



# A call for action to declare trauma as a disease

From the member academies of IAP for Health



the interacademy partnership

Acute injuries have been considered the “number one killer and major cause of disability of children and young people” for more than 20 years<sup>[1]</sup> and the “neglected disease of modern society” for more than 50 years<sup>[2]</sup>. In those countries that have replaced the concept of “accident” by “facts and injuries” and focused on acute injury/trauma as an integral, inclusive and undivided entity, significant progress has been made in the reduction of deaths and disability<sup>[3,4]</sup>. However, in most countries, acute injuries (trauma) are still typically considered as “accidents” with little research effort committed to studying and reducing this disease. Considering trauma as a disease with an integrated comprehensive approach in the health agenda will allow countries not only to control but to prevent trauma. It is time for all countries to make this transition and declare trauma as a disease.

## Introduction

Trauma (acute injury) has been the leading cause of death in young people for the last 50 years<sup>[2]</sup>. However, it has received limited attention from the medical community<sup>[5]</sup> and when reported<sup>[6]</sup>, it is still described by category (vehicle crashes, homicides, suicides, falls, drowning, etc.). Consequently, the healthcare community fails to consider trauma as a single disease. In contrast, while cancer has many different manifestations and aetiologies, healthcare systems have unified their prevention and control strategies.

Acute injury (trauma) is defined as the physical damage that results when a human body is exposed to levels of energy (kinetic, thermal, chemical, electrical or radiant, the causal physical agents) in amounts that exceed the threshold of mechanical/physiological tolerance and/or the impairment of normal function resulting from a lack of oxygen (drowning, smoke inhalation or strangulation) or heat resulting in hypothermia (trench foot, environmental hypothermia, freezing, etc.)<sup>[7]</sup>.

This definition of trauma remains valid<sup>[8]</sup> and there is a clear need to consider the diverse categories of acute injury not as different entities, but as particular aspects of the same disease model.

Injuries have been neglected within the global health agenda for

many years, despite being largely predictable and preventable<sup>[9]</sup>. There have been significant improvements in some countries and even though they have not redefined *trauma* as a *disease*, they have acted as though it is. For instance, Canada, Germany and the USA have given prominent status to this concept in their health and development agendas. The experience of “zero preventable deaths” from the USA<sup>[4]</sup> is another good example of this endeavour.

## The burden of disease

Globally, more than 5 million people die each year due to injuries, accounting for approximately 10% of deaths worldwide<sup>[9]</sup>. There is considerable variability between countries, with an eight-fold difference between Singapore (14/100,000) and the Russian Federation (118/100,000), which have the lowest and highest reported injury-related incidence death rates, respectively<sup>[10]</sup>. Injuries are the leading cause of death in adolescents and young adults (15-25 years) with very little variation in five of the six World Health Organization (WHO) geographic regions. The exception is Africa, where the number of injury-related deaths is increasing but it is still less than those caused by communicable diseases.

As another example of these differences at country level, for motor



vehicle crashes (MVC) in the European Union there are mortality rates as dissimilar as 2.8/100,000 (Sweden, United Kingdom) and 9.8/100,000 (Bulgaria)<sup>[11]</sup>.

Trauma can result in long term physical and mental health effects in all ages. One important issue that must be considered is that adolescents exhibit higher levels of risk-taking than adults<sup>[12]</sup>. Recent research has shown that exaggerated risk-taking is related to both biological and environmental (viz. specific social and psychological) factors which interact with brain maturation during adolescence<sup>[13,14]</sup>. Thus, prevention may be feasible through early psychological and medical interventions<sup>[15,16]</sup>. Trauma also has a significant impact among the elderly, and the same type of injury due to trauma results in significantly higher mortality if the victim is aged over 54.

WHO defines intentional injuries, as “interpersonal violence, such as homicide, sexual assault, neglect and abandonment, and other maltreatment, suicides and collective violence (war)”. In addition, unintentional injuries are defined as “most road traffic injuries, poisoning, falls, fire and burn injuries, and drowning.”<sup>[17]</sup>. Globally, 72% of total injury-related mortality results from unintentional injuries, with little difference between high income countries (HICs) and low/middle-income countries (LMICs). Most of the remaining total injury-related deaths are the result of violence (suicide and homicide)<sup>[9]</sup>.

## Disparities

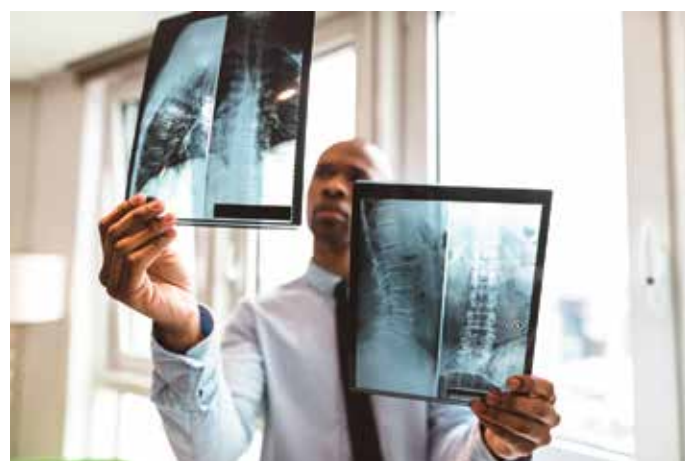
There are large disparities in life expectancy between HICs, with only 15% of the global population, and LMICs, with 85%, respectively. In HICs, 60% of individuals will live to 70 years of age, compared with only 30% in LMICs<sup>[18]</sup>. Furthermore, 90% of road traffic deaths occur in LMICs, even though these countries account for only 53% of the world’s registered vehicles. The most recent data indicate a greater decrease in road-traffic deaths in HICs compared to LMICs. Only 28 countries (representing 449 million people or 7% of the world’s population) have adequate policies addressing all five road traffic risk factors: speed, drink-driving, helmets, seat-belts and child restraints<sup>[19]</sup>. If no action is taken, this situation will continue to represent a huge public health problem in the coming years<sup>[20,21]</sup>. However, trauma resulting from motor vehicle crashes is not always the major cause of death in young people. In LMICs in the Americas, interpersonal violence results in nearly twice as many deaths of 15-29-year-old people than road crashes<sup>[22]</sup>.

Injury distribution disparities across countries are key to understanding the devastating impact of trauma. It is crucial to implement strategic interventions to develop a trauma system methodology, particularly in LMICs. To accomplish this initiative, it is relevant to consider the lack of adequate pre-hospital and hospital emergency care<sup>[23-25]</sup> and the scarcity of specific trauma training in

health teams<sup>[26-29]</sup>. This situation extends the critical time interval before trauma victims reach the right place at the right time with the right healthcare providers, contributing to increased morbidity and mortality. In such cases, internationally validated guidelines for the development of trauma systems and proper and efficient trauma care are often not followed, diagnostic and imaging facilities are poorly equipped, resources are insufficient, and treatment practices routinely used in HICs are not being implemented.

In addition, the paucity of road safety regulations<sup>[30-33]</sup> and the inequity in income and access to resources further contribute to the disparities in mortality and morbidity.

## The case for considering trauma as a disease



Since the 1800s and the pioneering work of Robert Koch on infectious diseases, diseases (as in the case of cancer, mentioned above) have been characterized as a defined morbid entity consisting of at least three out of four criteria: (1) known aetiological agent(s); (2) a distinctive pathophysiology; (3) a group of identifiable cellular and organ disruptions; and (4) signs and symptoms<sup>[34,35]</sup>.

Considering acute injury/trauma as a biopsychosocial disease would ensure that healthcare professionals and hospital leaders are addressing and treating patients exposed to key risks and causes in the same way they do for other broad groups of diseases/illnesses. This approach would also promote a solid platform for research that focuses on the elements that contribute to the severity of trauma and long-term disabilities (physical, cognitive and behavioural), as well as designing strategies to prevent the disease or decrease the severity of injury.

The failure to scientifically link causes to the magnitude of the





consequences has contributed to a confusing social understanding of trauma, precluding the development of a legitimate area for healthcare professionals to prevent and control injuries. An example of this is the widespread misuse of the word ‘accident’ (an unforeseen and unplanned event, which alters the normal course of events) to define unintentional injuries, as it suggests the actions that led to them are attributable to chance without causal attribution. Similarly, attributing accidents to “chance, fate or destiny” is unscientific and hinders, even inhibits, the implementation of prevention strategies. Eliminating the term accident to describe injury-related events would lead to them being seen as a consequence of a causal chain of facts and circumstances, allowing for the elaboration and testing of strategies that will not only reduce the events themselves but also the precursor events when they do occur.

Aristotle noted “there is no science of the accident – because all scientific knowledge is related to things that happen always or usually, so (...) having reviewed the nature and cause of the accidental, it is clear that there is no science of it”<sup>[36]</sup>. Furthermore, Professor Susan Baker, a pioneer in the area of injury prevention at Johns Hopkins, stated: “The word injury comes from Latin words that mean ‘not right’. I cannot think of a more fitting term for the number one killer andcrippler of children and young people. Surely that is ‘not right’, especially when it is in our power to change the situation”<sup>[1]</sup>. Thus, considering trauma as a foreseeable and preventable biopsychosocial disease<sup>[37]</sup> will allow for the development of more effective prevention, treatment and rehabilitation.

## Why a disease framework is suitable for trauma

Public health policies for communicable<sup>[38]</sup> and non-communicable<sup>[39]</sup> diseases cast light on the impact of interventions developed under the disease framework: identify the problem, measure the consequences, find the causative agent, develop treatment strategies and implement a prevention plan all within a measurement and analysis continuum.

To declare trauma as a disease would result in the following continuum and response: once the causes and consequences of this disease have been identified, health authorities must receive the appropriate support to develop an injury prevention and control plan to reduce trauma mortality, as well as improve treatment and rehabilitation. With respect to prevention, a horizontal plan (with integrated programmes, aiming for Health System improvement) is preferable to a vertical one (targeted, disease-specific programmes)<sup>[40,41]</sup> given that risk construction is determined by different components of the environment. Certain interventions, such as those linked to controlling the five road traffic risk factors, may act like “magic bullets”, so a diagonal approach, i.e., a strategy in which explicit interventions toward specific goals (such as the reduction of driving under the influence of alcohol) could mix with such generic issues as safer roads or the promulgation of helmet and speed limit laws, may also be appropriate<sup>[42-44]</sup>.

This is recognized in the Tampere Declaration of the 12<sup>th</sup> World Conference on Injury Prevention and Safety Promotion - Safety 2016<sup>[45]</sup>, which states “as the world orients itself to the 2030 Agenda for Sustainable Development, there is a unique opportunity for coordinated engagement from a range of government and non-government stakeholders in injury prevention and safety promotion. Governments are turning their attention to what can be done to achieve the Sustainable Development Goals and targets, and many will find they need to engage civil society groups, foundations and community-based organizations to reduce the impact of injuries and violence on their nations and communities. Several cross-cutting actions will facilitate scaled-up, effective prevention of injuries and violence”.



## Trauma-related costs

Worldwide, fatal and non-fatal trauma is associated with an annual economic cost of approximately US\$670 billion in medical care expenses and lost productivity<sup>[4]</sup>. In the specific case of car crashes, while figures vary between regions, globally 1.2 million people die annually and an additional 20-50 million survive but have mild to serious disabilities. The overall cost of car crashes has been estimated at more than US\$160 billion annually<sup>[46]</sup>.

24 of the 25 countries with the greatest disability-adjusted life years (DALY) losses due to traffic injuries are LMICs, while 48% of the 25 countries with the highest economic losses are HICs<sup>[46]</sup>. This disparity between impact and cost underlines the differences in the availability of resources, but there are few global reports on the cost of injuries, especially for LMICs<sup>[47,48]</sup>. However, some recent WHO estimates suggest that MVCs cost an average of 3% of a country's gross domestic product (GDP)<sup>[49]</sup>, being roughly 2% in HICs and up to 5% in LMICs. These estimates include direct costs of medical care, vehicle damage and administrative costs, as well as indirect costs related to loss of productivity and treatment of disability. As examples, from an intentional injuries' viewpoint, estimates of the economic costs of homicide and suicide ranged from 4% of GDP in Jamaica to 0.4% in Thailand<sup>[7]</sup>.

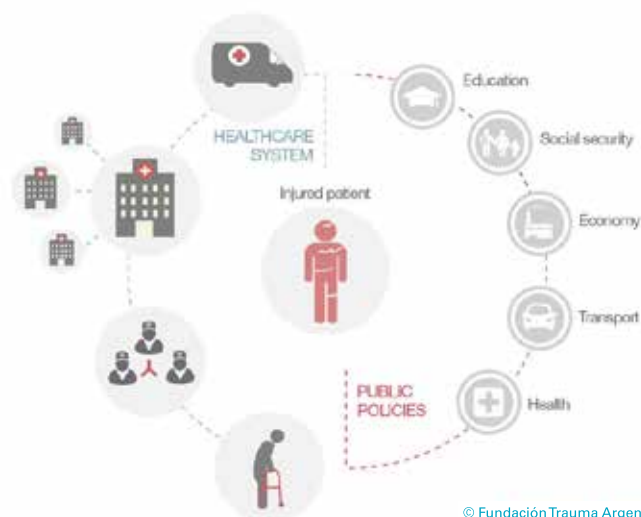
## The need for research

At a global level, more decision-makers recognize the need to prevent and control injuries, so it is necessary to develop a better understanding of local variability in order to design, implement and follow up on effective prevention programmes<sup>[7]</sup>.

As neuroimaging research (e.g., functional and structural magnetic resonance imaging)<sup>[50]</sup> has shown that risk-taking has specific neural underpinnings, it is essential that intensive age-specific research on diagnosis and therapeutic strategies be undertaken with the support of medical agencies in both HICs and LMICs.



The considerable knowledge and resource differences between HICs and LMICs can impact the effectiveness of transferring protocols from the former to the latter. Therefore, it is essential to develop registries relating to all facets of trauma, not only to yield rational interventions, but also to inform policymakers and improve clinical practice as well as for the advancement of knowledge acquisition through research. Such investments would ensure that societies would benefit by treating trauma in the same way they have addressed a myriad of communicable and non-communicable diseases.



The launch of the Global Alliance for the Care of the Injured (GACI), a global organization linking governments and NGOs from several countries, with the aim of minimizing the trauma burden through the development of trauma systems<sup>[51]</sup>, is an important initiative to achieve these goals.

## Recommendations for Academies

IAP for Health member academies should draw attention to the need for a strong paradigm shift to consider acute injury/trauma as a biopsychosocial disease. This will enhance the development of better acute and post-acute care systems, surveillance institutions as well as research organizations in each country. They should also encourage scientific and healthcare communities to join with other regional academies to promote an urgently-needed paradigm shift essential to reduce inequities in healthcare between countries.

### At country level, IAP for Health member academies should:

1. Engage with public health authorities and other decision-makers to assess current national responses to trauma victims and determine the most effective role they can play to improve the trauma systems that will meet the needs of their country.
2. Support scientific institutions offering trauma and emergency training to ensure that health teams can provide the best possible care according to international standards and local needs.
3. Work with universities to develop curricula for physicians, nurses and technicians, in both graduate and post-graduate courses, where trauma is framed as a disease.
4. Help universities and research institutions to secure funds to develop a disease model approach for the complex problem of trauma and the development of national trauma registries.
5. Encourage the development of systematic trauma prevention strategies based on local evidence using the "three E's" approach of prevention (environment, education and enforcement) with healthcare providers and the whole community.

### At regional level, IAP for Health member academies should help establish regional agreements to:

1. Reduce well-known risk factors for MVCs. These would include speed limits, drinking and driving laws, the compulsory use of helmets, seat-belts and child restraints, banning the use of cell phones while driving, and promoting violence prevention using the information obtained from trauma registries.
2. Develop collaborative strategies to secure more funds for the necessary research.
3. Establish a common standard for data reporting.



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