Trauma Epidemiology

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Trauma has long been one of the leading health problems worldwide. Nearly six million people die from injury yearly. Every day, 16,000 people die from injuries, but, for every person dying, several thousand more survive, often with permanent sequelae. Trauma represents around 10% of global mortality and 16% of the global burden of disease [1]. Although men are more likely than women to suffer a fatal injury (men account for two-thirds of trauma deaths worldwide), injury is a leading cause of death for both sexes in all age groups [1].

Trauma kills more people annually than HIV, tuberculosis, and malaria combined, and the overwhelming majority of these deaths, approximately 90%, occur in low- and middle-income countries. The categorization of countries by economic level is made according to the criteria of the World Bank [2] based on 2002 gross national income (GNI) per capita: low income, US$735 or less; lower middle income, US$736–2935; upper middle income, US$2936–9075; and high income, US$9076 or more. If fatality rates from severe injury were the same in low- and middle-income countries as in high-income countries, nearly two million lives could be saved every year [3].

In the United States, trauma is the fourth leading cause of death (accounting for 6% of all deaths) and the leading cause of death among children, adolescents, and young adults aged 1–44 [4]. In the United States, trauma accounts for more premature death than either cancer, heart disease, or HIV infection [5]. Among persons

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aged 15–44 years, the leading causes of fatal injury are as follows: (1) traffic collisions; (2) interpersonal violence; (3) self-harm; (4) war; (5) drowning; and (6) exposure to fire. Among people aged 45 years and over, the leading cause of fatal injury is self-harm [6]. It is predicted that road traffic accidents will emerge as the fifth leading cause of death in 2030, rising from its position as the ninth leading cause in 2004 [7].

Accurate accounting of the etiology of injury is limited by variations in diagnosis, terminology, and reporting practices for injury by place and over time [8, 9]. Rather, what is known about the overall nature of trauma deaths is based on a limited number of studies conducted in selected geographic regions using coroner's autopsy reports [10–12]. Injuries to the central nervous system are the most common cause of injury death, accounting for 40–50 percent. The second and third leading causes are hemorrhage, accounting for an additional 30–35% and multiple organ failure, accounting for 5–10 percent. The two leading mechanisms of trauma death are motor vehicles and firearms, accounting 29% and 18%, respectively. Nearly one-third (30%) of all injury deaths are intentional (suicides or homicides). Firearms were involved in 67% of all homicides and in 54% of all suicides [5, 13, 14].

It is important to understand that 50% of all deaths occur within minutes of the injury either at the scene or en route to the hospital. These immediate deaths are typically the result of massive hemorrhage or severe neurological injury. An additional 20–30% die primarily of neurologic dysfunction within several hours to 2 days post-injury. The remaining 10–20% die of infection or multiple organ failure many days or weeks after the injury [10, 15]. This distribution demonstrates how trauma systems are ineffective in preventing about one-half of all trauma deaths. Only efforts at preventing the occurrence of injuries or reducing the severity of the injury once it occurs will be effective in reducing the large numbers of immediate deaths [16].

Combined figures from Australia, the Netherlands, New Zealand, Sweden, and the United States indicate that, in these countries at least, for every person killed by injury, around 30 times as many people are hospitalized and 300 times as many people are treated in hospital emergency rooms and then discharged. Many more are treated in other healthcare facilities, such as family doctors' offices and first-aid clinics [17]. However, these figures reveal little about the extent of the injury problem in less wealthy countries. Typically, inhabitants of countries in the developing world experience a greater number and variety of hazards that lead to injury and have fewer resources for injury prevention, treatment, and rehabilitation. In all countries, people with low incomes are especially likely to experience injury and are less likely to survive or recover from disability.

There are notable disparities in mortality rates for injured patients around the world. For example, one study looked at the mortality rates for all seriously injured adults (Injury Severity Score of nine or more) in three cities, in countries at different economic levels. The mortality rate (including both pre-hospital and in-hospital deaths) rose from 35% in a high-income setting to 55% in a middle-income setting,

to 63% in a low-income setting [18]. Considering only patients who survive to reach the hospital, a similar study demonstrated a sixfold increase in mortality for patients with injuries of moderate severity (Injury Severity Score of 15–24). Such mortality increased from 6% in a hospital in a high-income country to 36% in a rural area of a low-income country [19].

In addition to an excess mortality, there is a tremendous burden of disability from extremity injuries in many developing countries [19, 20]. By comparison, head and spinal cord injuries contribute to a greater percentage of disability in high-income countries [21]. Much of the disability from extremity injuries in developing countries should be eminently preventable through inexpensive improvements in orthopedic care and rehabilitation. The loss of productivity due to death and disability from injury represents a significant loss of economic opportunity in all countries. The treatment and rehabilitation of injured people represent a large proportion of many national health budgets. Personal loss to the injured and to those close to them is immeasurable.

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