

Injury prevention in the developing world

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Abstract

Injuries are rapidly escalating by-products of growth and urbanization in developing nations and have become the number one global health threat to children, young adults, and developing nations. Injuries are also highly preventable with scientifically evaluated, cost-effective solutions. Yet these same injuries are highly underappreciated as a global health threat and receive inadequate attention and funding. Because injuries so heavily affect individuals in their most productive years, their continued growth is sure to hamper or wipe away economic gains in many developing nations and further health inequities between developed and developing nations. Injury prevention in developing countries thus represents an enormous opportunity since attention and funding has been limited even in the face of evidence-based, cost-effective solutions. This opportunity should be pursued in developing nations by choosing prevention programs that address key injury threats and, at the same time, affect long-term, sustainable, and measurable injury reductions. Such programs should have strong local buy-in, a history of evaluation (preferably in developing nations), high returns-on-investment, make use of existing infrastructures when possible, and include an implementation plan that is to be carried out by the developing nation itself.

Key words: injury prevention, developing world

Introduction

Largely due to unprecedented increases in birth rates and migration, many developing countries are now faced with the youngest, most urban populations they have ever seen. By 2007, over half of the world's people had moved to urban areas for the first time in human history. Mobile, youth-dominated populations, crowded into large cities are ready kindling for injuries due to road traffic and violence in developing nations [1-4].

Mechanization, whether it be from motor vehicles or weapons, is a rapidly escalating by-product of growth and urbanization in developing nations. While crucial for the movement of goods and people [5], the rapid growth of roadways and vehicles has far outpaced safety programs and the ability of local cultures to adapt. Developing nations are struggling to make sense of an increasingly motorized culture and the epidemic of traffic injuries growing in its wake [6]. Further, while crucial for security and the maintenance of order, the rapid proliferation and misuse of small arms has also outpaced safety programs and the ability of local cultures to adapt. Developing nations are thus also struggling to make sense of an increasingly weaponized culture and the epidemic of violent

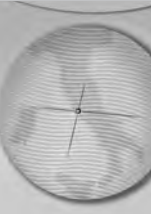
injuries growing in its wake [7].

The injury burden in developing nations

Injuries, mainly from motor vehicles and weapons, are rapidly becoming the number one global health threat to children, young adults, and developing nations [8-10]. In any given year about one out of every three people will be injured severely enough to seek medical care [8]. Injuries thus affect people from all walks of life but are very disproportionately experienced by the poor, creating one of the greatest sources of global health inequity between developed and developing countries.

As the leading cause of death during the first half of the human lifespan, injuries are the largest contributor to disability in low and lower-middle income countries [9, 10]. People who die from injuries are, on average, more than 30 years younger than people who die from other leading causes. They are children, workers, and young parents, society's most valued and economically productive members. Consider these statistics:

- Injury is the leading cause of long-term disability and years of healthy life lost in low and lower-middle income countries [10].
- Injury is the leading cause of death from 1 to



44 years of age and the third leading cause of death overall in low and lower-middle income countries [8-10].

- Over 90% of the world's injury deaths occur in low and middle income countries [11] and injury deaths per capita are 3 times higher in low as opposed to high income countries [12].
- Road traffic deaths are predicted to increase by 83% in low and middle income countries but to drop in high income countries by 27% as soon as 2020 [4].
- Road traffic crashes are the leading cause of death globally for 10 to 24 year olds [13].
- For every death due to war, there are 3 deaths due to homicide and 5 due to suicide [14].

Yet these same injuries are highly underappreciated as a global health threat and receive inadequate attention and funding [10, 15]. Because injuries so heavily affect individuals in their most productive years, their continued growth is sure to hamper or wipe away economic gains in many developing nations and further health inequities between developed and developing nations.

Thinking about injuries in developing nations

Injury is a highly preventable health threat with scientifically evaluated, cost-effective solutions. The occurrence and pathophysiology of injuries have been well studied, making them predictable and thus preventable. Given this, injury prevention strategists eschew the notion of injuries as unavoidable social accidents, applying rigorous, scientific approaches to treatment and prevention. However, inadequate funding and recognition of injury as a health problem, as well as limited cross-national communication, have left discoveries scientifically isolated and unapplied in the developing world.

Although many cost-effective interventions have been scientifically demonstrated to prevent injuries, these interventions have been scarcely implemented in developing nations. The cost-effectiveness of these interventions often exceeds that of other health conditions, including even several common vaccines [16]. Still more injury interventions are promising but require information and scientific testing specific to developing nations, while others are on the verge of discovery. Now, more than ever, the world is positioned to make an enormous impact on this emerging and rapidly advancing public health crisis. With relatively limited investment, a widespread prevention movement could stem the impending global surge of injuries [4, 12] and avert poor health, suffering and economic decline

in developing nations.

Injury prevention programs have been aptly equated with vaccines in terms of the protection they offer. The scientific evidence behind the treatment and prevention of injury is well-established and on par with other disease prevention campaigns, e.g., seat belts used to prevent auto injuries as compared to immunizations [16]. Evidence-based injury prevention programs in the United States have made the reduction of motor vehicle deaths a top ten public health achievement of the 20th century [17].

Proven injury prevention strategies are highly cost-effective solutions with very high returns-on-investment, in some cases higher by an order of magnitude when compared to certain non-injury prevention programs such as vaccinations [18]. Moreover, the medical response to injury, in the form of organized trauma care systems, have been credited with improving healthcare access and reducing mortality for severely injured people by as much as 25% [19, 20].

The epidemiologic model of disease prevention, although most commonly thought of when considering infectious diseases, has also been used for over half a century by injury scientists. Consider a specific infectious disease such as malaria, which affects the world's poorest countries and as such is a priority condition for many governments and NGOs. Prevention efforts might be directed at human hosts (e.g., distribution of bed nets), the agent containing the disease vector (e.g., spraying of pesticides to kill mosquitoes), the disease vector itself (e.g., administering mefloquine against the *Plasmodium falciparum* parasite), or the environment within which agent, vector, and host interact (e.g., draining swampy areas of stagnant water). If we were to apply the same basic epidemiologic model to a specific traumatic disease such as firearm injury, prevention efforts might be directed at human hosts (e.g., distribution of bulletproof vests), the agent containing the disease vector (e.g., restricting sales of firearms to criminals), the disease vector itself (e.g., restricting sales of armor piercing bullets), or the environment within which agent, vector, and host interact (e.g., creating urban gun-free zones for children to play). Figure 1 graphically shows this comparison [8].

To date however, nearly all of the scientific evidence-base for injury prevention has originated in high income countries and gets adapted for developing nations. These adaptations are often "lost in translation". Developing nations must

have their own local injury data, research, and evaluation programs if they are to succeed.

Taking action to prevent injuries in developing nations

Injury prevention in developing countries represents an enormous opportunity since attention and funding has been limited even in the face of evidence-based, cost-effective solutions. Even though injuries account for as many deaths as from HIV, malaria, and tuberculosis combined (the so-called “big three” in global health) [21], injury prevention efforts receive considerably less support relative to other health conditions [22, 23]. Few, if any, major funders or foundations have come forward in support of global injury prevention despite the fact that the cost-effectiveness of many injury prevention and treatment programs far exceeds that of interventions for other health conditions [16].

The amount of scientific and programmatic attention given the global injury problem is very small in relation to the attention and resources accorded most other health problems [22, 24]. Figure 2 demonstrates the starkly disproportionate magnitude of the injury problem relative to its level of grant support compared with other leading global diseases [10, 15]. Because the injury burden in developing nations has been grossly under-resourced relative to its magnitude and preventability, an enormous opportunity now exists to expand injury prevention in these nations and address the growing epidemic of injury.

This opportunity should be pursued in developing nations by choosing prevention programs that address key injury threats and, at the same time, affect long-term, sustainable, and measurable injury reductions. Such programs should have strong local buy-in, a history of

Figure 1. The epidemiologic model similarly applies to the prevention of infectious disease and injury.

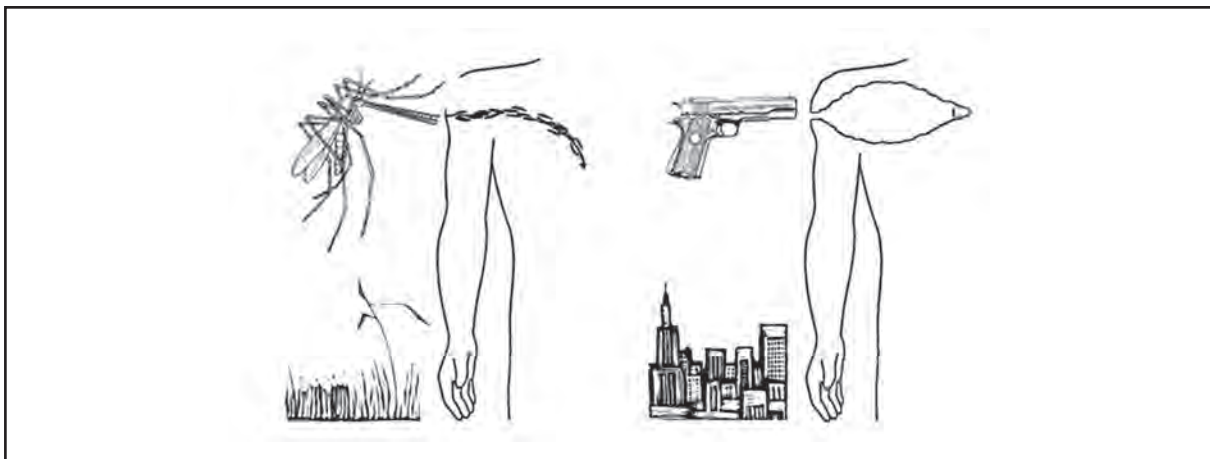
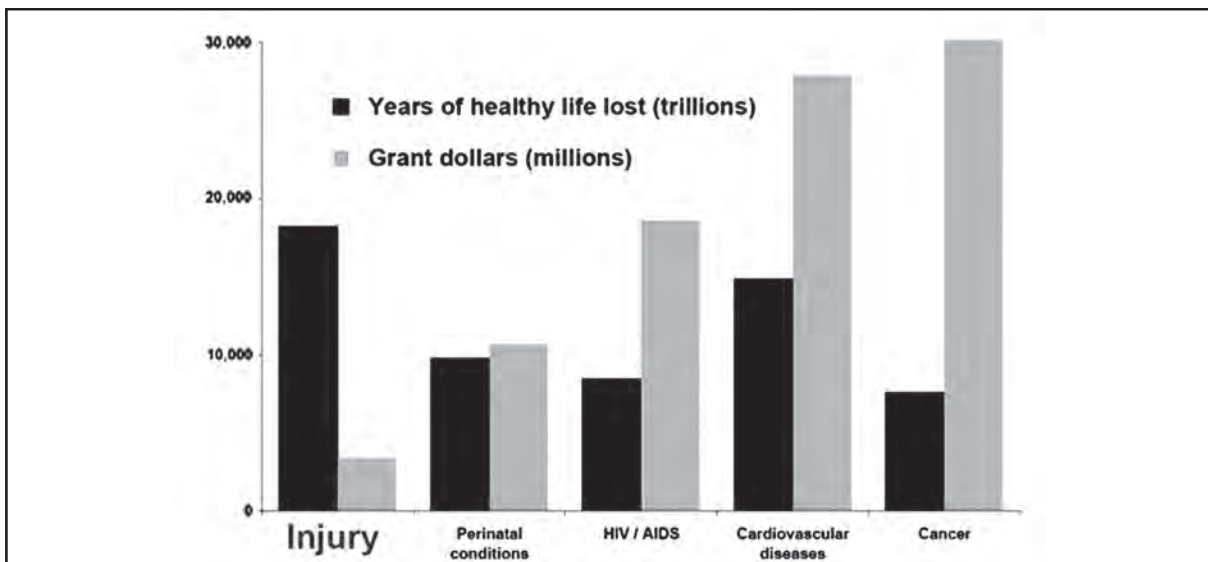
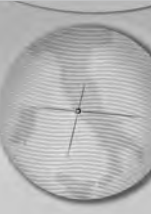


Figure 2. Disproportionate magnitude of the injury problem relative to its level of grant support compared with other leading global diseases.





evaluation (preferably in developing nations), high returns-on-investment, make use of existing infrastructures when possible, and include an implementation plan that is to be carried out by the developing nation itself. Promising program examples include: placement of speed bumps and other speed reduction measures in high traffic pedestrian areas [25, 26], laws that control the flow of illegal firearms [27-30], helmet laws and roadway cameras for motorcycles [14], police

or security personnel training in the transport of trauma victims to hospitals [28, 31], mass outreach and education through football (soccer) venues [32], and the institution of injury surveillance and data collection units. Thoughtful implementation of injury prevention programs such as these has the potential to offer significant benefit to highly marginalized and at-risk populations in the developing world.

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