

Measles — Continued

presence of records would allow rapid determination of susceptibles. The current spring breaks provide an excellent opportunity for students to obtain their immunization records before returning to campus. An aggressive approach, like that being taken by Boston University, will help ensure high levels of immunity and should end the outbreak quickly. The requirement to provide proof of immunity, such as that at Boston University, is much more effective than a voluntary vaccination clinic in ensuring that susceptibles are vaccinated.

The high attack rate (15.9%) at Principia College is undoubtedly due to these students' very low immunization levels. This outbreak illustrates the potential severity of measles and the rapidity of spread in an unvaccinated population. The very high apparent death-to-case ratio (2.3%) is unusual in the United States, which usually has a reported death-to-case ratio of 0.1% or lower. The reasons for this high mortality are under investigation.

Since 1980, when data on measles in colleges first began to be collected, at least 14 campuses have reported measles cases each year. During 1983, the 296 cases reported among college students accounted for 19.8% of all measles cases reported. If the present trend continues, college students will again account for a substantial proportion of the remaining morbidity from measles. Because susceptibility among college students may be as high as 15%, the potential for sustained outbreaks exists. To try to prevent outbreaks, the American College Health Association and the Immunization Practices Advisory Committee have both recommended that colleges require proof of measles immunity as a criterion for matriculation. To date, few colleges have such requirements, and it appears likely that measles will remain a problem in this population. It should be recognized that, for the next 5-7 years, a cohort of college students will exist that will not have optimal vaccination levels because its members were children during the start of the vaccination programs. State health department and college/university authorities should carefully consider measures to help decrease the vulnerability of this special cohort.

Reference

1. CDC. Measles on a college campus—Ohio. MMWR 1985;34:89-90.

Perspectives in Disease Prevention and Health Promotion

Fatal Occupational Injuries — Texas, 1982

A review of Texas death certificates for 1982 identified 710 deaths associated with occupational injuries. The average age at death was 37.2 years (range 16-84 years). This resulted in the premature loss (before age 65) of 19,924 potential years of life.

For this analysis, a case was defined as the fatality of a civilian male, 16 years of age or older, who died in Texas in 1982 as the result of traumatic injury occurring on the job in Texas. Only deaths coded as related to "external causes" according to the International Classification of Diseases were included in the analysis (ICD codes E800-E989, 9th revision). The leading causes of death were (1) motor vehicle-associated injuries (158 [22.3% of total]); (2) machinery- and tool-related injuries (105 [14.8%]); (3) homicide and firearm injuries (99 [13.9%]); (4) falls (84 [11.8%]); and (5) electrocutions (75 [10.6%]).

Industrial categories with the highest rates of fatal injury were: (1) mining (including crude petroleum and natural gas production) (51 per 100,000); (2) agriculture (35/100,000); and

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(3) construction (32/100,000) (Table 1). Analysis of the 10 occupations with the highest rates of fatal injuries are given below (Table 2).

Airplane pilots and navigators: Of the 18 deaths resulting from air accidents, five (27.8%) involved helicopter pilots, and three (16.7%) occurred during crop dusting or other agricultural spraying.

Oil well drillers: Machinery- and tool-related accidents accounted for 16 (47.1%) of the 34 deaths in this category, which includes roustabouts, roughnecks, and other unskilled oil-field workers.

TABLE 1. Fatal occupational injuries and rates for males 16 years of age or older for major industries and subindustries — Texas, 1982

Industry or type of business*	No. fatal injuries	Rate of fatal injuries/100,000 [†]
Mining	88	51
Crude petroleum/natural gas production	87	55
Agriculture, forestry, and fisheries	58	35
Agricultural production, crops	28	34
Agricultural production, livestock	14	27
Construction	170	32
Transportation, communications, other public utilities	114	31
Trucking service	54	61
Water transportation	12	75
Air transportation	14	48
Electric light and power	10	26
Personal services	11	19
Business and repair services	35	17
Automotive repair shops	10	19
Miscellaneous repair services	12	39
Public administration	27	15
Justice, public order, safety	19	32
Retail trade	53	10
Grocery stores	18	21
Wholesale trade	25	10
Petroleum products	10	65
Professional and related services	12	3
All industries	720	18

*Industry as recorded on death certificates was coded according to U.S. Bureau of the Census 1980 Classified Index of Industries and Occupations. Only industries and subindustries with 10 or more deaths are included.

[†]Population at risk is obtained from U.S. Bureau of the Census 1980 estimates of the experienced civilian labor force in Texas, male, 16 years and over, by industry.

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Structural-metal workers: All 12 deaths occurred among iron or steel workers employed in construction; 10 (83.3%) resulted from falls. Four (33.3%) of these deaths occurred as the result of a single incident.

Electrical-power installers and repairers: All 11 deaths involved electrical linemen; nine (81.8%) deaths resulted from electrocution. Seven (63.6%) of the workers were employed in the construction industry.

Construction laborers: This category includes general construction workers and nonspe-

TABLE 2. Rates of fatal injuries for the 10 occupations with the highest risk, and leading causes of fatal injury, males, 16 years old or older – Texas, 1982

Occupation*	No. fatal injuries	Texas population at risk [†]	Fatal injury rate/100,000	Leading cause of fatal injury	
				External cause of death	No. deaths (%)
Airplane pilots and navigators	18	8,288	217	Air and space transport incidents	18 (100)
Oil well drillers	34	21,501	158	Machinery and tool-related incidents	16 (47)
Structural-metal workers	12	7,678	156	Falls	10 (83)
Electrical-power installers and repairers	11	7,494	147	Electric current	9 (82)
Construction laborers	45	67,225	67	Falls	11 (24)
Heavy-truck drivers	85	130,139	65	Motor vehicle incidents	64 (75)
Material-moving operating engineers	11	18,117	61	Machinery and tool-related incidents	4 (36)
Farmers, except horticultural	30	64,031	47	Machinery and tool-related incidents	10 (33)
Police and detectives, public service	10	21,620	46	Motor vehicle incidents	7 (70)
Electricians	18	43,148	42	Electric current	11 (61)
All occupations	710	3,838,779	18	Motor vehicle incidents	158 (22)

*Occupations as recorded on death certificates were coded according to U.S. Bureau of the Census 1980 Classified Index of Industries and Occupations.

[†]U.S. Bureau of the Census 1980 estimates of the experienced civilian labor force in Texas, male, 16 years and over, by occupation.

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cialized laborers. Falls (11 cases [24.4%]) and electrocutions (8 cases [17.8%]) were the major causes of the 45 deaths recorded here.

Heavy-truck drivers: Motor vehicle-related injuries accounted for 64 (75.3%) of the 85 deaths among truck drivers. These drivers were employed in a wide range of industries, including mining, construction, manufacturing, wholesale trade, and general trucking.

Material-moving operating engineers: This category consists of heavy-equipment operators. Eight (72.7%) of the 11 deaths occurred among workers employed in construction.

Farmers, except horticultural: Farmers and ranchers are included here; farm workers and other salaried agricultural laborers are not. Machinery- and tool-related injuries caused 10 (33.3%) of the 30 deaths, and motor vehicle-related injuries resulted in 6 deaths (20.0%). Four deaths (13.3%) were caused by electrocution (1).

Police and detectives, public service: Seven (70.0%) of the 10 deaths among state and municipal police officers were caused by motor vehicle-related injuries; 2 officers were killed by handguns. In five (71.4%) of the seven motor vehicle-related deaths, the police officers were pedestrians.

Electricians: The major causes of the 18 deaths among electricians were electrocution (11 cases [61.1%]) and falls (3 cases [16.7%]). Sixteen deaths (88.9%) occurred among electricians employed in the construction industry.

Reported by L. Suarez, MS, WD Carroll, MPH, WE Barrington, MPH, CE Alexander, MD, State Epidemiologist, Texas Dept of Health; Div of Surveillance, Hazard Evaluations, and Field Studies, National Institute for Occupational Safety and Health, CDC.

Editorial Note: The National Institute for Occupational Safety and Health (NIOSH) estimates that at least 10 million persons in the United States suffer traumatic injuries on the job each year; about 3 million (30%) of these are severe, and 10,000 (0.1%) are fatal (2). In both Texas and the United States as a whole, mining, agriculture, and construction are the three industrial categories associated with the highest rates of mortality from injury.

A major impediment to the surveillance of work-related deaths is the absence of routinely coded occupation and industry information on death certificates in 22 states, including Texas. However, the accuracy of the occupation and industry information that is recorded on death certificates is generally high. In a recent examination of sample death certificates throughout the United States, data were found to be correct in 64.7% of the entries for occupation, and in 70.1% for industry (3). With the recognition of this accuracy, the review of death certificates has found increasing use as a technique for surveillance of deaths caused by occupational exposure (4,5). NIOSH and the National Center for Health Statistics have worked with state health departments extensively in recent years to develop universal coding from death certificates of data on occupation and industry; this coding is done with procedures developed by the U.S. Bureau of the Census (6).

In the present study, deaths among civilian males were included only when the answer, "yes," appeared on the death certificate in response to the question: "Injury at work?" Because of this restriction, the study probably underestimates the actual number of occupationally related deaths among males in 1982 that occurred in Texas.* However, because all the deaths studied were caused by occupational factors, and the interval between injury and death was less than 24 hours in 84% of the cases, the accuracy of these occupational data appears to be particularly high. All but 5 (0.7%) of the death certificates in this review provided information on occupation, and all but 25 (3.5%) provided an entry for industry.

*Forty-seven deaths associated with occupational injuries were also identified among females but were not analyzed with the males.

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The prevention of deaths caused by occupational injury is a major priority of NIOSH (2). Efficient prevention of such deaths requires that research and intervention be targeted to those industries and occupations that present the highest risk (7). The data from this study indicate that a periodic review of death certificates provides an accurate and easily accessible approach to the surveillance of deaths caused by occupational injuries.

References

1. CDC. Irrigation-pipe-associated electrocution deaths—Washington. MMWR 1983;32:169-71.
2. CDC. Leading work-related diseases and injuries—United States. MMWR 1984;33:213-5.
3. Steenland K, Beaumont J. The accuracy of occupation and industry data on death certificates. J Occup Med 1984;26:288-96.
4. Milham S. Occupational mortality in Washington state, 1950-1979. Cincinnati: National Institute for Occupational Safety and Health, 1983. (DHHS [NIOSH] publication no. 83-116).

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TABLE I. Summary—cases of specified notifiable diseases, United States

Disease	10th Week Ending			Cumulative, 10th Week Ending		
	Mar. 9, 1985	Mar. 10, 1984	Median 1980-1984	Mar. 9, 1985	Mar. 10, 1984	Median 1980-1984
Acquired Immunodeficiency Syndrome (AIDS)	111	52	N	1,084	633	N
Aseptic meningitis	69	67	65	635	817	797
Encephalitis: Primary (arthropod-borne & unsp.)	23	11	15	147	140	150
Post-infectious	4	1	1	20	9	14
Gonorrhea: Civilian	14,835	15,398	18,146	147,625	156,903	181,034
Military	455	325	506	3,634	3,743	5,361
Hepatitis: Type A	432	460	460	3,811	4,007	4,504
Type B	512	534	430	4,407	4,536	3,663
Non A, Non B	102	70	N	734	653	N
Unspecified	152	88	158	853	818	1,595
Legionellosis	15	20	N	102	88	N
Leptosy	7	6	3	65	44	43
Malaria	16	9	21	121	108	145
Measles: Total*	78	105	72	235	445	442
Indigenous	75	103	N	188	378	N
Imported	3	2	N	47	67	N
Meningococcal infections: Total	79	76	90	596	648	648
Civilian	79	76	89	596	648	648
Military	-	-	-	-	-	4
Mumps	91	82	115	659	690	1,054
Pertussis	26	34	20	205	333	201
Rubella (German measles)	11	19	43	46	103	369
Syphilis (Primary & Secondary): Civilian	407	535	547	4,634	5,477	5,814
Military	-	1	3	27	58	78
Toxic Shock syndrome	9	6	N	73	80	N
Tuberculosis	509	490	502	3,389	3,595	4,409
Tularemia	1	1	1	20	12	17
Typhoid fever	2	8	7	41	63	67
Typhus fever, tick-borne (RMSF)	1	-	1	5	10	10
Rabies, animal	64	74	108	759	761	889

TABLE II. Notifiable diseases of low frequency, United States

	Cum 1985		Cum 1985
Anthrax	-	Plague	-
Botulism: Foodborne	1	Poliomyelitis: Total	1
Infant	8	Paralytic	1
Other	-	Psittacosis (N.Y. City 1, Ga. 1)	23
Brucellosis (Calif. 5)	17	Rabies, human	-
Cholera	-	Tetanus (Ill. 1, Calif. 2)	11
Congenital rubella syndrome	-	Trichinosis (Upstate N.Y. 1)	7
Diphtheria	-	Typhus fever, flea-borne (endemic, murine) (Calif. 1)	3
Leptospirosis	4		

*Three of the 78 reported cases for this week were imported from a foreign country or can be directly traceable to a known internationally imported case within two generations.

M M W R

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Epidemiologic Notes and Reports

Multiple Measles Outbreaks on College Campuses — Ohio, Massachusetts, Illinois

Since January 15, 1985, measles outbreaks have occurred on at least three college campuses in the United States, with probable spread to three additional campuses. The first outbreak, which occurred at The Ohio State University and involved 12 confirmed cases, has been reported previously (1). The index patient acquired measles while traveling to London and Sierra Leone. Three additional suspected cases are being investigated, and over 2,000 doses of measles vaccine have been administered to students as part of the control effort. Approximately 50,000 students are enrolled at this university.

Boston University, in Massachusetts, has been the site of a large outbreak that began at the end of January. The index patient was a student who had acquired measles while traveling in Venezuela and developed onset of rash on January 29, 1985. As of March 12, 82 confirmed cases have been reported among students at Boston University, which has approximately 28,000 students. In addition, related cases appear to have occurred in two students at the Massachusetts Institute of Technology, one student at Boston College, and two students at Northeastern University. To control the outbreak, Boston University required all students to provide proof of immunity to reenter school at the end of spring break on March 11. In addition, 5,000 doses of measles vaccine have been administered to students at college-based vaccination clinics. The Massachusetts Department of Public Health is also working with all other Boston-area colleges to adopt similar programs to review their students' immune status and vaccinate susceptibles. Eventually, all college campuses in Massachusetts will be contacted.

The largest outbreak has occurred at Principia College, a Christian Science college in Illinois with an enrollment of 712 students, with 128 confirmed or probable cases (113 among students and 15 among other residents) reported between January 15 and March 10. In addition, three deaths apparently related to respiratory complications from measles have occurred among students and residents at the college. Students are being required to remain on campus unless they receive vaccine or produce other evidence of immunity. To date, approximately 421 doses of vaccine have been given to students. Possible related cases have occurred in Indiana, Michigan, and New Jersey. One hundred thirty-nine students of 712 enrolled pupils had histories of previous immunity to measles. The source of the outbreak remains unknown.

Reported by TJ Halpin, MD, State Epidemiologist, Ohio Dept of Health; MA Barry, MD, Boston Health and Hospitals, JW Taylor, MD, Boston University, PH Etkind, P Gallagher, GF Grady, MD, State Epidemiologist, Massachusetts Dept of Public Health; CR March, CE Jennings, RJ Martin, DVM, N Kramer, Jersey County Health Dept, BJ Francis, MD, State Epidemiologist, Illinois Dept of Public Health; Div of Immunization, Center for Prevention Svcs, CDC.

Editorial Note: A major problem in controlling measles outbreaks in colleges relates to the inability to determine who truly needs vaccine, because immunization records are lacking. The