

Published in final edited form as:

Int J Occup Environ Health. 2011 ; 17(1): 38–48.

Non-fatal Occupational Injuries among Non-governmental Employees in Malaysia

ADINEGARA BIN LUTFI ABAS, ABDUL RAZZAK BIN MOHD SAID, MOHAMMED AZMAN BIN AZIZ MOHAMMED, and NALINI SATHIAKUMAR

Department of Community Medicine, Melaka Manipal Medical College, Malaysia (ABLA, ARBMS), Malaysian Social Security Organization (SOCSSO) (MABAM), and the School of Public Health, University of Alabama at Birmingham (NS).

Abstract

We analyzed data on non-fatal occupational injuries reported to Malaysia's social security organization from 2002 to 2006. There was a decrease in both the absolute number and the incidence rates of these injuries over time. About 40% of cases occurred in the manufacturing sector followed by the service (17%) and trading (17%) sectors. The agriculture sector reported the highest incidence rate (24.1/1,000), followed by the manufacturing sector subcategories of wood-product manufacturing (22.1/1,000) and non-metallic industries (20.8/1,000). Men age 40 to 59 and persons of Indian ethnicity had a greater tendency to sustain injuries. Government and non-governmental organizations should strive to develop strategies to reduce the occupational injuries targeting vulnerable groups. Enforcement of safety measures will further play an important role to ensure that both employees and employers take special precautions to address workplace hazards.

Keywords

occupational injuries; surveillance; industry; wood products; agriculture; service sector; Malaysia

Globally, an estimated 100 million occupational injuries occur each year;¹ such injuries account for an estimated 350,000 deaths.² Most data pertaining to occupational injuries come from developed countries. Data on occupational injuries in Southeast Asia are limited to a few countries. Approximately 3% to 4% of workers registered with Thailand's Workmen's Compensation Fund were reported to have sustained occupational injuries each year from 1992 to 2001.³ Singapore's Ministry of Manpower reported 10,018 cases of workplace injuries for 2007, with 53% of these cases arising from manufacturing and construction.⁴ In Vietnam, the highest burden of work-related injuries was noted among farmers.⁵ Handling machinery and being struck by falling objects were the main causes of occupational injuries for persons admitted to the hospital emergency departments in the Putuo District, China.⁶

Most occupational injuries are preventable; therefore, an improved understanding of occupational injuries can pave the way for more effective preventive strategies. In the absence of systematic occupational injuries surveillance, particularly in developing countries, data collected by governmental agencies or industry is potentially useful in identifying the distribution patterns of occupational injuries.

Address correspondence to Adinegara Bin Lutfi Abas, Lecturer and Professor, Department of Community Medicine, Melaka Manipal Medical College, Jalan Batu Hampar, Bukit Baru 75150 Melaka, Malaysia; <adinegara@manipal.edu.my> . .

Disclosures: The authors report no conflict of interest.

In Malaysia, surveillance of non-fatal occupational injuries is fragmented. We explored alternative sources that may provide information on non-fatal occupational injuries in the country. Malaysia's Social Security Organization, PERKESO (Pertubuhan Keselamatan Sosial) was first set up in 1971 to provide socioeconomic security for working Malaysian citizens in non-governmental jobs.⁷ Workers in Malaysia contribute to PERKESO for the purpose of claiming benefits in the event of an occupational injury. We therefore undertook to analyze data from PERKESO. No previous study has assessed patterns of non-fatal occupational injuries using the PERKESO data. We have previously analyzed the PERKESO data on occupational diseases and found that workers in the non-metallic manufacturing industry had the highest incidence of hearing impairment and musculoskeletal disorders, compared to all other industries.⁸ The main aim of the present study was to identify and calculate the incidence rates of non-fatal occupational injuries by year of occurrence, sector, type of industry, cause of occupational injury, and other demographic variables. In future work, we will address fatal occupational injuries.

METHODS

Study Population

We conducted a secondary data analysis of the PERKESO nationwide database from 2002 to 2006, the time period for which computerized data were available. The study population comprised about 7 million (68%) of the total country's workforce of approximately 10 million⁹ who were registered with PERKESO (Table 1). The residual 32% of the country's workforce who were PERKESO-ineligible were self-employed persons (16%), including workers in the informal sector, government employees (8%), and foreign employees (8%).⁹

Social Security Organization Eligibility and Benefits

The Social Security Organization, through the Social Insurance program,⁷ provides socioeconomic security to working Malaysian citizens in non-governmental jobs. The implementation of this social security scheme was made mandatory by the Employees' Social Security Act of 1969, which makes it compulsory for employers to insure employees against workplace diseases or injury by contributing to PERKESO.¹⁰ Employees earning a monthly wage of 3000 or less Malaysian ringgits ([RM]; ≤ US\$850) qualify for employer contributions to PERKESO. Contributions must continue even if wages are subsequently raised over the RM3000 threshold.¹¹ Employees who earn more than RM3000 and who have not previously registered with PERKESO have the option to contribute to PERKESO contingent on an employer's approval; however, most (more than 90%) opt out of coverage.¹⁰ Four groups of employees are exempt from coverage by the Social Security Act: government employees, domestic servants, self-employed persons, and foreign workers.⁷ Foreign workers are mainly employed in manufacturing, agricultural, food service, and domestic service. Self-employed persons generally have small businesses such as food vending; in rural areas the self-employed are often engaged in farming or fishing. Workers employed in the government sector are provided medical benefits, including hospitalization for both occupational and non-occupational-related injuries or disease conditions.

To claim benefits, employees are required to notify their employers, who then complete a form known as "Form 21." Form 21 is then transmitted to the nearest PERKESO office along with an original copy of the medical certificate or a certified copy issued by the hospital or the clinic where the employee was treated for the injury. At PERKESO, the data from the form are entered into the PERKESO national database, which can be accessed by data entry clerks at any one of PERKESO's 45 branches nationwide.

After processing the claim, the employee is eligible for benefits through the Social Security Scheme. Medical and rehabilitation benefits are provided through a system of panel clinics, which are appointed by PERKESO and through all government hospitals.¹¹ Monetary benefits include temporary or permanent disability, which may be paid in a lump sum or as monthly payments.¹² Temporary disability benefits are only paid to an employee who is found unfit for work for a minimum of four days including the day of the accident.¹³

Data Collection

Two of the authors (AA and AS) visited the PERKESO headquarters in Jalan Ampang, Kuala Lumpur, to review their data stored in Microsoft Excel format. We reviewed Form 21, which contained the following information: demographic information including name, age, gender, and ethnicity; employment-related information, including the names of employers and types of industry; and occupational injury information, including causative agents, causes of accidents, types of injury, locations of injury, time of accident, and place of reporting (the PERKESO branch located in Kuala Lumpur, Melaka, Penang, Langkawi, Melaka, etc.). Since 2002, information from Form 21 has been entered into a computerized PERKESO database; in the earlier years, paper copies were retained.

Social Security Organization Classifications

The Social Security Organization categorizes industries into sectors as follows: manufacturing; service sector (business services, rental and leasing services, health, social and related community services, recreational and cultural services, and personal and household services); trading; transportation; finance and insurance; agriculture; mining and quarrying; construction; utility services (electricity, gas, water, and sanitary services); and hotels and restaurants (Table 1). Manufacturing industries are further subclassified into: machinery and metal; chemical; non-metallic; wood product; food and beverage; textile; and paper and printing.⁷ Accident agents categorization includes: machines; materials and substances; transport and lifting equipment; and working environment. Working environment pertains to the actual working conditions that the worker is exposed to, such as the floor, working surfaces, confined quarters, and stairs. Causes of accidents are classified into categories such as falls, being struck by falling objects, or overexertion in lifting objects.⁷ Types of injuries are described in categories such as fractures, dislocations, sprains, and concussions.⁷

Data Analysis

We performed descriptive analysis on non-fatal occupational injuries using the available demographic and work-related variables. We computed crude incidence rates of selected non-fatal occupational injuries per 1,000 workers by sector, manufacturing subcategory, gender, ethnicity, and age, as well as by injury characteristics according to calendar year. In calculating incidence rates, the numerator was comprised of the number of injury cases for a specific category in a year divided by the number of employed persons for that category in that year, and multiplied by 1,000. Sector or subcategory incidence rate averages were calculated by averaging the number of injury cases and the number of employees over five years, and then applying the formula to the averages. The denominator data for these computations were obtained from the PERKESO annual reports.^{7,11,12,14,15} In computations of age-, gender-, and ethnicity-specific incidence rates, we used estimates from employment data from the Labour Force Survey Report for the denominator data.⁹ The chi-square test for trend was used to test statistical significance of the change in the incidence rate over time. We used Epi Info version 3.4.3 for data analyses (US Centers for Disease Control and Prevention, Atlanta, GA).

RESULTS

A total of 7,015,578 employees were registered with PERKESO by the end of 2006 (Table 1). The total number of employees registered with PERKESO increased 28%, from 5,482,698 in 2002, to 7,015,578 in 2006. From 2002 to 2006, most were employed in the manufacturing sector (26% to 28%), followed by the service sector (25% to 27%), and trading (14% to 16%). Employers in service, trading, and manufacturing accounted for two-thirds of all employers (service sector: 33% to 34%; trading: 21% to 23%; manufacturing: 13% to 14%).

General Injury Patterns

For the years 2002 to 2006, the PERKESO data contained reports on 249,904 non-fatal occupational injury cases pertaining to 211,875 unique individuals. Descriptive characteristics and average incidence rates for the overall group and for subgroups according to year are shown in Table 2. The annual number of non-fatal occupational injury cases decreased by 37% from 2002 to 2006 (from 62,737 to 39,366). The incidence rate significantly decreased by 51% from 2002 to 2006 (from 11.4 per 1,000 workers to 5.6 per 1,000 workers [$p_{\text{trend}} < 0.001$]). This downward trend was also noted in all subgroups pertaining to age, gender, ethnicity, and industry (Table 2 and Figures 1 to 3). About three-fourths (76%) of cases occurred among the 19- to 49-year-old age group, with the mean age at the time of reporting being 36 years. The highest annual average incidence rate was seen among the 40- to 49-year-old age group (7.9 per 1,000) followed by the 30- to 39- and 19- to 29-year-old age groups (7.5 and 7.4 per 1,000, respectively).

About four-fifths (84%) of the study group were men and one-fifth (16%) were women. Men were noted to have almost a threefold increase in annual average incidence rates as compared to women (men: 10.7 per 1,000; women: 3.6 per 1,000). With regard to ethnicity, Malays comprised two-fifths (43%) of the total number of cases, followed by Chinese (31%), Indian (21%), and other (5%). However, Indians had a higher annual average incidence rate (21.1 per 1,000) as compared to either Malays (6.8 per 1,000) or Chinese (8.9 per 1,000). The above patterns pertaining to age, gender, and race/ethnicity were observed across the calendar years 2002 through 2006.

Number and percentage of injuries, as well as yearly and average incidence rates are shown in Table 2. The highest average incidence rates of non-fatal occupational injuries for 2002 through 2006 were in the agricultural sector, (24.1 per 1,000), followed by manufacturing (12 per 1,000 overall). The highest rates within manufacturing subcategories were in the wood-products manufacturing (22.1 per 1,000) and non-metallic products (20.8 per 1,000) industries (Table 3).

About 40% of cases occurred in the manufacturing sector during the five-year period, followed by the service (17%), and trading (17%) sectors. Within the manufacturing industries, workers employed in machinery and metal, wood product, and chemical industry reported the highest number of non-fatal occupational injuries (18%, 8%, and 5% of total cases, respectively).

The distribution of cases by type and cause of injury, as well as by accident agents, are described in Table 3. The most common types of injuries were unspecified wounds (55%), superficial injuries (10%), fractures (10%), and sprains and strains (7%). The other categories included concussion and other internal injuries (4%), contusions and crushings (4%), dislocations (2%), burns (2%), and amputations (2%). The main causes of occupational injuries were attributed to being struck by objects (33%), falling from heights (19%), and being caught between objects (17%). Working environment was the main

accident agent, contributing to 41% of all reported cases, followed by handling of machines (20%) and exposure to materials and substances (12%).

Injury Patterns for Areas of Most Concern

Further results focus on the agriculture sector and the manufacturing sector subcategories of wood-product and non-metallic industries, as these ranked highest industries in terms of incidence of occupational injuries.

Agriculture Sector—From 2002 to 2006, the number of non-fatal occupational injury cases decreased by 63%, from 8,080 to 3,004 (Table 4). In the same time period, the annual incidence rate also decreased by 67%, from 39 per 1,000 workers to 13 per 1,000 workers ($P_{\text{trend}} < 0.001$). This downward trend was noted in the different ethnicity/gender subgroups, with the Indian subgroup displaying the steepest decline (Figure 1). From 2002 to 2006, employees in the 50- to 59-year-old age group and the 40- to 49-year-old age group had the highest annual average incidence rate (from 36.1 per 1,000 to 35.2 per 1,000). Men had a 1.5-fold increase in annual average incidence rates of non-fatal occupational injuries compared to women (men: 27.5 per 1,000; women: 17.8 per 1,000). With regard to ethnicity, Indians had the highest annual average incidence rate of 125.2 per 1,000 workers, which was about an eightfold and 11-fold increase compared to Malays or Chinese, respectively (Table 4 and Figure 1). The main types of injuries reported were superficial injuries (17%), followed by sprains and strains (10%) and fractures (5%). Falling from heights (31%) was the main cause of accidents followed by being struck by objects (25%). Working environment (45%) was the main accident agent.

Among the subgroup of Indians working in the agriculture industry, as with the overall group, the 50- to 59-year-old and the 40- to 49-year-old age groups had the highest annual average incidence rates of 241.9 and 234.8 per 1,000 workers, respectively (data not shown). Falling from height (59.6 per 1,000) and being struck by objects (39.1 per 1,000) were the main causes of accidents. The main accident agents involved were working environment (68 per 1,000) and materials and substances (24.9 per 1,000). Women of Indian origin had a higher annual average incidence rate of 168.4 per 1,000, compared to 122.6 per 1,000 for men. The main cause of accident for these women was falling from heights (90.6 per 1,000).

Wood-product manufacturing—From 2002 to 2006, there was a 48% decline in the total number of non-fatal occupational injury cases, from 5,639 cases to 2,922 cases, respectively (Table 4). As in the agricultural sector, the annual incidence rate also declined. In the case of wood product manufacturing, from 2002 to 2006, this rate declined 56%, from 32.3 per 1,000 workers to 14.2 per 1,000 workers ($P_{\text{trend}} < 0.001$). The decline was also noted among the different ethnic and gender subgroups (Figure 2). The 60+, 50- to 59-, and 40- to 49-year-old age groups had the highest annual average incidence rates (29.6, 24.1, and 22 per 1,000 workers, respectively). Men had a 2.7-fold higher annual average incidence rate (28.7 per 1,000 workers) compared to women (Table 4 and Figure 2). Both Chinese and Indians had higher average annual incidence rates (29.1 per 1,000 workers and 28.6 per 1,000 workers, respectively) than Malays. Superficial injuries (13%) were the main type of injury, followed by fractures (7%) and sprains and strains (5%). Being struck by objects was the main cause of injuries (31%) followed by being caught between objects (26%) and being hit by falling objects (19%). Handling of machines (37%) and the working environment (34%) were the two main accident agents.

Non-metallic product manufacturing—Similar to the agricultural sector and wood-product manufacturing, there was a decline in the number of cases reported annually in the non-metallic product manufacturing industry from 2002 to 2006 (from 1,406 to 744 cases,

respectively: a 47% decline). There was also a downward trend (50% decline) in the reported annual incidence rate from 2002 to 2006 (28.3 per 1,000 workers to 14.1 per 1,000 workers, respectively [$p_{\text{trend}} < 0.001$]). The average annual incidence rate remained almost constant across the 19- to 59-year-old age group (18.4 to 21.0 per 1,000 workers). Lower rates were noted for the 15- to 18-year old and the 60+-year-old age groups. Men had a sixfold increase in annual average incidence rate compared to women (men: 29.6 per 1,000; women: 4.9 per 1,000). With regard to ethnicity, Indians had the highest average annual incidence rate of 56.5 per 1,000 workers, which was 2.8 and 3.5 times higher than Malays or Chinese, respectively (Table 4 and Figure 3). Sprains/strains (10%) and superficial injuries (9%) were the main type of injuries. As noted in the wood product industry, being struck by objects (35%) was the main cause of injuries, followed by being caught in between objects (21%). The working environment (35%) accounted for most injuries, followed by handling of machines (20%).

Among the subgroup of Indians working in the non-metallic products manufacturing industry, men had a higher annual average incidence rate of injuries compared to women (men: 85.9 per 1,000; women: 21.1 per 1,000) (data not shown). For both men and women, the 40- to 49-year-old and the 50- to 59-year-old age groups had the highest average annual incidence rates (81.4 per 1,000 and 68.2 per 1,000, respectively). Being struck by objects and falling from height were the main causes of accidents (24 per 1,000 workers and 11.7 per 1,000 workers, respectively). The main accident agents involved were working environment (24.4 per 1,000) and handling of machines (15 per 1,000).

DISCUSSION

This is the first study of patterns of non-fatal occupational injuries among non-governmental employees, who comprise 68% of the total workforce in Malaysia. We noted a general trend of decline in the annual number and annual incidence rates of non-fatal occupational injuries during the time period of the study, 2002 to 2006. Men had a higher incidence compared to women. The 40- to 59-year-old age group had a greater tendency to incur injuries than younger or older age groups. Employees in the agriculture industry reported the highest rate of work-related injuries, followed by those in the wood-product and non-metallic product manufacturing industries. Within the agriculture and the non-metallic product industries, the Indian ethnic subgroup had a higher incidence of injuries compared to Malays or Chinese.

The main strength of this study is that the PERKESO data cover about two-thirds of the country's workforce. Also, the PERKESO data are more comprehensive compared to the data received by Malaysia's Department of Safety and Health.¹⁶ However, there are several limitations. First, the PERKESO data are collected for tracking and monitoring benefit claims, and thus, are not structured for surveillance. Second, there is a likelihood of underreporting. Because injuries are self-reported, the "willingness to report" may depend on employees' discretion in terms of reporting. For example, less-severe injuries may not be reported. Third, certain PERKESO categories have the potential to be misclassified. For example, we noted for classification of injuries by type, 59% of cases were placed in the "unspecified" category. Fourth, the data do not include data on certain categories of the workforce who may be at high risk for occupational injuries, such as foreign or domestic employees who are typically employed in low-level jobs. Finally, the data are not representative of certain industries such as mining and quarrying, which are operated by the government.

The annual average incidence of 8.2 per 1,000 workers noted in our study is much lower than the rates reported in other countries. The US Bureau of Labor Statistics reported an incidence rate of 44.0 per 1,000,¹⁷ while the United Kingdom (UK) Labour Force Survey

Report observed an incidence rate of 9.5 per 1,000.¹⁸ As noted under limitations, the PERKESO is not structured to capture all episodes of injuries and has the potential for substantial underreporting of less-severe injuries. Other investigators also have noted underreporting of occupational injuries.¹⁹ Reasons suggested included fear of disciplinary action, denial of overtime, or loss of opportunities for promotion.²⁰ Some of the preceding factors may be additional contributing factors for underreporting in our study setting.

Our finding of a decline in the incidence of occupational injuries during the five-year study period is consistent with findings from other countries. Italian industries noted a downward trend in the rates of total injuries in certain sectors.²¹ As suggested by Mustard et al.,²² improved work organization and increasing attention to safety and health play a major role in the reduction of occupational injuries. Personal communication with the Malaysian PERKESO indicated that such factors may be operational in Malaysia as well.

Malaysia's Department of Safety and Health was also noted to have increased its efforts to enforce regulatory requirements in the workplace.¹⁶

We found that men had a threefold higher risk of incurring occupational injuries compared to women. A Norwegian study that examined insurance claims for occupational injuries found that men had a twofold higher risk of workplace injuries compared to women.²³ Men were noted to have a threefold higher rate of hospitalizations for work-related injuries in a Canadian study.²⁴ In general, men are more likely to be exposed to work-related activities that have an increased risk for sustaining occupational injuries. In Malaysia, the workforce is predominantly comprised of men (as seen in the data presented here) and hence, the gender difference in the incidence rate of injuries may be further magnified.

The 40- to 59-year-old age group had the highest risk of occupational injuries in the agricultural sector and in non-metallic and wood-product manufacturing. A study from Norway²³ and another from India had similar findings.²⁵ In this age group, a decrease in physical and mental abilities may alter the quality of work performance, increasing the likelihood of workers in these age groups incurring occupational injuries.²⁵ On the other hand, the 60-year-old and over age group had generally lower incidence rate of non-fatal occupational injuries in both the agricultural and non-metallic products industry as they are presumably placed in senior positions and hence, may be at a lower risk of incurring occupational injuries.

Our study noted the highest annual average incidence rate of non-fatal occupational injuries in the agricultural sector, followed by wood-product and non-metallic within the manufacturing sector. The UK Labour Force Survey Report reported that the agriculture, hunting, forestry, and fishing industries had the highest average incidence of non-fatal occupational injuries, with an average annual incidence rate of 22.4 per 1,000 workers.¹⁸ This was followed by postal and courier activities with 20.3 per 1,000 worker annual average incidence rate, defense and law activities with 18.1 per 1,000 worker rate, and wholesale trading with a 15.7 per 1,000 worker rate.¹⁸ Data from the US Bureau of Labor Statistics found that workers in the transportation and warehousing, construction, agriculture, and manufacturing had high incidence rates of occupational injuries involving days away from work (270.4, 219.5, 194.6, and 141.2 per 10,000 workers, respectively).²⁶

Agricultural work is known to be one of the most hazardous occupations worldwide. Several countries have reported that the accident rate is much higher compared to the average noted for all other industries.²⁷ About 4% of all PERKESO-registered employees were in the agricultural sector. Some of the factors contributing to the occurrence of workplace injuries in agriculture include the types of tasks carried out by workers, including the maintenance work of land, machinery, and buildings, and animal husbandry.²⁸ We noted that falling from

heights, suggestive of severe injury, was the main cause of injury in agriculture. This finding was inconsistent with other studies, which suggest less-severe injuries as the most common cause. In the UK, manual handling was the main cause of accidents in agriculture.²⁸ In Ontario, the use of farm machineries and overexertion were noted to be the common mechanisms of injury.²⁹ The discrepancies in these findings underscore the potential for substantial underreporting of less-severe injuries in our study.

We noted that Indians had the highest incidence rates of non-fatal occupational injuries in the agricultural sector and non-metallic product manufacturing industries, compared to other ethnic groups. We also noted a similar pattern in the machinery and metal, food and beverage subcategories. Our earlier study of occupational diseases also noted a higher occurrence of occupational diseases among Indian employees in Malaysia.⁸ In general, Indians may be at a higher risk of occupational injuries as they are more likely to hold high-risk jobs. For example, it was noted that 25.7% of the total Indian workforce in Malaysia were employed as machine operators or assemblers, compared to 8.4% of the Chinese workforce and 15.2% of the Malays.⁹

Among Indians working in the agriculture industry, women had a higher annual average incidence rate of non-fatal occupational injury as compared to men. A study in India of agricultural workers noted that men generally operate machinery in farms, while women were involved in activities like harvesting, transplanting, and using hand tools.³⁰ Despite the increased incidence patterns noted among Indians in the agriculture sector, we also noted that they had the steepest declining trend patterns compared to other ethnic subgroups. Several factors may account for these findings. As noted before, the more rigorous activities of the Department of Safety and Health may have played a major role. For example, in 2005, the Department of Safety and Health made 390 regulatory inspections in the agriculture industry, which was the largest number of inspections made in any industry; in 2006, the number of visits increased to 947.¹⁶ Other factors, such as workers becoming increasingly more experienced over time, the introduction of new technology, and enhanced mechanization may also affect the rates in this sector.

Workers in the wood-product industry were noted to have a high annual average incidence rate of non-fatal occupational injuries of 22.1 per 1,000, which was lower than the incidence rate of 85 per 1,000 reported by the US Bureau of Labour Statistics.³¹ A high risk of occupational injuries among wood industry workers has also been noted in Australia.³² We observed that being struck by objects and being caught between objects were the main causes of injuries, which was consistent with the findings from a Canadian study.³³ Our finding that men in the wood-product industry were at high risk was supported by the results of a study in Alberta.³⁴

We observed an annual average incidence rate of non-fatal occupational injuries of 20.8 per 1,000 workers in the non-metallic products industry, which was lower than that reported by the US Bureau of Labour Statistics (71 per 1,000 workers).³¹ In Japan, the non-metallic products industry was found to be one of the industries with a high occurrence of occupational injuries.³⁵ We noted sprains and superficial injuries as the common types of injuries in this industry. A similar finding was noted in the non-metallic industry in India, which reported that the most common types of injuries were cuts, lacerations, and sprains.³⁶

Prevention and Recommendations

Malaysia's 1994 Occupational Safety and Health Act was set up with the main purpose of requiring employers to implement preventive and control measures in the workplace.¹⁶ However, there are no mechanisms to monitor employee adherence patterns.

We noted a general trend of declining workplace injuries, but some industries and sectors continued to record a high incidence of occupational injuries. It is important that both governmental and non-governmental sectors continue to implement strategies to support the further reduction of occupational injuries. In addition, risk management should emphasize worker empowerment and involvement. In parallel, routine monitoring for employee adherence should be implemented.

In addition, more rigorous risk reduction strategies should be adopted for specific subgroups and for particular jobs that are identified with a high risk for occupational injury. In particular, for the agricultural sector and the wood-product and non-metallic product industries, hazards at the workplace should be identified and minimized. For example, special precautions must be adopted to minimize falling from heights and being struck by objects. Protection systems such as the use of safety nets and helmets and the development of training programs on safe work procedures should be initiated to minimize such accidents. In particular, these programs should take into account the demographics of specific jobs as well as the demographics of employees who are potentially at high risk for occupational injuries. For example, in the agricultural sector, strategies should particularly target Indians, and within this ethnic group, women and the male 40- to 59-year-old age group. There is a need to evaluate and improve the design of farm tools used by women working in the agriculture industry.³⁷ For the wood-product industry, measures should be adopted to help reduce the risks of being struck by objects. Finally, it is important that employers ensure that the design and workflow at worksites suit the workers so as to minimize accidents in the workplace.

This study has demonstrated that the PERKESO is a valuable source of data to study occupational injuries in Malaysia in the absence of routine surveillance data. Some improvements in the PERKESO database could greatly increase its utility. Numerator data on injury counts must be improved. Reporting of all injuries, particularly the less-severe injuries, could be mandated by SOSCO. Concurrently, increasing both employer and employee awareness of the importance of reporting all occupational injuries would be beneficial. Finally, some of the PERKESO classifications such as type of injuries need to be revised to minimize misclassifications.

CONCLUSIONS

We noted a general decline in the annual number and annual rates of non-fatal occupational injuries reported to the PERKESO during 2002 to 2006. Workers in agriculture had the highest incidence rates of injuries, followed by the wood-product and non-metallic product manufacturing industries. Falling from heights was the main cause of accidents in the agriculture industry, while being struck by objects was the main cause in the wood and non-metallic product industry.

The results from this study would be useful for all relevant stakeholders in both governmental and non-governmental sectors to develop strategies for the reduction and control of occupational injuries. Safety practices and interventions must effectively target workers with the highest risk and ensure adherence to safety standards. Although there has been an increase in industry regulatory inspections, targeted interventions emphasizing worker empowerment coupled with systematic monitoring and evaluation is critical to ensure success in prevention and control measures.

A national injury surveillance system, including all groups of workers in the country, is essential for a country-wide injury prevention program. In the interim, improvements to the PERKESO database could greatly increase its utility.

Acknowledgments

The present work was supported by the University of Alabama at Birmingham International Training and Research in Environmental and Occupational Health program, Grant Number 5 D43 TW05750 from the National Institute of Health-Fogarty International Center (NIH-FIC). The content is solely the responsibility of the authors and do not necessarily represent the official views of the NIH-FIC.

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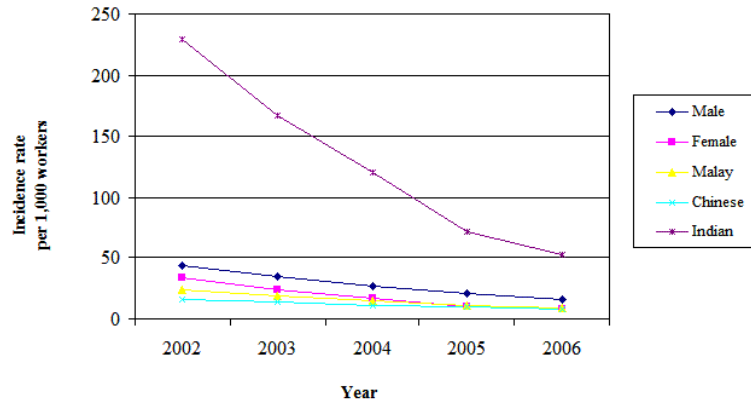


Figure 1. Incidence Rate of Non-fatal Occupational Injuries in the Agriculture Industry by Ethnicity and Gender, 2002–2006.

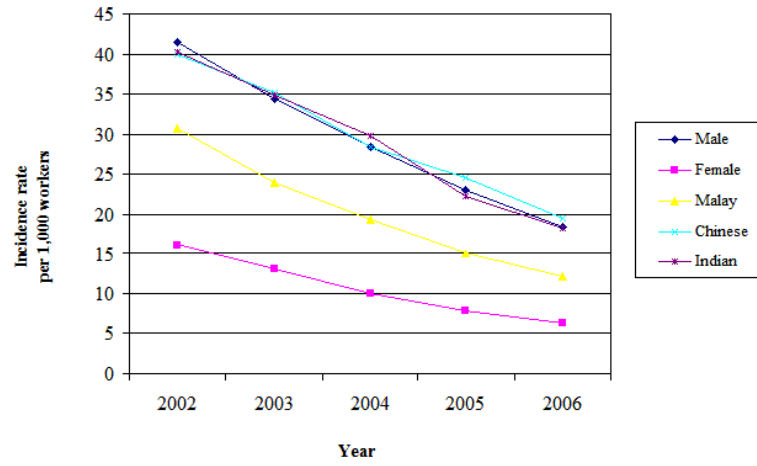


Figure 2. Incidence Rate of Non-fatal Occupational Injuries in the Wood-Product Industry by Ethnicity and Gender, 2002–2006.

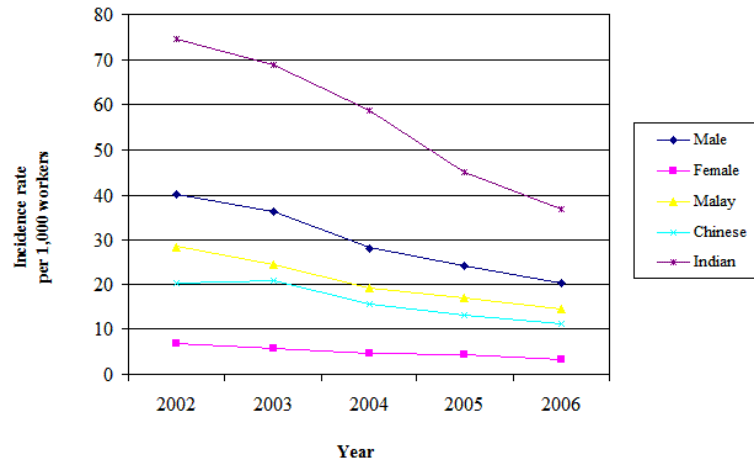


Figure 3. Incidence Rate of Non-fatal Occupational Injuries in Non-metallic Product Industry by Ethnicity and Gender, 2000–2006.

TABLE 1

Number of Employees and Employers in the PERKESO Database, By Year^a

	2002 N (%)	2003 N (%)	2004 N (%)	2005 N (%)	2006 N (%)
Employees					
Total	5,482,698 (100)	5,706,446 (100)	5,977,473 (100)	6,472,340 (100)	7,015,578 (100)
Manufacturing industry*	1,541,713 (28)	1,584,068 (28)	1,633,371 (27)	1,725,708 (27)	1,853,110 (26)
Machinery and metal	498,506 (9)	507,511 (9)	524,513 (9)	547,979 (8)	585,645 (8)
Chemical	218,440 (4)	226,340 (4)	230,569 (4)	244,192 (4)	256,737 (4)
Non-metallic	49,612 (1)	48,274 (1)	49,876 (1)	50,749 (1)	52,590 (1)
Wood product	174,419 (3)	177,171 (3)	180,508 (3)	193,964 (3)	206,249 (3)
Food and beverage	83,962 (2)	88,286 (2)	91,399 (2)	95,545 (1)	107,191 (2)
Textile	162,750 (3)	166,294 (3)	168,371 (3)	177,705 (3)	182,152 (3)
Paper and printing	106,601 (2)	107,847 (2)	111,296 (2)	112,622 (2)	123,755 (2)
Service sector	1,381,322 (25)	1,451,711 (25)	1,548,981 (26)	1,705,898 (26)	1,892,698 (27)
Trading	775,479 (14)	824,215 (14)	887,554 (15)	987,103 (15)	1,121,287 (16)
Transportation	205,261 (4)	216,488 (4)	226,097 (4)	247,629 (4)	265,018 (4)
Finance and insurance	208,682 (4)	232,026 (4)	210,221 (4)	247,696 (4)	242,869 (3)
Agriculture	207,082 (4)	202,298 (4)	209,340 (3)	229,249 (4)	230,838 (3)
Mining and quarrying	55,119 (1)	55,419 (1)	58,035 (1)	60,055 (1)	61,061 (1)
Other**	1,108,040 (20)	1,140,221 (20)	1,203,874 (20)	1,269,002 (20)	1,348,697 (19)
Employers					
Total	477,150 (100)	507,853 (100)	542,629 (100)	578,390 (100)	612,953 (100)
Manufacturing industry*	66,640 (14)	69,693 (14)	73,383 (14)	75,998 (13)	78,839 (13)
Service sector	159,006 (33)	170,423 (33)	181,679 (33)	195,470 (34)	208,386 (34)
Trading	101,831 (21)	109,750 (21)	119,925 (22)	129,980 (22)	139,493 (23)
Transportation	17,839 (4)	18,314 (4)	19,407 (4)	20,501 (4)	21,545 (4)
Finance and insurance	10,891 (2)	11,342 (2)	12,009 (2)	12,493 (2)	13,062 (2)
Agriculture	13,525 (3)	13,876 (3)	14,364 (2)	14,888 (2)	15,331 (2)
Mining and quarrying	2,873 (1)	2,941 (1)	3,036 (1)	3,097 (1)	3,171 (1)
All other	104,545 (22)	111,514 (22)	118,826 (22)	125,963 (22)	133,126 (22)

* Manufacturing industry includes machinery and metal, chemical, non-metallic product manufacture, wood-product manufacture, food and beverage, textile, paper and printing, and all other (residual).

** Includes construction, forestry, communications, hotel and restaurants, and fishing.

^aPERKESO Annual Report, Kuala Lumpur, 2002-2006. 7.11, 12, 14, 15

TABLE 2

Distribution and Rate* of Non-fatal Occupational Injury Cases Reported to PERKESO by Demographic Characteristics and Industry According to Year

	2002		2003		2004		2005		2006		Total N (%)	Average Rate
	N (%)	Rate	N (%)	Rate	N (%)	Rate	N (%)	Rate	N (%)	Rate		
Total	62,737 (100)	11.4	54,942 (100)	9.6	49,466 (100)	8.3	43,393 (100)	6.7	39,366 (100)	5.6	249,904 (100)	8.2
Age group (years)												
Unknown	5,004 (8)		5,058 (9)		5,318 (11)		5,019 (12)		4,146 (11)		24,545 (10)	
15-18	1,276 (2)	5.8	996 (2)	4.3	745 (2)	3.2	582 (1)	2.7	525 (1)	2.3	4,124 (2)	3.7
19-29	19,046 (30)	10.9	16,009 (29)	8.8	13,836 (28)	7.5	11,574 (27)	5.7	10,644 (27)	4.8	71,109 (28)	7.4
30-39	16,602 (27)	10.6	14,566 (26)	9.1	12,808 (26)	7.5	11,315 (26)	6.2	10,234 (26)	5.2	65,525 (26)	7.5
40-49	13,895 (22)	11.3	11,859 (22)	9.4	10,594 (21)	7.9	9,314 (21)	6.3	8,600 (22)	5.4	54,262 (22)	7.9
50-59	5,832 (9)	9.8	5,399 (10)	8.4	5,199 (10)	7.4	4,759 (11)	6.2	4,399 (11)	5.1	25,588 (10)	7.2
60 and above	1,082 (2)	8.6	1,055 (2)	7.7	966 (2)	6.7	830 (2)	5.8	818 (2)	4.9	4,751 (2)	6.6
Mean ± sd	35.5 ± 11.2		35.8 ± 11.2		36.2 ± 11.2		36.6 ± 11.2		36.6 ± 11.3		36.1 ± 11.2	
Median	35		35		35		36		36		35	
Gender												
Male	51,920 (83)	14.7	45,821 (83)	12.5	41,730 (84)	10.9	36,847 (85)	8.8	33,707 (86)	7.5	210,025 (84)	10.7
Female	10,817 (17)	5.5	9,121 (17)	4.4	7,736 (16)	3.6	6,546 (15)	2.8	5,659 (14)	2.3	39,879 (16)	3.6
Ethnicity												
Malay	26,287 (42)	9.5	22,975 (42)	7.9	21,193 (43)	7	18,435 (42)	5.6	17,178 (44)	4.8	106,068 (43)	6.8
Chinese	18,453 (29)	11.8	17,064 (31)	10.6	15,462 (31)	9	13,942 (32)	7.6	12,624 (32)	6.4	77,545 (31)	8.9
Indian	14,758 (24)	32.3	12,081 (22)	25.9	10,098 (21)	20.9	8,447 (20)	15.9	7,505 (19)	13	52,889 (21)	21.1
Other	3,239 (5)		2,822 (5)		2,713 (5)		2,569 (6)		2,059 (5)		13,402 (5)	
Sector												
Manufacturing	26,494 (41)	17.2	22,489 (41)	14.2	19,616 (40)	12	16,750 (39)	9.7	14,889 (38)	8	100,238 (40)	12
Machinery & metal	11,409 (18)	22.9	9,587 (17)	18.9	8,859 (18)	16.9	7,445 (17)	13.6	6,821 (17)	11.6	44,121 (18)	16.6
Chemical	3,491 (5)	16	2,964 (5)	13.1	2,558 (5)	11.1	2,186 (5)	9	1,903 (5)	7.4	13,102 (5)	11.1
Non-metallic	1,406 (2)	28.3	1,221 (2)	25.3	984 (2)	19.7	859 (2)	16.9	744 (2)	14.1	5,214 (2)	20.8
Wood product manufacture	5,639 (9)	32.3	4,728 (9)	26.7	3,933 (8)	21.8	3,428 (8)	17.7	2,922 (7)	14.2	20,650 (8)	22.1
Food and beverage	1,865 (3)	22.2	1,655 (3)	18.7	1,410 (3)	15.4	1,184 (3)	12.4	1,106 (3)	10.3	7,220 (3)	15.5
Textile	1,595 (2)	9.8	1,329 (3)	8	1,009 (2)	6	857 (2)	4.8	697 (2)	3.8	5,487 (2)	6.4

	2002		2003		2004		2005		2006		Total N (%)	Average Rate
	N (%)	Rate	N (%)	Rate	N (%)	Rate	N (%)	Rate	N (%)	Rate		
Paper and printing	1,089 (2)	10.2	1,005 (2)	9.3	863 (2)	7.8	791 (2)	7	696 (2)	5.6	4,444 (2)	7.9
Service sector	9,512 (15)	6.9	8,937 (16)	6.2	8,769 (18)	5.7	8,258 (19)	4.8	7,848 (20)	4.1	43,324 (17)	5.4
Trading	9,577 (15)	12.3	9,055 (16)	11	8,220 (16)	9.3	7,585 (17)	7.7	6,963 (18)	6.2	41,400 (17)	9
Transportation	2,863 (5)	13.9	2,612 (5)	12.1	2,464 (5)	10.9	2,116 (5)	8.6	2,062 (5)	7.8	12,117 (5)	10.4
Finance and insurance	227 (0)	1.1	219 (0)	0.9	209 (0)	1	187 (0)	0.8	192 (0)	0.8	1,034 (0)	0.9
Agriculture	8,080 (13)	39	6,153 (11)	30.4	4,880 (10)	23.3	3,833 (9)	16.7	3,004 (7)	13	25,950 (10)	24.1
Mining and quarrying	439 (1)	8	401 (1)	7.2	397 (1)	6.8	333 (1)	5.5	274 (1)	4.5	1,844 (1)	6.4
Utility services (electricity, gas, water and sanitary services)	334 (1)	6.2	313 (1)	5.7	301 (1)	5.4	288 (1)	4.7	277 (1)	4	1,513 (1)	5.1
Construction	3,759 (6)	10.8	3,508 (6)	9.5	3,242 (6)	8.2	2,878 (6)	6.7	2,616 (7)	5.5	16,003 (6)	7.9
Hotels and restaurants	1,085 (2)	7.2	955 (2)	6	1,060 (2)	6.2	911 (2)	4.6	909 (2)	4.1	4,920 (2)	5.5
Communications	367 (1)	2.7	300 (1)	2.3	308 (1)	2.2	254 (1)	2.1	332 (1)	2.7	1,561 (1)	2.4

* Per 1,000 workers.

TABLE 3

Distribution of Non-fatal Occupational Injury Cases Reported to PERKESO by Type of Injury, Cause of Accident and Accident Agent According to Year

Characteristics	2002 N (%)	2003 N (%)	2004 N (%)	2005 N (%)	2006 N (%)	Total N (%)
Total	62,737 (100)	54,942 (100)	49,466 (100)	43,393 (100)	39,366 (100)	249,904 (100)
Type of injury						
Unspecified wounds	35,071 (56)	30,492 (55)	27,177 (55)	23,993 (56)	21,274 (54)	138,007 (55)
Superficial injuries	6,959 (11)	5,358 (10)	4,848 (10)	4,061 (9)	3,718 (9)	24,944 (10)
Fractures	4,831 (8)	5,004 (9)	4,990 (10)	4,613 (11)	4,694 (12)	24,132 (10)
Sprains and strains	4,378 (7)	3,782 (7)	3,396 (7)	3,049 (7)	2,865 (7)	17,470 (7)
Concussions and internal injuries	2,698 (4)	2,407 (4)	1,853 (4)	1,797 (4)	1,458 (4)	10,213 (4)
Contusions and crushings	2,104 (3)	2,097 (4)	2,602 (5)	1,820 (4)	1,105 (3)	9,728 (4)
Other ^d	6,696 (11)	5,802 (11)	4,600 (9)	4,060 (9)	4,252 (11)	25,410 (10)
Cause of accident						
Struck by objects excluding falling objects	20,889 (33)	17,797 (32)	16,898 (34)	14,482 (33)	12,923 (33)	82,989 (33)
Fall from height	11,912 (19)	10,634 (19)	9,047 (18)	8,029 (19)	7,859 (20)	47,481 (19)
Falling objects	10,602 (17)	9,019 (17)	8,238 (17)	7,628 (18)	5,735 (15)	41,222 (16)
Caught between objects	10,234 (16)	9,218 (17)	8,081 (16)	7,085 (16)	7,236 (18)	41,854 (17)
Other ^b	9,100 (15)	8,274 (15)	7,202 (15)	6,169 (14)	5,613 (14)	36,358 (15)
Accident agent						
Working environment	24,197 (39)	21,995 (40)	20,375 (41)	18,788 (43)	17,896 (45)	103,251 (41)
Machine	12,802 (20)	11,283 (21)	9,795 (20)	8,414 (19)	7,107 (18)	49,401 (20)
Materials and substances	8,245 (13)	7,147 (13)	6,027 (12)	4,831 (11)	4,182 (11)	30,432 (12)
Transport and lifting equipment	6,069 (10)	5,131 (9)	4,545 (9)	4,174 (10)	4,000 (10)	23,919 (10)
Hand tools	3,025 (5)	2,648 (5)	2,248 (5)	2,171 (5)	1,841 (5)	11,933 (5)
Other ^c	8,399 (13)	6,738 (12)	6,476 (13)	5,015 (12)	4,340 (11)	30,968 (12)

^aIncludes dislocations (2% of the grand total), amputations (2%), burns (2%), multiple injuries of different nature (1%), effects of electric current (1%), effects of radiation (1%), and unspecified injuries (1%).

^bIncludes stepping on objects (2% of the grand total), contact with hot substances (2%), overexertion (2%), collapse (1%), slides and cave-ins (1%), exposure to heat (1%), strenuous movements (1%), exposure to radiation (1%), exposure to electric current (1%), exposure to cold (1%), and unknown (2%).

^c Includes other unspecified equipment (3% of the grand total), pressure vessels and furnaces (1%), ladders and mobile ramps (1%), refrigerating plants and installations (1%), unspecified products (1%), and unknown (5%).

TABLE 4

Number, Percent, and Rate* of Reported Non-fatal Occupational Injury by Year, Age Group, Ethnicity, Gender, Type of Occupational Injury, Cause of Accident and Accident Agent in the Agriculture, Wood-Product, and Non-metallic Product Industries

	Agriculture		Wood product		Non metallic	
	N (%)	Rate	N (%)	Rate	N (%)	Rate
Total	25,950 (100)	24.1	20,650 (100)	22.1	5,214 (100)	20.8
Year						
2002	8,080 (31)	39.0	5,639 (27)	32.3	1,406 (27)	28.3
2003	6,153 (24)	30.4	4,728 (23)	26.7	1,221 (23)	25.3
2004	4,880 (19)	23.3	3,933 (19)	21.8	984 (19)	19.7
2005	3,833 (15)	16.7	3,428 (17)	17.7	859 (17)	16.9
2006	3,004 (11)	13.0	2,922 (14)	14.2	744 (14)	14.1
Age group (years)						
15-18	230 (1)	5.8	627 (3)	18.3	67 (1)	7.2
19-29	3,650 (14)	10.7	5,139 (25)	17.5	1,456 (28)	18.4
30-39	6,524 (25)	21.3	5,002 (24)	18.9	1,421 (27)	20.0
40-49	8,528 (33)	35.2	4,604 (22)	22.0	1,184 (23)	21.0
50-59	4,536 (17)	36.1	2,613 (13)	24.1	566 (11)	19.4
60+	582 (2)	23.1	645 (3)	29.6	89 (2)	15.1
Ethnicity						
Malay	8,307 (32)	15.1	9,441 (46)	19.9	2,625 (51)	20.5
Chinese	3,512 (13)	11.5	7,692 (37)	29.1	1,150 (22)	16.2
Indian	11,067 (43)	125.2	2,188 (11)	28.6	1,162 (22)	56.5
Others	3,064 (12)		1,329 (6)		277 (5)	
Gender						
Male	19,076 (74)	27.5	17,163 (83)	28.7	4,770 (91)	29.6
Female	6,874 (26)	17.8	3,487 (17)	10.5	444 (9)	4.9
Type of injury						
Fractures	1,328 (5)	1.2	1,502 (7)	1.6	320 (6)	1.3
Sprains and strains	2,719 (10)	2.6	962 (5)	1.0	504 (10)	2.0
Concussions and other internal injuries	1,100 (4)	1.0	787 (4)	0.9	235 (5)	0.9
Superficial injuries	4,418 (17)	4.2	2,637 (13)	2.8	466 (9)	1.9

Cause of accident	Agriculture		Wood product		Non metallic	
	N (%)	Rate	N (%)	Rate	N (%)	Rate
Fall from heights	8,148 (31)	7.7	2,214 (11)	2.4	821 (16)	3.3
Falling objects	4,757 (18)	4.5	3,965 (19)	4.3	818 (16)	3.3
Struck by objects, excluding falling objects	6,470 (25)	6.1	6,412 (31)	7.0	1,829 (35)	7.3
Caught between objects	2,578 (10)	2.4	5,424 (26)	5.9	1,087 (21)	4.3
Accident agent						
Machine	3,477 (13)	3.3	7,724 (37)	8.4	1,059 (20)	4.2
Transport and lifting equipment	2,875 (11)	2.7	994 (5)	1.1	332 (6)	1.3
Materials and substances	3,768 (15)	3.6	2,031 (10)	2.2	938 (18)	3.8
Working environment	11,603 (45)	10.9	7,121 (34)	7.7	1,833 (35)	7.3

* Per 1,000 workers.