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Trends and Characteristics of Occupational Injuries in Thailand, 2002-2010

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Abstract

Occupational injuries are important health problems in Thailand and cause significant health impacts on workers, in addition to economic loss. Data was obtained and analyzed from National Injury Surveillance (NIS) System for describing epidemiology of agricultural injuries and from Workmen's Compensation Fund (WCF) statistics for identifying trends and characteristics of injuries and deaths in industrial and business workers during the period of 2002-2010. Results from NIS showed that from 103,501 reported occupational injuries, 17,481 were related to agriculture and accounted for 16.9% of all injuries, with 96 deaths (fatality rate of 0.5 per 100 workers). Leading causes of agricultural injuries were struck by thrown or falling object (12.2%), contact with agricultural machinery (9.6%) and foreign body entering into eye or skin (8.0%). Most cases occurred in the afternoon during 1-6 pm (44.2%). The WCF statistics revealed that rates of injuries among industrial workers had decreased from 31.4 per 1,000 workers in 2002 to 16.5 per 1,000 workers in 2010. Leading causes of deaths were vehicle accident, fall from height and electrocution. Young workers aged 20-29 years old (46.4%) were more likely to get injured. The outcomes of this study could be used to develop guideline and strategy on surveillance system and prevention of occupational injuries in Thailand.

Keywords: occupational injuries, agriculture, industry, business, Thailand

Introduction

Occupational injuries are important health problems among workers worldwide, especially in industrial and developing countries. Health effects of occupational injuries can vary significantly from acute or chronic pain, work loss, disability and financial loss to death. The highest proportion of injuries occurs among persons aged 15 to 59 years, the primary working ages. Globally, occupational-related injuries account for approximately 800,000 deaths and 100 million injuries, with estimated 14.5 billion USD spent annually for medical treatment.¹ These expenses can be considered as unjustified public health burden while many of injuries are preventable.

In 1997, the International Labor Organization (ILO) estimated burden of occupational accidents and injuries based on data gathered from selected ILO member states. Estimated rate for fatal occupational accidents was 14 per 100,000 workers, with 335,000 deaths annually.¹ Fatality rate in China was estimated as 10.5 per 100,000 workers while accident rate was 8,028 per 100,000 workers. There were 56 million of occupational accidents, with at least 3-days absence from work. In addition, over 48,000 workers

in India died annually because of occupational accidents. About 970 people died every day because of occupational accidents. One fatal accident occurred over 760 occupational accidents that cause at least 3-days absence from work.²

In Thailand, National Statistical Office (NSO) reported that population in Thailand was approximately 63.5 million in 2009. Estimated number of workers was 37.1 million, including 13.8 million of formal workers (37.3%) and 23.3 million of informal workers (62.7%). Formal workers were people worked with official contract arrangement while informal workers were people worked outside their employer's workplace without official control.

Data from National Injury Surveillance (NIS) System of Thailand showed that work-related fatalities accounted for 2.8% of all reported fatalities from injuries during 2000-2004.³ Most of the reported occupational injuries occurred at construction site (37.0%), followed by agricultural farm (18.9%). In addition, incidence rate of occupational injuries was 20.7 per 1,000 insured workers in 2008 based on social insurance data.⁴ The government of Thailand issued a policy on occupational safety and health to promote labor protection in both formal and informal

sectors. The policy called for reduction and prevention of accidents among workers with a focus on workplace injuries. The master plan on Safework Thailand (2007-2011) aimed to reduce occupational accidents, decrease loss of valuable workers' lives and promote better quality of life for them.

Purposes of this study were to describe trends and characteristics of occupational injuries and deaths in Thailand between 2002 and 2010. Findings could be used to evaluate health impact of occupational injuries, plan compensation for workers by social security insurance system and guide in monitoring of workers' health.

Methods

A descriptive cross-sectional study was conducted to describe trends and characteristics of occupational injuries and deaths using data from the NIS system and the Workmen's Compensation Fund (WCF) in 2002-2010.

Number of workers recorded by the WCF represented a limited fraction of Thai workforce who worked in manufacturing sectors and registered under Social Security Office, Ministry of Labor and Social Welfare.⁵ Although agricultural workers belonged to the largest group of workers (47.0%) in Thailand according to 2005 statistics from Bureau of Labor, they were not registered. Therefore, we used data from the NIS system to describe trends and characteristics of injuries among workers in agricultural sector and the WCF statistics for describing trends and characteristics of occupational injuries among industrial and business workers in Thailand.

A workplace injury was defined as an event of injury or accident occurred while working in industry or outside. Occupation injuries in this study included both cases and deaths.

The data sets were explored and cleaned to assure accuracy and completeness of individual records before analysis. Variables obtained from both databases included demographics, types of injury, behavior of work, organs injured, work time loss, places of accident, parts of body affected and others. Data management and analysis were done by EPI Info 2002.⁶

Results

The Bureau of Epidemiology, Ministry of Public Health routinely collected 104 variables on fatal and non-fatal injuries in Thailand. Severe cases of injuries and deaths were reported from 33 sentinel hospitals nationwide through the NIS. The WCF database, which was recorded by Ministry of Labor, provided information on injuries of all workers who had registered for compensation and had claimed for a workplace injury.

Data from NIS

The NIS reported 103,501 occupational injuries, including 1,080 deaths, from 2002 to 2010. Males made up 86% of all injured workers. There were 11,500 occupational injuries (range 7,891-17,311) annually, and average age of injured workers was 34.4 years (range 15-60 years).

Occupation with the greatest percentage of occupational injuries was labor (58.9%), followed by agricultural worker and farmer (16.9%). Common places of accidents were factory, construction site or hotel (39.1%), home (16.9%), farm or garden (16.8%) and road (10.8%) (Figure 1).

During 2002-2010, there were 17,481 agricultural injuries (16.9%) reported to NIS, resulting in 96 deaths (fatality rate 0.5 per 100 workers). Leading causes of occupational injuries in agriculture were struck by thrown or falling object (12.2%), contact with agricultural machinery (9.6%) and foreign body entering into eye or skin (8.0%) (Figure 2).

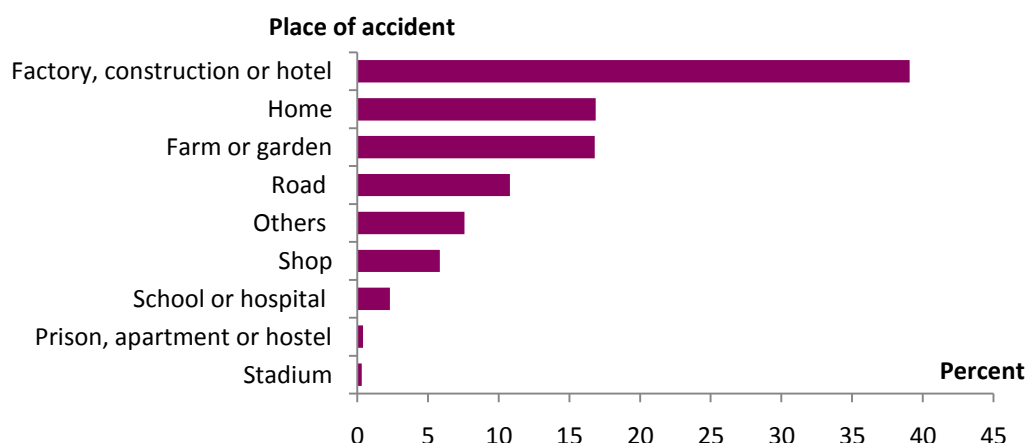


Figure 1. Occupational injuries by places of accident reported to the National Injury Surveillance System in Thailand, 2002-2010 (n=103,501)

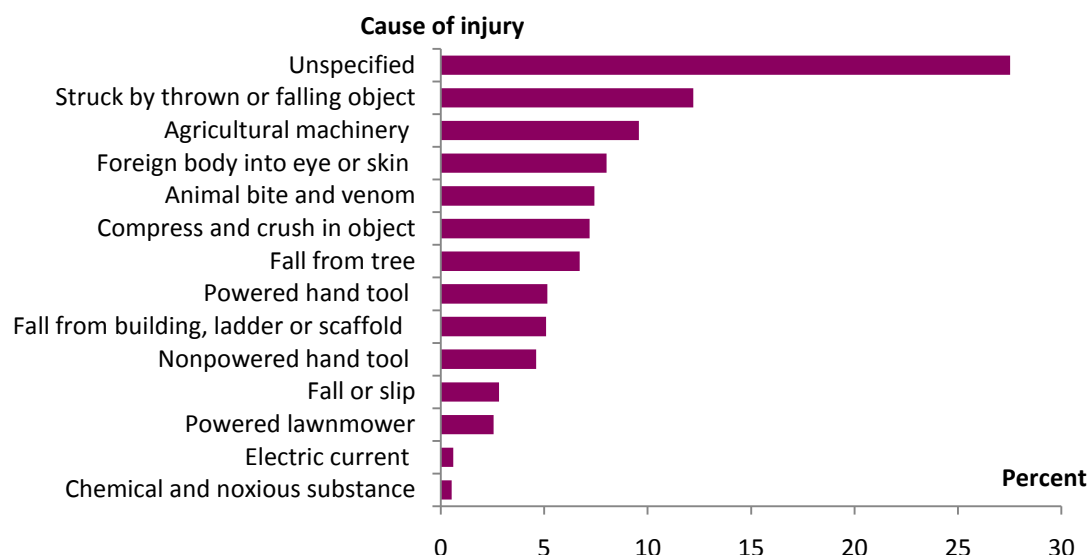


Figure 2. Causes of occupational injuries among agricultural workers reported to the National Injury Surveillance System in Thailand, 2002-2010 (n=17,481)

Although occupational injuries occurred anytime during working hours, most cases took place during 1-6 pm (44.2%). Common injured parts of body were extremities such as leg, arm and finger (53.1%), followed by skin (20.0%), eye and part of face (7.3%), and head and neck (6.7%). Severe cases were due to electrocution (11.2%) and fall from height (36.3%).

Data from WCF

Data from the WCF statistics were used to characterize trends and types of injuries among workers in manufacturing and business groups from 2002 to 2010. Average number of workers covered by the WCF was 8,100,183 and the system received 191,586 claims due to occupational injuries (23.7 per 1,000 workers) annually.

From 2002 to 2010, annual number of occupational injuries reported was nearly 190,000 and 800 deaths per year. Trends of non-fatality and fatality rates of occupational injuries had decreased consistently every year from 2002 to 2010. Injury rates, including deaths, decreased from 31.4 per 1,000 workers in 2002 to 16.5 per 1,000 workers in 2010. Fatality rate was also markedly decreased from 11.8 to 6.5 per 100,000 workers, except in the year 2005 that was slightly increased.

Table 1 revealed degree of work loss, disability and deaths from the injuries. Up to 72.4% of injured workers were absent from work three days or less, and only 0.4% were fatal or permanently disabled.

Table 1. Occupational injuries by degree of loss and death reported to the Workmen's Compensation Fund in Thailand, 2002-2010

Year	Number (Percent)					Total
	Death	Permanent disability	Permanent partial disability	≥ 3 days absence	< 3 days absence	
2002	650 (0.3)	14 (< 0.1)	3,424 (1.8)	49,012 (25.7)	137,879 (72.2)	190,979
2003	787 (0.4)	17 (< 0.1)	3,821 (1.8)	52,364 (24.9)	153,684 (72.9)	210,673
2004	861 (0.4)	23 (< 0.1)	3,775 (1.8)	52,893 (24.5)	157,982 (73.3)	215,534
2005	1,444 (0.7)	19 (< 0.1)	3,425 (1.6)	53,641 (25.0)	155,706 (72.7)	214,235
2006	808 (0.4)	21 (< 0.1)	3,413 (1.7)	51,901 (25.4)	148,114 (72.5)	204,257
2007	741 (0.4)	16 (< 0.1)	3,259 (1.6)	50,525 (25.4)	144,111 (72.5)	198,652
2008	613 (0.3)	15 (< 0.1)	3,096 (1.8)	45,719 (25.9)	127,059 (72.0)	176,502
2009	579 (0.4)	8 (< 0.1)	2,383 (1.6)	39,850 (26.7)	106,616 (71.3)	149,436
2010	619 (0.4)	11 (< 0.1)	2,149 (1.5)	39,919 (27.2)	103,813 (70.9)	146,511
Total	7,102 (0.4)	144 (< 0.1)	28,745 (1.7)	435,824 (25.5)	1,234,964 (72.4)	1,706,779

Common types of occupational injuries by physicians' diagnosis from 2004 to 2010 were puncture and penetrating wound, dislocation or displacement of bone, abrasion or laceration, and bone fracture. Most types of injuries decreased, except bone fracture (Table 2).

Finger (29.4%) and eye (20.6%) were the most commonly affected organs in occupational injuries among industrial and business groups (Figure 3). Majority of occupational deaths had injury in multiple organs (84.0%), head (7.9%), neck and back (1.8%) and chest (1.6%).

Table 2. Occupational injuries by physician diagnosis reported to the Workmen's Compensation Fund in Thailand, 2004-2010

Nature of injury	Number (Percent)						
	2004	2005	2006	2007	2008	2009	2010
Bone fracture	15,340 (7.1)	15,464 (7.2)	15,654 (7.7)	15,577 (7.8)	14,822 (8.4)	12,932 (8.7)	13,116 (9.0)
Dislocation or displacement of bone	30,895 (14.3)	33,657 (15.7)	32,758 (16.0)	33,240 (16.7)	29,769 (16.9)	27,453 (18.4)	27,158 (18.5)
Concussion and crushing	844 (0.4)	614 (0.3)	540 (0.3)	660 (0.3)	678 (0.4)	625 (0.4)	582 (0.4)
Amputation	3,165 (1.5)	3,105 (1.5)	2,790 (1.4)	2,737 (1.4)	2,662 (1.5)	2,159 (1.4)	2,361 (1.6)
Puncture and penetrating wound	94,581 (43.9)	92,857 (43.3)	87,732 (43.0)	83,965 (42.3)	73,167 (41.5)	61,517 (41.2)	60,129 (41.0)
Abrasion or laceration wound	34,581 (16.0)	33,715 (15.7)	30,135 (14.8)	29,220 (14.7)	26,502 (15.0)	21,117 (14.1)	20,582 (14.1)
Contusion and bruise wound	11,986 (5.6)	11,044 (5.2)	11,439 (5.6)	10,640 (5.4)	9,397 (5.3)	7,454 (5.0)	7,045 (4.8)
Burn	16,732 (7.8)	15,687 (7.3)	15,546 (7.6)	15,383 (7.7)	13,444 (7.6)	11,044 (7.4)	10,827 (7.4)
Chemical burn	908 (0.4)	892 (0.4)	1,288 (0.6)	869 (0.4)	772 (0.4)	729 (0.5)	830 (0.6)
Freezing and heat exposure	1,707 (0.8)	1,802 (0.8)	1,716 (0.8)	1,926 (1.0)	1,903 (1.1)	1,426 (1.0)	1,170 (0.8)
Asphyxiation	33 (< 0.1)	24 (< 0.1)	31 (< 0.1)	26 (< 0.1)	19 (< 0.1)	28 (< 0.1)	15 (< 0.1)
Electric Shock	675 (0.3)	687 (0.3)	748 (0.4)	784 (0.4)	645 (0.4)	582 (0.4)	555 (0.4)
Light and radiation	2,883 (1.4)	2,896 (1.4)	2,648 (1.3)	2,192 (1.1)	1,629 (0.9)	1,337 (0.9)	1,082 (0.7)
Multiple injuries	96 (< 0.1)	44 (< 0.1)	149 (0.1)	274 (0.1)	243 (0.1)	204 (0.1)	203 (0.1)
Others	1,108 (0.5)	1,747 (0.8)	1,083 (0.5)	1,159 (0.6)	850 (0.5)	829 (0.6)	856 (0.6)

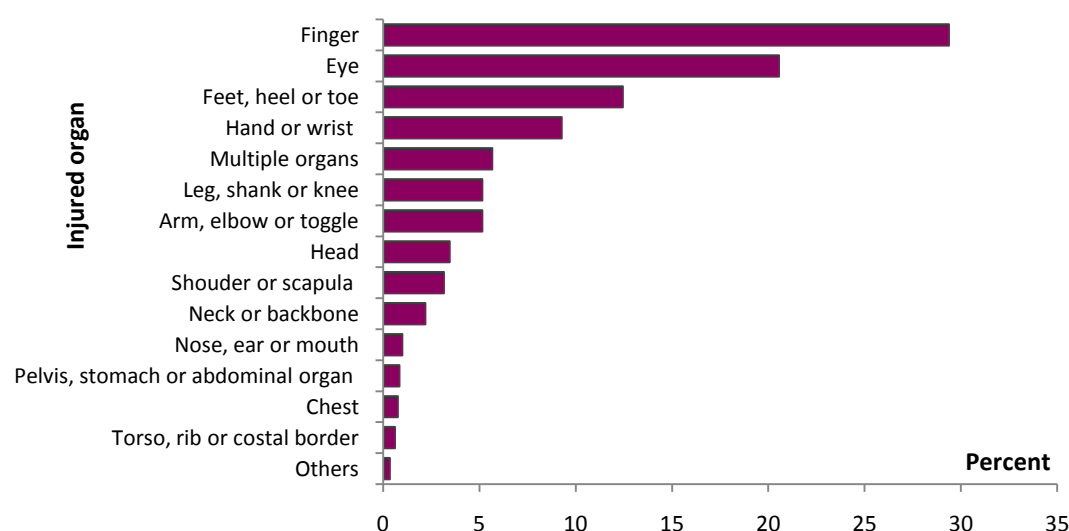


Figure 3. Occupational injuries by injured organs reported to the Workmen's Compensation Fund in Thailand, 2002-2010

Causes of occupational injuries in industrial and business groups were significantly different from agricultural group reported in the NIS system. The leading causes of injuries ranged from cut or penetrated by sharp material (24.0%), thrown or crashed in object (16.7%), foreign matter into eye

(16.6%) and falling object (13.6%). However, vehicle-related accident was the most common cause of death, which accounted for 43.9% of all fatalities, followed by fall from height (12.1%) and electrocution (11.7%) (Figure 4).

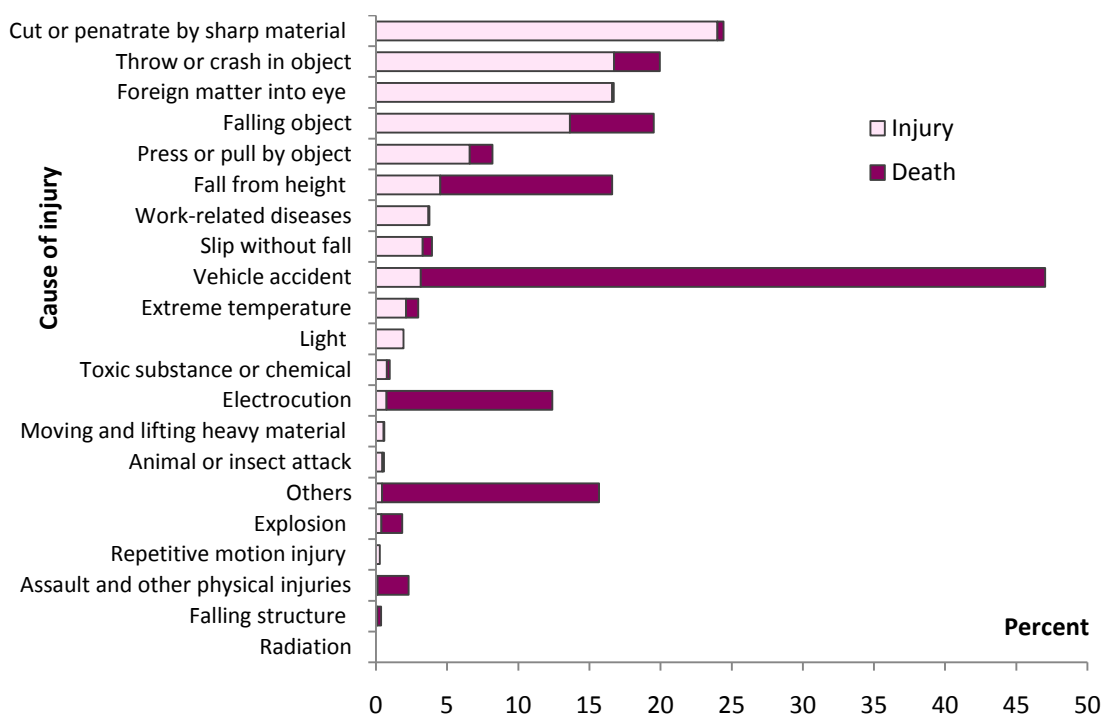


Figure 4. Causes of occupational injuries reported to the Workmen's Compensation Fund in Thailand, 2002-2010

Table 3. Occupational Injuries by age groups reported to the Workmen's Compensation Fund in Thailand, 2002-2010

Age (year)	Number (rate per 1,000 workers)								
	2002	2003	2004	2005	2004	2007	2008	2009	2010
< 15	6 (< 0.1)	-	3 (< 0.1)	3 (< 0.1)	-	3 (< 0.1)	-	1 (< 0.1)	2 (< 0.1)
15-19	14,963 (2.9)	16,185 (2.2)	15,824 (2.1)	14,523 (1.8)	12,654 (1.5)	11,645 (1.3)	10,342 (1.2)	7,737 (0.9)	8,111 (0.9)
20-24	48,764 (7.5)	52,952 (7.3)	52,287 (6.8)	48,209 (6.0)	42,790 (5.1)	37,946 (4.4)	31,617 (3.6)	23,799 (2.8)	23,116 (2.6)
25-29	47,368 (7.2)	51,448 (7.1)	52,862 (6.9)	53,039 (6.6)	50,473 (6.0)	47,015 (5.4)	40,520 (4.6)	32,728 (3.8)	36,652 (4.2)
30-34	32,434 (5.0)	35,611 (4.9)	36,465 (4.8)	37,039 (4.6)	36,898 (4.4)	37,233 (4.3)	33,180 (3.8)	28,907 (3.4)	22,254 (2.5)
35-39	21,229 (3.3)	24,154 (3.4)	25,511 (3.3)	26,086 (3.2)	25,935 (3.1)	26,871 (3.1)	24,625 (2.8)	21,741 (2.5)	21,556 (2.4)
40-44	12,921 (2.0)	14,812 (2.1)	15,879 (2.1)	16,915 (2.1)	16,930 (2.0)	17,772 (2.0)	16,677 (1.9)	15,611 (1.8)	15,440 (1.8)
45-49	7,379 (1.1)	8,788 (1.2)	9,347 (1.2)	10,333 (1.3)	10,161 (1.2)	10,883 (1.3)	10,451 (1.2)	9,944 (1.2)	10,192 (1.2)
50-54	3,822 (0.6)	4,408 (0.6)	4,756 (0.6)	5,260 (0.7)	5,346 (0.6)	5,956 (0.7)	5,852 (0.7)	5,765 (0.7)	5,789 (0.7)
55-59	1,413 (0.2)	1,615 (0.2)	1,892 (0.3)	2,099 (0.3)	2,301 (0.3)	2,521 (0.3)	2,488 (0.3)	2,409 (0.3)	2,580 (0.3)
≥ 60	680 (0.1)	687 (0.1)	708 (0.9)	729 (0.1)	769 (0.1)	807 (0.1)	750 (0.1)	794 (0.1)	819 (0.1)

Overall, the highest proportion of workers with occupational injuries aged between 20 and 29 years (46.4%) while rates of occupational injuries declined in all age groups, except 50-54 years and 55-59 years (Table 3).

As for the occupational injuries classified by the national industrial classification from Ministry of Labor, Thailand, the highest numbers of injuries from 2004 to 2010 were manufacturing of metal product (18.0%) and trade (11.9%), with mostly decrease in trends of injured workers. Rate of occupational injuries slightly decreased from 2004 (16.6%) to 2010 (11.3%) and rates of injuries in metal production decreased from 5.1 to 2.9 per 1,000 workers as well (Table 4). Occupations with high percent of fatality were observed in trade (16.5%), transportation and communication (16.0%), and construction (15.2%).

Discussion

This descriptive study identified many interesting characteristics and trends of occupational injuries in Thailand from 2002 to 2010. The study results revealed a significant proportion (16.9%) of agricultural injuries from all occupational injuries reported to the NIS during 2002-2010.

The data showed the leading causes of injuries in agricultures. Severe cases within this group occurred from electrocution and fall from height. This was a unique pattern and different from previous studies carried out in United States. Agricultural fatality rate in the United States was 22.0 per 100,000 workers through 1990s. Tractors-related injuries were the leading cause of deaths accounted for at least 300 fatalities each year and 16.6 per 100 injuries between 1998 and 2002.⁷

Table 4. Occupational Injuries by national industrial classification reported to the Workmen's Compensation Fund in Thailand, 2004-2010 (n=1,302,127)

Industrial classification	Number (Percent)							Total
	2004	2005	2006	2007	2008	2009	2010	
Metal products	39,300 (18.2)	38,542 (18.0)	38,255 (18.7)	35,573 (17.9)	32,296 (18.3)	25,634 (17.5)	25,939 (17.7)	235,539 (18.1)
Trade	21,624 (10.0)	22,992 (10.7)	22,247 (10.9)	23,194 (11.7)	20,660 (11.7)	18,818 (12.9)	18,038 (12.3)	147,573 (11.3)
Other types of business	18,743 (8.7)	20,963 (9.8)	19,978 (9.8)	21,057 (10.6)	19,370 (11.0)	17,044 (11.6)	16,649 (11.4)	133,804 (10.3)
Construction	18,982 (8.8)	20,979 (9.8)	20,201 (9.9)	21,021 (10.6)	17,101 (9.7)	15,184 (10.4)	12,919 (8.8)	126,387 (9.7)
Chemical products and petroleum	18,887 (8.8)	17,587 (8.2)	16,936 (8.3)	16,517 (8.3)	14,550 (8.2)	12,278 (8.4)	12,315 (8.4)	109,070 (8.4)
Manufacturing of foods and beverages	16,518 (7.7)	15,882 (7.4)	15,226 (7.5)	14,931 (7.5)	13,710 (7.8)	12,880 (8.8)	12,571 (8.6)	101,718 (7.8)
Assembling and manufacturing of vehicles	15,951 (7.4)	16,671 (7.8)	15,198 (7.4)	14,028 (7.1)	13,037 (7.4)	9,855 (6.7)	11,486 (7.8)	96,226 (7.4)
Manufacturing of textiles and accessories	16,147 (7.5)	14,386 (6.7)	13,676 (6.7)	11,895 (6.0)	10,324 (5.8)	8,326 (5.7)	7,583 (5.2)	82,337 (6.3)
Manufacturing of basic metals	13,766 (6.4)	13,080 (6.1)	12,358 (6.1)	11,719 (5.9)	10,639 (6.0)	8,184 (5.6)	8,061 (5.5)	77,807 (6.0)
Forestry and wood products	13,403 (6.2)	11,501 (5.4)	10,008 (4.9)	8,706 (4.4)	7,087 (4.0)	5,838 (4.0)	5,637 (3.8)	62,180 (4.8)
Transportation and communication	6,132 (2.8)	6,489 (3.0)	6,096 (3.0)	6,017 (3.0)	5,689 (3.2)	2,094 (1.4)	5,061 (3.5)	37,578 (2.9)
Products from non-metallic minerals	5,726 (2.7)	5,673 (2.6)	5,207 (2.5)	4,912 (2.5)	4,171 (2.4)	3,530 (2.4)	3,625 (2.5)	32,844 (2.5)
Paper products and printing	5,429 (2.5)	5,115 (2.4)	4,660 (2.3)	4,924 (2.5)	4,354 (2.5)	3,763 (2.6)	3,600 (2.5)	31,845 (2.4)
Other manufacturing industries	3,058 (1.4)	2,788 (1.3)	2,604 (1.3)	2,664 (1.3)	2,201 (1.2)	1,782 (1.2)	1,844 (1.3)	16,941 (1.3)
Mining survey	1,240 (0.6)	1,072 (0.5)	1,073 (0.5)	978 (0.5)	775 (0.4)	722 (0.5)	723 (0.5)	6,583 (0.5)
Public utilities	628 (0.3)	515 (0.2)	534 (0.3)	516 (0.3)	538 (0.3)	504 (0.3)	460 (0.3)	3,695 (0.3)

Both databases on occupational injuries, NIS and WCF, complemented each other in identifying trends and patterns of occupational injuries in Thailand. The WCF statistics revealed that rates of injuries among industrial workers had decreased from 31.4 per 1,000 workers in 2002 to 16.5 per 1,000 workers in 2010. Rates of annual occupational injuries among small-scale industrial workers in Zimbabwe and Nigeria were 131 and 22 per 1,000 workers respectively.^{8,9}

The most common causes of injuries included cut or penetrated by sharp material and thrown or crashed in object while causes of deaths were due to vehicle accident and fall from height. The findings were similar to a previous study in Qatar from 2006 to 2010 which stated leading causes of injuries were road traffic accidents (21.2%), injury by industrial machinery (16.4%) and accidents in construction (15.5%).¹⁰

After reviewing natures of injuries, workers involved with machine operation, material handling and unskilled workers were more prone to get injured. Workers who worked in manufacturing of metal products and trade had increased risk of injury in workplaces.

Majority of all injured workers in this study were males (86%). Reports from France and China showed that men had higher rate of work-related injuries than women.^{11,12} However, a study conducted in Addis Ababa of Ethiopia reported that gender had no association with prevalence of occupational injuries.^{13,14}

Findings of this study demonstrated high frequency of occupational injuries among workers aged between 20 and 34 years, indicating possible high impact on dependent family members if the injured workers developed permanent disability or death. In the United States, the Bureau of Labor Statistics collects data on annual census of fatal occupational injuries and reports number of fatal occupational injuries gathered from 50 states and the District of Columbia. During 2005, the highest proportion of workplace deaths (44%) was among workers aged 35-54 years.¹⁵ Similar observation was also reported by other studies that young workers tend to have higher rate of occupational injuries due to lack of information, low experience and no training on safety measures.^{5,16,17} Thus, young workers should be trained before starting a new job. Moreover, as we found that older workers aged between 50 and 59 years had increased rate of occupational injuries, restriction of people older than 50 years to work in industries with

heavy workload or limiting working duration might prevent injuries in old workers.

Both databases did not collect all needed data. The NIS system was operated in only 33 sentinel hospitals and data did not available in over half of the total 77 provinces. While data from the WCF statistics did not include agricultural workers in social insurance scheme and compensation fund, it was necessary to seek other sources of data to explain trend of injuries among agricultural workers which actually was the highest percentage of workforce in Thailand.

Information on occupational injuries is vital to identify work-related injuries and high risk groups for intervention measures. Surveillance systems should be developed to specifically collect data on agricultural workers, construction and others, including migrant and seasonal workers. Appropriate strategies, including regulations and prevention measures, should be developed based on findings obtained from the surveillance information.

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