Occupational Accidents and Injuries in Thailand

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The Workers' Compensation Fund (WCF) represents only a limited fraction of work-related injuries in the Thai workforce. This cross-sectional study examined 258,986 records from the Thai National Injury Surveillance (NIS) system collected during 2001–2004, focusing on 17,538 injuries coded as work-related. NIS records provided information generally not represented in WCF statistics, such as construction and agriculture. The reported mechanisms in 129 work-related fatalities were particularly informative, including electrical current (27%), transport accidents (20%), and falls (15%). Mortality in transport accidents was dramatically higher when seat belts or motorcycle helmets were not used, whether work-related or not. The findings emphasize the need to use multiple sources of information for a complete picture of work-related injuries in Thailand, and possibly in other countries. The mechanisms of fatal injury indicate areas where focused efforts are warranted. *Key words*: occupational injuries; surveillance; Asia, Southeastern; Thailand.

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Occupational accidents and injuries can have wide-ranging impacts on workers such as pain, lost work, disability, and death. In addition, injured workers can lose their wages and endure medical and other economic costs.[1] Globally, in 2002, there were an estimated 100 million occupational injuries and 350,000 work-related deaths.[2,3]

In Thailand, work-related injury and illness statistics are primarily compiled and reported by the Workmen's Compensation Fund (WCF) in the Ministry of Labor. In 2003, the WCF covered 7,214,548 workers and received 209,224 injury claims (2.9 per 100 workers).[4] During the same period, the WCF paid compensation for only 39 cases of occupational disease, including 11 individuals with lead poisoning, 15 with noise-induced hearing loss, and 13 with pneumoconiosis.

In 2003, the total workforce in formal and informal sectors in Thailand was estimated to be 35.7 million people (56% of the total population), which is almost five times larger than the number of workers encompassed by the WCF.[5] Workers are covered by the WCF only if they are registered under a social security program, which generally occurs only in the manufacturing, industrial service, and business sectors.[6] In 2003, the manufacturing (18%) and industrial service (21%) sectors accounted for less than half of the Thai workforce. Agriculture is the largest single sector (47%), although its relative size is gradually decreasing.[4,5]

The WCF statistics represent a limited fraction of the Thai workforce. Therefore, this study used records from the population-based National Injury Surveillance system, operated by the Bureau of Epidemiology in the Ministry of Public Health (MOPH), to characterize injuries reported as work-related across a broader portion of the Thai workforce.

METHODS

This cross-sectional study of the Thai National Injury Surveillance system (NIS) examined data collected between 2001 and 2004, focusing on work-related injuries and fatalities. The study used existing records, without subject identifiers. All study procedures were approved in advance by the University of Washington Human Subjects Division and MOPH of Thailand.

Data Source

Data were obtained from computerized NIS records maintained by the MOPH Bureau of Epidemiology. Injuries had originally been reported by participating regional and general hospitals, using a standardized form that included demographic information (gender and age), information about the injury, a dichotomous variable indicating whether the injury was work-related or not, and if so, the type of job and industry. Local personnel, who were trained by the MOPH specifically for the NIS project, interviewed the injured patients using a one-page form and guide created by the MOPH, and entered data in coded computer format. The responses were submitted electronically to the MOPH every six months.

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TABLE 1 Participation and Reporting in the Thai National Injury Surveillance (NIS) System, 2001 through 2004

	Year			
	2001	2002	2003	2004
Participants				
Hospitals	20	24	28	29
Provinces	18 (23.7%)*	21 (27.6%)	25 (32.9%)	26 (34.2%)
Population	63,130,400 (53.9%)†	63,660,900 (54.3%)	64,238,000 (55.2%)	65,231,000 (55.6%)
Reported injuries				
Total	64,404	65,065	64,973	64,544
Work-related	4,518 (7.0%)‡	4,249 (6.5%)	4,063 (6.3%)	4,708 (7.3%)
Reported fatalities				
Total	1,391	1,261	953	1,007
Work-related	36 (2.6%)‡	39 (3.1%)	29 (3.0%)	25 (2.5%)

*Percentage of provinces in Thailand (total, 76).
†Percentage of Thai population included in participating provinces (total employment and unemployment). National Statistical Office Thailand.
‡Percentage of work-related in reported injuries and fatalities.

Most residents of Thailand are served by the public health care system, which is controlled by the MOPH. Private hospitals serve a minority of residents. The public hospital system consists of 25 regional hospitals with over 500 beds, 67 general hospitals at the provincial level, 715 community hospitals at the district level, and 9,704 health centers in rural areas.[7,8] The NIS system covers only the regional and some general hospitals in participating provinces and still does not cover all provinces. The numbers of regional and general hospitals participating in the NIS system and the numbers included in the present study are presented in Table 1. Private hospitals are not obligated to participate in the NIS system.

The study sample included all injury cases reported to the NIS system in the four-year period 2001 through 2004. Cases were identified as work-related using one dichotomous variable, "injured while working."

Data analyses were primarily descriptive but included comparisons between work-related and all other injuries, using contingency tables and chi-square or Fisher's exact test. Categories with small values (≤ 5) were combined for comparisons. Odds ratios and 95% confidence intervals were used to characterize fatality risk in transport accidents with use or non-use of safety devices. Epi Info version 3.4 was used for all statistical analyses.[9]

RESULTS

There were 258,986 reported injury cases in total during the four-year study period, including 17,538 work-related injuries (6.8%). Reported injuries resulted in fatality less often in work-related cases (n = 129; 0.7%) than in other cases (n = 4,612; 1.8%). Work-related fatalities accounted for 2.8% of all reported injury fatalities.

Most patients with work-related injuries were male (85%; Table 2). The average age was 31.1 years (standard deviation, 18.4). Work-related injuries were most prevalent among individuals who were 20 to 49 years old (72.7%, compared with 51.6% in the general population), with slightly more than half (53.3%) involving individuals 20 to 39 years old. It is noteworthy that 465 reported injuries and two fatalities (in four years) involved workers under the age of 15 years. Alcohol or medication use was found significantly less often with work-related injuries than in the general population, but the number of cases associated with alcohol use was not trivial (n = 1,180; 6.7%).

The head, neck, and face were the parts of the body most commonly affected in work-related injuries and among the general population, although severe head and neck injuries were significantly more common in work-related injuries (Table 2). However, these values must be interpreted cautiously. Notice that Table 2 shows "body part" values only for cases with severe or critical injuries (level > 3 on a six-category severity scale), because the values were less informative epidemiologically when cases with any level of injury severity were considered; for example, nearly all (94.6%) work-related injuries were categorized as affecting the head/neck and most cases also involved one or more other body parts (including, 31.0%, face). On the other hand, the affected body part appeared to be under-reported for fatal injuries (i.e., the values added to less than the total number of cases), when the values were restricted to cases coded as severe or critical. However, fatal injuries are inherently severe or critical, regardless of the reported (or under-reported) severity level; therefore, considering *all* reported work-related fatalities, including those coded as only mild or moderate severity, the most frequently affected body parts in fatal injuries were the head/neck (59.7%), face (31.8%), and thorax (17.1%).

The most common mechanism of injury among the general population was transport accidents, for both all injury cases (55.0%) and fatal injuries (62.5%; Table 2). A different pattern was found for work-related

TABLE 2 Features of Injuries and Injury Fatalities Reported in the Thai National Injury Surveillance System (NIS; Total, 2001 through 2004)

	Injuries (Including Fatalities)*					Fatalities*				
	Work-related (n = 17,538)		All Others (n = 241,448)			Work-related (n = 129)		All Others (n = 4,483)		
	No.	(%)	No.	(%)	Significance	No.	(%)	No.	(%)	Significance
Gender (male)	14,887	(84.9)	173,229	(71.7)	< 0.001	119	(92.2)	3,627	(80.9)	0.001
Age (years)										
<15	465	(2.7)	39,575	(16.4)	< 0.001	2	(1.6)	346	(7.7)	0.002
15–19	1,637	(9.3)	37,461	(15.5)		9	(7.0)	554	(12.4)	
20–29	4,686	(26.7)	56,746	(23.5)		38	(29.5)	1,156	(25.8)	
30–39	4,645	(26.5)	38,423	(15.9)		37	(28.7)	938	(20.9)	
40–49	3,423	(19.5)	29,394	(12.2)		26	(20.2)	694	(15.5)	
50–59	1,728	(9.9)	17,368	(7.2)		12	(9.3)	343	(7.7)	
>60	953	(5.4)	22,481	(9.3)		5	(3.9)	452	(10.1)	
Substance use										
Alcohol	1,180	(6.7)	67,628	(28.0)	< 0.001	3	(2.3)	435	(9.7)	0.008
Medication	48	(0.3)	2,646	(1.1)	< 0.001	1	(0.8)	15	(0.3)	0.37
Body part injured (severe and critical injuries only)†										
Head/neck	13,474	(76.8)	142,142	(58.9)	< 0.001	18	(14.0)	727	(16.2)	0.20
Face	4,523	(25.8)	62,467	(25.9)		23	(17.8)	1,092	(24.4)	
Thorax (chest)	1,096	(6.2)	24,983	(10.3)		15	(11.6)	755	(16.8)	
Abdomen and pelvic	296	(1.7)	10,288	(4.3)		3	(2.3)	388	(8.7)	
Extremities	100	(0.6)	4,050	(1.7)		3	(2.3)	187	(4.2)	
External and body surface	15	(0.1)	1,362	(0.6)		0		72	(1.6)	
Mechanism of injury										
Transport accidents	2,220	(12.7)	132,900	(55.0)	< 0.001	26	(20.2)	2,800	(62.5)	< 0.001
Mechanical forces	10,804	(61.6)	26,171	(10.8)		21	(16.3)	58	(1.3)	
Falls	3,136	(17.9)	30,161	(12.5)		19	(14.7)	99	(2.2)	
Animal and plant venoms	386	(2.2)	6,544	(2.7)		0		8	(0.2)	
Electrical current	541	(3.1)	990	(0.4)		35	(27.1)	214	(4.8)	
Heat and hot substance	81	(0.5)	966	(0.4)		0		0		
Smoke, fire and flame	92	(0.5)	530	(0.2)		0		5	(0.1)	
Other	278	(1.6)	43,186	(17.9)		28	(21.7)	1,299	(29.0)	
Transport accidents										
Motorcycle	721	(4.1)	103,460	(42.8)	< 0.001	6	(4.7)	1,889	(42.1)	< 0.001
Other vehicle	1,499	(8.5)	29,440	(12.2)	< 0.001	20	(15.5)	911	(20.3)	0.21
Safety device use†										
Helmet (motorcycle)	577	(80.0)	88,339	(85.4)	< 0.001	0		18	(1.0)	0.99
Seat belt (vehicle)	997	(66.5)	13,986	(47.5)	< 0.001	2	(10.0)	73	(8.0)	0.67

*Numbers of cases (and column percentages, in parentheses). Significance is p value for comparisons between occupational and non-occupational values, determined by chi-square or Fisher's exact test. Categories with small values (≤ 5) were combined for fatality comparisons.
†"Body part injured" values are shown for injuries categorized as severe or critical only (level > 3, on six-category scale).
‡Percentage of motorcycle or other vehicle users.

cases, where the most common mechanism of injury was mechanical forces (61.6%), and transport accidents were less commonly reported (12.7%). The reported mechanisms for work-related fatal injuries were much more varied than in the general population. The largest single mechanism of injury in work-related fatalities was electrical current, which accounted for more than a fourth (27.1%) of cases. Three other mechanisms occurred with approximately similar frequencies in fatal cases: transport accidents (20.2%), mechanical forces (16.3%), and falls (14.7%).

The use of safety devices was moderately high but still much less than universal in injury cases involving transport accidents (vehicle seat belts, 85% overall, work-related or not; motorcycle helmet, 48%). Seat-belt use was higher in work-related vehicle accidents than in the general population, but helmet use was slightly lower in work-related motorcycle accidents (Table 2). It is noteworthy that use of safety devices was rarely reported (≤ 10%) in fatal transport injury cases, whether the case was work-related or not. Overall, the risk of death was markedly increased for motorcycle accidents where a

TABLE 3 Features of Work-related Injuries and Injury Fatalities Reported in the Thai National Injury Surveillance (NIS) System (Total, 2001 through 2004)*

	Non-fatal (n = 17,409)		Fatal (n = 129)		Significance
Work location					
Construction site	6,448	(37.0)	31	(24.0)	$p < 0.001$
Farmland/field	3,296	(18.9)	10	(7.8)	
House	2,856	(16.4)	7	(5.4)	
Road	1,989	(11.4)	23	(17.8)	
Market place	1,134	(6.5)	10	(7.8)	
School/hospital	442	(2.5)	2	(1.6)	
Apartment	52	(0.3)	0		
Stadium/playing field	49	(0.3)	0		
Other	1,143	(6.6)	46	(35.7)	
Job category					
Labor workers	9,884	(56.8)	92	(71.3)	$p < 0.001$
Agriculture	3,482	(20.0)	7	(5.4)	
Private company	1,278	(7.3)	10	(7.8)	
Students	537	(3.1)	2	(1.6)	
Business/trade	463	(2.7)	1	(0.8)	
Craftsmen	320	(1.8)	1	(0.8)	
Civil services	195	(1.1)	3	(2.3)	
Transportation (drivers)	142	(0.8)	2	(1.6)	
Police officers/military	118	(0.7)	1	(0.8)	
Fisheries	92	(0.5)	1	(0.8)	
Public owned corporation	80	(0.5)	1	(0.8)	
Housewives	48	(0.3)	0		
Other	770	(4.4)	8	(6.2)	

*Numbers of cases (and column percentages, in parentheses). Significance is p for comp;arison between occupational and non-occupational values, determined by chi-square test. Categories with small values (≤ 5) were combined for comparisons.

helmet was not worn (odds ratio, OR = 692; 95% CI 427–1,136), and the risk was substantial although not as dramatic for accidents involving another type of vehicle without a seat belt (OR = 11.3; 8.9–14.5).

Most of the reported work-related injuries occurred at construction sites (37.0%) or farm sites (18.9%; Table 3). Similarly, most of the injuries involved labor workers (56.7%) or agricultural workers (20.0%). The relative lack of reported injuries at manufacturing sites suggests they are under-detected in the NIS system.

DISCUSSION

The findings of this study emphasize the need to use multiple sources of information to paint a complete picture of occupational morbidity and mortality in Thailand, and possibly in any other country that does not have a universal record-keeping system. In Thailand, national statistics about occupational injuries are generally based on reports by WCF of the Ministry of Labor. However, this office covers workers in the social security program only, which represents only about one fifth of the estimated total number of workers in formal and non-formal sectors.[4] The present study used data from the NIS system operated by the Ministry of Public Health and identified work-related injuries among workers for whom data are generally not captured by the WCF statistics, particularly construction and agricultural laborers.

The NIS system appears to provide a complementary albeit limited source of information about work-related injuries in Thailand. It is not possible with the available information to characterize how much overlap exists between the WCF and NIS systems; however, the amount of overlap is likely to be slight. The industry sectors that are generally prevalent in the WCF system—manufacturing, industrial service, and business—were not common in the NIS reports. This is not unexpected, since individuals who have workers' compensation coverage often seek care in private medical facilities, which are not obligated to participate in the NIS system. On the other hand, the number of work-related injuries detected by the NIS system (< 5,000 per year) is small compared with the number of injury claims received by the WCF (> 200,000 per year), suggesting that under-detection might be substantial in the NIS system. There are many factors that could cause this, particularly the fact that the NIS system is based on reports from larger public hospitals, where the scope of injuries is probably influenced by accessibility and relative severity of the injury. Furthermore, among reported injuries, there may be limited ability or incentive to identify cases as work-related injuries or not. Nonetheless, with awareness of these constraints, the broad population base and the standardized data-collection procedures make the NIS statistics potentially very informative.

Occupational accidents and injuries comprised an important percentage (6.8%) of reported injuries among the general population in Thailand. This is lower than has been reported in previous studies in developing countries (e.g., Nicaragua, 18.6%; Ghana, 18.5% in urban areas and 45.0% in rural areas).[10,11] Although the lower percentage in the present study is likely to represent incomplete detection of cases, it is interesting that the percentage of injury fatalities that were reportedly work-related (2.8%) was similar to what has been reported previously (e.g., Latin America and the Caribbean, 3.2%; China, 2.8%; Asia, 2.7%).[12,13]

A number of findings from the present study are worthy of mention. The high percentage of males among injury cases, particularly work-related cases (85%), could be explained by male-predominant occupations being more hazardous than female-predominant occupations, but also could reflect differences in reporting. The disproportionately high frequency of work-related injuries among persons with ages between 20 and 50 years indicates a high potential for impacts on dependent family members, if the injured worker suffers temporary or permanent disability.

The reported mechanisms of work-related injuries indicate areas where focused efforts are warranted. The majority of work-related injuries were associated with "mechanical forces," which undoubtedly represents a wide array of hazards and situations that would be challenging to confront. However, more than a fourth of the injuries (27%) were attributed to electrical current, and large percentages of injuries (18%) and fatalities (15%) were associated with falls. It is plausible that these relatively discrete types of hazards might involve identifiable situations that are occurring again and again, and further research could provide the foundation for regulatory or educational interventions. Transport accidents accounted for substantial percentages of work-related injuries (13%) and fatalities (20%). However, regardless of whether a transport injury was work-related or not, the major risk for fatality appeared to be failure to use safety devices, as illustrated by the nearly tenfold increased risk associated with not using vehicle seat belts and the hundredsfold risk associated with not using motorcycle helmets. Clearly, there is a need for expanded regulation or greater enforcement of requirements for transport safety devices.

There are a number of factors beyond those already mentioned, that limit the ability of this study and the NIS system to provide a complete picture of the occupational injury situation in Thailand. The data-collection protocol provided only limited data about the injury and no information about whether injuries were eventually covered by the WCF or not. This study was a secondary data analysis, and without clear delineation of the encompassed population, it was not possible to calculate incidence rates.

This study demonstrated that the NIS surveillance system can be a useful source of information about work-related injuries in Thailand. This surveillance system will grow to cover every regional hospital and general hospital in the next few years, and this should increase the utility of NIS statistics.[8] Injury surveillance in Thailand would probably benefit from expanded cooperation between the Ministry of Public Health and the Ministry of Labor, to share and compare surveillance information on a regular or ongoing basis.

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