totals.

TABLE I. Summary — cases of specified notifiable diseases, United States, cumulative, week ending December 9, 1995 (49th Week)

	Cum. 1995		Cum. 1995
Anthrax	-	Psittacosis	64
Brucellosis	83	Rabies, human	2
Cholera	16	Rocky Mountain Spotted Fever	556
Congenital rubella syndrome	6	Syphilis, congenital, age < 1 year†	469
Diphtheria	-	Tetanus	32
*Haemophilus influenzae**	1,086	Toxic shock syndrome	167
Hansen Disease	129	Trichinosis	26
Plague	7	Typhoid fever	309
Poliomyelitis, Paralytic	-		

*Of 1,061 cases of known age, 259 (24%) were reported among children less than 5 years of age.
†Updated quarterly from reports to the Division of STD Prevention, National Center for Prevention Services. This total through third quarter 1995.
-: no reported cases

TABLE II. Cases of selected notifiable diseases, United States, weeks ending December 9, 1995, and December 10, 1994 (49th Week)

Reporting Area	AIDS*	Gonorrhea		Hepatitis (Viral), by type						Legionellosis	
				A		B		C/NA,NB			
	Cum. 1995	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994
UNITED STATES	65,705	330,311	381,825	27,265	23,701	9,429	10,813	3,507	3,857	1,098	1,476
NEW ENGLAND	3,119	6,005	7,695	295	277	190	321	12	140	36	75
Maine	81	80	87	30	24	12	11	-	-	6	5
N.H.	87	108	104	11	17	20	27	12	11	2	-
Vt.	30	63	34	5	13	1	12	-	16	-	1
Mass.	1,339	2,733	3,084	129	102	83	175	-	93	23	52
R.I.	214	520	450	34	26	8	8	-	20	5	17
Conn.	1,368	2,501	3,936	86	95	66	88	-	-	N	N
MID. ATLANTIC	17,668	33,315	42,535	1,699	1,597	1,227	1,453	461	437	185	244
Upstate N.Y.	2,127	3,851	10,599	457	512	377	351	253	206	53	57
N.Y. City	9,225	11,818	15,006	775	621	369	376	1	4	5	7
N.J.	4,158	5,592	4,831	266	278	305	358	167	190	28	43
Pa.	2,158	12,054	12,099	201	186	176	368	40	37	99	137
E.N. CENTRAL	4,940	68,507	77,547	2,851	2,547	974	1,136	241	310	302	420
Ohio	1,017	19,058	20,678	1,681	1,061	102	157	15	23	145	191
Ind.	499	7,943	8,766	170	357	234	202	2	9	71	45
Ill.	2,054	19,281	23,342	479	584	202	292	64	78	22	41
Mich.	1,039	17,033	17,340	350	317	378	393	160	200	34	82
Wis.	331	5,192	7,421	171	228	58	92	-	-	30	61
W.N. CENTRAL	1,555	18,077	21,324	1,777	1,146	584	636	109	90	110	102
Minn.	347	2,609	3,321	176	227	63	63	4	17	6	3
Iowa	94	1,475	1,538	75	61	46	26	12	13	21	33
Mo.	713	10,573	11,609	1,217	586	394	484	67	29	53	41
N. Dak.	5	26	37	24	6	4	1	8	1	4	4
S. Dak.	18	207	221	79	37	2	2	1	-	4	1
Nebr.	101	757	1,060	54	121	31	29	6	13	14	14
Kans.	277	2,430	3,538	152	108	44	31	11	17	8	6
S. ATLANTIC	16,629	98,394	101,655	1,267	1,256	1,563	1,955	575	421	169	349
Del.	279	2,122	1,892	8	22	8	14	-	2	2	31
Md.	2,409	9,222	17,388	213	186	250	336	4	20	30	78
D.C.	976	4,548	6,724	21	27	19	52	-	1	5	7
Va.	1,400	9,601	12,771	207	176	107	128	18	25	20	14
W. Va.	116	631	785	24	22	53	45	43	43	4	4
N.C.	951	22,205	26,717	105	139	286	264	60	54	32	27
S.C.	868	11,780	12,296	44	39	49	32	16	10	30	16
Ga.	2,144	18,835	U	54	42	63	543	13	197	14	110
Fla.	7,486	19,450	23,082	591	603	728	541	421	69	32	62
E.S. CENTRAL	2,093	38,989	44,054	1,789	653	776	1,141	873	900	44	82
Ky.	267	4,631	4,897	41	162	65	75	23	30	10	9
Tenn.	843	13,086	14,637	1,458	295	607	982	848	852	24	44
Ala.	562	15,593	13,868	81	122	104	84	2	18	7	13
Miss.	421	5,679	10,652	209	74	-	-	-	-	3	16
W.S. CENTRAL	5,626	34,062	46,564	4,492	2,980	1,431	1,238	189	309	20	42
Ark.	243	4,655	6,270	607	187	75	32	5	7	3	8
La.	972	10,055	11,367	140	147	208	160	-	177	3	13
Okla.	256	4,955	4,497	1,172	358	205	128	74	56	6	11
Tex.	4,155	14,397	24,430	2,573	2,288	943	918	110	69	8	10
MOUNTAIN	2,071	7,631	9,629	3,914	4,852	768	633	332	428	107	93
Mont.	22	65	84	164	24	23	20	13	13	4	16
Idaho	43	134	85	338	357	95	72	-	67	2	2
Wyo.	15	49	84	101	29	26	23	148	161	12	5
Colo.	631	2,651	3,384	492	555	130	92	54	75	38	19
N. Mex.	155	945	1,027	760	1,054	276	202	42	45	4	4
Ariz.	635	2,868	3,080	1,213	1,992	103	87	46	30	12	16
Utah	143	131	297	645	610	77	81	12	18	17	7
Nev.	427	788	1,588	201	231	38	56	17	19	18	24
PACIFIC	12,004	25,331	30,822	9,181	8,393	1,916	2,300	715	822	125	69
Wash.	855	2,381	2,717	788	1,020	185	224	206	256	21	12
Oreg.	426	364	958	2,138	1,070	108	144	31	41	-	-
Calif.	10,441	21,132	25,628	6,050	6,042	1,583	1,892	473	520	99	53
Alaska	62	645	862	54	205	11	13	3	-	-	-
Hawaii	220	809	657	151	56	29	27	2	5	5	4
Guam	-	77	127	6	23	1	4	-	-	1	1
P.R.	2,189	550	463	89	81	489	377	18	188	-	-
V.I.	30	6	41	-	3	2	8	-	1	-	-
Amer. Samoa	-	35	31	6	9	-	-	-	-	-	-
C.N.M.I.	-	42	46	18	12	13	1	-	-	-	-

N: Not notifiable U: Unavailable -: no reported cases C.N.M.I.: Commonwealth of Northern Mariana Islands

*Updated monthly to the Division of HIV/AIDS Prevention, National Center for Prevention Services, last update November 30, 1995.

TABLE II. (Cont'd.) Cases of selected notifiable diseases, United States, weeks ending December 9, 1995, and December 10, 1994 (49th Week)

Reporting Area	Lyme Disease		Malaria		Measles (Rubeola) Indigenous		Measles (Rubeola) Imported*		Measles (Rubeola) Total		Meningococcal Infections		Mumps	
	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994	1995	Cum. 1995	1995	Cum. 1995	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994
UNITED STATES	8,857	11,987	1,194	1,043	-	261	-	26	287	889	2,743	2,548	780	1,350
NEW ENGLAND	2,003	2,712	47	71	-	8	-	2	10	27	132	123	11	25
Maine	34	27	7	6	-	-	-	-	-	5	11	22	4	3
N.H.	26	30	2	3	-	-	-	-	-	1	23	8	1	4
Vt.	9	16	1	3	-	-	-	-	-	3	11	4	-	-
Mass.	191	202	18	33	-	2	-	1	3	7	43	57	2	3
R.I.	285	471	4	9	-	5	-	-	5	7	-	-	1	3
Conn.	1,458	1,966	15	17	-	1	-	1	2	4	44	32	3	12
MID. ATLANTIC	5,681	7,413	334	226	-	7	-	5	12	223	307	276	112	110
Upstate N.Y.	2,810	4,564	64	54	-	1	-	-	1	26	98	90	25	31
N.Y. City	229	28	181	86	-	2	-	3	5	15	45	32	16	10
N.J.	1,366	1,483	64	50	-	4	-	2	6	173	76	56	17	13
Pa.	1,276	1,338	25	36	-	-	-	-	-	9	88	98	54	56
E.N. CENTRAL	87	524	132	101	-	13	-	4	17	102	368	369	169	245
Ohio	52	44	12	15	-	1	-	1	2	17	110	108	51	71
Ind.	20	18	17	13	-	-	-	-	-	1	51	50	10	7
Ill.	10	23	63	42	-	4	-	2	6	56	92	117	47	106
Mich.	5	31	26	28	-	6	-	1	7	25	70	57	61	47
Wis.	-	408	14	3	-	2	-	-	2	3	45	37	-	14
W.N. CENTRAL	271	283	26	45	-	2	-	-	2	170	186	164	48	67
Minn.	191	150	6	14	-	-	-	-	-	-	27	20	8	4
Iowa	15	16	2	5	-	-	-	-	-	7	30	20	10	16
Mo.	40	100	8	13	-	1	-	-	1	160	77	75	24	42
N. Dak.	-	-	2	1	-	-	-	-	-	-	2	1	1	4
S. Dak.	-	-	2	-	-	-	-	-	-	-	9	9	-	-
Nebr.	3	3	3	5	-	-	-	-	-	2	16	13	4	1
Kans.	22	14	3	7	-	1	-	-	1	1	25	26	1	-
S. ATLANTIC	524	792	234	222	-	11	-	1	12	73	511	373	98	196
Del.	23	105	1	3	-	-	-	-	-	-	6	5	-	-
Md.	291	299	61	80	-	-	-	1	1	4	35	35	20	63
D.C.	2	9	16	14	-	-	-	-	-	-	7	6	-	-
Va.	53	128	54	37	-	-	-	-	-	3	61	66	25	42
W. Va.	23	27	4	-	-	-	-	-	-	37	9	14	-	3
N.C.	83	77	17	11	-	-	-	-	-	3	82	51	16	36
S.C.	17	7	3	5	-	-	-	-	-	-	57	31	11	8
Ga.	14	120	37	34	-	2	-	-	2	4	106	76	10	9
Fla.	18	20	41	38	-	9	-	-	9	22	148	89	16	35
E.S. CENTRAL	55	43	26	31	-	-	-	-	-	28	175	183	21	29
Ky.	10	24	3	11	-	-	-	-	-	-	56	37	-	-
Tenn.	28	13	10	10	-	-	-	-	-	28	42	36	5	8
Ala.	10	6	10	9	-	-	-	-	-	-	42	74	4	12
Miss.	7	-	3	1	-	-	-	-	-	-	35	36	12	9
W.S. CENTRAL	112	126	48	62	-	31	-	3	34	19	335	315	53	238
Ark.	10	8	2	3	-	2	-	-	2	1	31	44	10	6
La.	7	2	5	9	-	17	-	1	18	1	50	40	13	32
Okla.	48	73	1	7	-	-	-	-	-	-	41	33	-	23
Tex.	47	43	40	43	-	12	-	2	14	17	213	198	30	177
MOUNTAIN	12	18	61	36	-	68	-	2	70	166	188	169	26	158
Mont.	-	-	3	-	-	-	-	-	-	-	4	6	1	-
Idaho	-	3	1	2	-	1	-	1	2	1	11	17	4	10
Wyo.	3	5	-	1	-	-	-	-	-	-	8	9	-	3
Colo.	1	1	26	16	-	26	-	-	26	20	45	37	2	4
N. Mex.	1	5	8	3	-	30	-	1	31	-	36	15	N	N
Ariz.	1	-	13	8	-	10	-	-	10	2	58	56	2	99
Utah	1	3	6	4	-	-	-	-	-	134	17	19	11	27
Nev.	5	1	4	2	-	1	-	-	1	9	9	10	6	15
PACIFIC	112	76	286	249	-	121	-	9	130	81	541	576	242	282
Wash.	10	4	21	30	-	16	-	4	20	4	90	89	15	19
Oreg.	14	6	21	16	-	-	-	1	1	2	101	131	N	N
Calif.	88	66	230	187	-	105	-	3	108	61	333	346	201	241
Alaska	-	-	4	2	-	-	-	-	-	10	13	3	13	4
Hawaii	-	-	10	14	-	-	-	1	1	4	4	7	13	18
Guam	-	-	-	-	U	-	U	-	-	228	3	-	4	7
P.R.	-	-	1	5	-	11	-	-	11	11	23	7	2	2
V.I.	-	-	-	-	U	-	U	-	-	-	-	-	2	4
Amer. Samoa	-	-	-	-	-	-	-	-	-	-	-	-	-	3
C.N.M.I.	-	-	1	1	U	-	U	-	-	29	-	-	-	2

*For imported measles, cases include only those resulting from importation from other countries.

N: Not notifiable U: Unavailable -: no reported cases

TABLE II. (Cont'd.) Cases of selected notifiable diseases, United States, weeks ending December 9, 1995, and December 10, 1994 (49th Week)

Reporting Area	Pertussis			Rubella			Syphilis (Primary & Secondary)		Tuberculosis		Rabies, Animal	
	1995	Cum. 1995	Cum. 1994	1995	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994
UNITED STATES	68	3,966	4,018	-	140	216	14,283	19,731	18,894	20,913	6,426	7,314
NEW ENGLAND	2	556	621	-	49	131	245	209	489	490	1,426	1,789
Maine	1	47	18	-	1	-	2	4	24	27	45	-
N.H.	1	54	88	-	1	-	1	4	18	14	148	199
Vt.	-	65	46	-	-	-	-	-	4	8	171	140
Mass.	-	359	423	-	7	125	65	88	265	258	395	695
R.I.	-	4	7	-	-	3	4	15	46	44	315	40
Conn.	-	27	39	-	40	3	173	98	132	139	352	715
MID. ATLANTIC	20	387	614	-	13	7	800	1,318	3,794	4,280	1,213	1,969
Upstate N.Y.	17	219	229	-	4	6	43	162	491	574	480	1,467
N.Y. City	-	40	176	-	8	-	368	569	1,974	2,460	-	-
N.J.	-	15	15	-	1	1	163	221	742	759	319	266
Pa.	3	113	194	-	-	-	226	366	587	487	414	236
E.N. CENTRAL	17	481	560	-	5	9	2,401	2,928	1,777	1,973	91	67
Ohio	5	158	150	-	-	-	848	1,105	259	318	12	4
Ind.	-	73	67	-	1	-	271	244	171	177	13	13
Ill.	12	128	104	-	1	1	834	1,020	911	994	15	21
Mich.	-	110	93	-	3	8	288	278	370	430	40	14
Wis.	-	12	146	-	-	-	160	281	70	54	11	15
W.N. CENTRAL	-	248	203	-	1	2	685	1,120	534	542	338	217
Minn.	-	127	87	-	-	-	37	45	124	123	24	19
Iowa	-	12	21	-	-	-	44	67	57	58	119	84
Mo.	-	54	42	-	-	2	567	942	217	232	23	27
N. Dak.	-	8	5	-	-	-	-	1	5	9	28	13
S. Dak.	-	12	24	-	-	-	-	2	22	25	96	39
Nebr.	-	12	11	-	-	-	11	11	21	19	5	-
Kans.	-	23	13	-	1	-	26	52	88	76	43	35
S. ATLANTIC	2	322	398	-	25	16	3,536	5,125	3,132	3,621	2,012	1,922
Del.	-	10	3	-	-	-	17	25	49	40	88	68
Md.	2	40	70	-	-	-	207	307	282	320	300	502
D.C.	-	6	10	-	-	-	100	203	98	104	11	3
Va.	-	31	36	-	-	-	550	772	283	292	433	412
W. Va.	-	-	5	-	-	-	10	9	68	76	112	74
N.C.	-	110	140	-	1	-	1,070	1,566	433	484	443	163
S.C.	-	27	14	-	1	-	554	762	301	366	119	172
Ga.	-	30	30	-	-	2	664	774	319	659	268	352
Fla.	-	68	90	-	23	14	364	707	1,299	1,280	238	176
E.S. CENTRAL	-	270	128	-	2	-	3,513	3,745	1,478	1,504	276	216
Ky.	-	24	60	-	-	-	195	200	292	302	28	26
Tenn.	-	207	22	-	1	-	868	985	372	519	92	71
Ala.	-	36	34	-	-	-	624	626	389	413	147	115
Miss.	-	3	12	N	N	N	1,826	1,934	425	270	9	4
W.S. CENTRAL	-	279	188	-	8	13	2,320	4,188	2,791	2,845	574	650
Ark.	-	41	28	-	1	-	466	452	304	243	50	36
La.	-	17	12	-	-	-	971	1,599	111	193	45	69
Okla.	-	30	27	-	-	4	182	148	330	224	29	37
Tex.	-	191	121	-	7	9	701	1,989	2,046	2,185	450	508
MOUNTAIN	10	542	504	-	5	5	202	230	593	555	162	148
Mont.	-	9	11	-	-	-	4	3	10	9	43	22
Idaho	2	101	87	-	-	-	-	2	14	11	3	3
Wyo.	-	1	-	-	1	-	1	2	4	8	25	19
Colo.	-	103	221	-	-	-	98	116	66	92	9	18
N. Mex.	5	144	32	-	-	-	31	21	72	66	6	8
Ariz.	2	151	115	-	3	-	35	45	300	212	50	56
Utah	1	28	35	-	1	4	4	11	37	51	15	13
Nev.	-	5	3	-	-	1	29	30	90	106	11	9
PACIFIC	17	881	802	-	32	33	581	868	4,306	5,103	334	336
Wash.	13	334	106	-	2	-	15	32	231	244	7	15
Oreg.	-	59	104	-	2	4	9	35	66	90	-	13
Calif.	4	429	573	-	24	25	556	794	3,769	4,459	323	275
Alaska	-	1	-	-	-	-	1	3	72	85	4	33
Hawaii	-	58	19	-	4	4	-	4	168	225	-	-
Guam	U	1	2	U	-	1	8	3	53	75	-	-
P.R.	-	15	3	-	-	-	289	298	195	189	47	74
V.I.	U	-	-	U	-	-	2	28	-	-	-	-
Amer. Samoa	-	-	1	-	-	-	-	1	5	4	-	-
C.N.M.I.	U	-	-	U	-	-	12	2	16	30	-	-

U: Unavailable -: no reported cases

TABLE III. Deaths in 121 U.S. cities,* week ending December 9, 1995 (49th Week)

Reporting Area	All Causes, By Age (Years)						P&I[†] Total
	All Ages	≥65	45-64	25-44	1-24	<1	
NEW ENGLAND	544	397	82	50	7	8	52
Boston, Mass.	144	103	18	17	3	3	14
Bridgeport, Conn.	38	23	12	1	1	1	1
Cambridge, Mass.	15	10	3	2	-	-	4
Fall River, Mass.	25	21	3	1	-	-	3
Hartford, Conn.	52	31	12	8	1	-	-
Lowell, Mass.	30	27	2	1	-	-	2
Lynn, Mass.	28	25	1	2	-	-	-
New Bedford, Mass.	25	19	4	2	-	-	3
New Haven, Conn.	48	38	3	4	2	1	5
Providence, R.I.	U	U	U	U	U	U	U
Somerville, Mass.	4	3	-	1	-	-	1
Springfield, Mass.	43	31	9	2	-	1	7
Waterbury, Conn.	34	26	3	5	-	-	2
Worcester, Mass.	58	40	12	4	-	2	10
MID. ATLANTIC	2,625	1,783	464	273	49	56	128
Albany, N.Y.	42	31	8	2	-	1	2
Allentown, Pa.	20	18	1	1	-	-	-
Buffalo, N.Y.	U	U	U	U	U	U	U
Camden, N.J.	50	36	7	-	3	4	3
Elizabeth, N.J.	33	22	9	2	-	-	1
Erie, Pa.[§]	38	31	6	1	-	-	1
Jersey City, N.J.	59	37	11	9	1	1	4
New York City, N.Y.	1,495	986	283	174	30	22	57
Newark, N.J.	78	35	16	22	2	3	14
Paterson, N.J.	29	15	6	3	-	5	1
Philadelphia, Pa.	400	268	65	50	8	9	22
Pittsburgh, Pa.[§]	39	30	8	-	1	-	5
Reading, Pa.	12	9	2	-	1	-	2
Rochester, N.Y.	135	112	12	6	2	3	11
Schenectady, N.Y.	24	21	2	1	-	-	-
Scranton, Pa.[§]	24	21	2	1	-	-	-
Syracuse, N.Y.	81	67	12	-	-	2	5
Trenton, N.J.	43	26	10	-	1	6	-
Utica, N.Y.	23	18	4	1	-	-	-
Yonkers, N.Y.	U	U	U	U	U	U	U
E.N. CENTRAL	2,005	1,389	361	166	43	44	126
Akron, Ohio	51	40	6	3	2	-	-
Canton, Ohio	48	37	6	4	-	1	2
Chicago, Ill.	396	250	74	48	15	7	37
Cincinnati, Ohio	86	57	17	7	1	4	8
Cleveland, Ohio	165	106	28	20	4	7	-
Columbus, Ohio	147	103	30	6	2	6	16
Dayton, Ohio	138	95	31	6	3	3	10
Detroit, Mich.	254	148	64	29	6	7	5
Evansville, Ind.	49	40	8	-	-	1	2
Fort Wayne, Ind.	53	42	8	3	-	-	2
Gary, Ind.	19	11	4	2	-	2	-
Grand Rapids, Mich.	64	48	9	7	-	-	5
Indianapolis, Ind.	U	U	U	U	U	U	U
Madison, Wis.	51	39	10	2	-	-	4
Milwaukee, Wis.	163	123	24	10	3	3	14
Peoria, Ill.	58	46	10	-	1	1	5
Rockford, Ill.	56	40	7	8	1	-	8
South Bend, Ind.	37	30	3	3	1	-	-
Toledo, Ohio	87	63	12	6	4	2	5
Youngstown, Ohio	83	71	10	2	-	-	3
W.N. CENTRAL	829	606	128	47	22	11	41
Des Moines, Iowa	61	47	7	6	1	-	6
Duluth, Minn.	20	15	3	2	-	-	1
Kansas City, Kans.	35	23	6	3	2	1	3
Kansas City, Mo.	141	93	23	5	4	1	7
Lincoln, Nebr.	33	28	4	1	-	-	1
Minneapolis, Minn.	161	117	27	10	4	3	8
Omaha, Nebr.	108	81	15	7	5	-	6
St. Louis, Mo.	119	83	22	5	4	5	9
St. Paul, Minn.	72	58	11	2	1	-	-
Wichita, Kans.	79	61	10	6	1	1	-
S. ATLANTIC	1,289	829	235	148	46	31	72
Atlanta, Ga.	209	129	46	23	9	2	5
Baltimore, Md.	222	129	41	41	8	3	17
Charlotte, N.C.	90	65	13	6	1	5	11
Jacksonville, Fla.	139	95	22	16	5	1	8
Miami, Fla.	97	55	22	15	5	-	-
Norfolk, Va.	68	49	9	5	1	4	3
Richmond, Va.	83	49	19	9	4	2	3
Savannah, Ga.	35	29	3	2	-	1	1
St. Petersburg, Fla.	69	54	5	3	1	6	3
Tampa, Fla.	174	127	26	12	5	4	17
Washington, D.C.	98	48	26	14	7	3	4
Wilmington, Del.	5	-	3	2	-	-	-
E.S. CENTRAL	570	364	121	48	18	16	27
Birmingham, Ala.	150	90	31	13	9	4	4
Chattanooga, Tenn.	83	54	17	7	3	2	5
Knoxville, Tenn.	46	31	14	1	-	-	5
Lexington, Ky.	57	32	16	6	-	3	2
Memphis, Tenn.	U	U	U	U	U	U	U
Mobile, Ala.	44	23	7	9	4	1	1
Montgomery, Ala.	54	37	12	3	1	1	1
Nashville, Tenn.	136	97	24	9	1	5	9
W.S. CENTRAL	1,526	932	314	184	54	42	94
Austin, Tex.	77	50	16	8	1	2	8
Baton Rouge, La.	47	31	5	6	2	3	-
Corpus Christi, Tex.	55	38	11	3	-	3	2
Dallas, Tex.	197	107	43	35	8	4	7
El Paso, Tex.	72	50	10	6	2	4	5
Ft. Worth, Tex.	124	77	25	10	6	6	7
Houston, Tex.	440	243	93	76	19	9	28
Little Rock, Ark.	57	37	13	3	2	2	8
New Orleans, La.	119	65	29	15	6	4	-
San Antonio, Tex.	215	141	47	18	6	3	18
Shreveport, La.	9	8	1	-	-	-	1
Tulsa, Okla.	114	85	21	4	2	2	10
MOUNTAIN	945	604	182	111	33	14	69
Albuquerque, N.M.	106	61	20	18	7	-	6
Colo. Springs, Colo.	56	39	7	9	1	-	2
Denver, Colo.	108	72	16	15	5	-	8
Las Vegas, Nev.	228	139	59	23	4	2	17
Ogden, Utah	19	15	3	-	-	1	1
Phoenix, Ariz.	171	106	33	19	4	9	16
Pueblo, Colo.	14	10	2	1	1	-	-
Salt Lake City, Utah	110	72	12	15	9	2	10
Tucson, Ariz.	133	90	30	11	2	-	9
PACIFIC	1,350	923	243	130	21	33	109
Berkeley, Calif.	30	22	4	3	-	1	2
Fresno, Calif.	91	64	20	4	2	1	14
Glendale, Calif.	U	U	U	U	U	U	U
Honolulu, Hawaii	70	50	15	3	1	1	7
Long Beach, Calif.	95	65	19	5	4	2	8
Los Angeles, Calif.	U	U	U	U	U	U	U
Pasadena, Calif.	37	28	6	3	-	-	2
Portland, Oreg.	146	105	30	7	-	4	8
Sacramento, Calif.	U	U	U	U	U	U	U
San Diego, Calif.	190	131	29	21	-	9	24
San Francisco, Calif.	154	83	32	35	3	1	5
San Jose, Calif.	190	142	30	11	2	5	10
Santa Cruz, Calif.	40	29	7	3	1	-	9
Seattle, Wash.	152	92	31	22	4	3	5
Spokane, Wash.	69	47	8	8	3	3	8
Tacoma, Wash.	86	65	12	5	1	3	7
TOTAL	11,683[¶]	7,827	2,130	1,157	293	255	718

*Mortality data in this table are voluntarily reported from 121 cities in the United States, most of which have populations of 100,000 or more. A death is reported by the place of its occurrence and by the week that the death certificate was filed. Fetal deaths are not included.
[†]Pneumonia and influenza.
[§]Because of changes in reporting methods in these 3 Pennsylvania cities, these numbers are partial counts for the current week. Complete counts will be available in 4 to 6 weeks.
[¶]Total includes unknown ages.
U: Unavailable -: no reported cases

Lead Toxicity — Continued

Editorial Note: An estimated 90,000 bridges in the United States are coated with lead-based paints (*4*), which become a hazard to workers when these structures are refurbished or demolished. High exposures to lead among bridge workers were first documented in 1982 (*5*), and in 1992, personal exposures of a cohort of bridge workers to airborne lead ranged from 3690 $\mu g/m^3$ to 29,400 $\mu g/m^3$ for abrasive blasters and from 5 $\mu g/m^3$ to 6720 $\mu g/m^3$ for workers in other job categories (*6*). Despite such high exposures, bridge workers have typically accounted for only a small proportion of workers with elevated BLLs who are reported to lead registries, probably reflecting both a lack of medical monitoring of this worker population and underreporting of elevated results (*7*). In contrast, in Massachusetts, where blood lead monitoring has been required for workers involved in lead paint removal and structural painting since 1990, bridge painters have accounted for approximately one third of workers with BLLs ≥60 µg/dL and for whom specific industry/occupation information was available (*8*).

CRISP was initiated in 1990 to reduce lead exposure and toxicity in Connecticut bridge workers through the incorporation of worker protection measures into road construction contracts. During 1991–1994, mean BLLs among painters/blasters in Connecticut declined from 41.8 µg/dL to 16.6 µg/dL (*1*). However, in May 1993, OSHA promulgated the Interim Final Standard for Lead in Construction (*3*), which lowered the permissible lead exposure limit in the construction industry from 200 $\mu g/m^3$ to 50 $\mu g/m^3$ and implemented requirements for exposure assessment, respiratory protection, protective clothing and equipment, hygiene facilities and practices, medical surveillance, medical-removal protection, employee training, signs, and record keeping. Because of the overlap in the periods of implementation of CRISP and the OSHA Interim Standard, the independent effects of these interventions in reducing BLLs among Connecticut bridge workers cannot be determined.

The findings in this report indicate that, in other states, lead exposure and elevated BLLs are problems among bridge workers that persist despite the regulatory requirements of the OSHA standard. In contrast to the elevated BLLs observed among these workers, only a small proportion of the 949 Connecticut bridge workers monitored by CRISP during the same period had elevated BLLs (Table 1). The mean of the most recent BLL in Connecticut bridge workers monitored by CRISP during

TABLE 1. Blood lead levels (BLLs) in bridge workers monitored by a primary-care physician and the Connecticut Road Industry Surveillance Project (CRISP), March–December, 1994

BLL	Primary-care physician's database*		CRISP data	
(µg/dL)	No.	(%)	No.	(%)
<20	133	(36)	775	(82)
20–29	80	(21)	109	(11)
30–39	70	(19)	48	(5)
40–49	55	(15)	12	(1)
≥50	35	(9)	5	(1)
Total	**373**	**(100)**	**949**	**(100)**

*Worker population obtained from Arkansas, Florida, Georgia, Kentucky, New Jersey, New York, Ohio, and Tennessee.

Lead Toxicity — Continued

March–December 1994 was 11.7 µg/dL (standard deviation: 9.5 µg/dL; range: <5–56 µg/dL), less than half the mean[§] among the group of bridge workers in this report.

Data from CRISP differ from the data in this report because CRISP data are comprehensive and represent nearly all lead-exposed bridge workers in Connecticut, while the data in this report are not comprehensive, were not collected according to a specific sampling scheme, and may not be representative of all bridge workers in the eight states from which the specimens were obtained or generalizable to bridge workers in other states. Despite this limitation, the substantially lower proportion of workers with elevated BLLs—and generally lower BLLs—in the CRISP program suggests that a strategy like CRISP, which uses contract health and safety language that requires medical management with centralized data reporting and intervention, is independently effective in lowering BLLs. NIOSH and CRISP have initiated efforts to adapt the CRISP approach for implementation in other states.

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[§]The limit of detection for lead for BLLs obtained from the group of bridge workers in this report (2 µg/dL) was lower than that for workers monitored by CRISP (5 µg/dL). If the CRISP limit of detection had applied to BLLs obtained from the bridge workers in this report, their mean BLL would have changed only from 27.2 µg/dL to 27.3 µg/dL.

Work-Related Injuries Associated with Falls During Ice Storms — National Institutes of Health, January 1994

Although some environmental cold-related occupational health problems have been described previously (e.g., hypothermia and related thermal conditions) (*1*), the risks associated with pedestrian injuries related to surface ice are not well characterized. During January 18–31, 1994, freezing rain and record cold temperatures created icy conditions in the Washington, D.C., area that were sufficiently severe to prompt early or complete closure of the operations of the National Institutes of Health (NIH) and many other public- and private-sector organizations. During this period, the Occupational Medical Service (OMS) of NIH and a local hospital that provides most initial care for workplace-related problems among NIH employees noted a substantial increase in fall-related injuries. This report summarizes an analysis of OMS data regarding these injuries during January 18–31, 1994.

Falls During Ice Storms — Continued

OMS logs were reviewed for work-related acute musculoskeletal injuries sustained by NIH employees (total estimated: 18,000) during January 18–31. Additional details about diagnosis and disposition were obtained for each case from clinical charts and workers' compensation claims files. In June 1994, all injured employees were contacted by telephone to assess 1) the presence of persisting symptoms and/or need for ongoing medical care, and 2) lost work time attributable to the injury. For those unavailable by telephone, an attempt was made to obtain this information from clinical and compensation files.

During the 2-week period, OMS recorded 53 NIH employees with acute musculoskeletal injuries. Of these, 22 (42%) injuries were bruises and contusions; 24 (45%), strains or sprains; and seven (13%), fractures. When calculated as quarterly rates and compared with the first quarter of 1993, the type-specific rates during 1994 increased fourfold, 15-fold, and fivefold, respectively. Of the 53 injuries, 39 (74%) resulted from falls on ice on NIH campuses, including all seven fractures (four coccygeal and three upper extremity), 15 (63%) strain/sprains, and 17 (77%) bruises/contusions. Based on follow-up contact in June 1994, 12 (38%) of the 32 who had fallen on the ice and for whom current information could be obtained continued to have symptoms and to receive treatment. Based on referrals for outside medical care, bills paid, and work time lost, the overall direct cost attributable to the ice-related injuries among NIH employees was estimated to be $20,000.

Reported by: LG Stansbury, MD, AA Swinson, MD, JM Schmitt, MD, MB Stevens, KR Kobayashi, CP Vangellow, Occupational Medical Svc; D Lampkins, Grounds and Maintenance, National Institutes of Health. Div of Safety Research, National Institute for Occupational Safety and Health, CDC.

Editorial Note: The substantial increase in outdoor ice-related falls among NIH employees is consistent with reports for communities characterized by consistently severe winters or by only occasionally severe winter weather (*2,3*). However, because the comparison period in this report included a major blizzard (March 1993), the increased rates of fall-related injury during early 1994 highlighted the risks especially associated with icy conditions (*4,5*).

Although icy conditions persisted in the Washington, D.C., area during February 1994, the number of outdoor fall-related injuries on NIH campuses declined to predicted levels, probably reflecting the availability and spreading of dry sand by NIH grounds and maintenance staff and the clearing to dry pavement of outdoor parking areas and major walkways. In addition, coverage by local news media promoted awareness of the needs for appropriate foot-gear and avoiding unsanded or otherwise unmaintained areas. Prompt implementation of such measures during future icy conditions should reduce the occurrence of fall-related injuries.

An NIH requirement that information about occupational injuries sustained by NIH employees be recorded enabled the assessment of the incidence, severity, and estimated costs of the ice-related injuries described in this report. The establishment and maintenance of such occupational injury surveillance systems by employers permits assessment of the need for and effectiveness of injury intervention strategies.

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Falls During Ice Storms — Continued

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Poverty and Infant Mortality — United States, 1988

Although previous reports have documented that rates of low birthweight and intrauterine growth retardation are higher among infants of women living in poverty (*1*), the infant mortality risk among infants born to women with low incomes has not been characterized recently. To analyze the relation between parental low income and infant mortality, CDC analyzed data from the 1988 National Maternal and Infant Health Survey (NMIHS) (the most recent data available). This report presents the findings of the analysis and indicates that for women with household incomes below the poverty level* in 1988, the infant mortality rate was 60% higher and the postneonatal mortality rate was twice as high as those for women living above poverty level.

NMIHS was a national population-based survey that collected data about pregnancy outcomes from vital records and questionnaires administered by mail and telephone. The survey had two stratified systematic samples: 13,417 women who had had a live-born infant in 1988 and 8166 women whose infant had died within 1 year after birth (*2*). Of the mothers in the live-born infant sample and the infant death sample, 9953 (74%) and 5332 (65%), respectively, participated in the survey. Data on household income and household size from the NMIHS maternal questionnaire were used to classify women as living below or above the U.S. poverty threshold (in 1988: $12,092 for a family of four) (*3*). Because previous studies consistently demonstrated relatively high risks for adverse pregnancy outcomes among blacks, black infants were oversampled in NMIHS to allow for more detailed analysis of this group (*4*). Data are presented only for blacks and whites because numbers for other racial/ethnic groups were too small for meaningful analysis.

An infant death was defined as the death of a live-born infant before his or her first birthday; a neonatal death, as the death of a live-born infant <28 days after birth; and a postneonatal death, as the death of a live-born infant 28–364 days after birth (*4*). Data were statistically weighted to reflect the number of live births and infant deaths in the United States in 1988, and mortality rates were computed as estimates of the number of deaths per 1000 live births. Risk ratios were calculated by dividing the mortality rate for infants born to women living below the poverty threshold by the mortality rate for infants born to women living above the poverty threshold. Confidence intervals (CIs) for the risk ratios were computed using SUDAAN (*5*). Mortality rates and risk ratios for the relation of income to mortality were calculated for six

*Poverty statistics are based on a definition originated by the Social Security Administration in 1964, subsequently modified by federal interagency committees in 1969 and 1980, and prescribed by the Office of Management and Budget as the standard to be used by federal agencies for statistical purposes.

Poverty and Infant Mortality — Continued

sociodemographic and behavioral variables that consistently have been associated with both poverty and infant mortality (*4*): marital status, maternal age, cigarette smoking during pregnancy, timing of the first prenatal-care visit, maternal educational attainment, and race of the mother.

Based on NMIHS, overall, 20.1% of the women who delivered live-born infants in 1988 reported a household income below the poverty level (Table 1). However, the percentage of women living below poverty level varied substantially in relation to specific risk characteristics (e.g., 6.8% of mothers with >12 years of education compared with 45.8% of those with ≤11 years). Overall, 13.9% of mothers did not report information about household income.

In the total 1988 NMIHS birth population, the overall estimated infant mortality rate was 10.0 per 1000 live-born infants. However, the rate varied by poverty level and was 8.3 for infants of women with incomes above poverty level and 13.5 for women with incomes below poverty level (risk ratio [RR]=1.6 [95% CI=1.5–1.8]) (Table 2). The overall association between poverty and infant mortality was stronger for postneonatal deaths (RR=2.0 [95% CI=1.8–2.3]) than for neonatal deaths (RR=1.4 [95% CI=1.3–1.6]).

Compared with the rates for infants of mothers living above poverty level, the rates for infants of mothers living below poverty level were consistently higher among women who were married, aged ≥18 years, received prenatal care during the first trimester of pregnancy, had ≥12 years of education, and were either smokers or nonsmokers (Table 2). There was no relation between poverty and mortality rates for infants born to mothers aged ≤17 years or mothers who did not receive prenatal care during the first trimester of pregnancy. The association between poverty and infant mortality was stronger for infants born to white women (RR=1.5 [95% CI=1.3–1.7]) than for those born to black women (RR=1.1 [95% CI=1.0–1.3]). For blacks, while neonatal death rates were similar for infants born to women living above or below poverty level (RR=0.9 [95% CI=0.8–1.1]), postneonatal death rates were higher for infants of women living below poverty level (RR=1.6 [95% CI=1.4–1.9]).

Reported by: Infant and Child Health Studies Br, Div of Health and Utilization Analysis, National Center for Health Statistics, CDC.

Editorial Note: An association between poverty and risk for increased infant mortality in the United States was first noted in the early 1900s (*5*). However, information about income has not been routinely available on U.S. birth or death certificates, and estimates of the excess risk for death among infants born to women living in poverty can be derived primarily from special surveys such as the NMIHS (*1,5*).

The findings in this analysis of NMIHS indicate that, for infants born to women living in poverty in the United States in 1988, overall excess mortality risk was approximately 60% compared with infants born to women living above the poverty level. Although higher proportions of women living below poverty level than above were in high-risk groups (i.e., unmarried, adolescent, smokers, black, or had had late or no prenatal care), the higher risk for death among infants born to women living below the poverty level was not associated with these maternal characteristics. Instead, the effect of poverty was stronger for infants born to women who were otherwise at low absolute risk for infant mortality (i.e., women who were married, aged ≥18 years, nonsmokers, white, had had early prenatal care, or with ≥12 years of education). One possible explanation for this is that mortality rates for infants born to high-risk women

Poverty and Infant Mortality — Continued

TABLE 1. Percentage distribution of infants born to women above and below the poverty level*, by selected maternal characteristics — National Maternal and Infant Health Survey, United States, 1988†

		Household income					
	No. live-born infants	Below poverty level		Above poverty level		Not reported	
Maternal characteristic	(n=9953)	%	(SE§)	%	(SE)	%	(SE)
Marital status							
Married	5869	12.9	(0.5)	76.5	(0.7)	10.6	(0.5)
Unmarried	4084	41.0	(1.3)	35.5	(1.3)	23.5	(1.1)
Age (yrs)							
≤17	679	42.3	(3.2)	29.7	(3.1)	28.0	(2.8)
≥18	9274	19.0	(0.5)	67.8	(0.6)	13.2	(0.5)
Cigarette smoking during pregnancy							
Yes	2997	26.3	(1.1)	59.1	(1.3)	14.6	(0.9)
No	6956	17.4	(0.6)	69.0	(0.7)	13.6	(0.5)
First prenatal-care visit							
1st–3rd month of pregnancy	6903	14.9	(0.5)	72.6	(0.7)	12.5	(0.5)
After 3rd month or none	3050	37.3	(1.3)	44.1	(1.4)	18.6	(1.1)
Education							
≤11 yrs	2454	45.8	(1.5)	32.5	(1.5)	21.7	(1.2)
12 yrs	4098	20.5	(0.8)	65.4	(1.0)	14.1	(0.7)
>12 yrs	3401	6.8	(0.5)	83.4	(0.8)	9.8	(0.7)
Race¶							
White	4703	16.0	(0.6)	71.6	(0.8)	12.4	(0.6)
Black	4960	40.6	(0.8)	37.5	(0.8)	21.9	(0.7)
Total	**9953**	**20.1**	**(0.5)**	**66.0**	**(0.6)**	**13.9**	**(0.5)**

*In 1988, the poverty threshold was $12,092 for a family of four (*3*).
†Most recent year for which data were available.
§Standard error.
¶Numbers for other racial/ethnic groups (n=290) were too small for meaningful analysis.

are already so high—even among those living above poverty level—that poverty has little additional effect.

The NMIHS data also indicate that the relation of poverty to mortality was especially strong for postneonatal death, with approximately a twofold excess risk for postneonatal death among infants of women living in poverty. This finding is consistent with the established concept that environmental factors are more often associated with postneonatal deaths than with neonatal deaths (*4,6–8*).

The findings in this report are subject to at least two limitations. First, the nonresponse rates for mothers among the live-born infant sample and the infant death sample were substantial (26% and 35%, respectively); however, postsampling adjustments were made to account for nonresponse (*2*). Second, because 14% of NMIHS respondents did not report information about household income—and the percentage was even higher for relatively high-risk groups (Table 1)—the relation between

Poverty and Infant Mortality — Continued

poverty and infant mortality may have been biased. Although the direction of this potential bias is unknown, its magnitude is probably relatively small.

A high proportion of the increased risk for death among infants born to women living in poverty reflects an excess of postneonatal deaths, many of which are caused by infectious etiologies or injuries (*7*) and which can be prevented by medical care and public health interventions. Strategies to reduce the excess risk for postneonatal death in low-income families include increasing the availability of health care in medically underserved areas and removing the financial barriers to health care. In addition, improved access to health care should be linked to education and community-oriented programs to inform parents about preventive measures for infections (e.g., rehydration for diarrhea) and injuries (e.g., child restraints and smoke detectors). Identification of infants at high risk for postneonatal death can assist in ensuring that such infants receive adequate health care; this strategy was used to reduce postneonatal death rates in a statewide intervention program in West Virginia, in which high-risk infants were linked with primary-care physicians who provided specified care plans (*9*).

The Public Health Service recently highlighted the need for improved characterization of inequalities in health (*10*), and in September 1994, participants at a conference sponsored by the National Institutes of Health concluded that research efforts should focus on the mechanisms that link social and economic disparities to health (*10*). The findings in this report suggest that planning efforts for maternal and child health programs should include consideration of low income, in addition to other social and behavioral characteristics, such as adolescent childbearing, cigarette smoking during pregnancy, access to prenatal care, low maternal educational attainment, and race/ethnicity.

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TABLE 2. Estimated mortality rate* for infants born to women living above and below poverty level†, by age of infant at death and selected maternal characteristics — National Maternal and Infant Health Survey (NMIHS), United States, 1988§

		Household income			
Age of infant at death/ Maternal characteristic	No. deaths¶ (n=4246)	Below poverty level (n=1677)	Above poverty level (n=2569)	Risk ratio	(95% CI**)
<28 DAYS††					
Mother's marital status					
Married	1680	7.1	5.1	1.4	(1.2–1.6)
Unmarried	1066	8.5	7.5	1.1	(0.9–1.3)
Maternal age (yrs)§§					
≤17	188	9.1	9.0	1.0	(0.6–1.6)
≥18	2553	7.6	5.4	1.4	(1.3–1.6)
Cigarette smoking during pregnancy					
Yes	889	8.5	5.8	1.5	(1.2–1.8)
No	1857	7.3	5.3	1.4	(1.2–1.6)
First prenatal-care visit					
1st–3rd month of pregnancy	1678	6.4	4.6	1.4	(1.2–1.6)
After 3rd month or none	1068	9.6	10.1	0.9	(0.8–1.1)
Mother's education					
≤11 yrs	713	8.3	7.4	1.1	(0.9–1.4)
12 yrs	1077	7.1	5.5	1.3	(1.1–1.5)
>12 yrs	956	8.3	5.1	1.6	(1.3–2.1)
Mother's race¶¶					
White	1413	6.4	4.9	1.3	(1.1–1.5)
Black	1278	10.9	11.6	0.9	(0.8–1.1)
Total	**2746**	**7.8**	**5.5**	**1.4**	**(1.3–1.6)**
28–364 DAYS* **					
Mother's marital status					
Married	888	5.1	2.7	1.9	(1.6–2.3)
Unmarried	609	6.2	3.5	1.8	(1.4–2.2)
Maternal age (yrs)§§					
≤17	126	6.6	4.6	1.4	(0.8–2.4)
≥18	1369	5.5	2.8	2.0	(1.7–2.3)
Cigarette smoking during pregnancy					
Yes	613	7.5	3.6	2.1	(1.7–2.5)
No	884	4.5	2.6	1.8	(1.5–2.1)
First prenatal-care visit					
1st–3rd month of pregnancy	834	4.4	2.3	1.9	(1.6–2.2)
After 3rd month or none	663	7.4	5.5	1.3	(1.1–1.6)
Mother's education					
≤11 yrs	487	6.5	4.6	1.4	(1.1–1.8)
12 yrs	574	5.0	2.8	1.8	(1.5–2.2)
>12 yrs	436	4.8	2.5	1.9	(1.4–2.6)
Mother's race¶¶					
White	809	4.9	2.7	1.8	(1.5–2.2)
Black	641	7.1	4.4	1.6	(1.4–1.9)
Total	**1497**	**5.7**	**2.8**	**2.0**	**(1.8–2.3)**
<1 YEAR					
Mother's marital status					
Married	2571	12.2	7.9	1.6	(1.4–1.8)
Unmarried	1675	14.6	11.0	1.3	(1.1–1.6)
Maternal age (yrs)§§					
≤17	314	15.7	13.7	1.1	(0.8–1.7)
≥18	3925	13.2	8.2	1.6	(1.5–1.8)
Cigarette smoking during pregnancy					
Yes	1502	16.0	9.4	1.7	(1.5–2.0)
No	2744	11.8	7.9	1.5	(1.3–1.7)
First prenatal-care visit					
1st–3rd month of pregnancy	2512	10.8	6.9	1.6	(1.4–1.8)
After 3rd month or none	1734	17.0	15.6	1.1	(0.9–1.3)
Mother's education					
≤11 yrs	1200	14.8	12.0	1.2	(1.0–1.5)
12 yrs	1654	12.1	8.3	1.5	(1.3–1.7)
>12 yrs	1392	13.0	7.5	1.7	(1.4–2.2)
Mother's race¶¶					
White	2224	11.3	7.6	1.5	(1.3–1.7)
Black	1920	17.9	16.0	1.1	(1.0–1.3)
Total†††	**4246**	**13.5**	**8.3**	**1.6**	**(1.5–1.8)**

*Per 1000 live-born infants.
† In 1988, the poverty threshold was $12,092 for a family of four (*3*).
§ The most recent year for which data were available.
¶ Infant deaths for which maternal household income was not reported (n=1086) were excluded from this analysis.
** Confidence interval.
†† Neonatal death.
§§ For seven infants, maternal age at the infant's death was unknown.
¶¶ Numbers for other racial/ethnic groups were too small for meaningful analysis: for infants aged <28 days at death, 55 deaths were excluded from analysis; for those aged 28–364 days at death, 47; and for those aged <1 year at death, 102.
*** Postneonatal death.
††† For three infants, age at death was unknown.

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