Safety and Health at Work 5 (2014) 66–72

Contents lists available at ScienceDirect

Safety and Health at Work

journal homepage: www.e-shaw.org

Original Article

Occupational Injuries and Illnesses and Associated Costs in Thailand

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ARTICLE INFO

Article history:
Received 5 January 2014
Received in revised form
3 April 2014
Accepted 3 April 2014
Available online 18 April 2014

Keywords:
costs
occupational injury
workplace injury

ABSTRACT

Background: The purpose of this study was to enumerate the annual morbidity and mortality incidence and estimate the direct and indirect costs associated with occupational injuries and illnesses in Bangkok in 2008. In this study, data on workmen compensation claims and costs from the Thai Workmen Compensation Fund, Social Security Office of Ministry of Labor, were aggregated and analyzed.
Methods: To assess costs, this study focuses on direct costs associated with the payment of workmen compensation claims for medical care and health services.
Results: A total of 52,074 nonfatal cases of occupational injury were reported, with an overall incidence rate of 16.9 per 1,000. The incidence rate for male workers was four times higher than that for female workers. Out of a total direct cost of $13.87 million, $9.88 million were for medical services and related expenses and $3.98 million for compensable reimbursement. The estimated amount of noncompensated lost earnings was an additional $2.66 million.
Conclusion: Occupational injuries and illnesses contributed to the total cost; it has been estimated that workers' compensation covers less than one-half to one-tenth of this cost.

1. Introduction

The global burden of occupational injuries and illnesses is substantial, particularly in developing countries. Rates of occupational injury fatalities, for example, are estimated to be at least two to five times higher in the developing regions of the world, compared to North America and Western Europe [1]. The associated medical and disability costs are also considerable. In the USA, the total costs associated with occupational injury and illness in 1992 were estimated to be $171 billion, including directly accountable costs of $65 billion and a larger component of indirect costs ($106 billion) [2–4]. According to *Workers' Compensation: Benefits, Coverage, and Costs* in 2008, the total medical expense was $29.1 billion and total cash benefit $28.6 billion [5]. Estimated costs have been less well characterized in developing countries, because there are usually no large, centralized record systems that include health conditions having an occupational cause. Record systems in Thailand, however, allow opportunities to assess the scope of occupational morbidity, mortality, and associated costs for a large sector of the population.

In the past 4 decades, the economy in Thailand has changed from a mainly agriculture base to a broader array of manufacturing and services sectors that now account for about 80% of the country's annual expansion of GDP [6]. In 2007, the total workforce in Thailand was estimated to be 35.7 million people (~56% of the total population). The major employment sectors in the workforce included agriculture (47%), manufacturing (18%), and industrial service (21%). However, only 9.1 million (~25%) of the total workforce was employed in the formal sector that was covered by the Thai Workmen Compensation Fund (WCF) [7].

In 1996, more than half of the 12,325 firms, inspected by Thailand's Ministry of Labor and Social Welfare, were found to have violated Thai occupational and safety regulations (n = 7,015; 57%) [8]. In 1996, 246,616 cases of occupational injuries in the formal sector were insured by the WCF, at a rate of 40 per 1,000 workers. However, the rate of occupational injuries has declined since then, with a rate of 21 per 1,000 workers being reported in 2008. The rate of permanent or temporal disability (>3 days) was 6 per 1,000 workers [9].

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http://dx.doi.org/10.1016/j.shaw.2014.04.001

The Thai WCF was set up according to the Workmen's Compensation Act (1994). According to the WCF, the purpose of compensation costs is to replace the employer's liability when employees are injured, sick, or disabled or when they die from work-related injuries and illnesses from employment-based claims based on risks and types of industrial classifications [9]. This funding covers all establishments with at least one employee after 2002. It is the employer's sole liability to contribute an insurance premium to the WCF each year. Employees are eligible to claim compensation benefits, consisting of medical services, monthly indemnities, rehabilitation, or funeral grants, for work-related illnesses or injuries [9]. The employer contribution rate varies from 0.2% to 1.0% of employee wages, based on the risk rating for the type of establishment classified by the Thailand Standard Industrial Classification (TSIC) [10]. No published studies have estimated the costs of occupational injuries and illnesses in Thailand. The main purpose of this study was to estimate the annual incidence of morbidity and mortality, and calculate the direct costs and forgone (uncompensated) earnings associated with occupational injuries and illnesses in Bangkok in 2008. To achieve these aims, researchers examined the actual compensation claims of workmen and claim related reimbursements by the WCF, Social Security Office of the Ministry of Labor. These workplace injury costs are useful for a number of reasons. They provide a compact, comprehensive, and stable measure for describing a diverse range of injuries and illnesses. They also allow us to better understand differences between incidence rates and costs of occupational morbidity and mortality, and provide a baseline for future comparisons.

2. Materials and methods

Data were collected for the 11 social security offices (SSOs) covering 50 districts of Bangkok, Thailand, which consisted of all occupational injuries, illnesses, and fatalities, along with the costs associated with direct payment of medical and related claims by the WCF, Social Security Office of the Ministry of Labor, for the year 2008. This study mainly focused on the direct costs associated with occupational claims, in cases of both morbidity and mortality, in terms of medical expenses, rehabilitation costs, funeral compensation costs, and work compensation costs for lost earnings. In addition, the researchers estimated indirect costs of forgone earnings. All costs in Thai Baht (THB) were converted into US dollar values (US $) ($1 = 31 THB, as of 2013).

2.1. Incidence data management and costing data

The TSIC divides occupations into 140 subgroups. However, this study used only nine major main occupational groups: legislators and managers, professionals, technicians, clerks, service workers, agricultural workers, craftsmen, plant and machine operators, and elementary workers. Similarly, the major industrial types were classified into 15 groups based on an aggregation of 243 subgroups used in the TSIC.

Direct medical costing data related to payment information included health service utilization and costs, including hospital inpatient and outpatient costs, transportation and ambulance, drugs and laboratory tests, medical equipment and disposable supplies, rehabilitation services, and physicians' and nurses' salaries. In addition, compensable costs for rehabilitation, monthly disability allowances, and funeral costs were included (Table 1).

The estimated costs for wage compensation were calculated using the national salary base for each subgroup of minimum wage (male = 7,854 THB and female = 7,338 THB). It should be noted that this study did not take into account costs related to foster care, administrative, and legal services for estimating the total direct costs.

Table 1
Costs associated with occupational injuries and illnesses, according to Thai Labor Act Number 18 (1–4) and Number 19 [8]

Cost category	Component	Description
Direct		
Medical and emergency services	Medical cost	Hospital inpatient/outpatient
		Transport/ambulance
		Physicians, nurses, etc.
		Drugs/laboratory tests
		Counseling
Nonmedical	Rehabilitation cost	
	Work compensation cost	Types I–IV*
	Funeral cost	
Indirect		
Forgone earning loss†	Work compensation cost	Types I–IV

* Type I: paid 60% monthly allowance for temporary disability >3 days (paid for a maximum of 1 year); type II: paid 60% monthly allowance for permanent partial disability (paid for a maximum of 10 years); type III: paid 60% monthly allowance for permanent total disability (paid for a maximum of 15 years); and type IV: paid 60% monthly allowance for death (paid for a maximum of 8 years).

† Estimated costs according to different types of work compensation costs (type I–IV).

In addition, this study did not take into consideration all indirect costs, for instance, costs associated with loss of investment, life insurance, macroeconomics, and health-related decline in quality of life.

In this study, the researchers estimated indirect costs only for forgone earnings losses, based on the average of compensation reimbursements for fatalities and injuries according to Thai Labor Act Number 18 (types 1–4) and Number 19, by measuring the value of time lost due to absence from work or reduced productivity. Indirect costs have been calculated based on each type of compensation claims, including temporary disability >3 days, permanent partial disability, permanent total disability, and death. For each type of claim (defined below), the injured worker receives 60% of the monthly allowance, for the allowed coverage duration. The indirect cost of forgone wages was estimated to be approximately two-thirds of wage compensation (i.e., the uncompensated 40% of monthly allowance).

2.2. Definitions

Workers included in the data set are defined as insured persons under article 33 of the Thai Labor Act who pay premium insurance, which provides entitlement to benefits under the Social Security Act B.E. 2533 that was amended by the Social Security Act.

Under article 39, an insured person is one who has been an insured person under article 33 and whose insurance has subsequently ceased [article 38(2)] and s/he notifies the area SSO for his/her intention to continue to be an insured person.

Compensable forgone earning losses based on Thai Labor Act Number 18 (1–4) and Number 19 are classified into four types (when an employee suffers from injuries or sickness or disappears, the employer shall pay monthly indemnity to the employee or the person entitled to compensation under Article 20): type I, 60% of the monthly wages in case the employee is unable to work for more than 3 consecutive days, irrespective of whether the employee has lost an organ or not—the payment should be made from the 1st day until the employee is unable to work, but not exceeding 1 year; type II, 60% of the monthly wages in case the employee has lost certain organs of the body—the payment should be made according to the category of the organs lost and for the period as specified by the Announcement of the Ministry of Labor and Social Welfare, but not exceeding 10 years; type III, 60% of the monthly wages where the

Table 2
Description of insured persons of Bangkok province and their percentages, 2008

Descriptive characteristics	Number	%
Gender		
Male	1,543,761	50.07
Female	1,539,261	49.93
Age (y)		
15–19	99,074	3.21
20–24	447,849	14.53
25–29	726,933	23.58
30–34	597,524	19.38
35–39	455,560	14.78
40–44	338,705	10.99
45–49	218,489	7.09
50–54	121,901	3.95
55–59	57,189	1.85
>60	19,800	0.64
Total	3,083,023	100.00

employee suffers from disablement—the payment should be according to the type of disablement and for the period as specified by the Announcement of the Ministry of Labor and Social Welfare, but not exceeding 15 years; type IV, 60% of the monthly wages in case of the death of employee or disappearance—payment for a period of 8 years. In case of suffering from injuries or sickness, causing loss of organs or the working capability of certain part of an organ, the indemnity should be calculated on the basis of the percentage of the period specified for loss of organs or working capability of those organs, as specified by the Announcement of the Ministry of Labor and Social Welfare. However, this Compensation Act is not applicable to employees or government officials of the central, provincial, and local administrations; employees of nonprofit organizations; and employees of state enterprises [9].

3. Results

In Bangkok's database of the workmen compensation claims during the year 2008, there were 130,969 insured firms (129,988 employers) and 3,083,023 active, covered employees, which accounted for 40% of firms (n = 323,526) and 36% of insured employees (n = 8,135,606) in the whole country (Table 2). In Bangkok, 50 districts are classified into 11 SSOs. The majority of the labor workforce was between 20 years and 40 years of age (72%; n = 2,227,866), with a ratio of male to female employees of 1.002:1. Insured workers aged <25 years accounted for almost 18% of the labor workforce.

Rates of occupational accidents and injuries were found to be highest in SSO area number 7, with 39 cases per 1,000. The area with the second highest rate was SSO area number 10, with 25 cases per 1,000. These areas were located in the outskirts of Bangkok and included major intensive labor industries such as construction, automobile and transportation equipment, and metal product industries (Fig. 1).

A total of 52,074 nonfatal cases of occupational injury or illness were reported in Bangkok during 2008, with an overall incidence rate of 16.9 cases per 1,000 insured workers (Table 3). The overall incidence rate for male workers was nearly four times higher than that for female workers. The overall incidence rate decreased with age, and ranged from 30.4 per 1,000 among teen workers to 12.4–13.7 per 1,000 among workers aged 55 years or older. After excluding milder cases that had no permanent disability and no more than 3 days of work loss, the incidence rate of moderate and severe cases was relatively uniform across most age groups (age ≥20 years, rate 4.2 per 1,000) but was more than twice as high among teen workers (8.4 per 1,000). Considering cases of any severity, the incidence rates were relatively low among professional workers, managers, and legislators (≤1 per 1,000); moderate among technicians, clerks, and agricultural workers (4–5 per

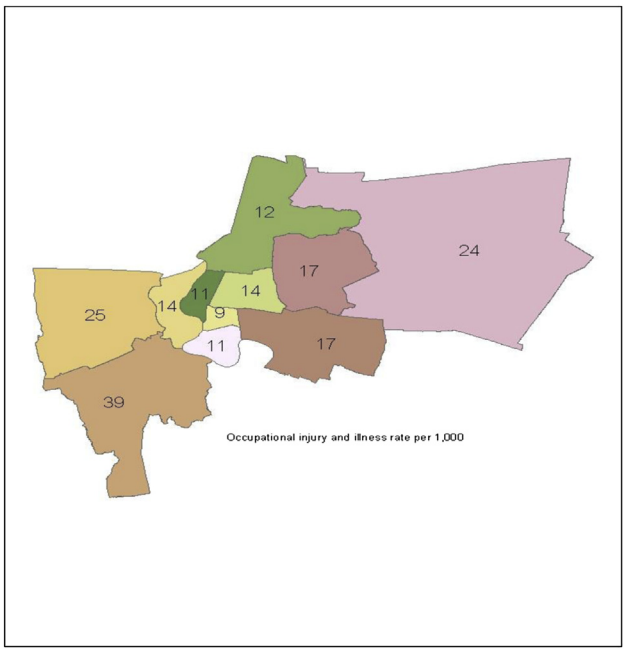

Fig. 1. Occupational injury and illness rate (per 1,000) in various Social Security Office areas, 2008.

1,000); relatively high among service workers, elementary workers, and craftsmen (21–29 per 1,000); and highest among plant and machine operators (40 per 1,000). The proportion of moderate and more severe cases was higher among technicians and clerks (36% of cases) than among all other occupational groups (23–29%); however, as noted, their overall incidence was still relatively moderate.

Of a total direct cost of $13.87 million in 1 year (2008), $9.88 million were for medical services and related expenses such as drugs and X-ray, and $3.98 million for compensable reimbursement under Labor Act article 33 and article 39. Rehabilitation expenses were much lower—$5,893 (Table 4). The estimated amount of noncompensated (forgone) lost earnings was an additional $2.66 million, amounting to a total accountable direct and indirect cost of $16.53 million. Median and mean statistics revealed different patterns, suggesting the presence of differences at the higher-cost end of cost distributions. For example, median overall costs per case were comparable for male and female workers, but the mean costs of medical care and wage compensation were 1.3–1.5 times higher for male workers. In general, costs per case increased with age, primarily reflecting the cost of wage compensation. The costs of medical care were highest in the 40–54-year-old age group and lower for younger and older age groups.

The costs per case revealed surprising patterns across the occupational groups (Table 4). The highest costs were observed in the legislator and manager group, which paradoxically had a relatively low incidence rate of injury or illness. Their costs of medical care were more than seven times higher than the mean cost, and compensation costs were more than twice as high. The next highest medical costs were seen among service workers and the relatively small group of agricultural workers, at two to four times the mean cost. The mean costs of medical care and compensation in other high-incidence occupations were closer to the overall means.

A total of 186 fatal occupational injuries and illnesses were reported, at a rate of 6 per 100,000. The total cost for reimbursed compensation was approximately $3 million, with an average cost of $15,729 per case. Compensable costs reimbursed to male workers were higher than those were reimbursed to female workers. The total costs of fatality were highest in the age group of

Table 3
Numbers and incidence rates of nonfatal occupational injuries and illnesses in Bangkok, 2008

Characteristics	Number of cases	Severity*					Rate (per 1,000 workers)	
		Lost work (no permanent disability)		Permanent disability		Lost work >3 d or disability(% of cases)	All cases	Lost work >3 d or disability
		0–3 d	>3 d (type I)	Partial (type II)	Total (type III)			
All cases	52,074	38,773	12,197	1,092	12	26	16.9	4.3
Sex								
Male	41,270	30,740	9,703	815	12	26	26.7	6.8
Female	10,804	8,033	2,494	277	0	26	7.0	1.8
Age (y)								
15–19	3,015	2,179	747	87	2	28	30.4	8.4
20–24	9,005	6,929	1,934	142	0	23	20.1	4.6
25–29	11,589	8,840	2,552	193	4	24	15.9	3.8
30–34	9,884	7,493	2,208	182	1	24	16.5	4.0
35–39	7,443	5,540	1,717	183	3	26	16.3	4.2
40–44	5,061	3,635	1,304	122	0	28	14.9	4.2
45–49	3,122	2,115	924	82	1	32	14.3	4.6
50–54	1,973	1,394	513	65	1	29	16.2	4.7
55–59	710	463	221	26	0	35	12.4	4.3
>60	272	185	77	10	0	32	13.7	4.4
Occupational group								
Legislators and managers	216	156	56	4	0	28	0.9	0.3
Professionals	132	94	38	0	0	29	0.3	0.1
Technicians	1,963	1,257	670	36	0	36	4.5	1.6
Clerks	1,726	1,109	580	36	1	36	4.6	1.6
Agricultural workers	57	44	12	1	0	23	3.7	0.8
Service workers	8,301	6,245	1,984	69	3	25	21.2	5.3
Elementary workers	9,888	7,361	2,387	137	3	26	26.7	6.8
Craftsmen	13,068	9,952	2,874	241	1	24	28.8	6.9
Plant and machine operators	16,723	12,555	3,596	568	4	25	40.2	10.0
Size of establishment†								
Small	35,258	25,586	8,790	877	5	27	17.0	4.7
Medium	6,033	4,773	1,168	90	2	21	15.4	3.2
Large	10,783	8,414	2,239	125	5	22	17.5	3.8

* Costs associated with occupational injuries and illnesses according to Thai Labor Act Number 18 (1–4) and Number 19.
† Small: number of employees <200; medium: number of employees 200–500; and large: number of employees >500.

35–39 years, whereas these costs for above 40-year-olds were less than those for 20–24-year-olds. The occupational group at a high risk of fatality consisted of labor workers. However, the highest reimbursed compensation costs were for legislators and managers, which averaged $29,922 per case (Table 5). Compensable reimbursement costs due to occupational fatality were $2.8 million on average and accounted for $15,131 per case. However, on average, the estimated costs were higher for male than for female workers ($17,029 vs. $15,909; Table 5).

The median of cost expenses per case was slightly high in firms with less than 100 employees. Specifically, the highest cost was found to be associated with firms with less than 100 employees (median = $68.72 per case). In general, male workers had higher cost expenses than female workers, except for firms with 20–100 employees (Fig. 2).

Of all the industrial types classified by TSIC, mining and related industries were associated with the highest cost, which were almost twice the compensable costs per case in other industries (median = $120.37). Other industrial types were found to have similar medical expense costs (median = $ 58-66) (Fig. 3).

In general, the six leading causes of occupational injuries and illnesses, including injured by cut or wounded by sharp, thrown, or falling objects, foreign material in eyes or eye injuries, falls, and car accidents: Fig. 4) were higher in male workers than in female workers. The highest cause of occupational injuries and illnesses was cut or wounded by sharp objects, at a rate of 6.5 per 1,000 for male workers and 2 per 1,000 for female workers. The body regions that were mostly injured were fingers, on average 6.5 per 1,000 for male and 2.1 per 1,000 for female workers. Other body regions injured were eyes, hands, feet, and multiple body parts. For leading causes and major injured body regions, male workers got injured more than female workers.

4. Discussion

Findings of this study suggest that occupational injuries and illnesses contribute to the total costs of health care and lost productivity in Bangkok. It is estimated that workers' compensation covers less than one-half to one-tenth of the costs of occupational injuries and illnesses, compared with payments of the SSO for nonoccupational injuries and illnesses ($246 million) [8]. These costs were approximately 18 times less than reimbursement from the SSO ($16.53 million). This study took into consideration only Bangkok SSO areas and, hence; the results could not be interpolated to national level. It should be noted that industrial types and job characteristics of workers in Bangkok may be different from other provinces. It should also be noted that approximately one-third of insured workers under the WCF in the whole country are from Bangkok (3.1 million out of 9.3 million) [9]. The researchers determined the data on occupational claims and compensable costs of insured workers under WCF during the year 2008. This study primarily focused on direct costs and estimated forgone (uncompensated) earnings. To our knowledge, this study represented the first attempt to estimate the costs of occupational injuries and illnesses in Thailand. The researchers did not attempt to estimate direct costs such as administrative and legal costs and indirect costs such as loss of productivity and health-related quality of life (pain/suffering/psychological problems).

Out of the total direct costs of $13.87 million for nonfatal occupational injuries and illnesses, $9.88 million (71%) were for medical care costs and $3.98 million (29%) for compensation for lost earnings. Only $5,839 was reimbursed for rehabilitation expenses (Table 4) which were associated with a few identified cases that were reported for partial and total disability (1,104 cases; 2%; Table 3). Costs of medical care were higher in the 40–54-year-old

Table 4
Accountable costs of nonfatal occupational injuries and illnesses in Bangkok, 2008 (US $)

Characteristics	Direct costs				Uncompensated lost earnings (estimated)	Grand total	Average costs (per case)			
	Medical expense	Rehabilitation expense	Compensation for lost earnings	Total (direct)			Median and interquartile interval*		Mean medical expense	Mean compensation for lost earnings†
All cases	9,883,896	5,839	3,984,862	13,874,597	2,656,575	16,531,172	57	[10–104]	190	300
Sex										
Male	8,445,061	4,625	3,324,994	11,774,744	2,216,663	13,991,407	58	[11–106]	205	316
Female	1,438,693	1,227	659,790	2,099,649	439,860	2,539,509	52	[7–97]	133	238
Age (y)										
15–19	595,011	0	253,169	848,180	168,779	1,016,959	56	[8–104]	197	303
20–24	1,473,302	498	422,208	1,896,003	281,472	2,177,475	55	[12–98]	164	203
25–29	1,425,746	690	695,280	2,121,714	463,520	2,585,234	54	[11–97]	123	253
30–34	1,719,679	1,364	631,220	2,352,293	420,813	2,773,106	56	[12–100]	174	264
35–39	1,264,258	1,506	704,587	1,970,385	469,725	2,440,110	56	[11–101]	170	370
40–44	1,741,245	0	426,179	2,167,424	284,119	2,451,543	60	[6–114]	344	299
45–49	880,273	943	438,541	1,319,701	292,361	1,612,062	65	[7–123]	282	435
50–54	580,223	340	251,928	832,507	167,952	1,000,459	77	[0–188]	294	435
55–59	146,426	513	119,096	266,002	79,397	345,399	73	[4–142]	206	482
>60	57,586	0	42,654	100,240	28,436	128,676	114	[57–171]	212	490
Occupational group										
Legislators and managers	344,863	0	41,994	386,857	27,996	414,853	95	[0–450]	1,597	700
Professionals	14,246	0	8,818	23,064	5,879	28,943	49	[3–96]	108	232
Technicians	408,218	527	210,366	619,111	140,244	759,355	62	[9–115]	208	298
Clerks	1,348,347	352	236,891	1,585,590	157,927	1,743,517	69	[0–155]	781	384
Agricultural workers	31,262	0	5,325	36,588	3,550	40,138	76	[0–156]	548	410
Service workers	1,291,849	621	453,562	1,746,032	302,375	2,048,407	56	[11–102]	156	221
Elementary workers	1,450,297	1,708	675,201	2,127,205	450,134	2,577,339	53	[10–96]	147	267
Craftsmen	1,963,489	1,092	726,643	2,691,224	484,429	3,175,653	55	[12–98]	150	233
Plant and machine operators	3,025,133	1,551	1,632,010	4,658,693	1,088,007	5,746,700	59	[5–113]	181	392
Size of establishment‡										
Small	5,930,338	3,503	2,390,917	8,324,758	1,593,945	9,918,703	59	[10–104]	168	247
Medium	1,482,584	876	597,729	2,081,190	398,486	2,479,676	53	[21–87]	246	474
Large	2,470,974	1,460	996,216	3,468,649	664,144	4,132,793	56	[22–97]	229	421

* Interquartile range = 25th and 75th percentiles.
† Mean cost, but considering only the potentially compensable cases with disability or >3 days' work loss.
‡ Small: number of employees <200; medium: number of employees 200–500; and large: number of employees >500.

age group than that in other age groups, whereas compensation costs for lost earnings increased with age, associated with higher salary. In addition, legislators' and managers' claims of compensable medical expenses for occupational injuries and illnesses were higher than those of other occupational groups (median = $95 per case).

These costs were likely to be less than the actual costs because the researchers did not account for administrative and legal costs. In addition, these costs did not include indirect costs associated with pain and sufferings, as well as those associated with home health care provided by family members. In addition, this study did not account for medical costs and related expenses of injured workers who sought medical care and did not claim for occupational injuries and illnesses from the WCF. It is possible that occupational injured cases were under-reported. It was likely that a part of these expense costs was related to occupational injuries and illnesses, but was not claimed and confirmed by occupational physicians. It was also possible that employers did not report their injured workers as occupational and injuries cases to avoid a higher compensation contribution, using experience rate. Therefore, the costs of nonfatal occupational injuries and illnesses were likely to be under-reported and underestimated.

Interestingly, almost 80% of claimed workers were male. This was similar to the findings of a previous study by Thepaksorn et al [7] conducted between 2001 and 2004, using data from the Thai National Injury Surveillance System (85% male workers) and the Washington State Department of Labor and Industries in 2004 (70% male workers) [11]. This might be due to male workers performing high-risk tasks or occupations such as construction, machine operation, and transportation. In addition, the incidence rate was highest in the teenager group—30.4 per 1,000 for all cases and 8.4 per 1,000 for work loss for more than 3 days or disability. It is possible that they had less working skills and experience than other age groups. Similar to other age groups, male teenagers' claims for occupational injuries were four times higher than that of female teenagers (2,445 cases vs. 570 cases). The six leading causes of occupational injuries and illnesses were cut or wounded by sharp objects, injured by thrown objects, injured by falling objects, foreign materials in eyes or eye injuries, car accidents, and falls. The five major body regions that were injured were fingers, eyes, hands, feet, and multiple body parts.

In this study, only 2% (n = 1,233) were confirmed by occupational physicians as cases of occupational diseases and/or illnesses, including noise-induced hearing loss (20 cases), dust exposure (6 cases), infectious disease (1 case), traumatic injuries from lifting/moving (634 cases), traumatic injuries from ergonomic (175 cases), and skin diseases (397 cases). As mentioned above, it was possible that cases of occupational diseases and illnesses remained underdetermined and under-reported when data from occupational clinics were not accessed. In addition, occupational diseases and illnesses are generally required time for developing prognosis of diseases and for completed records. Claims of male workers for occupational diseases and illnesses were higher than those of female workers (221 cases vs. 176 cases).

Similar to nonfatal occupational injury claims, male workers' compensable claims for fatal occupational injuries were much higher than those of female workers (14 times). This rate was similar to fatal occupational injuries in the USA from 1980 to 1997

Table 5
Numbers, incidence rates, and costs of fatal occupational injuries and illnesses in Bangkok, 2008 (US $)

Characteristics	No. of cases*	Rate (per 100,000 workers)	Direct costs			Uncompensated lost earnings (estimated)	Grand total	Average costs (per case)			
			Funeral	Compensation for lost earnings	Total (direct)			Median and interquartile intervals		Mean funeral expense	Mean compensation for lost earning
All cases	186	6.0	111,217	2,814,284	2,925,501	1,950,334	4,875,835	13,794	[399–14,193]	598	15,131
Sex											
Male	155	10.0	104,041	2,639,475	2,743,516	1,829,011	4,572,527	14,289	[125–14,414]	671	17,029
Female	11	0.7	7,173	175,003	182,176	121,451	303,627	11,060	[1,036–12,096]	652	15,909
Age (y)											
15–19	9	9.1	8,458	146,925	155,383	103,589	258,972	11,087	[3,649–24,736]	940	16,325
20–24	19	4.2	16,734	373,315	390,049	260,033	650,082	12,806	[0–12,997]	881	19,648
25–29	15	2.1	13,161	276,159	289,320	192,880	482,200	11,217	[378–12,595]	877	18,411
30–34	24	4.0	18,530	475,818	494,348	329,565	823,913	11,218	[7,473–18,691]	772	19,826
35–39	24	5.3	16,833	488,933	505,766	337,177	842,943	13,847	[12,917–26,764]	701	20,372
40–44	42	12.4	13,705	343,123	356,828	237,885	594,713	18,033	[0–19,681]	326	8,170
45–49	16	7.3	10,054	297,769	307,823	205,215	513,038	14,272	[7,657–21,929]	628	18,611
50–54	12	9.8	9,615	303,252	312,867	208,578	521,445	15,354	11,152–32,506	801	25,271
55–59	3	5.2	2,958	77,107	80,065	53,377	133,442	13,794	[9,370–23,164]	986	25,702
>60	2	10.1	1,167	20,317	21,484	14,323	35,807	10,742	[0–11,371]	584	10,159
Occupational group											
Legislator and managers	7	2.9	4,143	209,455	213,598	142,399	355,997	35,479	[0–37,739]	592	29,922
Professionals	0	0.0	0	0	0	0	0	0	0	0	0
Technicians	9	2.0	6,558	217,204	223,762	149,175	372,937	18,042	[9,655–27,967]	729	24,134
Clerks	41	10.9	14,365	310,827	325,192	216,795	541,987	18,033	[0–19,554]	350	7,581
Agricultural workers	1	6.4	588	23,564	24,152	16,101	40,253	0	0	588	23,564
Service workers	24	6.1	18,948	475,638	494,586	329,724	824,310	421,229	[0–55,371]	790	19,818
Elementary workers	29	7.8	24,463	484,060	508,523	339,015	847,538	119,923	[0–128,309]	844	16,692
Craftsmen	27	5.9	22,287	553,083	575,370	383,580	958,950	220,147	[0–271,601]	825	20,485
Plant and machine operators	28	6.7	19,859	464,800	484,659	323,106	807,765	214,042	[0–235,378]	709	16,600
Size of establishment †											
Small	116	116.0	66,730	1,688,570	1,755,301	1,170,200	2,925,501	12,794	[399–14,193]	575	14,557
Medium	17	17.0	16,683	422,143	438,825	292,550	731,375	12,001	[856–10,193]	981	24,832
Large	32	32.0	27,804	703,571	731,375	487,584	1,218,959	11,284	[1,451–15,121]	869	21,987

* Costs associated with occupational injuries and illnesses according to Thai Labor Act Number 18 (1–4) and Number 19.
† Small: number of employees <200; medium: number of employees (200–500); and large, number of employees >500.

[12]. Specifically, compensation costs for lost earnings were highest in the 50–59-year-old age group, approximately $25,000 per case, similar to nonfatal occupational injuries and illnesses. In addition, legislators and managers claimed the highest compensations, approximately $30,000 per case, for fatal occupational injuries.

Despite the fact that the incidence rates of occupational injuries were comparable with other studies [11,12], the researchers did not attempt to compare compensable costs due to occupational injuries and illnesses with those studies. There were differences among them in terms of labor costs, inflation rate, cost of living, and medical costs and related expenses. Generally, most previous studies estimated costs using only a number of cases multiplied by estimated costs for occupational injuries and illnesses [2,12–15]. For example, in the USA, the estimated 6,500 fatality and 13.2 million morbidly cases resulted in an estimated cost of $170.9 billion and accounted for 3% of the gross domestic product in 1992. A total of 5,214 fatal work injuries, and 3.7 million nonfatal workplace injuries and illnesses occurred in 2008. However, the frequency of reported nonfatal occupational injuries and illnesses (incidence rates) has declined every year since 1992 [5]. They also suggested that costs associated with occupational injuries and illnesses were large compared with those associated with other diseases [2].

In calculating costs for occupational injuries and illnesses, the researchers relied heavily on the actual compensable cost data of

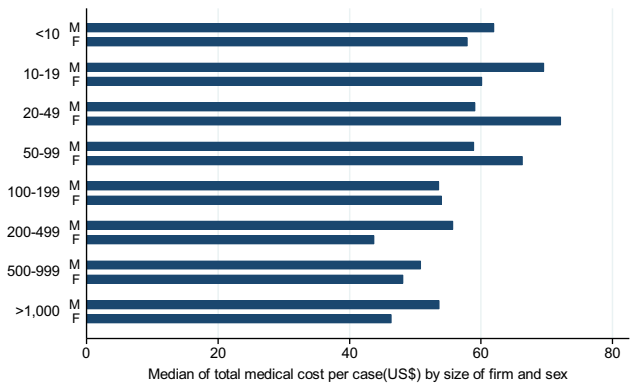

Fig. 2. Median of total medical cost per case by firm size and gender, 2008. F, female; M, male.

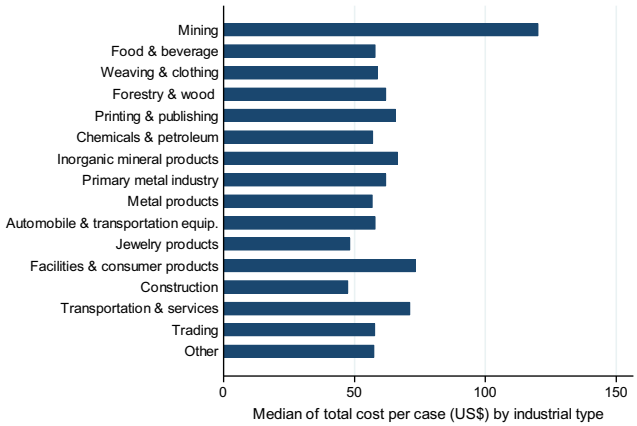

Fig. 3. Median of total medical cost per case by industrial types, 2008.

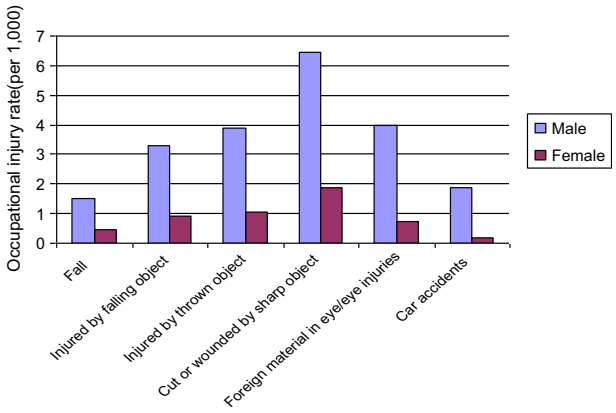

Fig. 4. Six leading causes of occupational injuries and illnesses in Bangkok, 2008.

the WCF. In addition, this study determined only the incidence rate and costs of occupational injuries and illnesses in formal workers. It should be noted that the WCF covered only the industries registered under the Labor Act. Self-employed and agricultural workers were not covered. As mentioned above, the researchers suggested that actual occupational injury cases may be more than reported. As a result, compensable claims for nonoccupational cases of the SSO may be inflated. This study relied on data on medical expenses for the year 2008. For direct costs, therefore, the researchers could not capture the medical expenses if insured workers were undergoing medical care and treatment for disability in the following year. However, the incidence rate of occupational injuries and illnesses declined slightly between 2004 and 2009 [9]. Therefore, the estimated costs could be slightly over-estimated. In addition, only a few environmental and occupational clinics or trained occupational physicians were accessible in Bangkok. The quality of workmen's compensation health care services needs to be improved through crucial measures, such as increasing the number of occupational medicine clinics and occupational physicians in each province. The morbidity and fatality rates of occupational injuries in Bangkok may be different from those in other provinces. Bangkok was classified as an urban area, but most areas in other provinces were less urbanized. In addition, the types of industries were also different. A study comparing Bangkok and other provinces may resolve the differences between occupational injury rate and costs of occupational injuries. It would also be valuable to study specific groups related to incidence rate and costs such as teenager's injuries and illnesses and occupational diseases and illnesses.

Conflicts of interest

No potential conflict of interest relevant to this article was reported.

Acknowledgments

The authors thank Roongnapa Thongmuang, a social security analyst, for providing data on workmen compensation claims and costs and Pensri Trairat, Director of Research and Development Division, for assisting in acquiring data from the WCF, Social Security Office of Ministry of Labor.

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