Emergency Department Surveillance of Occupational Injuries in Shanghai's Putuo District, People's Republic of China

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PURPOSE: Although the People's Republic of China has an enormous worker population, occupational injury data availability has been hindered by the lack of a national surveillance system. This study compared work with non-work-related injuries by diagnosis, cause, and demographic characteristics of cases treated in a moderate-sized emergency department (ED) in Shanghai.
METHODS: Data on all injury cases presenting to the ED were collected prospectively from November 1, 1998 through November 31, 1999 at the Putuo District Hospital.
RESULTS: A total of 5200 injuries were recorded; 3175 (61.1%) injuries occurred in individuals aged 18 to 60 years and of these, 38% occurred at work, 15.8% occurred going to or coming from work, and 46.2% were non-work-related. Top three causes of at-work-only injuries were cutting/piercing instruments, assault, and struck by/caught in objects. Injuries caused by machinery (prevalence ratio [PR] = 2.4; 95% confidence interval [CI], 2.2–2.6) and being struck by a falling object (PR = 1.8; CI, 1.6–2.1) were among those more likely to have occurred at work.
CONCLUSIONS: These findings are an important first step in implementing injury surveillance in Shanghai hospitals to track injury patterns and to ultimately inform injury prevention efforts in this major international urban center.
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KEY WORDS: Injuries, Injury Surveillance, Occupational Medicine, China, Emergency Medicine, Occupational Health.

INTRODUCTION

Recent morbidity (1999) and mortality (1998) statistics from China showed injuries caused an annual potentially productive years of life lost (PPYLL) of 12.6 million years with an estimated annual economic cost equivalent to US$12.5 billion (1). Although the People's Republic of China has an enormous worker population, occupational injury epidemiology and prevention have become heightened concerns only recently. As they face the major tasks of improving workplace safety and preventing costly injuries, Chinese occupational health specialists are left with limited data for designing safety interventions. A National Library of Medicine search (*MEDLINE* database) on occupational injury epidemiology in Asia reveals the paucity of empirical data. A recent search of reports published in any language found only one report abstracted before 1990 pertaining to acute occupational injury. This report was published in an international journal and reported on injury data collected in work sites in eight Asian countries (2). It is unlikely that investigations of workplace injuries in Asia were not conducted prior to 1990, but few data have been made widely available either within Asia or internationally. Since 1990, contributors to Chinese medical journals have called for more attention to injury epidemiology (3–5) while a few systematic studies of occupational injuries have been reported in the last few years (6–8).

Emergency departments (EDs) are the primary source of population-based injury data short of national occupational injury surveillance systems. When data collection systems are in place, ED data present a wide spectrum of injuries evidenced in a population and afford useful comparisons of work- and non-work-related injuries (9). ED injury studies in the US have been used recently to monitor work-related injuries in rural populations (9), older workers (10), construction workers (11), and adolescents (12). In a comprehensive analysis of US work-related ED injuries, McCaig and colleagues (13) used national probability data from the 1995–1996 National Hospital Ambulatory Medical Care Survey. They estimated an annual average of 26.9 million ED visits related to injury and 4.4 million work-related injury ED visits among persons aged 16 years and older. Per 100 workers, the annual average was 11.2 for non-work-related injury and 3.5 for work-related injury.

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The primary objective of this investigation was to test a hospital-based injury surveillance system in order to generate needed data on the frequency and characteristics of occupational injuries in Shanghai. The study hospital was a moderate-sized ED in Shanghai, and injury visits were tracked and analyzed by comparing occurrence patterns of work- and non-work-related injuries by diagnosis, cause, and patient demographic characteristics.

METHODS

Sample, Setting, and Data Collection

Data were collected prospectively from November 1, 1998 through November 31, 1999 at the Putuo District Hospital, Shanghai. This hospital was targeted because ED physicians were concerned about the lack of injury data available and the hospital administration was amenable to implementing an injury data collection system for 1 year. Based on China's three-tiered system for classifying hospitals according to size, specialty, and resources, this hospital was classified as level II at the time of the study. It provided 500 inpatient beds, which is considered a medium size for inpatient hospitals in Shanghai; and it also provided outpatient and emergency treatment facilities, but it did not specialize in trauma cases. The catchment area for this hospital was the Putuo district, near the center of Shanghai City proper with an approximate population of 450,000 in 1999. A former industrial zone and worker district (with textiles as the leading industry), this district experienced a shift in the last decade toward the service sector with the construction of office buildings and high-rise apartments, and the arrival of thousands of workers migrating from rural areas outside of Shanghai. This level II hospital would most likely serve patients who were living or working in the Putuo District and experienced injuries that were minor to moderate in severity. This hospital would be less likely to see patients who were living or working outside Putuo or who experienced a life-threatening injury which would warrant care at a level I trauma hospital, located in Shanghai but outside the Putuo District.

The total ED visits to the hospital in 1999 was 45,180. All injury visits to the ED during the study period were entered into the study. Study personnel were trained to extract injury data from new case records, assign *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* diagnosis and injury cause codes, and transfer this information onto study data forms. These forms were subsequently double entered into an electronic data file. Visits were the unit of analysis and patients presenting more than once were included and counted separately. However, a review of all patients by hospital ID number, date of visit, date of diagnosis, diagnosis code, and injury cause code yielded only 4 cases presenting on two or more days with the same injury date, diagnosis, and injury cause. The total number of injury-related ED visits was 5200 for ages 0 to 94 years and 3175 for ages 18 to 60 years. The number of ED visits for injuries occurring at work among patients aged 18 to 60 years was 1206.

Measures

Data collected from each injury case included: *demographic*, *injury circumstance*, and *nature of injury* data.

Demographic data included date of birth, address, place of origin, years at current address, and current salary. *Injury circumstance* data included date of injury, time of day, description of circumstance, and where the injury happened: at work, going to work, going from work, or other (with description). *Nature of injury* included location on the body and type of injury (laceration, fracture, blunt trauma, crash, electrocution, thermal burn, or chemical burn). ICD-9-CM diagnosis codes for anatomic injury were assigned to each injury. One injury circumstance and one injury diagnosis were coded for all visits. A total of 913 visits included a secondary diagnosis code, however, only the primary diagnosis code was used in the analyses for this study. No visits had injury circumstance or injury diagnosis codes missing. Injury circumstance codes were validated prior to data analysis for this study by returning to the hospital records and verifying that the injury circumstance description documented in the hospital records of all of the 5200 cases corresponded with the injury circumstance codes entered in the data set. No discrepancies were identified during the validation.

Data Analysis

Analyses were restricted to working-age adults 18 to 60 years old who reported earning any salary. Two definitions of work-relatedness were compared. In the first definition, work-related injuries were defined as injuries occurring at work and were compared with all others (going to work, coming from work, and other). The second definition defines work-related injuries as injuries occurring at work, going to work, or coming from work compared with the "other" category. The mechanism of external cause (e.g., struck by/against, falls) was taken from ICD-9-CM "Supplementary Classification of External Causes of Injury and Poisoning" and diagnosis categories were taken from the ICD-9-CM diagnosis codes.

It was hypothesized that males, non-Shanghai natives, and workers earning lower salary would have increased risk of work-related injury because they are more likely to work in physically hazardous jobs. To explore relationships between salary and work-related injury, the reported monthly salary distribution was separated into tertiles expressed in Chinese yuan (low = 10–560; medium = 561–920; high = 921–6000).

The prevalence ratio (PR) was used to evaluate the association between gender, place of origin, and salary with work-relatedness and with assault-related injury. Recent reports in the epidemiology literature have demonstrated that the PR is preferable to the prevalence odds ratio (POR) for the analysis of cross-sectional data because it is conservative, consistent, and interpretable whereas the POR can overestimate an association, especially if the condition of interest (in this case work-related injury and assault-related injury) is common (14,15). The prevalence ratio of work-related injury associated with different patient demographic characteristics was calculated as the ratio of the prevalence of work-relatedness in different categories, compared with the corresponding prevalence in the reference category. Female gender, Shanghai native, and the high salary tertile were considered reference categories respectively. For each of the three demographic factors, PRs together with 95% confidence intervals (CI) were calculated using logistic regression analysis. Crude estimates were calculated for each separate factor and adjusted estimates included all three factors in the logistic model simultaneously. Calculation of the adjusted PRs and corresponding confidence intervals used formulae described by Thompson et al. (15). Statistical Analysis Software (SAS Corp., Cary, NC) version 8.0 was used to perform data analyses.

It was hypothesized that cutting/piercing, machinery, and overexertion injuries would more likely be attributed to work, and that open wounds and sprains and strains would also more likely occur in relation to work. Unadjusted prevalence ratios were calculated to compare the prevalence of a specific injury location with all other injury locations (referent); and to compare a specific type of injury with all other injury types (referent), stratified by work-relatedness.

The association between assault-related injury and demographic characteristics was explored post hoc, after determining a high prevalence of this type of injury in our sample. The prevalence ratio of assault-related injury associated with different patient demographic characteristics was calculated as the ratio of the prevalence of assault-related injury in different categories, compared with the corresponding prevalence in the reference category.

RESULTS

A total of 5200 (including 6 fatal) injuries were recorded; 3175 (61.1%) injuries occurred in individuals aged 18 to 60 years and of these, 38% occurred at work, 15.8% going to or coming from work, and 46.2% were non-work related. Based on the total ED visits in 1999 for ages 18 to 60 years (N = 27,559), the estimated incidence rate for all injury-related visits (n = 3175) was 11.5; the rate for non–work-related visits (n = 1969) was 7.1, and the rate for work-related visits (n = 1206) was 4.4 (per 100 population aged 18–60 years). Table 1 shows that in examining crude and adjusted prevalence ratios for work relatedness, the prevalence was higher for non-Shanghai natives (crude PR = 2.0; 95% CI, 1.8–2.2) and for males (crude PR = 1.8; 95% CI, 1.6–2.1). Workers earning salary in the medium tertile had a higher prevalence of work-related injury than workers in the higher salary tertile (crude PR = 1.3; CI, 1.1–1.4). The crude prevalence ratio for lower salary workers suggested there was decreased prevalence of work-related injury than higher salary workers, (crude PR = 0.9; CI, 0.8–1.0). The magnitude of the prevalence ratios were similar in the adjusted model that included place of origin, gender, and salary suggesting the independent variables were not strongly correlated and the main effects of each of the demographic factors were maintained in the multivariate model.

Table 2 shows that when the cause of injury was analyzed by where the injury happened, the leading three causes of

TABLE 1. Proportion, prevalence ratio (PR) and 95% confidence interval (CI) of work-related injury associated with patient demographic characteristics; working age adults (aged 18–60 years; N = 3175)

	Work-related[a] n = 1206 (38%)		Non-work-related n = 1969 (62%)		Work-related PR	
Demographic factor	n	(%)	n	(%)	Crude	Adjusted
Place of origin						
Shanghai native	697	(57.8)	1624	(82.5)	1.0	1.0
Non-Shanghai native	509	(42.2)	345	(17.5)	2.0 (1.8–2.2)	1.6 (1.3–1.9)
Gender						
Female	301	(25.0)	904	(45.9)	1.0	1.0
Male	905	(75.0)	1065	(54.1)	1.8 (1.6–2.1)	1.5 (1.3–1.7)
Salary (yuan; tertiles)						
High (921–6000)	492	(40.8)	835	(42.4)	1.0	1.0
Med (607–920)	335	(27.8)	387	(19.7)	1.3 (1.1–1.4)	1.3 (1.1–1.4)
Low (10–600)	379	(31.4)	747	(37.9)	0.9 (0.8–1.0)	0.9 (0.8–1.1)

[a]Work-related defined as injury occurring at work only compared to all other injuries not occurring at work, including while going to or coming from work.

TABLE 2. Cause of injury compared with where injury happened, working age adults (aged 18–60 years; N = 3175)

	At work		Going to work		Coming from work		Non-work related		Work-related[a] PR
	n 1206	(%)[b] (38.0)	n 277	(%)[b] (8.7)	n 224	(%)[b] (7.1)	n 1468	(%)[b] (46.2)	(95% CI)
Cause of injury (ICD-9 ECode)	n	(%)[c]	n	(%)[c]	n	(%)[c]	n	(%)[c]	
Cutting/Piercing instruments (920)	293	(24.3)	27	(9.8)	7	(3.1)	197	(13.4)	1.6 (1.5–1.8)
Assault (960–969)	228	(18.9)	33	(11.9)	17	(7.6)	360	(24.5)	0.9 (0.8–1.0)
Struck by object/persons (917, 918)	139	(11.5)	18	(6.5)	12	(5.4)	123	(8.4)	1.3 (1.1–1.5)
Falls on same level (885–888)	113	(9.4)	32	(11.6)	48	(21.4)	254	(17.3)	0.6 (0.5–0.7)
Machinery (919)	106	(8.8)	9	(3.3)	0	(0)	7	(0.5)	2.4 (2.2–2.6)
Overexertion/Strenuous movements (927)	88	(7.3)	21	(7.6)	27	(12.1)	140	(9.5)	0.8 (0.7–1.0)
Struck by falling object (916)	85	(7.1)	9	(3.3)	1	(0.5)	31	(2.1)	1.8 (1.6–2.1)
Other road vehicle (826, 829)[d]	79	(6.6)	125	(45.1)	111	(49.6)	279	(19.0)	0.3 (0.3–0.4)
Falls to other level (880–884)	34	(2.8)	1	(0.4)	0	(0)	29	(2.0)	1.4 (1.1–1.8)
Excessive heat (900)	27	(2.2)	0	(0)	0	(0)	26	(1.8)	1.3 (1.0–1.8)
Other[e]	14	(1.2)	2	(0.7)	1	(0.5)	22	(1.5)	0.9 (0.6–1.4)

[a]Work related defined as injury occurring at work only; compared with all other injuries not occurring at work including while going to or coming from work PR = prevalence ratio, CI = confidence interval.
[b]Percent of total.
[c]Column percent.
[d]Includes pedal cycles and pedestrians; does not include motor vehicles.
[e]Includes: railway accidents (800–807); motor vehicle traffic accidents (810–819); motor vehicle non–traffic accidents (820–825); vehicle accidents not elsewhere classifiable (846–848); poisoning by drugs (850–858); poisoning by solids/liquids (860–869); medical misadventures (870–876); fires (890–899); nature and environment (900–909; 928); foreign body (914, 915); explosion (921–924); electric current (925); radiation (926); injury late effects (929); therapeutic drugs (930–949); suicide (950–959); legal intervention (970–978); undetermined accident or purposeful (980–989); and war (990–999).

at-work-only injuries (n = 1206) were cutting/piercing instruments (24.3% of total at work), assault (18.9%), and struck by objects or persons or caught in objects (11.5%), respectively. The leading three causes of all non-work-related injuries (not occurring at work, going to work, or coming from work) (n = 1468) were assault (24.5% of total non-work-related), other road vehicles (not including motor vehicles) (19.0%), and falls on the same level (17.3%), respectively. Injuries that occurred going to or coming from work most frequently involved other road vehicles. In comparing prevalence ratios for causes of work-related injury, cutting/piercing, struck by object/persons, machinery, struck by falling object, falls to other level, and excessive heat were all more likely to have occurred at work.

Table 3 shows that when injury diagnosis group was analyzed by work relatedness the leading three work-related injury diagnoses were open wound of upper limb (29.0%); contusion with intact skin surface (26.5%); and open wound of head, neck, or trunk (11.7%). The leading three diagnoses of all non-work-related injuries were contusion with intact skin surface (32.8%); sprains/strains of joints and muscles (14.5%); and open wound of upper limb (13.0%). Open wound of upper limb and burns were more likely to have occurred at work than outside of work.

Table 4 shows that in examining crude and adjusted prevalence ratios for all assault injuries (n = 638) versus all other injury causes, the prevalence ratios were not significantly increased for non-Shanghai natives compared with Shanghai natives (crude PR = 0.9; CI, 0.8–1.1), whereas the prevalence was higher for males than females of experiencing an assault injury (crude PR = 1.6; CI, 1.3–1.8). As compared to individuals earning salary in the high range tertile, individuals earning in the medium salary range had a lower prevalence of assault injury (crude PR = 0.6; CI, 0.5–0.7), as was true for individuals in the low salary range (crude PR = 0.7; CI, 0.6–0.8). The magnitude of the prevalence ratios was the same in the adjusted model that included place of origin, gender, and salary suggesting the independent variables were not strongly correlated and the main effects of each of the demographic factors were maintained in the multivariate model.

DISCUSSION

This study is an important first step in developing hospital-based injury surveillance in China. The study demonstrated that tracking ED injury-related visits in a busy hospital in urban China was feasible, given adequate hospital co-operation and proper training of personnel to review and code ED visits. Use of a standardized injury coding system (i.e., ICD-9-CM) was critical to the systematic tracking and analyses of specific injury diagnoses and causes. Several important injury occurrence patterns were discernable in the data collected from this one hospital. The estimated rates for all injury-related visits were 11.5; for non-work-related visits the rate was 7.1; and for work-related visits the rate was 4.4 (per 100 workers). A descriptive comparison with the 1996 US rates of 11.2 for all non-work-related injury ED visits and 3.5 for all work-related injury visits

TABLE 3. Diagnosis group of work vs. non-work-related injuries, working age adults (age 18–60; N=3175)

	Work-related		Non-work-related		
	n 1206	(%)[a] (38.0%)	n 1969	(%)[a] (62.0%)	
Location of injury (ICD-9 code)	n	(%)[b]	n	(%)[b]	PR (95% CI)
Open wound of upper limb (880–887)	348	(29.0)	255	(13.0)	1.7 (1.6–1.9)
Contusion with intact skin surface (920–924)	320	(26.5)	645	(32.8)	0.8 (0.8–0.9)
Open wound of head/neck/trunk (870–879)	141	(11.7)	248	(12.6)	0.9 (0.8–1.1)
Sprains/Strains of joints and muscles (840–848)	123	(10.2)[c]	286	(14.5)[d]	0.7 (0.7–0.9)
Open wound of lower limb (890–897)	91	(7.6)	116	(5.9)	1.2 (1.0–1.4)
Fracture of upper limb (810–819)	55	(4.6)	128	(6.5)	0.8 (0.6–1.0)
Fracture of lower limb (820–829)	56	(4.6)	143	(7.3)	0.7 (0.6–0.9)
Burns (940–949)	29	(2.4)	25	(1.3)	1.4 (1.1–1.8)
Injury to blood vessels (900–904)	19	(1.6)	53	(2.7)	0.7 (0.5–1.0)
Fracture of neck/trunk (805–809)	5	(0.4)	11	(0.6)	0.8 (0.4–1.7)
Other[e]	19	(1.6)	59	(3.0)	0.6 (0.4–0.9)

Work-related defined as injury occurring at work only.
PR = prevalence ratio.
[a]Percent of total.
[b]Column percent.
[c]28 (20.3% of sprains; 2.1% of work-related total) are back sprains.
[d]83 (19.2% of sprains; 2.5% of non-work-related total) are back sprains.
[e]Includes:fracture of skull (800–804); crushing injury (825–829); dislocation (830–839); intracranial injury, excluding skull fracture (850–854); internal injury: thorax/abdomen/pelvis (860–869); superficial injury (910–919).

(per 100 workers) suggests that the rates of injuries seen at this urban Chinese ED are in comparable range with US rates collected from EDs nationally (13).

Comparing the patterns of injury diagnosis and work relatedness found here with US ED data shows that open wounds and contusions were the two most frequent injury types in both the US and Shanghai data. Head wound was the third most common diagnosis in the Shanghai data but ranked fifth behind other sprains and back sprains, respectively, in the US data. Head wounds were also a frequent diagnosis group for non-work-related injuries in this sample. Bicycle and other road vehicle accidents and being struck by objects were each involved in 27% of the open wound of head/neck/trunk injuries (data not shown). The frequency of head trauma resulting from bicycle collisions has been documented in prior reports from China. Wang and colleagues (16) conducted a probability survey of head trauma in six cities in China and found an age-adjusted incidence rate of 56 per 100,000. The main cause of brain injury due to head trauma in their study was bicycle accidents. Further, Li and Baker (17) reported that the death rate for bicycling injuries in the city of Wuhan in the Hubei Province of China was 2.2 per 100,000 population, more than seven times the rate for the US. Our data showed that other road vehicle accidents involving bicycles and/or pedestrians accounted for 19% (n = 594) of all adult injuries. This included 45% (n = 125) of injuries occurring while traveling to work; 50% (n = 111) of injuries

TABLE 4. Proportion, prevalence ratio (PR) and 95% confidence interval (CI) of injury due to assault vs. all other causes by patient demographic characteristics; working age adults (aged 18–60 years; n = 3175)

	Assault[a] n = 638 (20%)		All other causes n = 2537 (80%)		Assault PR	
Demographic factor	n	(%)	n	(%)	Crude	Adjusted
Place of origin						
Shanghai native	473	(74.1)	1848	(72.8)	1.0	1.0
Non-Shanghai native	165	(25.9)	689	(27.2)	0.9 (0.8–1.1)	0.9 (0.7–1.1)
Gender						
Female	180	(28.2)	1025	(40.4)	1.0	1.0
Male	458	(71.8)	1512	(59.6)	1.6 (1.3–1.8)	1.7 (1.4–2.0)
Salary (yuan; tertiles)						
High (921–6000)	330	(51.7)	997	(39.3)	1.0	1.0
Med (607–920)	107	(16.8)	615	(24.2)	0.6 (0.5–0.7)	0.6 (0.4–0.7)
Low (10–600)	201	(31.5)	925	(36.5)	0.7 (0.6–0.8)	0.7 (0.6–0.9)

[a]ICD-9 ECodes = 960–969.

occurring while traveling from work; and 19% (n = 279) of all non-work related injuries. These data argue for promoting bicycle helmet use to reduce the high frequency of head wounds in urban China.

Major differences were not seen in the demographic profiles of injury patients when the definitions of work-relatedness were varied to include or exclude going to and coming from work (data not shown). However, separating where the injury occurred into the four categories of going to work, coming from work, at work, or other (i.e., non-work-related) revealed useful information on the types of injuries occurring to workers in transit. The current US National Center for Health Statistics (NCHS) definition of work-related injuries used in the National Hospital Ambulatory Care Survey includes only those injuries occurring at work or while traveling for the purposes of work. Injuries occurring while commuting to and from work are not included. The current data show that a sizable percentage of injuries occurred to workers in transit (~16%) and most often from encounters with other road vehicles, pinpointing a time when workers are at higher risk for injury but are not actually on the job.

Recent migration patterns have resulted in changes in the demographic profiles of workers in urban China. This investigation showed that in this ED population, workers who originated outside of Shanghai had a higher prevalence of work related injury, suggesting that unskilled workers from rural communities and villages may be taking on more hazardous jobs in Shanghai and experiencing more injuries than Shanghai native workers as a result. Occupational injuries frequently occur among inexperienced workers who are new on the job. More attention to preparing rural migrants for urban labor jobs is needed to reduce this disproportionate injury risk. Less clear however is how salary was associated with occupational injury risk in this sample. Medium salary workers were at higher risk for occupational injury than low salary workers in this study. One interpretation is that jobs earning the lowest salaries are menial but less likely to involve traumatic injuries such as street vendors, whereas medium income jobs such as in construction may expose workers to more traumatic injury risks. Job titles were not well coded in this patient sample because study personnel were not given a uniform job classification system to work from, and so more information on the relationship between salary and jobs that may have inherent trauma risks in Shanghai is needed to further explain this finding.

Perhaps the most surprising finding of this investigation was the prominence that assault had in both work and non-work related injuries. Assault was the most frequently reported cause of non-work-related injuries and the second most frequently reported cause of work-related injuries in this study. Analysis of all assaults stratified by demographic characteristics showed that assault injuries were more likely among men than women and more likely in the high salary range compared with the medium and low ranges. The male assault association has been well documented in other countries (18). That assault was associated with higher salary has not been frequently reported previously but this finding is difficult to interpret without better information on job categories or injury contexts. These may be some of the only data available on the occurrence of non-fatal intentional injuries in the People's Republic of China, but interpretation of these findings is also limited by the lack of population adjustment. Some data specific to violent deaths in China have been made available by the World Health Organization recently albeit not for non-fatal violent injuries (18). The 1999 data showed that self-inflicted fatal injury occurs with similar frequency in the US and China (17.4 vs. 15.5 per 100,000), but the US homicide rate is over three times the rate in China (6.9 vs. 1.8 per 100,000). This difference in homicide rates suggests either interpersonal violence is less frequent in China than in the US or it occurs with similar frequency but it more likely results in fatality in the US because more lethal means such as hand guns are used.

Without more thorough data for comparison, it remains unclear why nonfatal assaults were frequent in this emergency room sample of treated injuries. This finding warrants expanded injury surveillance efforts to collect data that is population-adjusted and that better characterizes injury circumstance including the context and the factors leading up to the interpersonal conflict.

Some limitations are of note in interpreting the findings of this investigation. ED data represent treated rather than population-based incidence. Any injuries occurring when treatment is not sought are not captured in ED data. Only six fatalities were reported in this study (five were non-work related). The most severe injuries were likely seen at the level I hospital located in an area adjacent to the Putuo District. Also, workers in large companies who experienced minor work-related injuries may have been treated in company medical service departments, which would also lead to an underestimation of the occurrence of minor injuries in this catchment area. The generalizability of these findings to other hospital settings in China would be limited to trauma care level II urban hospitals. Due to the inherent limitations in interpreting treated incidence data, these data are unlikely to provide a complete picture of the frequency of work- and non-work-related fatal injuries occurring in the population during the period of observation.

In lieu of little other non-fatal occupational injury data for Shanghai or for China, these data are important because they suggest injury patterns in the working population of urban Shanghai that should be explored further. Systematic surveillance of ED injuries throughout Shanghai, adjusted for population demographics is the next important step in achieving a more complete picture of the occupational and non-occupational injury patterns in this rapidly developing urban center in one of the world's largest countries.

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