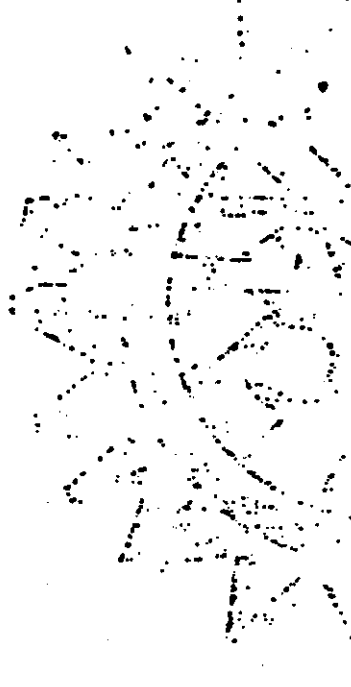


Professional Safety:



Workers' compensation claims relating to heat and cold exposure

by Roger C. Jensen

People are able to work in a relatively broad range of both hot and cold environments without apparent ill effects. They do this by making protective adjustments which help reduce their level of strain and risk of harm. For example, when exposed to cold environments, workers normally wear more clothes, and when exposed to hot environments they normally drink more fluids.

In most instances of occupational exposure to thermally stressful conditions, workers successfully make these adjustments and avoid harm. However, in those situations in which the thermal stress is either too great or the adjustments are inadequate, the worker may develop one or more of the disorders attributable to stressful thermal exposure, e.g., heat stroke, heat exhaustion, heat cramps, frostbite, trenchfoot, or hypothermia.

The adverse effects of exposure to hot or cold work environments may be manifested in several ways: 1) reduced work time due to the need for more frequent and longer breaks; 2) performance decrements in terms of reduced production rates or increased error rates;¹ 3) increased injury rates associated with less consistency in performing tasks in the planned and safe manner due to stressful thermal conditions;²⁻³ 4) temperature related injuries which do not cause lost workdays or result in workers' compensation claims;^{4,5} 5) temperature related injuries which are severe enough to result in the filing of a workers' compensation claim; 6) fatalities due to hypothermia or heat stroke,^{6,7,8,9} and 7) fatalities in which the environmental stress was a contributing factor.

The fifth item concerning workers' compensation claims attributed to thermally stressful working conditions is a topic which has not been reported in the liter-

Results

The industries which accounted for more than two percent of workers' compensation claims attributed to heat stress and cold stress are listed in Tables 4 and 5 respectively along with their associated incidence. The industries are classified according to the 1972 Standard Industrial Classification (SIC) system.¹²

The occupation of the workers who filed compensation claims for heat stress and cold stress injuries are listed in Tables 6 and 7 respectively. Only occupational groups which account for more than two percent of the claims are separately identified.

The gender of the compensation claimants for heat disorders in the 26 states showed that males made up 82.4% (N = 628) and females constituted 17.6% (N = 134) of the 762 total claims. Similarly, of the 645 cases of cold injury, 89% (N = 574) were male and 11% (N = 71) were female.

The age distribution of the claimants is shown in Figure 2 for heat disorders and Figure 3 for cold injuries. The month of occurrence is shown in Figure 4. About three-fourths (74.8%) of the heat illness cases originated during June, July, and August. The cold injury cases also show a strong seasonal trend with 77% of the cases originating in January or February.

Table 4. Industries with more than 2 percent of workers' compensation claims in the year 1979 for heat disorders reported by 26 states.

SIC Code	Industry	Incidence	% of all Heat Cases
33	Primary metal industries	68	8.9
17	Construction—special trade contractors	54	7.1
92	Justice, public order, and safety	48	6.3
16	Construction—other than building construction	47	6.2
91	Executive, legislative, and general government	41	5.4
01	✓ Agricultural production—crops	39	5.1
20	Food and kindred products	29	3.8
82	Educational services	27	3.5
49	Electric, gas, and sanitary services	24	3.1
15	Construction—buildings	24	3.1
42	Motor freight transportation and warehousing	21	2.8
79	Amusement and recreational services	19	2.5
28	Chemicals and allied products	18	2.4
73	Business services	17	2.2
07	Agricultural services	17	2.2

Workers' compensation claims are also coded to indicate which part of the body was injured. The coding system does not have a category for failure of the thermoregulatory system. Consequently, the heat illness cases found in the SDS system are classified as follows: entire body system failure (19%), circulatory system failure (43%), other body system failure (34%), and respiratory system failure (4%).

The absence of claims involving the legs and arms indicates that cases of heat cramps are not included in this data system. The part of the body classifications for cases attributed to cold stress are listed in Table 8.

Finger and hand injuries account for about 38% of the compensation claims, with foot and toe injuries making up about 27%.

The Bureau of Labor Statistics recommends against the use of SDS data to make national estimates of total workers' compensation claims for particular injuries. Instead, BLS uses the SDS data to estimate the number of lost-workday injuries in a specified year. The BLS technique is based on the assumption (which BLS has found to be generally correct) that the proportion of cases of a particular injury in the SDS data is the same as the proportion of cases for that injury among lost-workday cases.

Thus, to obtain the estimate one simply multiplies the proportion determined from the SDS data by the num-

Table 5. Industries with more than two percent of workers' compensation claims in the year 1979 for cold injuries reported by 26 states.

SIC Code	Industry	Incidence	% of all Cold Cases
49	Electric, gas, and sanitary services	52	8.1
92	Justice, public order, and safety	39	6.0
20	Food and kindred products	35	5.4
17	Construction—special trade contractors	34	5.3
42	Motor freight transportation and warehousing	32	5.0
91	Executive, legislative, and general government	31	4.8
16	Construction other than buildings	31	4.8
15	Construction of buildings	30	4.7
24	Lumber and wood products, except furniture	28	4.3
13	Oil and gas extraction	23	3.6
	Business services	21	3.3
50	Wholesale trade—durable goods	21	3.3
82	Educational services	18	2.8
75	Automotive repair, services, and garages	17	2.6
51	Wholesale trade—nondurable goods	17	2.6
55	Automotive dealers and gasoline service stations	14	2.2

Table 6. Incidence by occupational classification of 1979 workers' compensation claims for heat disorders reported by 26 states.

Occupation	Incidence	% of all Heat Cases
✓ Farm Laborer	57	7.5
Firemen	52	6.8
Miscellaneous Laborer	43	5.6
Construction Laborer	40	5.2
Miscellaneous Operative	36	4.7
Truck Driver	33	4.3
Laborer not specified	29	3.8
Gardeners and Groundskeepers	26	3.4
Miscellaneous Machinists	23	3.0
Miscellaneous Mechanics	18	2.4
Carpenter	17	2.2
All others (individually less than 2%)	388	51.0

Table 7. Incidence by occupational classification of 1979 workers' compensation claims for cold injuries reported by 26 states.

Occupation	Incidence	% of all Cold Claims
Miscellaneous Laborer	67	10.4
Truck Driver	49	7.6
Construction Laborer	28	4.3
Firemen	23	3.6
Garbage Collectors	22	3.4
Policemen and Detectives	21	3.3
Farm Laborer	20	3.1
Foremen	17	2.6
Gas Station Attendant	16	2.5
Linemen and Cablemen	15	2.3
Freight and Material Handlers	15	2.3
Carpenter	15	2.3
All others (individually less than 2%)	333	52.0

ber of lost-workday cases in the nation as determined by the BLS annual survey.¹⁴ Using this estimation technique for the year 1979 yields the following estimates for the number of lost-workday cases: 1,432 heat disorder cases and 1,212 cold injury cases.

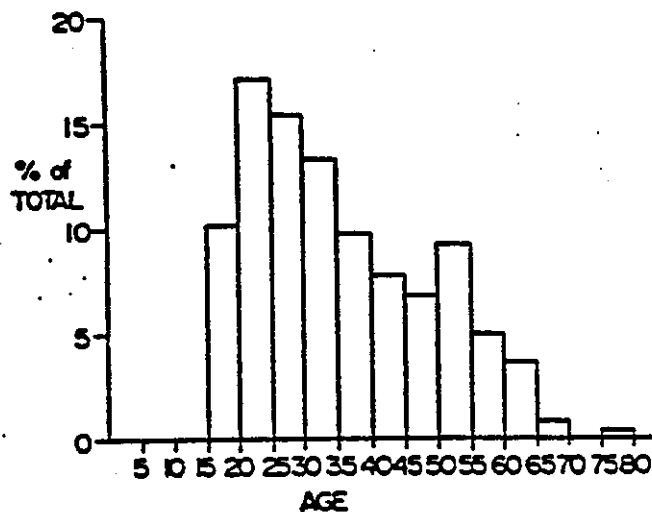


Figure 2. Age distribution of workers at time heat illness occurred.

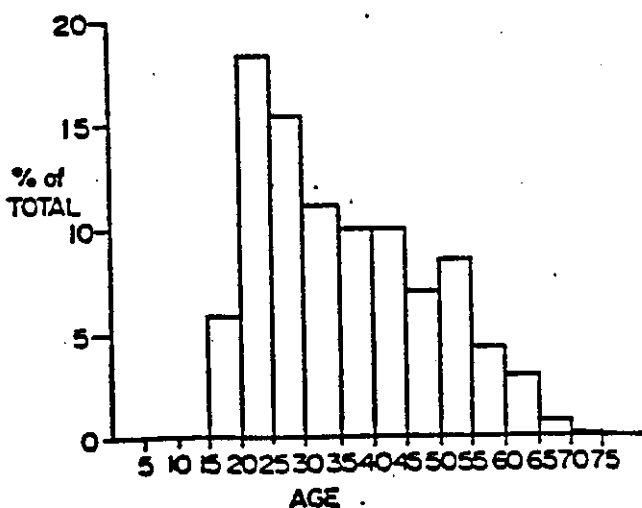


Figure 3. Age distribution of workers at time cold injury occurred.

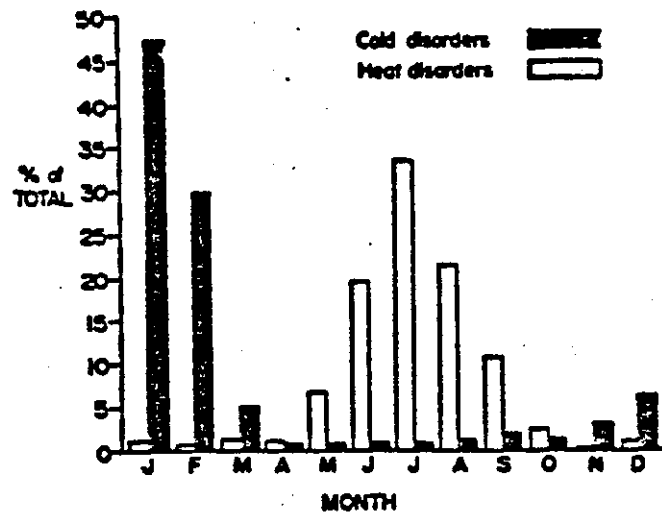


Figure 4. Distribution of workers' compensation claims by month for heat illnesses (in white) and cold injuries (in black).

Table 8. Incidence of 1979 workers' compensation claims for cold injuries reported by 26 states according to the part of body injured.

Part of Body	Incidence	% of all Cold Claims
Finger	158	24.5
Foot (not toes)	93	14.4
Hand	90	14.0
Toe	83	12.9
Multiple Body Parts	33	5.1
Ear	27	4.2
Upper Extremities	22	3.4
Respiratory System	20	3.1
Lower Extremities	16	2.5
Other Body Systems	14	2.2
Nose	9	1.4
Other body parts (individually less than 1.1%)	80	12.4

New information

The results of this assessment of SDS data provide some new information about the incidence of workers' compensation claims for work-related disorders attributed to stressful thermal exposure. These data must not, however, be regarded as a measure of the actual incidence for several reasons. First, several large groups of workers are not included in state workers' compensation programs, e.g., farm owners and their families, railroad employees, maritime workers, and Federal employees. Secondly, workers' compensation is only available to workers who incur costs for medical treatment or are unable to work for a certain number of workdays (most states have a 3, 5, or 7 day waiting period).

Consequently, disorders which are treated at the place or which disable a worker for only a few hours (e.g. heat cramps) are not generally included. Similarly, an injury to a worker may not become a workers' compensation claim if the employer assigns the worker to an alternate job which can be performed while recuperating. Finally, workers' compensation data does not provide sufficient information to identify cases in which exposure to heat or cold may have contributed to a cardiac incident or traumatic injury.

One important limitation to the SDS data is that not all the states participate. Thus, projections to the nation as a whole are only rough estimates. For cases attributed to heat stress and cold stress this limitation is particularly important because of the geographical distribution of the participating and non-participating states. The warm weather states on the Gulf of Mexico do not participate in the SDS systems. Consequently, these states probably have different incidence rates than the 26 SDS states. For cold-related injuries these states would be expected to have lower incidence rates; thus, the national estimate of lost-workday cold injuries is probably too high.

For heat-related disorders the situation is less clear. It may be that workers in the Gulf states tend to be better acclimatized to hot conditions and possibly more skilled at making other adjustments to avoid excessive heat strain. For example, in a heat stress study at one aluminum reduction plant in Texas, the monitoring of sweat rates and water intake of several workers disclosed that they would sweat in the range of 4.5 to 6.8 Kg (10 to 15 pounds) of water per shift, and replace almost exactly that amount of water through drinking.¹⁸

This remarkable skill in self-protection may, however, be offset by the generally hotter climate and working conditions found in the Gulf states. Due to these uncertainties the national estimates provided in this paper should only be regarded for what they are, rough estimates based on available data.

Summary

Workers' compensation data for the year 1979 provides some new information about work-related disorders attributed to heat stress and cold stress. The data on heat-related claims suggests that the claims are for heat stroke and heat exhaustion, not heat cramps, although the precise diagnosis of the disorders is not available from this source of data. The industrial groups with the largest incidence rates (claims per 100,000 employees) for heat-related claims were found to be agriculture (9.2), construction (6.4), and mining (5.0). The occupations with the most claims were laborers and firemen.

Among the cold-related claims, over three-fourths were apparently cases of frostbite involving the fingers, hands, toes, feet, ears, and nose. The industries with the largest incidence rates for cold-related claims were mining (10.2), construction (5.1), agriculture (4.7), and

Table 9. Comparison of heat illness compensation case rate by major industry group based on reports from 26 states for the year 1979.

Industry	Cases reported by 26 states	Employment in the 26 states (in thousands)	Reported cases per 100,000 employees
Agriculture	62	677.0	9.16
Construction	125	1,964.2	6.36
Mining	16	319.5	5.01
Manufacturing	226	8,871.4	2.55
Transportation	55	2,166.7	2.54
State & Local government	97	5,859.9	1.66
Services	115	7,371.5	1.59
Trade	57	8,956.3	0.64
Finance	8	2,063.6	0.39

Table 10. Comparison of cold injury compensation case rate by major industry group based on reports from 26 states for the year 1979.

Industry	Cases reported by 26 states	Employment in the 26 states (in thousands)	Reported cases per 100,000 employees
Mining	32	319.5	10.02
Construction	95	1,964.2	4.84
Transportation	100	2,166.7	4.62
Agriculture	28	677.0	4.14
State & Local government	83	5,859.9	1.42
Services	96	7,371.5	1.30
Manufacturing	108	8,871.4	1.22
Trade	90	8,956.3	1.00
Finance	12	2,063.6	0.58

transportation (4.6 claims per 100,000 employees). The occupational groups with the most claims were laborers, truck drivers, firemen, policemen, and garbage collectors.

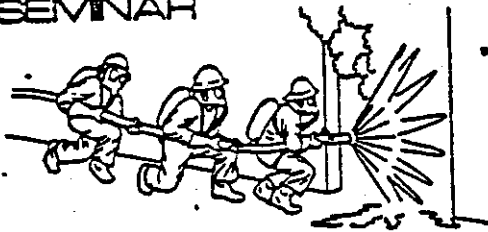
These data reflect only those injuries which were both serious enough to involve compensation and coded to indicate that hot or cold environmental conditions caused the disorder. Consequently, it may be regarded as the tip of an iceberg. Unseen by these compensation data are: (1) injuries to workers not covered by the state workers' compensation systems, (2) injuries which are not disabling enough to qualify for compensation, (3) cardiac incidents in which heat stress or cold stress was a contributory factor, and (4) traumatic injuries which may have resulted from less than optimal human performance due to hot or cold working conditions.

Safety professionals are encouraged to use these workers' compensation data together with their own knowledge of working conditions and the past experiences of their organization to identify groups of workers who are at greatest risk of incurring an injury due to hot or cold environmental conditions. If the environmental conditions cannot be improved, then the implementation of a few basic precautions can significantly reduce the risks. Useful guidelines are provided in numerous articles in the safety literature as well as many reference books.^{16,17,18,19,20}

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