

Injury surveillance

A review of data sources used by the Division of Safety Research

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COLEMAN PJ. Injury surveillance: A review of data sources used by the Division of Safety Research. *Scand j work environ health* 9 (1983) 128—135. Injury surveillance by the Division of Safety Research in the National Institute for Occupational Safety and Health has the following two major purposes: the detection of significant changes in the status of worker safety to help define areas for research and the assessment of importance of various safety problems for priority setting in the Division. Surveillance of occupational injuries in recent years has realized a quantum improvement due to the availability of several extensive work-injury case data bases. The Division of Safety Research utilizes three of these to provide essentially independent sources of evidence for the identification and definition of problems for safety research. The National Electronic Injury Surveillance System, based on daily reports from a representative sample of hospital emergency rooms across the nation, provides case data such as age and sex of the injured worker, injury diagnosis, and product involvement. The Supplementary Data System annually provides worker's compensation case files which include the occupation and industry of the injured worker from selected states. A third level of detail is provided by the work injury report surveys of injured workers, conducted annually, and focused on specific accident types or injury groups. Findings include high-risk occupations, age groups, tools, and equipment.

Key terms: accidents, epidemiology, hospital emergency rooms, priorities, risk, worker's compensation.

Occupational injury surveillance in the Division of Safety Research of the US National Institute for Occupational Safety and Health is a major component of the Safety Surveillance Branch of the Division of Safety Research. The discovery of high-risk groups of workers, and the characteristics of their injuries and exposures, is the chief objective of the surveillance activity. Subsequent uses of these findings include the estimation and evaluation of risk (4, 6) and the generation

of hypotheses (2). Collectively these activities lead to the identification of problems for further research and serve as important inputs to the process of determining priorities for the Division and the Institute.

This paper presents a brief description of three data sources used in the injury surveillance program: the National Electronic Injury Surveillance System, a system based on reports from hospital emergency rooms; the Supplementary Data System, a system of records based on worker's compensation first reports of injury or illness in selected states; and the Work Injury Report Survey, a series of topical mail surveys of injured workers. General findings are presented for each data source, and specific hypotheses growing out of the data analysis are discussed.

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National Electronic Injury Surveillance System

The National Electronic Injury Surveillance System, instituted in 1972 by the US Consumer Product Safety Commission, was created by the agency with a specific strategy in mind, ie, when consumer products began showing unusually frequent or severe involvement in consumer accidents and injuries, immediate steps would be taken to examine these products and order them removed from the market. Of course, redesign or modification of the products by the manufacturer to reduce or eliminate the chances of injury was the preferred solution.

In May of 1981 the Division of Safety Research began receiving job injury reports from the network of hospitals connected with the National Electronic Injury Surveillance System. Our strategy in utilizing these reports was somewhat different from that of the Consumer Product Safety Commission. We knew that products would be involved in job accidents and injuries, but it was clear that many of these products had been in use for years or decades in industry and were not likely to be the sole factor in these injuries, nor was it likely that we would be able to legislate the recall or redesign of these products. Instead, it seemed clear that we should examine a number of items of information about

each injury and attempt then to make a more informed decision about general countermeasure strategies.

Hospitals currently reporting in the sample were chosen randomly from a frame of US state and jurisdictional hospitals stratified by size. Table 1 shows selected items of information provided for each case. Many of these items are available from our other data sources, but a few are not, notably diagnosis of injury as made by the attending physician, locale (street, industrial place, apartment building, etc), and severity.

The overall assessment of the patterns of injury reported to us through this system generated the categories listed in table 2. One general impression created by these rankings is that a large proportion of the injuries are relatively minor: 97 % are treated and released, 24.4 % involve only the fingers, and the diagnosis is laceration, contusion or abrasion in 47.8 % of the cases. This impression may be misleading, however, since estimates show that these emergency-room cases constitute 36 % of all injuries incurred on the job or at the place of business (5). It seems plausible to assume that many of the truly minor injuries are treated at the workplace medical facilities and that the System reports those that are generally serious enough to merit a trip to the hospital. This hypothesis will be tested in future studies.

Table 1. Items of information provided by the National Electronic Injury Surveillance System. (CPSC = Consumer Product Safety Commission)

Variable	Coding system	Examples or range
Type of accident or exposure	ANSI Z16.2 ^a	Fall from elevation; caught-in, under or between
Source of injury	ANSI Z16.2 ^a	Metal item, bodily motion, struck by
Part of body affected	ANSI Z16.2 ^a	Finger, trunk, head
Diagnosis	CPSC	Avulsion, fracture
Age		Cases excluded if age < 14
Sex		Male or female
Treatment date		.
Collection date		Date case is transmitted to CPSC
Locale	CPSC	Industrial place, street, apartment
Hospital	CPSC	66 currently reporting occupational cases
Disposition	CPSC	Treated and released, admitted to hospital, dead on arrival
Severity	CPSC	1 to 6, depending on disposition, diagnosis and body part injured
Comment		Short narrative or accident sequence, etc

^a American National Standards Institute method of recording basic facts relating to the nature and occurrence of work injuries.

Table 2. Leading categories of occupational injury from the National Electronic Injury Surveillance System, May 1981 — May 1982.

Leading categories	Number of cases	Percentage
<i>Diagnosis^a</i>		
Laceration	723,800	24.4
Contusions, abrasions	694,300	23.4
Strain, sprain	534,200	18.0
Puncture	179,600	6.0
Fracture	166,100	5.6
All others	674,000	23.0
Total	2,972,000	100.0
<i>Part of body injured</i>		
Finger	749,400	25.3
Hand	298,500	10.0
Eyeball	259,000	8.7
Lower trunk	251,000	8.4
All others	1,414,100	47.6
Total	2,972,000	100.0
<i>Type of accident or exposure</i>		
Struck against	751,900	25.3
Struck by	621,200	20.6
Caught in, under or between	282,300	9.5
Overexertion	276,400	9.3
All others	1,049,200	35.3
Total	2,972,000	100.0
<i>Disposition</i>		
Treated but not hospitalized	2,884,000	97.00
Hospitalized	73,000	2.50
Dead on arrival	900	0.03
All others	14,100	0.47
Total	2,972,000	100.0
<i>Location</i>		
Industrial place	1,817,600	61.3
Other property (eg, store, office building, restaurant, hotel)	875,900	29.5
Street or highway	67,600	2.3
All others	210,900	6.9
Total	2,972,000	100.0

^a Listed according to the primary diagnosis stated by the attending physician.

An example of perhaps the most surprising finding is shown in fig 1. From the combined injury estimates of the Surveillance System and the employment estimates of the Bureau of Labor Statistics age-, sex-, and month-specific incidence rates were developed for the United States. These data indicate that, in the summer months, young male workers are at more than five times the risk of their male co-workers aged 55 years and older. Similarly, overall risks for female workers are an average of one-fourth that of males,

and they do not display the pronounced seasonal trend of the latter. Several efforts are now underway to examine these differences in more detail and to explore the implications for workplace safety programs.

Supplementary Data System

Under federal grants to state labor departments, the Bureau of Labor Statistics has, since 1976, sought to utilize the ex-

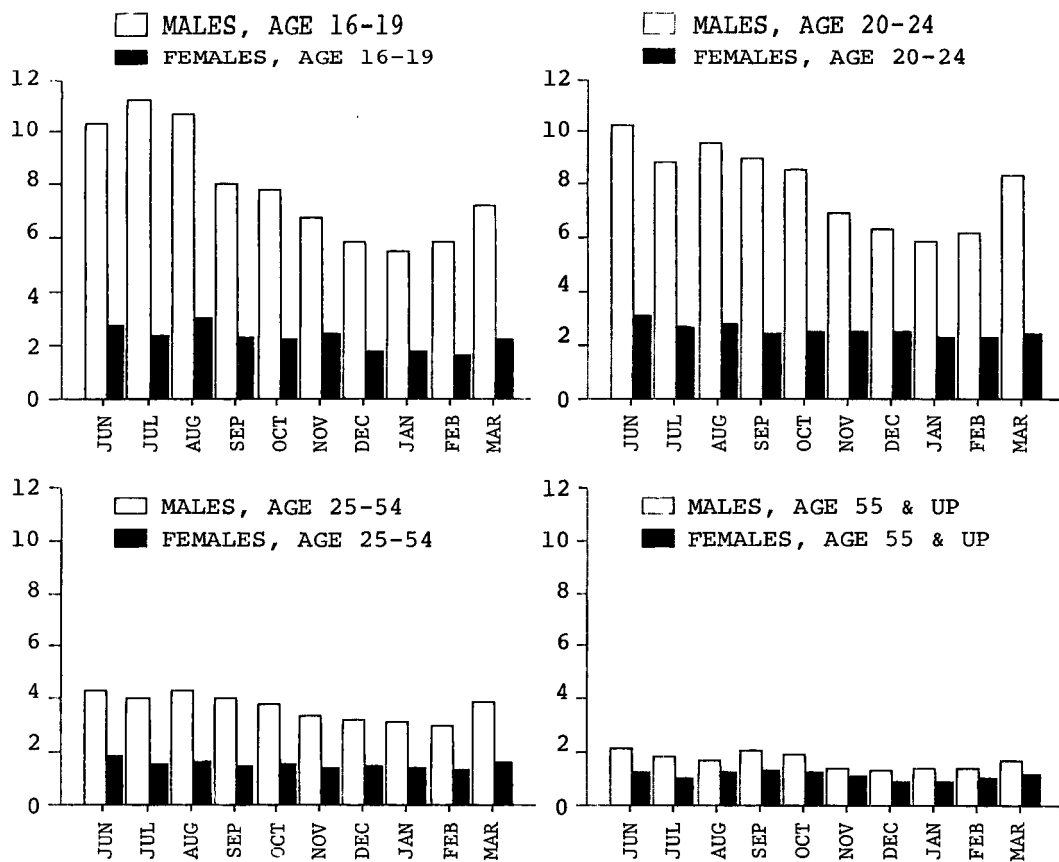


Fig 1. Age- and sex-specific incidence rates, by month, for occupational injuries requiring emergency-room treatment in 1981—1982. The ordinate axis shows injuries per 100 persons per year. Age groupings were determined by available employment statistics from the Bureau of Labor Statistics, US Department of Labor.

Table 3. Items of information provided for 1979 by the Supplementary Data System.

Variable	Coding system	Comments on range, examples, qualifiers
Type of accident or exposure	ANSI Z16.2 ^a	Fall from elevation, struck by
Source of injury or illness	ANSI Z16.2 ^a	Metal item, working surface
Part of body affected	ANSI Z16.2 ^a	Finger, trunk, head
Nature of injury or illness	ANSI Z16.2 ^a	Amputation, fracture (similar to diagnosis)
State		33 participating 1979
Reference year of occurrence (year, month)		• Cases from previous years included
Occupation of injured/ill	1970 US census	•
Industry of injured/ill	1972 SIC ^b	•
Ownership		Indicates whether public or private sector
Age		•
Sex		Male or female
Length of service		Optional item, varies by state
Weekly wage		Optional, provided by 23 states
Extent of disability		Optional, provided by 8 states
Indemnity compensation		Optional, provided by 8 states
Medical payments		Optional, provided by 2 states

^a American National Standards Institute method of recording basic facts relating to the nature and occurrence of work injuries.

^b Standard Industrial Classification, 1972 revision.

tensive but varied systems of records collected by state workers' compensation agencies more effectively. The efforts have been successful in some respects, but not so in others. Since state laws covering worker's compensation have evolved somewhat independently since 1911, there is questionable comparability of data from state to state. Since 1977 a total of 33 states and jurisdictions have participated in the program, the result being a not-necessarily representative subset of work injuries and illnesses in the United States.

The Bureau of Labor Statistics has, however, successfully obtained the cooperation of these states in reporting the cases they do cover in a uniformly coded format. Even though cases collected by the Supplementary Data System (table 3) cannot easily be aggregated to produce national estimates, the patterns of injury are remarkably similar to those produced from the cases collected by the National Electronic Injury Surveillance System (cf tables 2 & 4).

As can be seen in table 4, patterns of injury can easily be revealed by the sorting of cases of the Supplementary Data System by various combinations of descriptors. Limited of course by total case counts, one can produce counts of injuries having up to 15 general characteristics. For example, a program used by the Surveillance Branch produced the following: out of 133,744 cases from two states for the years 1978 and 1979, exactly 48 were strains and sprains to the back due to the lifting of objects, these injuries involving male truck drivers in North Carolina and occurring in the month of August.

Work injury report surveys

In 1977 the National Institute for Occupational Safety and Health began collaboration with the Bureau of Labor Statistics and the Occupational Safety and Health Administration on a program designed to provide a level of detail on job accidents previously unavailable. This program, known as the Work Injury Report Survey, has as its basic component a questionnaire which is mailed to injured workers who have filed worker's

compensation claims. Mailing and survey management are handled by state agencies operating under grants from the Bureau of Labor Statistics, while the selection of survey topics and questionnaire design are jointly carried out by all three organizations. Each year since 1978 roughly four surveys have been conducted, each typically running for three to four months and covering roughly 750 cases each.

The work injury report surveys start where the Supplementary Data System stops. Worker's compensation first reports of injury or illness are screened for injuries fitting the current survey definition. Questionnaires include a variety of items that provide much more detail on the characteristics of the injured worker, exposure to various conditions, experience, training, personal protective equipment worn, and, in some surveys, actions taken by the employer after the accident. Some of the past topics covered include ladder, scaffold, welding and cutting accidents; face, eye, foot, and head injuries; and accidents involving equipment servicing (1), back injuries, hand injuries, and amputations. Current surveys cover logging accidents, oil and gas industry accidents, falls from elevations, and falls on stairs. Table 5 presents some of the major findings of one such survey, that on equipment servicing injuries.

Future surveillance plans

In the developing phases of any science, researchers often rely on whatever data is at hand, particularly when methods are not sufficiently developed or agreed upon for generating more meaningful data (2). Surveillance, as an epidemiologic tool for describing disease distribution, is clearly developed and has proved its utility in public health for many years (3). This is not the case with the surveillance of occupational injury, where it is not clear which factors or characteristics of injury should be recorded on a routine, timely, national basis in the United States. As the examples presented show, surveillance often proceeds from case series data usually representing only frequency, and occasionally severity, of injury. Rates of

Table 4. Leading categories of occupational injury from the Supplementary Data System — Selected states, 1974.

Leading categories	Number of cases	Percentage
<i>Occupation</i>		
Miscellaneous laborer	73,700	4.4
Truck driver	69,500	4.2
Machine operative, miscellaneous	57,700	3.5
Miscellaneous operative	51,100	3.1
Construction laborer	50,700	3.1
Assembler	40,200	2.4
Carpenter	38,700	2.3
Laborer, not specified	34,400	2.1
Janitor	34,400	2.1
Material handler	33,600	2.0
All other occupations	1,176,400	70.8
Total	1,660,000	100.0
<i>Source of injury</i>		
Metal items, not elsewhere classified	150,000	9.0
Bodily motion	102,500	6.2
Boxes, crates, cartons	68,600	4.1
Containers, not elsewhere classified	61,400	3.7
All other sources	1,277,500	77.0
Total	1,660,000	100.0
<i>Nature of injury</i>		
Sprain or strain	560,200	33.8
Cut, laceration, puncture	290,100	17.5
Contusion, crushing, bruise	225,200	13.6
All other natures	584,500	35.1
Total	1,660,000	100.0

Table 5. Highlights of the work injury report survey on equipment servicing injuries in 1980.

Variable	Number of injuries	Percentage
<i>Industry</i>		
Food and kindred products manufacturing	115	15
Papers and allied products manufacturing	58	7
Printing and publishing	62	7
All other industries	588	71
Total	833	100
<i>Part of body injured</i>		
Finger	487	58
Hand	140	17
All others	206	25
Total	833	100
<i>Activity when injured</i>		
Unjamming objects from equipment	250	30
Cleaning equipment	245	29
Adjusting equipment	99	12
All others	239	29
Total	833	100

(continued)

Table 5. (Continued)

Variable	Number of injuries	Percentage
<i>Length of task</i>		
Less than 2 minutes	328	40
2 to 15 minutes	253	31
15 minutes to 1 hour	124	15
Other	109	14
Total	814	100
<i>Frequency of task</i>		
Daily	429	56
Once per week	110	14
Once per month	106	14
Once per year	42	5
First time worker did task	81	11
Total	768	100
<i>How injury occurred</i>		
Injured by machine parts in motion	735	88
Injured by contact with electric current	45	5
Other	53	7
Total	833	100
<i>Emergency shutoff within reach</i>		
No	411	50
Yes	380	46
Unknown	28	4
Total	819	100
<i>Type of warning system</i>		
None	596	77
Audible warning (bell, alarm, etc)	54	7
Visual warning (lights, etc)	92	12
Unknown	43	6
Total	779	100
<i>Equipment turned off before task</i>		
No	653	78
Yes	180	22
Total	833	100
<i>Reason(s) for not turning equipment off ^a</i>		
Did not think necessary	209	35
Could not do task with equipment off	209	35
Felt it would slow production or take too long	112	19
Not required by company procedures	69	12
<i>Equipment turned off</i>		
Co-worker turned equipment or system on, not knowing worker was working on it	56	32
Parts were still in motion	30	17
Injured person accidentally turned equipment or system back on	20	11
Other	70	40
Total	176	100

^a Injuries are not totalled since multiple responses were allowed.

injury per unit of exposure across categories of person, place, and time can only be calculated after the introduction of such surrogates for exposure as employment or population estimates.

Current plans call for a more extensive analysis of the described data, as well as the integration of these data with vital statistics and routinely collected public health data. In particular, plans include the application of epidemiologic methods to these data. The objectives in safety, as in general health research, are to define problems, causal factors, and hypotheses clearly. Long proved in epidemiologic studies, such logical starting points as JS Mill's "method of differences" (4) will be examined for their applicability to job injury problems. It is hoped that this more extensive use of surveillance data to identify and characterize risk factors will help to guide more effectively the research

needed to help in the reduction of workplace injuries.

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