Non-fatal injuries treated outside a hospital in Hunan, China: results from a household interview survey

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Background: Injury morbidity data are collected through hospital-based surveillance in many countries. We assessed the extent of non-fatal injures treated outside a hospital. **Methods**: Data from the first provincial health household interview survey of Hunan, China, conducted in 2013, were used. Injury events were identified and included as medically significant when any of the following circumstances occurred in the prior 14 days: (i) receiving medical treatment from a doctor at a hospital following an injury; (ii) receiving medical treatment by self or others outside a hospital following an injury (e.g. taking medications, or receiving massage or hot compress); and/or (iii) being off work or school, or in bed for more than 1 day, following an injury. The 2-week prevalence of non-fatal injuries and 95% confidence intervals were calculated. We calculated the proportion of injury events treated outside a hospital and the reasons for not visiting a hospital for injury events occurring during the previous 2 weeks. **Results**: We captured 56 injury events during the previous 2 weeks. The weighted injury prevalence was 4.9 per 1000 persons during the last 2 weeks (95% confidence interval: 2.9–6.9 per 1000 persons). Of the 56 events, 14 (weighted proportion 41.2%) were treated outside a hospital. Primary explanations for skipping hospital visits included perceiving injuries were too minor and economic limitations to travel to hospitals or seek treatment. **Conclusion**: Results imply the burden of non-fatal injury may be underestimated by hospital-based surveillance systems such as that used in China.

Introduction

In 2013, about 973 million people sustained injuries that warranted some type of healthcare globally. Non-fatal injuries cause 36.8 million years lived with disability (YLD), accounting for 14.8% of injury-induced disability adjusted life years (DALYs).[1] Accurate statistics concerning non-fatal conditions are critical to valid calculation of the burden of injury. Currently, there are two commonly-used methods to collect non-fatal injury data: hospital-based surveillance systems or population-based surveys.[2] Hospital-based surveillance systems, such as the National Injury Surveillance System (NISS) of China,[3] have the advantage of written records collected typically in a systematic manner, but they fail to collect data concerning injured individuals who do not visit the hospital because of physical, financial or other barriers that lead to comparatively minor but still burdensome injuries relevant to public health. Such injuries may be treated at home or left untreated.[4,5] Population-based surveys offer different advantages. They permit detailed collection of injury morbidity data from the people who are injured but suffer from limitations including 'lay diagnoses' (incorrect reporting by lay persons in the population rather than medical professionals), low response rate to surveys, and recall bias in reporting information that occurred months or years ago.[6–10]

Given the expense involved in population-based surveys, especially in populous countries like China, this study was designed to evaluate the extent to which medically-relevant injuries are incurred by individuals in China but are not accompanied by hospital visits. If such cases are uncommon, hospital-based surveillance can serve as an excellent means to understand the burden of injuries in the Chinese population. If they are common, population-based surveys may be required to obtain accurate data about injury morbidity in the population. Therefore, we addressed two research questions: (i) what is the extent of injury events incurred by residents who did not visit a hospital following the injuries? and (ii) what are the main reasons for individuals experiencing injury events but not visiting hospitals following them?

The first provincial health household interview survey of Hunan, China, conducted in 2013, included items assessing illness and injury prevalence over the previous 2 weeks, including information about whether the persons having injuries over that time period visited hospitals or not, and the reasons for not visiting hospitals if applicable. These data were used to address our research questions.

Methods

Data source

Data from the first provincial health household interview survey of Hunan, China were used. The survey was organized by the

Provincial Health and Family Planning Commission of Hunan and all interviews were completed by trained local interviewers from July through October, 2013.[11] In the survey, a multi-stage stratified random cluster sampling method selected 8400 households for face-to-face interviews.[11] All family members in the 8400 representative households participated. Adults in the household who were home at the time of the survey participated themselves. For children (under age 15) and household adults not home at the time of the survey, parents or other adult family members answered on their behalf.

Outcome measure and demographic variables

Injury events were defined as the occurrence of any of the following circumstances in the prior 14 days: (i) receiving medical treatment at a hospital (defined to include any medical facility with physicians or other health care professionals present) following an injury; (ii) receiving medical treatment outside a hospital following an injury (e.g., treatment by self or others at home, such as taking medications, or receiving massage or hot compress); and/or (iii) being off work or school, or in bed for more than 1 day, following an injury.[11]

Based on variables identified in the survey that related literature suggests are relevant to our hypotheses,[12,13] we included the following variables in the statistical analysis: urban vs. rural setting, sex, age group, household income per capita. We divided household income equally into four categories based on the household income per capita in the last year for urban and rural areas: lowest (urban, <9000 CNY; rural, <4000 CNY); low (urban, 9000–14 999 CNY; rural, 4000–6666 CNY); high (urban, 15 000–24 959 CNY; rural, 6667–9999 CNY); and highest (urban ≥24 960 CNY; rural ≥10 000 CNY).

Statistical analysis

Data analyses were conducted with de-identified data. Injury prevalence rates over the past 2 weeks were calculated as 'number of injuries divided by total number of respondents × 1000%'. Injury events that occurred earlier than 2 weeks were regarded as 'injuries at other times'.

Sampling weights (the multiplicative inverse of respondents' probability of being selected, $W = \frac{1}{\pi}$) were applied to correct unequal probabilities of being selected and non-response so as to obtain unbiased estimates.[14] The probability (π) that a study subject was randomly selected was calculated as the product of the probabilities of being chosen at all four stages ($\pi = \pi_1 \times \pi_2 \times \pi_3 \times \pi_4$), where π_1 is the probability that the primary sample unit (district/county) being sampled in stage one, π_2 is the probability that the second sample unit (subdistrict/town) was selected at stage two, π_3 is the probability that the third sample unit (community/village) was chosen at stage three, and π_4 is the probability that the fourth sample unit (household) was sampled at last stage. Using the probabilities of being sampled, we calculated the sample weight as $W = \frac{1}{\pi_1 \times \pi_2 \times \pi_3 \times \pi_4}$ in this study. When the complex sample design (sampling weight) is considered, the confidence interval can be significantly wider than may be expected. When the complex sample design is ignored, standard errors are often greatly underestimated, increasing the probability of type I error for the statistical test.[15]

Poisson regression with robust estimates is suggested as an alternative to control for overestimation of errors in binomial data for cross-sectional studies when the algorithms do not converge.[16] We conducted Poisson regression to detect differences in prevalence rates by urban vs. rural setting, sex, age group and Household income per capita. Sampling weights were considered in all statistical analyses; details about sample weighting appear elsewhere.[17] Statistical analyses were conducted using Statistical Analysis System (SAS) 9.2 software. '$P < 0.05$' was considered to be statistically significant.

All procedures were reviewed and approved by the medical ethics committee of Central South University, Changsha, China.

Results

A total of 24 282 individuals were interviewed (Table 1). The weighted injury prevalence was 4.9 per 1000 persons during the previous 2 weeks, with a 95% confidence interval (CI) of 2.9–6.9 per 1000 persons. Rural inhabitants had a prevalence rate over two times that of urban inhabitants (adjusted prevalence ratio: 2.5; 95% CI, 1.1–6.4). Compared to children aged 0–14 years old, persons aged 45–64 years and aged 65+ had higher prevalence rates, with adjusted prevalence rate ratios of 3.9 (95% CI: 1.9–8.0) and 7.0 (95% CI: 2.3–21.7), respectively. Inhabitants from households with the lowest and low per capita household income were at higher risk of suffering injuries compared to those from households with the highest per capita household income (adjusted prevalence rate ratio: 4.7, 95% CI: 1.1–21.9 and 1.9, 95% CI: 1.0–3.6, respectively).

We identified 108 injury cases, including 56 in the previous 2 weeks and 52 at other times (Table 2). Of the 56 injury events occurring during the previous 2 weeks, 14 were not treated at a hospital (weighted proportion 41.2%, 95% CI: 0–84.7%). For injury events occurring at other times, 38.8% (95% CI: 5.6–72.1%) were not treated at hospitals.

Participants reported that 'perceiving the injury to be too minor to be treated', 'economic limitations to travel to the hospital and receive treatment', and 'having no time to seek medical care' were the three most common reasons to explain why they did not visit a hospital following an injury event that occurred in the past 2 weeks, accounting for 56.9, 36.4 and 6.3% of all reasons, respectively (Table 3).

Table 1 Weighted 2-week prevalence of non-fatal injuries in Hunan Province, China, 2013

Demographic variable	N	Prevalence/1000 persons (95% CI)	Adjusted PRR[a,b] (95% CI)
Total	24 282	4.9 (2.9, 6.9)	
Setting			
Urban	11 966	2.4 (0.8, 4.1)	Reference
Rural	12 316	5.6 (0.3, 8.0)	2.5 (1.1, 6.4)*
Sex			
Male	12 814	5.9 (4.3, 7.5)	1.5 (0.8, 2.9)
Female	12 098	4.0 (0.9, 6.9)	Reference
Age group (years)			
0–14	4413	1.5 (0.4, 2.5)	Reference
15–44	7406	3.7(0.0, 7.9)	3.2 (0.6, 18.5)
45–64	8644	5.3 (3.5, 7.1)	3.9 (1.9, 8.0)*
≥65	3819	10.9 (3.6, 18.2)	7.0 (2.3, 21.7)*
Household income per capita[c]			
Lowest	7266	11.0 (1.1, 21.0)	4.7 (1.1, 21.9)*
Low	6443	4.3 (2.2, 6.4)	1.9 (1.0, 3.6)*
High	4604	2.9 (0.1, 5.7)	1.4 (0.3, 6.6)
Highest	5896	2.3 (0.9, 3.7)	Reference

CI confidence interval.
a: Prevalence rate ratio.
b: Controlling for setting, sex, age group, and Household income per capita.
c: Household income per capita was equally classified into four categories based on quartiles: lowest (urban, <9000 CNY; rural, <4000 CNY); low (urban, 9000–14 999 CNY; rural, 4000–6666 CNY); high (urban, 15 000–24 959 CNY; rural, 6667–9999 CNY); and highest (urban, ≥24 960 CNY; rural, ≥10 000 CNY). Due to missing value, the sum of numbers of four categories was less than 24 282.
*: $P < 0.05$.

Table 2 Weighted proportions of injuries treated outside a hospital during the previous 2 weeks

Time of injury	Number of injuries	Injuries treated outside a hospital	
		Number	**Proportion (95% CI)**
During the previous 2 weeks	56	14	41.2% (0.0%, 84.7%)
At other times	52	16	38.8% (5.6%, 72.1%)

CI, confidence interval.

Table 3 Reasons given for not obtaining treatment at a hospital following an injury during the previous 2 weeks

Reasons	Number	Weighted proportion (%) (95% CI)
Injury perceived as too minor to need treatment	7	56.9% (39.2%, 74.5%)
Economic limitations to travel to a hospital and receive treatment	4	36.4% (21.8%, 50.9%)
Having no time to travel to a hospital and receive treatment	2	6.3% (0.0%, 21.8%)
Long waiting time to see a doctor	1	0.4% (0.0%, 1.4%)

CI, confidence interval.

Discussion

About 40% of injuries reported by participants in the first Provincial Household Interview Survey in Hunan Province, China, were not treated in a hospital or medical facility. Participants explained they did not go to a hospital for various reasons, including perceptions that the injuries were too minor to need treatment or not having time to go to a hospital, as well as unaffordable access to hospital care due to economic limitations or distance limitations due to transportation barriers. Based on the survey results, the 2-week injury prevalence of the full population was 4.9 per 1000 persons.

The findings concord with previous reports[4,5] and indicate that many non-fatal injury events are not captured by the hospital-based surveillance system in China due to economic and physical restrictions to access of care at hospitals,[4,5] and disparities in how serious an injury is for hospital-based treatment to be considered worthwhile by citizens.[2,6] These results also suggest the burden of non-fatal injury is substantially underestimated by the hospital-based National Injury Surveillance System in China[18] and reinforce the need for China and other nations to use population-based survey data in conjunction with hospital surveillance systems to correctly estimate the burden of injury morbidity. In China, a good option to collect ancillary data would be through the National Household Health Interview Survey, which is conducted every five years.[19] Appropriate questions about injury incidents could be designed and included in the survey to obtain adjustment coefficients between population-based survey data and hospital-based surveillance data.

Due to lack of incidence and prevalence data over longer recall periods for the same population, we cannot quantify differences in non-fatal injury incidence between 2-week and longer recall periods. Considering the potential for recall bias over longer time periods,[7–9] it would be valuable to conduct studies that obtain transformation coefficients of injury morbidity incidences between short and long (e.g. 12 months) recall periods, thus offering accurate input to the calculation of DALY.

In addition, we also detected significant gaps between urban areas and rural areas, and across age group and income groups. Rural, lower income, and older individuals had higher injury rates. These results are consistent with previous studies[12,13,20] and reflect the substantial disparities present in Chinese culture, where rural inhabitants, older persons and low-income households are at elevated risk of injuries. The precise reason for elevated risk among rural, older, and lower-income individuals is not known definitively, but the literature points to multiple contributing factors. Risk among both rural and low-income individuals is likely elevated for a variety of factors, including societal prejudice or bias, reduced financial and tangible resources, and diminished social capital. There may also be reduced access to quality health care services and both physical and financial barriers to obtain medical care.[21–23] The mechanisms behind risk for older individuals overlap somewhat but may also include risks that emerge with physical, perceptual, and other biological changes that occur as humans grow older, many of which increase injury risk.[24] Policy-makers and other stakeholders might prioritize these vulnerable populations for prevention initiatives.

This study was limited by the lack of detailed information over different recall periods for injury incidence and prevalence, cause of injury, type of injury and severity of injury. Without such information, we cannot set up comparability coefficients of different operational injury definitions with varying recall periods. Such information would provide a basis to compile data based on various injury definitions and estimate global, national, or local injury burden. In addition, the sample size was inadequate to obtain stable proportions of injury events not visiting a hospital and to do subgroup analysis. Analysis based on larger samples will provide stable and valuable proportions that can be used to reliably estimate injury incidence or prevalence.

Key points

- The weighted injury prevalence was 4.9 per 1,000 persons during the last 2 weeks in Hunan, China.
- Of the 56 injury events occurring in the previous 2 weeks, 14 (weighted proportion 41.2%) were treated outside a hospital.
- Major reasons for skipping hospital visits included perceiving injuries were too minor and economic limitations to travel to hospitals or seek treatment.

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Searching for sustainability within public health policy: insights from an injury prevention perspective

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Background Sustaining public health programmes in the long-term is key to ensuring full manifestation of their intended benefits. Although an increasing interest in sustainability is apparent within the global literature, empirical studies from within the European setting are few. The factors that influence sustainability are generally conceptualized at three levels: programme level, the immediate context and the wider environment. To-date attention has focused primarily on the former two. Using a community-based child injury prevention programme in England as an exemplar, this paper explores the concept of sustainability within the wider policy environment, and considers the impact of this on local programmes. **Methods** A content review of global and UK national public health policies (1981–2014) relevant to child safety was undertaken. Interviews were held with senior representatives of global and UK agencies involved in developing child safety policy. **Results** Forty-nine policies were reviewed. The term 'sustain', or its derivatives, featured in 36 (73%) of these. Its' use however, related primarily to conservation of resources rather than continued programme operation. Potential mechanisms for supporting programme sustainability featured within some documents; however, the approach to sustainability was inconsistent between policies and over time. Policy stakeholders identified programme sustainability as relevant to their core business, but its' conceptualization varied according to individual interpretation. **Conclusions** Programme sustainability is poorly addressed within global and UK-based public health policy. Strengthening a national and international policy focus on sustainability and incorporating sustainability into public health planning frameworks may create a more supportive environment for local programmes.

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