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# Catastrophic household costs due to injury in Vietnam

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ABSTRACT

*Objective:* Little is known about the costs of injury and their impact on injured persons and their families in Vietnam. This study aimed to examine the cost of injury in hospitalised patients and to identify the most costly injuries and those more likely to result in catastrophic household expenditure.
*Method:* A prospective cohort study was conducted, recruiting individuals admitted to Thai Binh General Hospital due to injury in Vietnam from January to August 2010. During the hospitalisation period, data on expenditure including direct medical, direct non-medical and indirect costs were collected. Demographic and injury characteristics were also obtained. The associations between the risk of catastrophic expenditure and injury cause, severity and principal injured region were examined by modified Poisson regression approach. Payment of more than 40% of the household non-subsistence spending was considered a catastrophic expenditure.
*Results:* Of 918 patients approached, 892 (97%) were recruited. Total costs for all participants during the hospitalisation period were US$ 325,812. Patients admitted for road injury accounted for the largest number of injuries ($n$ = 477, 53%), and the largest percentage of the total costs (US$ 175,044, 57%). This was followed by individuals hospitalised due to falls, representing 29% of the sample ($n$ = 261) and 31% of the total costs (US$ 103,128). In terms of cost per hospital stay, burn injuries were the most costly (US$ 427), followed by falls (US$ 395) and road crashes (US$ 367). Of all sample, 26% experienced catastrophic expenditure due to their injuries. Factors significantly associated with increased risk of catastrophic expenditure were having more severe or higher MAIS injuries (RR = 2.02, 95% CI: 1.14–3.57), principal injured region to lower extremities (RR = 3.34, 95% CI: 1.41–7.91) or head (RR = 3.21, 95% CI: 1.37–7.52), longer hospital stay (RR = 1.09, 95% CI: 1.07–1.10), older age, lower income and not having insurance (RR = 1.63, 95% CI: 1.21–2.21).
*Conclusion:* A high proportion of households experienced catastrophic expenditure following injury, highlighting the important need for programmes to prevent injuries, road traffic and fall-related injuries in particular. Furthermore, expansion of health insurance coverage may help individuals cope with the financial consequences of injury.



## Introduction

Injury is a serious public health issue in Vietnam, the thirteenth most populous country in the world with a population of 85.8 million.[1] Every day in Vietnam, injuries claim almost 100 lives, or about 35,000 lives per year.[2,3] It has been estimated that the number of potential life years lost due to injuries in Vietnam is more than double those due to non-communicable diseases, and more than six times higher than those due to communicable diseases.[4] In addition to fatalities, injuries are also the cause of hundreds of thousands of hospital admissions.[4] Because the largest proportion of injuries occur among people under 60 years of age[5] who comprise the majority of the labour force, injuries may have a serious economic impact at the country level. The impact not only results from the loss of productivity, but also from significant expenses for medical treatment, rehabilitation and recovery.[6]

Injuries can potentially lead to catastrophic financial losses to injured persons and their families, leading to a substantial risk of impoverishment. The idea of financial catastrophe comes from an ethical position that no one ought to spend more than a given of fraction of their income on health care.[7] In Vietnam, health care costs are paid directly from the income of patients and their families. According to Ministry of Health estimates, health expenditure in Vietnam consists of private out-of-pocket payments (67%), public sources including from central government

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budgets (6%), provincial government budgets (10%), official development assistance funds (2%), and social insurance and primary health insurance (9%).[8] During 2001–2006, despite fluctuations, the average household expenditure on health contributed more than 60% of the total health expenditure in the country.[8] In a study comparing 59 countries, Xu et al. found that Vietnam had the highest proportion of households facing catastrophic payments for health. Specifically, more than 10.5% of households had health expenditures exceeding 40% of the household capacity to pay.[9] In a study on costs of traumatic brain injury, Hoang et al. found that 84% of the sample, which included 35 households, faced catastrophic expenditure.[10]

By converting the impact of injuries into monetary terms, cost of injury studies can provide a common language for policy and decision makers.[11] Cost of injury studies have been widely conducted, particularly in high or middle income country settings. For instance, Meerding et al. reported total health care costs due to injuries in the Netherlands in 1999 were € 1.2 billion or 3.7% of the total health care budget.[12] In Australia, a snap shot of injuries presented by the Australian Bureau of Statistics show that, resources spent on injured people during 2000–2001 were 8% of total allocated health expenditure, almost AU$ 4 billion.[13] In China, Zhou et al. estimated the economic cost of injury in 1999 at US$ 12.5 billion, almost four times the total public health services budget of China.[6] More recently in South Korea, estimated medical treatment costs for injuries in 2006 accounted for 9.5% of the national health expenditure, and the annual economic burden associated with injury was more than US$ 39.8 billion.[14] A recent World Health Organisation Global Status Report on Road Safety also highlighted a need for comprehensive cost estimates of injuries in addition to cost-effectiveness of various interventions to inform preventive action and mobilise support.[15]

In Vietnam, very little is known about the costs of injury and their impact on injured persons and their families. Existing knowledge on costs of injury in Vietnam comes from work conducted by Thanh et al. in 2000 and Hoang et al. in 2008. However, the first study was limited in identification of injury cause, which was self-reported by respondents,[16] and he later study had a small sample size,[10] limiting the conclusions that can be drawn from these works. The present study is an effort to fill in knowledge gaps by estimating the costs of injuries to the injured persons and their families during the hospitalisation period. These will be examined in greater detail in terms of injury characteristics, patient demographics, insurance status, external causes of injury, severity, and body region injured. This study also aims to identify the most costly injuries and those most likely to result in a catastrophic expenditure for the household.

## Methods

A prospective cohort study was used to examine the economic burden of injuries. The study was conducted in Thai Binh General Hospital, the largest trauma hospital in Thai Binh province, with 440 beds. The Thai Binh province is in the Red River delta, approximately 100 km south of Hanoi, the capital city of Vietnam. In 2009, the population of this province was 1,900,000.[17] According to the National Household Living Standards survey in 2010, the average monthly per capita income in Thai Binh province was VND 1,129,300, equivalent to US$ 57.90.[18] There are nine hospitals at the provincial level and twelve at the district level in the province. As the largest trauma hospital at the provincial level, the Thai Binh General Hospital receives the majority of trauma patients in the province either directly or indirectly – those transferring from lower level hospitals or from same level hospitals in the province.

Study participants were those individuals who were admitted to Thai Binh General Hospital due to an injury. An injury is defined as physical damage that results when a human body is suddenly or briefly subjected to intolerable levels of energy. An injury may result from acute exposure to energy in amounts that exceed the threshold of physiological tolerance, or an impairment of function resulting from a lack of one or more vital elements (i.e. air, water, warmth), such as in drowning, strangulation or freezing.[19] Additional inclusion criteria also included inpatient hospital treatment for at least one day, age of 18 years or older, current residential address within Thai Binh province area and consent to participate in the study. Fatal cases were not included. In Vietnam, there is a traditional belief that a person should die at home[20] and therefore those patients not expected to survive are often taken home by their families.

Participants were recruited from 01 January 2010 to 31 August 2010 by trained research assistants and doctors in the hospital. After critical treatment and hospital admission, 918 injured persons meeting inclusion criteria were approached; 892 (97%) consented to participate into the study. The International Classification of Diseases 10th revision (ICD-10) was used to code injuries into categories of external causes prior to reporting the results. Diagnoses also included the principal injured body region, which is the most severely injured region, and injury severity measured by the abbreviated injury score (AIS), which is an anatomical scoring system representing the 'threat to life' associated with an injury. The numerical ranking of the AIS ranges from 1 to 6: 1 (minor injury), 2 (moderate), 3 (serious), 4 (severe, life threatening), 5 (critical, survival uncertain) to 6 (un-survivable).[21] The most severe injury was scored using the AIS during data collection, and thus the measure of severity used is the maximum abbreviated injury score (MAIS).[21] Demographic information (e.g. age, gender, occupation) and injury context (e.g. place, time of injury, specific external cause) were collected after hospital admission by face to face interview. Questions on injury context were adapted from the World Health Organisation Guideline for conducting community surveys on injuries and violence.[19] All data collection took place in the hospital by hospital nurses trained as research assistants in this study.

### *Costing method*

The economic impact of injury was measured in terms of out-of-pocket costs from the individual and family perspective. All costs incurred by participants and their household members associated with treatment during hospitalisation were reported. They were categorised into direct medical, direct non-medical and indirect costs.[22] Cost data were also collected by means of face to face interview with all 892 injured persons and their caretakers the day before their hospital discharge. These include direct and indirect costs.

Direct costs included expenditure associated with treatment and care for the injured person. Taking a similar approach to other studies on cost of injuries,[12,23–26] cost items associated with treatment included during hospitalisation were emergency service, surgery or treatment, paramedical or diagnostic examination tests (such as X ray, CT scan), medication (prescribed and over-the-counter drugs), equipment (wheelchair, splint) and rehabilitation in the hospital. In addition to items directly associated with treatment for the injured person, information on non-medical costs incurred by the injured person and their relatives including transportation to the hospital, accommodation and meals were also collected.

Indirect costs refer to lost productivity because of injury treatment and recovery.[10,12,23,25,26] Using the human capital approach from the individual and family perspective, the indirect costs during the hospitalisation period were estimated by the product of the total days off work over this period and the average