



1998 Y-12 Plant Annual Epidemiologic Surveillance Report

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Y-12 Plant

1998 Epidemiologic Surveillance Report

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Y-12 PLANT 1998

At a Glance

This is the first annual epidemiologic surveillance report for the Oak Ridge Y-12 Plant.

About 13 percent of the Y-12 work force reported at least one absence of five or more days in 1998 due to illness or injury.

The most common diagnoses were conditions affecting the muscles and skeleton.

Seven of the 13 possible sentinel health events (possibly work-related but not specifically designated as occupational) identified from absence data were identified as carpal tunnel syndrome. One of the seven cases was also reported as an OSHA-recordable event. There were 10 other OSHA-recordable events involving a diagnosis of carpal tunnel syndrome.

The overall rate of OSHA-recordable events was the same for men and women (5 per 100 workers). The average number of lost or restricted workdays increased with age.

The Security group had the highest rate of OSHA events among women. Nuclear Workers and Laborers and General Workers had the highest rates of OSHA events among men.

Sprains and strains were the most common type of occupational injury reported. They were about equally divided between those affecting the back and those involving other parts of the body among men. Other than injuries, the most common type of OSHA-recordable diagnoses among both men and women were conditions involving the muscles and skeleton.

Laborers and General Workers were at particularly high risk for sprains and strains, compared with other workers.

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Introduction

The U.S. Department of Energy's (DOE) commitment to assuring the health and safety of its workers includes the conduct of epidemiologic surveillance activities that provide an early warning system for health problems among workers. The Epidemiologic Surveillance



Program monitors illnesses and health conditions that result in an absence of five or more consecu-

tive workdays, occupational injuries and illnesses, and disabilities and deaths among current workers.

This report provides a summary of epidemiologic surveillance data collected from the Y-12 Plant from January 1, 1998 through December 31, 1998. The data were collected by a coordinator at Y-12 and submitted to DOE's Epidemiologic Surveillance Data Center, located at Oak Ridge Institute for Science and Education, where quality control procedures and data analyses were carried out. Epidemiologic surveillance begins at Y-12 with this report.

The information presented in this report provides highlights of the data analyses conducted. Additional supporting tables are posted on the Office of Health Programs Web site (<http://www.eh.doe.gov/epi/surv>), or are available by request. The main sections of the report include: work force characteristics; absences due to injury or illness of 5 or more consecutive work-

days; workplace injuries, illnesses, and deaths that were reportable to the Occupational Safety and Health Administration ("OSHA-recordable" events); and disabilities and deaths among current workers.



Note: In the figures and calculations that follow, percentages have been rounded to the nearest whole number.

DOE sites vary by mission, function, job classification, and worker exposures; therefore, comparisons of Y-12 with other DOE sites should be made with caution. In addition, many factors can affect the completeness and accuracy of health information reported at the sites, thereby affecting the observed patterns of illness and injury.



Site Overview

The Y-12 Plant is a DOE facility located in Oak Ridge, Tennessee on 811 acres within the Oak Ridge Reservation. Its 250 buildings contain about seven million square feet of floor space of laboratory, research and development, machining, dismantlement, and storage areas. The site was established in 1943 as part of the Manhattan Project to produce highly enriched uranium and other components for nuclear weapons. Construction of the plant started in February 1943; enriched uranium production started in November of the



same year. Plant construction, however, was not entirely finished until 1945. At its peak during World War II, the plant employed approximately 22,000 workers.

For more than 50 years, Y-12 Plant has been one of the DOE weapons complex's manufacturing facilities. Every weapon in the stockpile has some components manufactured at the Y-12 Plant.

Today, the mission of the Y-12 Plant is to meet the needs of DOE, other agencies, and private industry through:

- Production of complex components and assemblies,
- Safe and secure storage of nuclear materials,
- Dismantlement, disposition, evaluation, and assessment of weapon components,
- Transitioning the plant size to meet DOE needs,
- Transfer of technology to private industry,
- Maintenance of DOE capabilities,
- Support of other national priorities.

The nation's first DOE Defense Programs deployment/user facility was located at the Y-12 Plant, and the plant continues to be the home of eight user centers. Such designation allows easier access to the centers, where manufacturers can conduct their own research using unique machinery available at Y-12.

Y-12 was placed on the National Priorities List under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) in 1989. The CERCLA activities are covered under a 1992 tri-party agreement among the Environmental Protection Agency, DOE, and the Tennessee Department of Environment and Conservation. This tri-party, umbrella agreement established a procedural framework and schedule to investigate and remediate contaminant releases and potential releases at the Oak Ridge Reservation in accordance with CERCLA requirements.

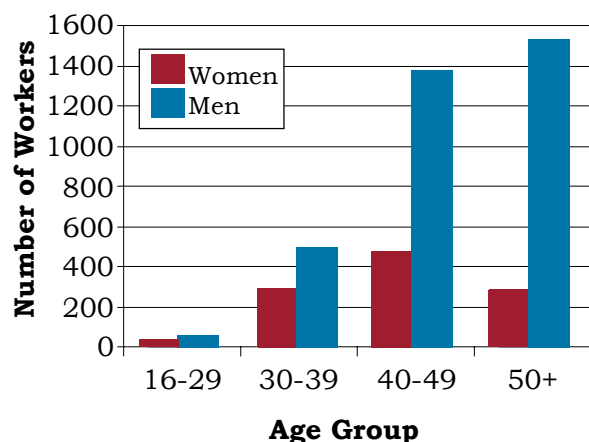
Lockheed Martin Energy Systems, Inc. is the primary managing and operating contractor for the Y-12 Plant.

The Y-12 Plant Work Force - 1998

A total of 4,429 Y-12 employees were included in epidemiologic surveillance in 1998. The gender and age distribution of the 1998 work force is shown in Figure 1. There were 1,021 (23 percent) women and 3,408 (77 percent) men in the work force. The average age of male Y-12 workers was 48 years and 44 years for females.



Figure 1. The Work Force by Gender and Age



The distribution of workers by job category and gender is shown in Figure 2. Individual job titles reported by Y-12 were grouped together into 11 job categories. This is because there were either too few workers or too few health events within a particular job title, thereby limiting the type of analyses that could be conducted. Men and women were not distributed equally among the various job categories. The largest percentage of women in the work force (31 percent) were Administrative workers, while only 1 percent of men were in this group. Almost half of men (47 percent) were in the Engineering, Scientific, and Health Care group (24 percent) or were Crafts workers (23 percent).

Figure 2. The Work Force by Job Category and Gender

Job Category	Women	Men
Management	82 8%	503 15%
Engineering, Scientific, & Health Care	148 14%	828 24%
Professional	147 14%	256 8%
Administrative	314 31%	30 1%
Technical	115 11%	220 6%
Crafts	20 2%	790 23%
Security	28 3%	222 6%
Operators	9 1%	115 3%
Nuclear Workers	51 5%	159 5%
Laborers & General Workers	88 9%	228 7%
Unknown	19 2%	57 2%

Number and Length of Absences

Epidemiologic surveillance examines absences of five or more consecutive workdays (also referred to as “five-day absences”). This absence threshold is based on DOE Order 440.1, which requires contractor management to notify Occupational Medicine when a



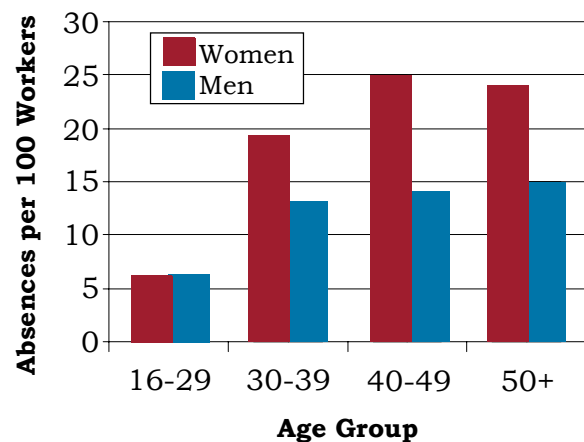
worker has been absent for five or more consecutive workdays. If an absence on a Friday continues through Tuesday, the length of that absence includes the weekend. All injuries and illnesses due to a work-related incident also must be reported. Non-occupational illnesses and injuries that involve absences of fewer than five days do not routinely require a medical clearance for return to work and are therefore excluded from these analyses.

Specific absences of five or more consecutive workdays that were not the result of an injury or illness were excluded. These include 12 women with reported absences due to maternity leave and 2 female workers and 2 male workers with reported absences due to elective surgical procedures not related to the treatment of an illness or injury.

Throughout this report, analyses take gender, age, and occupation into account because the risk of illness and injury varies by these factors.

The rate of five-day absences due to injury or illness varied by gender and age as shown in Figure 3. The 227 five-day absences among 180 women resulted in an absence rate of 22 per 100 workers (227/1,021). Among the 3,408 men, 474 absences resulted in an absence rate of 14 per 100 workers (474/3,408). The rate of five-day absences among men increased with age. Among women, the rate increased with age up to age 50 with a slight decrease in the absence rate among those aged 50 or older.

Figure 3. Absence Rate by Gender and Age



The average length of absence by gender and age is shown in Figure 4. The average length of absence was 44 days for men and 45 days for women. The average duration of absence increased with age among men, but was not related to age among women.



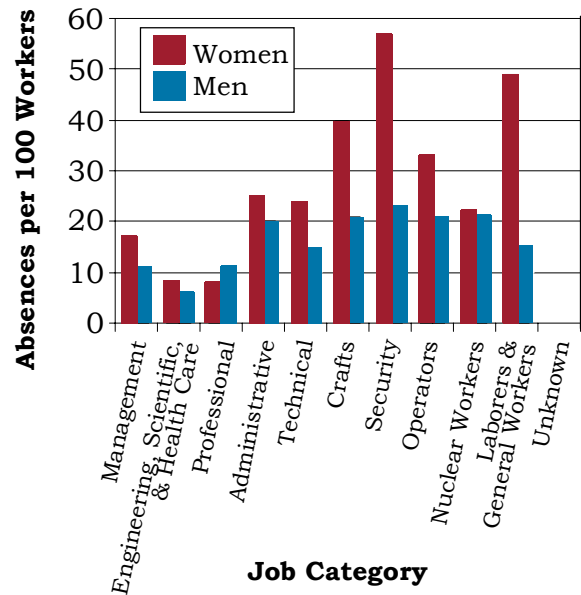
Figure 4. Number of Days Absent by Gender and Age

Gender	Age	Number of Absences	Number of Days Absent	Average Number of Days Absent
Women	16 - 29	2	151	76
	30 - 39	49	1,745	36
	40 - 49	111	5,277	48
	50 +	65	2,959	46
	Total	227	10,132	45
Men	16 - 29	3	43	14
	30 - 39	62	1,888	30
	40 - 49	184	7,728	42
	50 +	225	11,022	49
	Total	474	20,681	44

The rate of five-day absences due to illness or injury varied by job category for both men and women (Figure 5). Women had a higher rate of absence than did men within the same job category except for those in the Professional category. Security workers had the highest absence rate among male workers; those in the Engineering, Scientific, and Health Care category had the lowest absence rate. The same job categories had the highest and lowest rates among women.

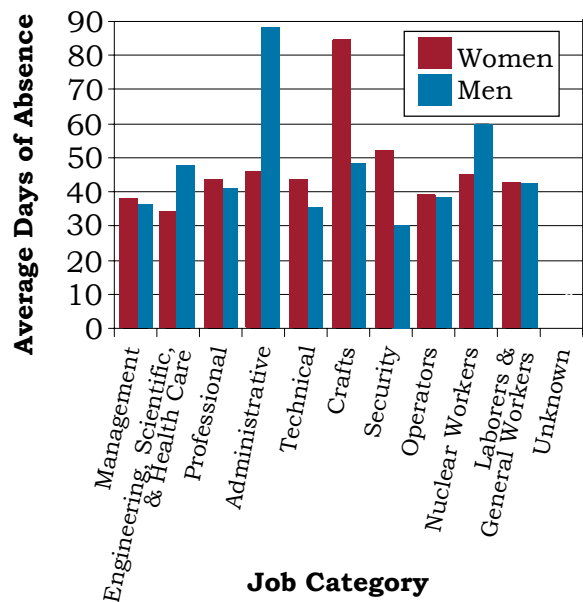
We saw no consistent pattern for average absence duration among men and women within a job category (Figure 6). Although Security workers had the highest absence rate among men, the average duration of their absences, 30 days, was at least 5 days shorter than in other job categories.

Figure 5. Absence Rate by Job Category and Gender



Male Administrative workers had the longest average number of days absent, 88 days. Three of the six absences reported by male Administrative workers lasted 3 months or more. Among women, Crafts workers had the longest average absence, 83 days. Five of the eight absences reported by these workers lasted over eight weeks. Female Engineering, Scientific, and Health Care workers averaged the shortest absences, 34 days.

Figure 6. Average Duration of Absence by Job Category and Gender



Diagnostic Categories

Epidemiologic surveillance monitors all illnesses and injuries among active workers because it is not always possible to determine which health effects are due to occupational exposures and which ones are due to other causes. Most illness and injury diagnoses were reported to the occupational medicine clinic by workers who required return-to-work clearances. An absence due to illness or injury may involve more than one diagnosis, and epidemiologic surveillance includes all reported diagnoses. In addition, the OSHA 200 Log provides information on recorded occupational injuries and illnesses whether or not they involve absences.

This report organizes illness and injury categories based on a standard reference, the *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM). This reference is used to classify health events for statistical purposes. You can find specific health conditions in the Explanation of Diagnostic Categories.

The number of reported diagnoses categorized according to the ICD-9-CM and the number of lost calendar days are presented in Figure 7. Women reported 241 diagnoses and men reported 490 diagnoses in 1998. The most frequently reported diagnoses varied little by gender. Among both women and men, the most common diagnoses were conditions affecting the muscles and skeleton.

Women lost 10,132 calendar days due to injury and illness. Muscles and skeleton conditions (23 percent), respiratory diseases (20 percent), and injuries (13 percent) accounted for 56 percent of all reported diagnoses among women. Arthritis made up 41 percent of the

muscles and skeleton conditions, followed by disc and back problems (34 percent) and rheumatism (18 percent). The majority of the respiratory conditions were due to acute upper respiratory type infections (79 percent), followed by flu and pneumonia (15 percent). Fifty-five percent of the injuries were reported as sprains and strains, 16 percent as fractures, and 16 percent as bruises.

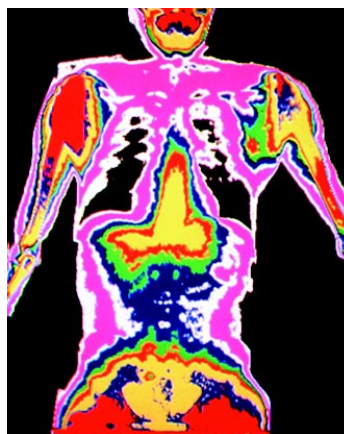
Figure 7. Number of Diagnoses and Lost Calendar Days by Diagnostic Category (Categorized by ICD-9-CM) and Gender

Diagnostic Category	Women		Men	
	Number of Diagnoses	Number of Lost Calendar Days	Number of Diagnoses	Number of Lost Calendar Days
Benign Growths	0	0	4	127
Blood	1	115	2	118
Cancer	2	204	15	1,044
Digestive	19	868	53	1,684
Endocrine / Metabolic	4	73	2	16
Existing Birth Condition	2	309	1	18
Genitourinary	25	931	25	651
Heart / Circulatory	12	598	53	3,698
Infections / Parasites	7	130	10	113
Injury	31	1,302	64	3,313
Miscarriage	0	0	NA	NA
Muscles & Skeleton	56	3,797	115	7,079
Nervous System	15	545	16	354
Psychological	7	281	12	556
Respiratory	47	804	84	1,489
Skin	2	43	12	287
Unspecified Symptoms	11	464	22	685

Note: Lost calendar days for each absence are counted more than once when multiple diagnoses occur in different diagnostic categories for the same absence.

Men lost 20,681 calendar days due to injury and illness. Fifty-three percent of all reported diagnoses among men were due to muscles and skeleton conditions (23 percent), respiratory conditions (17 percent), and injuries (13 percent). A closer look at diagnoses affecting the muscles and skeleton showed that about 36 percent were rheumatism, 33 percent were back problems and disc disorders, and 30 percent were arthritis (primarily knee derangement and joint disorders). Acute respiratory infections accounted for 67 percent of the respiratory conditions, followed by pneumonia and flu (21 percent). As with female workers, frequently reported injuries included sprains and strains (55 percent) and fractures (22 percent).

The previously mentioned diagnoses did not vary much by age. Injuries, conditions affecting the respiratory system, and diagnoses of the muscles and skeleton were among the more frequently reported categories for men of all ages. Digestive diseases were commonly reported among men 30 years and older.



Of this group, 49 men reported 53 diagnoses of the digestive system.

Twenty-eight percent of the diagnoses were intestinal disorders, 25 percent for hernias, and the remainder for gastro-

enteritis, colitis, and diseases of the gallbladder. Among men age 40 or older, diagnoses of the heart and circulatory system were frequently reported. Fifty men reported 53 diagnoses, 64 percent of which were for high blood pressure and ischemic heart disease (restricted blood flow to an artery).

Among women, the most frequently reported diagnoses were also consistent among the various age groups. Conditions of the genitourinary system were reported frequently by women 30 to 49 years old. Twenty women reported 21 diagnoses; 86 percent of which were conditions of the female reproductive organs.



Figure 8 shows the frequency of reported diagnoses by job category for men and women. The types of diagnoses did not vary significantly by job category. Injuries, muscles and skeleton conditions, and respiratory diagnoses were common across most job categories. We saw no indication that any particular diagnoses occurred disproportionately in a specific job category.

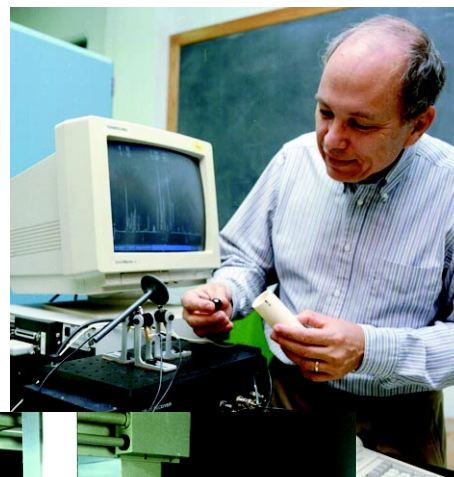


Figure 8. Most Frequently Reported Diagnoses by Job Category and Gender

Job Category	Women	Men
Management	Respiratory (4) Genitourinary (3) Injury (2)	Muscles & Skeleton (12) Digestive (10) Injury (9) Respiratory (9)
Engineering, Scientific, & Health Care	Injury (4) Muscles & Skeleton (4) Respiratory (2) Heart/Circulatory (2)	Muscles & Skeleton (11) Heart/Circulatory (10) Injury (9) Digestive (7)
Professional	Muscles & Skeleton (4) Respiratory (3) Digestive (2)	Muscles & Skeleton (9) Respiratory (5) Genitourinary (4) Heart/Circulatory (4)
Administrative	Muscles & Skeleton (23) Respiratory (14) Genitourinary (12) Digestive (11)	Digestive (2) Respiratory (2) Injury (1) Unspecified Symptoms (1)
Technical	Respiratory (9) Muscles & Skeleton (7) Injury (5)	Muscles & Skeleton (9) Injury (7) Respiratory (6)
Crafts	Muscles & Skeleton (3) Cancer (1) Genitourinary (1) Injury (1) Respiratory (1) Psychological (1)	Muscles & Skeleton (41) Respiratory (29) Heart/Circulatory (21) Injury (16)
Security	Respiratory (5) Injury (3) Infections/Parasites (2) Muscles & Skeleton (2) Nervous System (2) Unspecified Symptoms (2)	Respiratory (14) Injury (10) Muscles & Skeleton (10)
Operators	Genitourinary (1) Muscles & Skeleton (1) Unspecified Symptoms (1)	Respiratory (8) Muscles & Skeleton (5) Nervous System (3)
Nuclear Workers	Injury (3) Muscles & Skeleton (3) Respiratory (2)	Digestive (8) Injury (8) Muscles & Skeleton (7) Respiratory (5)
Laborers & General Workers	Respiratory (9) Muscles & Skeleton (8) Heart/Circulatory (5) Unspecified Symptoms (5)	Muscles & Skeleton (11) Heart/Circulatory (6) Unspecified Symptoms (4)
Unknown	None	None

Note: Numbers in parentheses represent the number of diagnoses reported.

Rates of Disease Occurrence

A Word about Rates: The previous section considered the number of absences and health conditions among various worker groups. For example, Figure 7 shows that men reported 64 and women reported 31 diagnoses involving injuries during 1998. Men, therefore, reported more than twice as many injuries as women. As there are more than 3 times as many men than women at Y-12, it seems reasonable to expect more injuries among men than women. Does this mean that men were at greater risk of injuries compared with women in 1998? To correctly answer that question, the total number of men and women in the work force must be considered. To compare risk among men and women, it is necessary to calculate the injury rate for each gender. Rates are calculated by dividing the number of injury diagnoses in a given gender by the total number of employees of that gender. Multiply this number by 1,000 to get the diagnosis rate per 1,000 workers.

For example:

64 injury diagnoses
 $\div 3,408 \text{ men} = .019 \times 1,000 =$
 19 injury diagnoses per 1,000 men

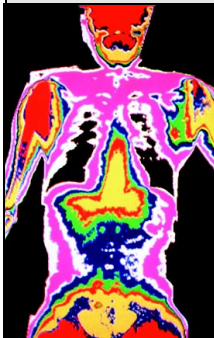
31 injury diagnoses
 $\div 1,021 \text{ women} = .030 \times 1,000 =$
 30 injury diagnoses per 1,000 women

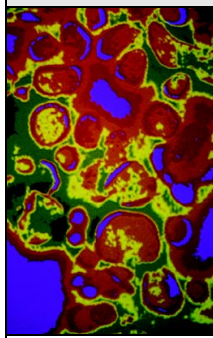
Comparing these rates now correctly suggests that the rate of reported injuries among women is over 50 percent higher than the rate for men. They are called **crude rates** because they do not account for possible differences between men and women, such as age and other factors that might affect the individual's risk of having an injury. Because age is so strongly related to the risk of disease and injury, epidemiologists almost always take age into account when comparing groups. This is done by using age-specific categories or by statistical methods of adjustment.

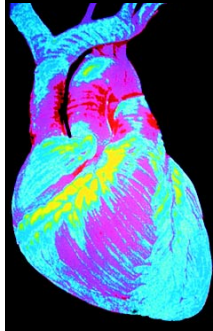
The diagnosis rate, also called the illness and injury rate, is the number of occurrences of a given disease or health condition observed over the course of a year per 1,000 workers at risk of getting that condition (see shaded box). One health condition, arthritis for example, may result in several five-day absences over a year. Conversely, one five-day absence may be associated with multiple diagnoses (e.g., the flu and a sprained wrist) recorded for epidemiologic surveillance.

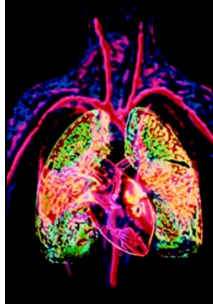
In the following set of analyses, the four age groups previously used were collapsed into two groups: workers younger than 50 years of age and those 50 or older. In addition, the 11 job categories were combined into five larger groups. Five groups of diagnoses of particular interest to workers are presented in Figure 9: all illnesses and injuries combined, cancer, heart/circulatory system, respiratory system, and injury. Additional information about 11 other disease groups is also analyzed and can be found in the Supplemental Tables.

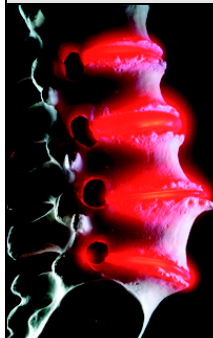
Figure 9. Illness and Injury Rates by Job Category, Gender, and Age

Diagnostic Category	Rate per 1,000			
	Job Category	Age	Men	Women
	Management/Professional/Administrative	<50	134	216
		50+	101	199
	Engineering, Scientific, & Health Care/Technical	<50	64	138
		50+	98	239
	Crafts/Security/Operators/Laborers & General Workers	<50	203	560
		50+	210	407
	Nuclear Workers	<50	209	240
		50+	247	231
	Unknown	<50	0	0
		50+	0	0

Diagnostic Category	Rate per 1,000			
	Job Category	Age	Men	Women
	Management/Professional/Administrative	<50	0	2
		50+	0	0
	Engineering, Scientific, & Health Care/Technical	<50	3	0
		50+	10	0
	Crafts/Security/Operators/Laborers & General Workers	<50	4	0
		50+	8	19
	Nuclear Workers	<50	0	0
		50+	14	0
Unknown	<50	0	0	
	50+	0	0	

Diagnostic Category	Rate per 1,000			
	Job Category	Age	Men	Women
	Management/Professional/Administrative	<50	12	2
		50+	16	14
	Engineering, Scientific, & Health Care/Technical	<50	3	5
		50+	21	22
	Crafts/Security/Operators/Laborers & General Workers	<50	20	44
		50+	22	37
	Nuclear Workers	<50	12	0
		50+	41	38
	Unknown	<50	0	0
		50+	0	0

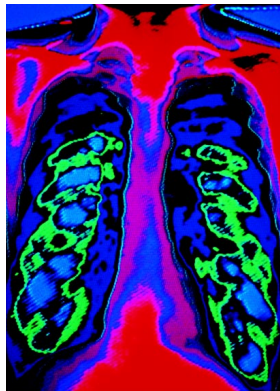
Diagnostic Category	Rate per 1,000			
	Job Category	Age	Men	Women
	Management/Professional/Administrative	<50	26	50
		50+	14	7
	Engineering, Scientific, & Health Care/Technical	<50	12	32
		50+	3	43
	Crafts/Security/Operators/Laborers & General Workers	<50	36	121
		50+	44	74
	Nuclear Workers	<50	12	80
		50+	55	0
	Unknown	<50	0	0
		50+	0	0

Diagnostic Category	Rate per 1,000			
	Job Category	Age	Men	Women
	Management/Professional/Administrative	<50	14	15
		50+	11	35
	Engineering, Scientific, & Health Care/Technical	<50	17	37
		50+	13	22
	Crafts/Security/Operators/Laborers & General Workers	<50	27	66
		50+	17	37
	Nuclear Workers	<50	81	80
		50+	14	38
	Unknown	<50	0	0
		50+	0	0

The rates for all illnesses and injuries combined tended to be greater for female Y-12 workers younger than 50 years of age compared with older workers. The opposite was true for men. Women classified as Crafts/Security/Operators/Laborers and General Workers had the highest rates. The highest illness and injury rates for men were among those classified as Nuclear Workers.

Cancer rates presented in this report are based on reported five-day absences during the year. A worker may experience several periods of absence from one cancer diagnosis due to medical complications or treatment regimens. Each absence results in the report of a cancer diagnosis, however, it does not imply that this is a new cancer. The cancer rates in this report are not comparable to the *incidence* rates frequently published in many articles on cancer with which you may be familiar. Incident cancer rates are based on the number of new cancer cases diagnosed within a given time, usually a year.

The likelihood that an individual in the U.S. develops cancer increases with age. Our data reflect this observation for men; in all job categories that cancer was reported, cancer rates were highest among older workers. Fourteen men reported 15 five-day absences due to cancer. The diagnoses were five prostate cancers, two lung cancers, two kidney cancers, two skin cancers, one colon cancer, one malignant melanoma, and one lymphoma. We found no trend between cancer and age among female workers. Two women



reported two cancer diagnoses during 1998: one kidney and one brain cancer. Of the 16 workers who reported cancer, 10 were 50 years of age or older. We found no relationship between the type of cancer and job category.

Older workers had the highest rates due to heart/circulatory problems, with one exception among women. Among men, the highest rate was seen in older Nuclear Workers, but the rate was based on only three reported diagnoses. Thirty-one of the 53 absences among men occurred in workers aged 50 or older; 34 of the 53 diagnoses involved hypertension or ischemic heart disease (restricted blood flow through an artery). Only 4 of 12 diagnoses for heart/circulatory problems reported among women were for hypertension or ischemic heart disease. Compared with other workers, Laborers and General Workers were at three times the risk of reporting heart/circulatory conditions.



Women had higher rates of respiratory disease than did men in nearly all job categories. Younger women generally had higher rates than did women aged 50 or older. Crafts/Security/Operators/Laborers and General Workers had the highest rates of respiratory disease for female workers. Men in this job category also had higher rates than did male workers in other job categories. Workers in the Security and Operators job categories were three times more likely to report a respiratory condition, and Crafts workers were twice as likely to report these conditions than were other workers.

Except for women in the Management/Professional/Administrative category, younger workers had higher rates of injury than did older workers. Women had higher rates than did men in all job categories except Nuclear Workers less than 50 years of age. The highest rates of injury were among men and women in the Nuclear Workers group. Nuclear Workers were three times more likely to report an injury than were other workers. Compared with other workers, they were also at over 10 times higher risk of reporting a sprain or strain at a site other than the back. Security workers were more than twice as likely to report an injury and almost five times more likely to report a back sprain or strain compared with other workers. The Technical category was almost three times more likely to report a back sprain or strain.

In other analyses, we compared the risk of illness and injury among workers classified in one job category with the risk to workers in the remaining 10 job categories. Workers in the Crafts, Security, and Laborers and General Workers categories were at almost twice the risk compared with all other groups. Administrative workers were three times as



likely to report a digestive condition compared with other workers. Crafts workers were at increased risk of reporting a number of conditions: almost four times the risk for conditions of the nervous system, three times the risk for genitourinary disorders, and twice the risk of muscles and skeleton conditions. Operators had six times the risk of other workers for reporting an infection, and Nuclear Workers had three times the risk of a digestive disorder.

Sentinel Health Events for Occupations

A sentinel health event for occupation (SHEO) is a disease, disability, or death that is likely to be occupationally related. Its occurrence may serve as a warning signal that materials substitution, engineering control, personal protection, or medical care may be required to reduce the risk of injury or illness among the work force. Sixty-four medical conditions associated with workplace exposures from studies of many different industries have been identified as sentinel health events. Although sentinel health events may indicate an occupational exposure, many may also result from non-occupational exposures. Due to this uncertainty, sentinel health events are assessed in two categories.

Definite Sentinel Health Events: Conditions that are unlikely to occur in the absence of an occupational exposure. Asbestosis, a lung disease resulting from exposure to asbestos, is an example.

Possible Sentinel Health Events: Conditions such as lung cancer or carpal tunnel syndrome may or may not be related to occupation. Detailed occupational and non-occupational information is required to determine the work-relatedness of the illness. For example, lung cancer may result from asbestos exposure or smoking. Carpal tunnel syndrome may result from a job requiring typing or from a hobby such as playing the piano.

One definite sentinel health event was identified in 1998. One male Crafts worker, aged 40-49, was diagnosed with berylliosis. This event resulted in 10 lost calendar days. Thirteen of 731 diagnoses (2 percent) were identified as possible sentinel health events (Figure 10).

Seven of the 13 possible sentinel health events were identified as carpal tunnel syndrome, reported by seven workers (four women and three men), and resulted in 346 lost calendar days. Two of the carpal tunnel diagnoses were reported by workers in the Administrative job category and two workers were Laborers and General Workers. Three diagnoses occurred among workers aged 50 or older; the remaining four workers were aged 40 to 49.

Figure 10. Characteristics of SHEOs by Gender

	Total Number of SHEO Diagnoses		Total Number of Days Absent	
	Men	Women	Men	Women
Definite	1	0	10	0
Possible	7	6	396	491
Total	8	6	406	491

Disabilities Among Active Workers

Disability data for the 1998 Y-12 work force were not available.

Deaths Among Active Workers

Death data for the 1998 Y-12 work force were not available.

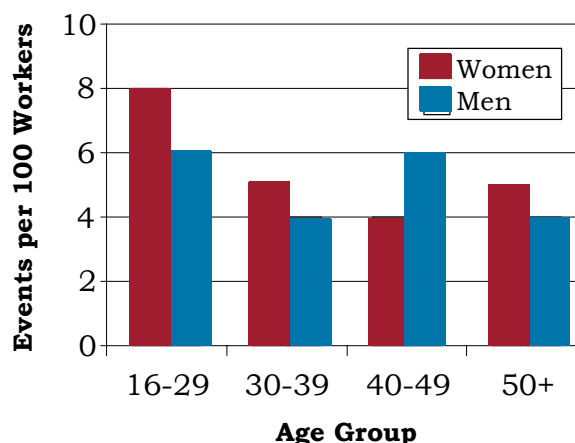
OSHA-Recordable Events

The Occupational Safety and Health Administration (OSHA) requires employers to maintain a record of occupational

injuries and illnesses that have occurred among employees and to make that information available to OSHA on request. Employers maintain the information from these OSHA-recordable events in the OSHA 200 Log. OSHA-recordable events differ from health events captured through return-to-work clearances in at least two important respects: 1) they do not necessarily result in days lost from work, and 2) they are usually accompanied by a specific determination that they are work-related.

Figure 11 shows the rate of OSHA events by gender and age. There were 50 OSHA-recordable events among women and 168 OSHA-recordable events among men. The rate of OSHA-recordable events was the same for men and women (5 per 100 workers). The average number of lost or restricted workdays increased with age for both men and women.

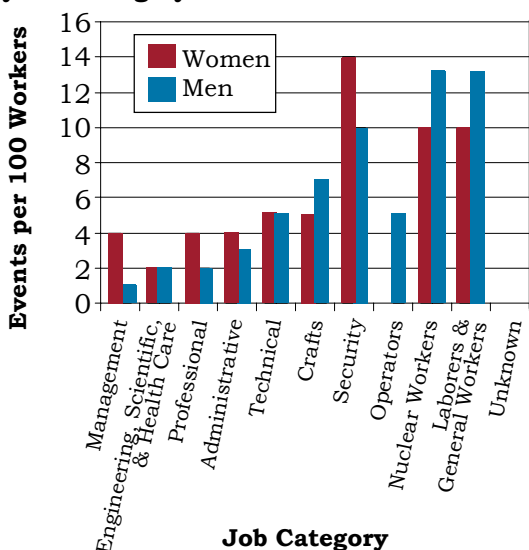
Figure 11. OSHA-Recordable Events by Gender and Age



The rate of OSHA-recordable events by job category and gender is shown in Figure 12. Women had higher rates of OSHA-recordable events than did men in four job categories: Management, Professional, Administrative, and

Security. Men and women in the Unknown job category and women in the Operators category did not report any OSHA events. The Security group had the highest rate of OSHA events (14 per 100 workers) among women. Nuclear Workers and Laborers and General Workers had the highest rates of OSHA events among men (13 per 100 workers).

Figure 12. OSHA-Recordable Events by Job Category and Gender



The average number of workdays lost or with restricted activity due to an OSHA event was almost 30 percent higher for women (18 days) than for men (14 days). Security workers had the highest average number of lost or restricted workdays (20 days) among male workers. Women in the Nuclear Workers category averaged the highest number of lost or restricted workdays (72 days). This average was based on five events, two of which involved sprains and strains to the back and the shoulder and upper arm and resulted in 124 and 136 lost/restricted workdays, respectively. Both of these events were the result of overexertion and strenuous movements.

Diagnostic and Accident Categories for OSHA-Recordable Events

There were 218 OSHA events recorded on the OSHA 200 Logs, containing 71 diagnoses among women and 200 diagnoses among men (Figure 13).

Figure 13. OSHA-Recordable Diagnoses by Diagnostic Category and Gender

Diagnostic Category	Gender	
	Women	Men
Digestive	0	1
Endocrine/Metabolic	0	1
Heart/Circulatory	2	0
Muscles & Skeleton	17	37
Nervous System	5	12
Respiratory	0	5
Skin	0	5
Unspecified Symptoms	5	3
Injury	42	136
Fractures-Upper Limb	0	2
Fractures-Lower Limb	0	1
Dislocations	0	3
Back Sprains and Strains	12	33
Other Sprains and Strains	5	29
Open Wounds-Head, Neck, Trunk	1	6
Open Wounds-Upper Limb	5	19
Open Wounds-Lower Limb	2	2
Superficial Injuries	2	5
Bruises	7	11
Foreign Bodies Entering Orifice	0	5
Burns	1	4
Unspecified Injuries	6	6
Adverse Reactions to Non-Medical Substances	1	6
Adverse Reactions to External Causes	0	3
Complications of Surgical/Medical Care	0	1

Among women, injuries accounted for 59 percent of the diagnoses reported; the most common (40 percent) type of OSHA-recordable injury was sprains and strains. Nineteen percent of the reported injuries among women were open wounds and 17 percent were bruises.



Among men, injuries accounted for 68 percent of the diagnoses reported, again primarily due to sprains and strains (46 percent). Open wounds (20 percent) were also frequently reported among men. After injuries, the most common type of OSHA-recordable diagnoses among both men and women were conditions involving the muscles and skeleton.

Ninety-one percent (198) of the 218 OSHA events were described as “an accident” in the OSHA logs (Figure 14). The majority of events were described as “other accidents,” 36/45 (80 percent) among women and 113/153 (74 percent) among men. Overexertion and strenuous movements were responsible for 56 percent of the “other accidents,” followed by being struck by an object (17 percent) and repetitive trauma (14 percent). Falls were the second most common type of accident (15 percent).

Figure 14. OSHA-Recordable Accidents by Type and Gender

Accident Category	Gender	
	Women	Men
	Number of Accidents	Number of Accidents
Motor Vehicle Traffic	1	0
Poisoning-Non-Medicinal	1	2
Surgical & Medical Procedures	0	1
Falls	7	23
Fire	0	1
Natural/Environmental Factors	0	8
Submersion/Suffocation/Foreign Bodies	0	5
Other Accidents	36	113
Caught Between Objects	0	4
Cutting/Piercing Instrument/Object	1	6
Hot, Corrosive, or Caustic Material/Steam	1	3
Machinery	0	1
Noise	0	2
Overexertion & Strenuous Movements	18	66
Repetitive Trauma	10	11
Struck by an Object	6	19
Unspecified	0	1
Total	45	153

Rates of OSHA-Recordable Events

The rates of all OSHA-recordable events by age and job categories and gender are shown in Figures 15 and 16. Women tended to have higher rates than did men for most job categories. The OSHA-recordable rates among women were highest among Crafts/Security/Operators/Laborers and General Workers. Nuclear workers had the highest rates for men. Most of the OSHA health conditions involved injury. When the rate for OSHA-recordable injuries was considered separately from other OSHA-recordable health conditions, the same job categories had the highest rates.

Laborers and General Workers were at nine times greater risk of a back sprain or strain and



strain and four times more likely to suffer a sprain or strain other than the back than were other groups of workers. Nuclear Workers were also at increased risk (5 times) for sprains

and strains other than the back. Crafts workers were four times more likely to report an open wound of the upper limb as other workers, and Laborers and General Workers were at higher risk for bruises (4 times). Disorders of the muscles and skeleton were more likely among Security workers (4 times), Nuclear Workers (3 times), and Crafts workers (2 times) than other workers.

Figure 15. OSHA-Recordable Rates by Age and Job Category Among Women, All Diagnoses Combined

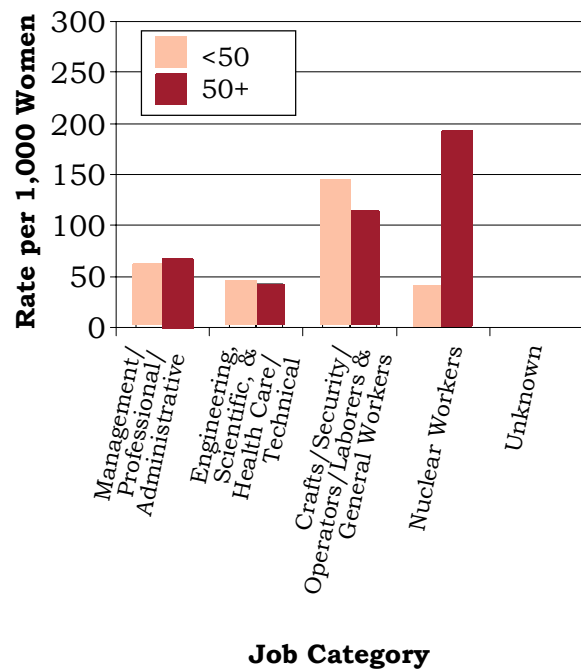
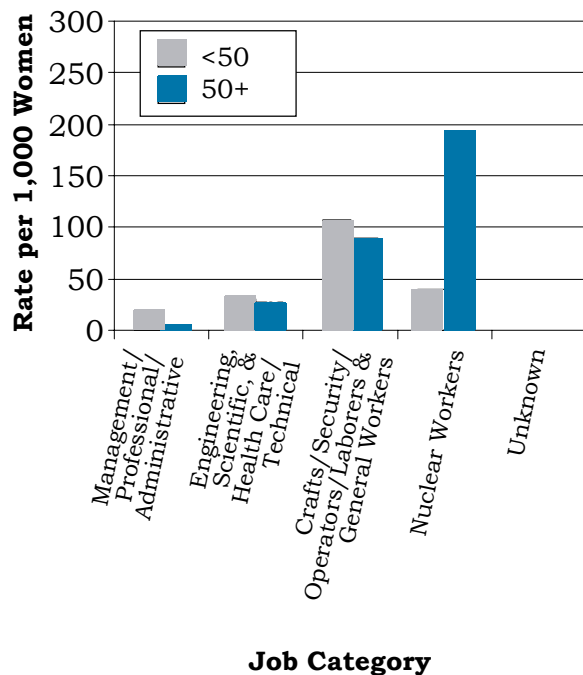


Figure 16. OSHA-Recordable Rates by Age and Job Category Among Men, All Diagnoses Combined



Glossary

Adjustment: A mathematical procedure for rates in which the effects of differences of a characteristic (such as age or gender) between groups have been removed. The purpose of adjustment is to allow comparisons between two or more groups with the effect of the differences for the characteristic removed.

Age-Adjusted Rate: A rate that has been mathematically adjusted to account for the effects of differences in the age composition between groups.

Age-Specific Rate: A rate that is calculated for a specific age group (e.g., 16 to 29 years old). Only people in the specific age group are included in the calculation of the rate.

Confidence Interval: A range of values determined by the degree of random variability in the data. The width of the confidence interval is affected by the size of the group being studied and how often the event whose true value is sought occurs. Generally, as the size of the group or the frequency of the event increases, the width of the confidence interval decreases. The level of confidence, for example a 95 percent confidence level, indicates the percentage (e.g., 95 percent) of time that the true value is expected to fall within the confidence interval if the mathematical procedure is repeated 100 times.

Demographics: Characteristics of human populations related to their size, density, age distribution, and vital status.

Diagnosis (diagnoses): Identification of a disease or health condition from signs and symptoms.

Diagnosis Rate: The number of occurrences of a given disease or health condition observed during a given time period per the number of workers at risk of getting that disease during that time period. It is usually multiplied by 100 or 1,000 to produce a rate expressed as a convenient number.

Diagnostic Category: A particular type of disease, a group of related health conditions, or diseases that all affect the same organ system.

Epidemiologic Surveillance: The ongoing evaluation of the health of a human population which is based on the collection and interpretation of demographic and health information for that population.

Epidemiology: The study of the distribution and determinants of diseases and health conditions in human populations.

ICD-9-CM Code: An abbreviation for the *International Classification of Diseases, 9th Revision, Clinical Modification*. An internationally accepted standardized system for the classification of disease and health data collected from medical records.

OSHA: An acronym for the Occupational Safety and Health Administration.

OSHA Event: An abbreviation used throughout this report for an OSHA-recordable event.

OSHA-Recordable Event: An accident that occurs on the job and involves fatalities (regardless of time between injury and death), time lost from work, transfer of employment, medical treatment other than first aid, loss of consciousness, or restriction of work or motion. Also included is any diagnosed occupational health event reported to the employer that is neither fatal nor results in workdays lost. By law, these events are recordable in the OSHA 200 Log.

Person-Year: A unit of measurement combining the number of people being studied with the time that each was observed equivalent to one person followed for one year. For example, 5 persons followed for one year contribute five person-years, as do 10 people each followed for half a year.

Relative Risk: The ratio of the occurrence of a disease or health condition in one group compared to the rate of occurrence of that same disease or health condition in another group.

Explanation of Diagnostic Categories

Throughout this report, health conditions have been grouped into a number of diagnostic categories which come from the *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM). For the text of this report, the categories are abbreviated to make the report easier to read. The following table lists the abbreviated categories used throughout the annual report and the corresponding ICD-9-CM codes found in the supporting tables.

Abbreviated Categories Used in the Annual Report	ICD-9-CM Codes
Benign Growths	210-229 235-239
Blood	280-289
Cancer	140-208 230-234
Digestive	520-579
Endocrine/Metabolic	240-279
Existing Birth Conditions	740-759
Genitourinary	580-629
Heart/Circulatory	390-459
Infections/Parasites	001-139
Injury	800-999
Miscarriage	630-676
Muscles and Skeleton	710-739
Nervous System	320-389
Psychological	290-319
Respiratory	460-519
Skin	680-709
Unspecified Symptoms	780-799

ICD-9-CM Codes

All conditions	001-V82	All reported health events
Infectious and parasitic diseases	001-139	Diseases caused by bacteria, viruses, and parasites
• Intestinal infections	001-009	Infections of the bowel or gut
• Tuberculosis	010-018	TB in the lungs and other organs
• Zoonotic bacterial diseases	020-027	Bacterial diseases that animals transmit to humans
• Other bacterial diseases	030-041	Whooping cough, diphtheria, strep throat, and gangrene
• Human Immunodeficiency Virus (HIV) infection	042	AIDS
• Poliomyelitis and other non-arthropod diseases of the central nervous system	045-049	Viral meningitis (swelling of the layers covering the brain and spinal cord); viral encephalitis (swelling of the brain); and polio
• Viral diseases accompanied by exanthem	050-057	Diseases accompanied by rashes or blisters like chickenpox, measles, shingles, and herpes
• Arthropod-borne viral diseases	060-066	Encephalitis (swelling of the brain) caused by bites from virus-carrying ticks or mosquitoes
• Other diseases caused by viruses and chlamydiae	070-079	Viral hepatitis, mumps, rabies, and mononucleosis
• Rickettsioses and other arthropod-borne diseases	080-088	Rocky Mountain spotted fever, malaria, and lyme disease
• Other spirochetal diseases	100-104	Trench mouth and Weil's disease (jaundice caused by coil-shaped bacteria)
• Mycoses	110-118	Athlete's foot; fungal infections of fingernails and toenails; and thrush
• Helminthiases	120-129	Pinworms, tapeworms, roundworms, and whipworms

• Other infectious and parasitic diseases	130-136	Lice, chiggers, scabies, and mites
• Late effects of infectious or parasitic diseases	137-139	Side effects of TB, chickenpox, or polio even though the disease is no longer active
Malignant neoplasms	140-208, 230-234	All cancers, regardless of the part of the body affected
• Lip, oral cavity, and pharynx	140-149	Lip, mouth, throat, and tongue
• Digestive organs and peritoneum	150-159	Stomach, esophagus (tube that transports food to the stomach), intestines, colon, rectum, anus, liver, pancreas, and gallbladder
• Respiratory system and intrathoracic organs	160-165	Sinuses, throat, voice box, lungs, and heart
• Bone, connective tissue, skin, and breast	170-176	Bone, muscle, ligament, tendon, blood vessels, fat, skin, and breast
• Genitourinary organs	179-189	Kidney, bladder, and cervix, ovary, uterus, and prostate
• Other and unspecified sites	190-199	Eye, brain, and thyroid
• Lymphatic and hematopoietic tissue	200-208	Leukemia, lymphoma, Hodgkin's disease, multiple myeloma, lymphosarcoma, and reticulum cell sarcoma
• Carcinoma in situ	230-234	A cancer that is confined to the site of origin (has not spread to neighboring tissue)
Benign neoplasms and neoplasms of uncertain behavior and unspecified nature	210-229 235-239	Tumors that are not cancerous or do not exhibit cancerous behavior, regardless of the part of the body affected
Endocrine, nutritional, and metabolic diseases and disorders of the immune system	240-279	Diseases affecting the hormone secreting glands and organs. Overactive thyroid; underactive thyroid; vitamin deficiency; diabetes; gout; and problems affecting the antibody producing system
Disorders of the blood and blood forming organs	280-289	Anemia and hemophilia (excludes leukemia)

Mental disorders	290-319	Psychiatric diagnoses - Non-psychotic disorders: depression; anxiety, fear, and stress disorders; alcoholism; drug dependence; and eating disorders, such as anorexia; Psychotic disorders: dementia, schizophrenia, and manic depression
Diseases of the nervous system and sense organs	320-389	Huntington's chorea; Alzheimer's and Parkinson's disease; epilepsy; multiple sclerosis; migraine; diseases of the eye, such as cataract and glaucoma
• Inflammatory diseases of the central nervous system	320-326	Bacterial meningitis (swelling of the layers covering the brain and spine); bacterial encephalitis (swelling of the brain); and brain and spinal abscesses
• Hereditary and degenerative diseases of the central nervous system	330-337	Alzheimer's and Parkinson's disease, tremors, and Huntington's chorea
• Other disorders of the central nervous system	340-349	Multiple sclerosis (MS), cerebral palsy, epilepsy, and migraine
• Disorders of the peripheral nervous system	350-359	Nerve disorders of the face, carpal tunnel syndrome, muscular dystrophy
• Disorders of the eye	360-379	Inflammation and ulcers of the eye and eyelid; detached retina; pink eye; problems with tear ducts; glaucoma; and cataracts
• Diseases of the ear and mastoid process	380-389	Infections of the outer, middle, or inner ear; ringing of the ears; hearing loss
Diseases of the circulatory system	390-459	Rheumatic fever, heart murmurs, heart attacks, angina, hardening of the arteries, varicose veins, hemorrhoids, and phlebitis
• Acute rheumatic fever	390-392	High fever and joint pain with possible heart damage
• Chronic rheumatic heart disease	393-398	Long lasting swelling and damage to the heart which results from rheumatic fever
• Hypertensive disease	401-405	High blood pressure

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- Ischemic heart disease (Restricted blood flow to the heart) 410-414 Heart attack and angina
 - Diseases of pulmonary circulation 415-417 Blood clots in the lung and pulmonary aneurysm (bulge that develops in the wall of the pulmonary artery, which is the artery that carries blood to the lungs)
 - Other forms of heart disease 420-429 Swelling of the inner lining, middle lining, or sac enclosing the heart; heart failure; and irregular heartbeat
 - Cerebrovascular disease 430-438 Stroke, bleeding in the brain, and blockage or low blood flow in blood vessels of the brain
 - Diseases of the arteries and capillaries 440-448 Hardening of the arteries; aneurysm (bulge that develops in the walls of arteries); and blood clots
 - Diseases of the veins, lymphatics, and other circulatory system diseases 451-459 Phlebitis (swelling of a vein), thrombophlebitis (swelling of a vein which has a blood clot), varicose veins, and hemorrhoids

 - Diseases of the respiratory system** 460-519 Colds, sinusitis, laryngitis, pneumonia, influenza, chronic bronchitis, asthma, and emphysema
 - Acute respiratory infections 460-466 Colds, sore throat, sinus infections, swollen tonsils, and bronchitis
 - Other diseases of the upper respiratory tract 470-478 Allergies, hay fever, sinus infections, bronchitis, and sore throat that continue for a long time
 - Pneumonia and influenza 480-487 “The flu” and pneumonia caused by a bacteria or virus
 - Chronic obstructive pulmonary diseases and allied conditions 490-496 Emphysema and asthma
 - Pneumoconiosis and other lung diseases caused by external agents 500-508 Black lung; miners’ asthma; asbestosis; silicosis; berylliosis; and conditions caused by chemical fumes and vapors

- Other diseases of the respiratory system 510-519 Pleurisy (swelling of the lining of the lungs), collapsed lung, and respiratory failure

- Diseases of the digestive system** 520-579 Diseases affecting the teeth and mouth, salivary glands, digestive tract, and the abdominal cavity. Examples include dental abscess, ulcers, appendicitis, hepatitis (excluding viral hepatitis), cirrhosis of the liver, gallstones, pancreatitis, abdominal hernia, and intestinal polyps

- Diseases of the oral cavity, salivary glands, and jaw 520-529 Tooth problems (too many, too few, abnormal shape or size, cavities, bleeding gums, toothaches), and infections and swelling of the mouth, jaw, and tongue

- Diseases of the esophagus, stomach, and duodenum 530-537 Ulcers of the esophagus (tube that transports food to the stomach), stomach, and small intestine; indigestion; and uncontrollable vomiting

- Appendicitis 540-543 Swelling of the appendix (rupture, surgery, or both may result)

- Hernia of the abdominal cavity 550-553 Ruptures of the groin and diaphragm (muscle which separates the chest area from the lower part of the trunk)

- Non-infectious enteritis and colitis 555-558 Crohn's disease and swelling of the intestine and colon

- Other diseases of the intestines and peritoneum 560-569 Irritable bowel syndrome, blockage of the intestine, constipation, and diarrhea

- Other diseases of the digestive system 570-579 Diseases of the liver, gallbladder, and pancreas; hepatitis; blood in stool; and bleeding in the stomach and intestine

- Diseases of the genitourinary system** 580-629 Diseases affecting the kidneys, the prostate, and testes; benign breast diseases; infertility (male and female); diseases of the ovary; pelvic inflammatory disease; and menstrual disorders

- Nephritis, nephrotic syndrome, and nephrosis 580-589 Swelling of the kidney; swelling of the small blood vessels in the kidney; and kidney failure

• Other diseases of the urinary system	590-599	Swelling and infection of the kidney and bladder; kidney stones; and difficulty urinating
• Diseases of the male genital organs	600-608	Enlarged prostate; swelling of the scrotum and prostate; and abscess of the prostate
• Disorders of the breast	610-611	Benign tumors, cysts, and infections of the breast
• Inflammatory disease of the female pelvic organs	614-616	Swelling of the uterus, ovary, fallopian tubes, or cervix
• Other diseases of the female genital tract	617-629	Conditions associated with menopause and postmenopause; PMS; infertility; and cramps
Complications of pregnancy, childbirth, and the puerperium	630-676	Miscarriage; complications of pregnancy, such as hemorrhage; pregnancy-related high blood pressure; preeclampsia; and premature labor or other complications of labor
• Ectopic and molar pregnancy	630-633	Development of fetus outside the uterus and growth of cysts
• Other pregnancy with abortive outcome	634-639	Miscarriage and complications associated with miscarriage
• Complications mainly related to pregnancy	640-648	Abnormal bleeding and possible miscarriage; infections; high blood pressure caused by pregnancy; and premature labor
• Normal delivery, and other indications for care in pregnancy, labor, and delivery	650-659	Delivery requiring little or no assistance; multiple births; breech birth; and problems of the fetus or placenta which affect care of mother
• Complications occurring mainly in the course of labor and delivery	660-669	Long labor; unusually fast delivery; and abnormal bleeding after delivery
• Complications of the puerperium	670-676	Infections of the breast; blood clot in lung; and varicose veins
Diseases of the skin and subcutaneous tissue	680-709	Acne, cellulitis, sunburn, psoriasis, and seborrhea

• Infections of the skin and subcutaneous tissue	680-686	Abscesses, boils, hair-containing cysts, and pus-filled blisters
• Other inflammatory conditions of skin and subcutaneous tissue	690-698	Skin rashes caused by detergents, oils, greases, solvents, sun, food, drugs, or medicine
• Other diseases of the skin and subcutaneous tissue	700-709	Corns, calluses, heat rash, swollen hair follicles, acne, and ingrown fingernails and toenails
Diseases of the musculoskeletal system and connective tissue	710-739	Arthritis, systemic lupus erythematosus, ankylosing spondylitis, herniated intervertebral disc (“slipped disc”), lumbago, sciatica, rheumatism, tendonitis, and osteoporosis
• Arthropathies and related disorders	710-719	Arthritis; joint pain and stiffness; and other diseases of the connective tissue which supports and connects internal organs, forms bones and blood vessel walls, and attaches to bones
• Dorsopathies	720-724	Swelling of the spine; herniated, slipped, and ruptured disc; rheumatoid arthritis of the spine; lumbago; and sciatica
• Rheumatism, excluding the back	725-729	Swelling and degeneration of joints, muscles, tendons; tennis elbow; and bursitis
• Osteopathies, chondropathies, and acquired musculoskeletal deformities	730-739	Fracture caused by bone disease; osteoporosis; curvature of the spine; flat foot; hammer toe; and development of deformities of the nose, toes, feet, legs, arms, and hands
Congenital anomalies	740-759	Spina bifida; cleft palate; harelip; and various chromosomal anomalies, such as Klinefelter’s syndrome
Certain conditions originating in the perinatal period	760-779	Maternal high blood pressure; maternal malnutrition; ectopic pregnancy; breech birth; fetal malnutrition or slow growth; injuries related to birth trauma; and perinatal jaundice

Symptoms, signs, and ill-defined conditions	780-799	Blackout, chills, dizziness, fatigue, pallor, abnormal weight loss, undiagnosed chest pain, and heartburn
• Symptoms	780-789	Hallucinations, fainting, convulsions, dizziness, fatigue, fever, sleep disturbance, rash, headache, sore throat, chest pain, nausea, vomiting, and heartburn
• Non-specific abnormal findings	790-796	Abnormal x-ray, blood, stool, and urine test results
• Ill-defined and unknown causes of morbidity and mortality	797-799	Senility; asphyxia; respiratory arrest; nervousness; and unexplained death within 24 hours of onset of symptoms
Injury and poisoning	800-999	Dislocation of joints; sprains and strains of associated muscles; concussions; bruises; cuts; internal injuries from crushing, puncture, tearing, or blunt impact; burns; blisters; poisoning; frostbite; heatstroke; and complications of medical or surgical care
• Fractures, all sites	800-829	Cracks or breaks of any bone
• Dislocations	830-839	Separation of a bone from its normal socket or joint
• Sprains and strains of joints and adjacent muscles	840-848	Strains are injuries to muscle from overuse or stretching the muscle beyond its normal limit; sprains are injuries involving tearing or overextending the ligaments of a joint
• Intracranial injuries excluding those with skull fractures	850-854	Concussions; internal bruises; and bleeding within the head without a fracture of the bones of the skull
• Internal injuries of the thorax, abdomen, and pelvis	860-869	Bruising, crushing, tearing, or rupturing the chest, abdomen, and pelvis and the organs within these areas of the body
• Open wounds	870-897	Animal bites; cuts; lacerations; punctures; and amputations, excluding the arteries and veins

- Other injuries and late effects of external causes

900-999 Miscellaneous injuries, including injuries to the arteries and veins; problems that occur an extended period of time after the injury has taken place ("late effects"); superficial bruises and abrasions; burns; post-injury shock; poisoning; toxic side effects of chemicals; heatstroke; electrocution; and altitude sickness

Supplementary classifications related to personal or family history of disease

V10-V19 Covers situations in which the person is not ill or injured but has a personal or family history of problems, such as cancer, mental illness, allergies, or arthritis that may affect his or her risk of illness

Supplementary classifications related to health care for reproduction and child development

V20-V28 Problems related to pregnancy, postpartum care, contraception, outcome of delivery, and physical development of child

Contact with health services for reasons other than illness or injury

V50-V59 Care for workers who have been treated previously for an illness or injury that is no longer present but who receive care to complete treatment or prevent recurrence

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