



Hugh Greenwood Lecture

## The importance of pediatric trauma prevention: The work of *Criança Segura – Safe Kids Brazil*

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## ARTICLE INFO

## Article history:

Received 28 September 2022

Accepted 11 October 2022

## Keywords:

Trauma  
Prevention  
Education  
LMIC

## ABSTRACT

Trauma is the leading cause of death in children and adolescents less than 14 years of age worldwide. Although there have been advances regarding treatment in the last decades, it is still complex to assemble well-trained teams and proper hospitals to care for traumatized children. The most effective vaccine and the less expensive tool to deal with such a burden is prevention. The aim of the Non-Governmental Organization (NGO) *Criança Segura – Safe Kids Brazil* is to work with child and adolescent trauma prevention through three pillars: mobilization, communication, and public policy. Nationwide actions, campaigns, education material, events, research, and proposing laws resulted in a 53% decrease of trauma deaths in Brazil in a 20-year period. The strategy contributes to build the culture of prevention in Brazil with the involvement of every sector of society. Childhood trauma prevention is effective in decreasing trauma deaths. *Criança Segura* is now part of *Children's Villages*, an international organization that will be able to multiply the model through different countries.

*Levels of evidence:* Review article

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### 1. The burden of pediatric trauma

According to the World Health Organization (WHO), 6 million people die of trauma worldwide each year [1]. Of these, 1 million deaths and perhaps 50 million who are permanently disabled are aged from 0 to 14 years. Furthermore more than 90% of deaths occur in developing countries. The WHO World report on Child Injury Prevention [1] says that every day 2000 families around the world are torn apart by the occurrence of a so-called accident or unintentional injury that most of the time could have been avoided. This brings consequences to parents, siblings, grandparents, friends, communities, and society. Some projections state that changes in the environment and increased exposure to risk will enhance these numbers drastically. But the good news is that 90% of accidents in children can be easily prevented.

The consequences of a traumatized children are huge: children stay away from playing, from school, from their friends and families; parents divorce, lose their jobs; siblings feel neglected, not to mention all the psychological issues for all family, especially when a child has permanent sequelae or dies. For society, there are high costs either to keep this child integrated in society or to cope with the years and quality of life missed.

In the last 40 years, better organization of care for polytrauma patients had an unquestionable impact on reducing morbidity and mortality but, unfortunately, the same was not true for the trau-

matized child, which can be treated in various types of structures [2] and with or without pediatric specialists. Pediatric specialists committed to trauma are few and adult trauma experts feel inadequate and insecure to treat children. Only 6% of American emergency rooms have all the equipment needed in pediatric care. A study showed that children and adolescents up to 15 years of age are 60 min away from pediatric trauma centers and that 17.4 million children have no access to them [3–5]. These observations illustrate the need to plan the treatment of children within trauma systems. This is also unfortunately true for disaster scenarios where there is typically a lack of pediatric equipment and, to make things worse, affected children are often separated from their families [5,6].

Our study in 2006 evaluated the prehospital care of 13,000 children in São Paulo, Brazil and, although this number is not small, it constituted only 4% of all ambulance dispatches (basic and advanced care units) during the study period [7]. A dispatch system of advanced support ambulances for children, validated with international trauma severity scores was proposed, which may optimize the use of this scarce and expensive resource.

A study of medical pre-hospital system in Brazil showed that 51% of physicians feel unprepared to treat traumatized children; 35% have difficulties in performing physical exam and obtaining vital signs in children, and 60% have difficulty with pediatric advanced life support procedures [9].

Official data from Brazil [8], show that the main cause of mortality among children and young people up to 19 years are external causes (21,000–22,000 deaths/year), with a dramatic increase in cases related to violence and motorcycles [10]. Although

Based upon the Hugh Greenwood Lecture at the 68th British Association of Paediatric Surgeons Congress in July 2022.

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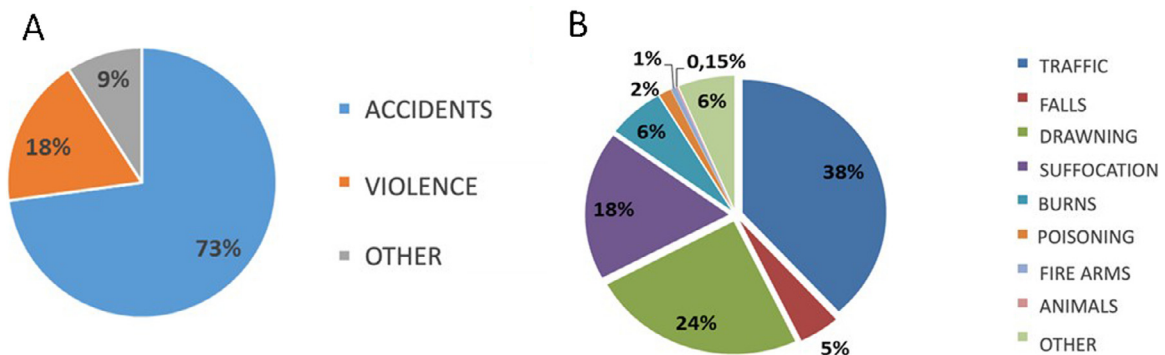


Fig. 1. A and B – External causes of deaths 0–14ys – Brazil [DATASUS, Brazilian Ministry of Health].

there has been an evident increase in violence in the country, the main causes of death (79%) are accidents rather than violence in those aged from 0 to 14 years of age (Fig. 1A). The same applies to admissions: 89% of them are owing to accidents and only 4% owing to violence. In Brazil, approximately 3300 children die annually owing to unintentional trauma and 325 traumatized children are hospitalized daily. The burden for the child, for families and for society are enormous.

Although the Ministry of Health official data on mortality and hospitalizations are quite reliable, there is no detail about events and products that may have directly caused the accident or educational socioeconomic analysis linked to such data and the severity of pediatric patients. To fill this need the NGO *Criança Segura - Safe Kids Brazil*, with the Brazilian Society of Pediatric and PROTESTE (a Brazilian consumer protection association) created a questionnaire to be used as a national database and that has been tested in a pilot study in five hospitals in the city of São Paulo [11].

*Criança Segura - Safe Kids Brazil* studies the official data annually and show that traffic accidents (40%) are the most common cause followed by drowning (25%), suffocation (15%), burns (6%), falls (4%) and intoxications (2%) as the primary causes of death. If we look at the data and stratify it by age group then suffocation is the leading cause of mortality in infants (<1 year) whereas traffic accidents and drownings, followed by falls are prominent in older age groups (1–4, 5–9 and 10–14 years). Falls are the leading cause of hospitalization (48%), followed by burns (16%), traffic accidents (12%), poisoning (4%) and suffocation (1%) [12]. (Fig. 1A and B)

Although it is important to train professionals and organize capable and effective trauma care systems, the best thing really is to invest in prevention. Prevention is the vaccine for the main cause of childhood and adolescent deaths from 1 to 14 years of age.

## 2. Criança Segura – Safe kids Brazil

*Criança Segura – Safe Kids Brazil* is part of *Safe Kids Worldwide*, the only network devoted to pediatric trauma prevention, and currently has a presence in some 30 countries across the globe. This organization was founded in the USA in 1988 by Dr Martin Eichelberger, who happens to be Brazilian but was also a pediatric trauma surgeon working in Washington DC. He brought the idea and concept to Brazil during a pediatric surgery meeting in São Paulo in 1999. From this starting point, and with help from both government and private sources, *Criança Segura* was born in 2001. Since Brazil is a very large country, at first we had 3 offices: one in São Paulo, one in Curitiba and one in Recife. Some years later, we continued our activities with a single office and promoted our mission and activities adding the online format to the already existing strategy.

*Criança Segura – Safe Kids Brazil* works with three principle pillars: mobilization; communication and public policy. I shall consider each of these in turn:

1. **Mobilization:** training and empowerment of multipliers for accident prevention in children and adolescents up to 14 years old nationwide, with involvement of every area of society. On-site Training Programs and online courses for different audiences: parents and family, educators, health, traffic and safety professionals, community and other civil society organizations to be multipliers of the cause of accident prevention.

### § Accomplishments:

- Development of educational material: folders, guides, videos and e-books for pedestrians, walking bus, baby security/ how to prepare to receive your baby in a safe way, safe house, safe kids in cars, drowning prevention, playground safety, safe vacation, safe holidays, burns prevention, falls prevention, safe playing, safe toys, safety devices for cars guide, safe sleep, safe kids at school, prevention of sports accidents, mobilization guide. Presential workshops, events in public parks. As results, 16,000 people finished the presential workshops and 500,000 families were reached.
- Criança Segura – Safe Kids at school program: material for teachers, parents and children – prevention inserted horizontally at school in all disciplines.
- Online courses: for parents, teachers, traffic agents and healthcare professionals. One of the courses is for multipliers. With online education, 1200 multipliers are graduated a year and we estimate that 77,000 people were impacted. (Figs. 2–4)

2. **Communication:** disseminates information and social awareness of accident prevention in children and adolescents. Press office; TV, radio and internet campaigns; social networks, research.

### § Accomplishments

- Thousands of campaigns on radio, TV and internet. Social media as means to reach higher number of people.
- 500 broadcasted materials a year in the most important press vehicles
- Thousands of campaigns on radio, TV and internet
- 300,000 website visits a year

3. **Public policy:** ensures that the theme of accidents involving children and adolescents are on the agenda of politicians and the political establishment. We monitor, propose and work on improvements of laws in municipal chambers, state and federal legislative assemblies.

### § Accomplishments

- Childhood safety transportation law (Resolução 277/2008). Before the law, only 32% of children were adequately transported in the country.
- Certified child safety devices are mandatory in vehicle transportation
- Restriction on sale of liquid alcohol for domestic use
- Child walkers were prohibited



Fig. 2. Educational material.



Fig. 3. Online courses layout.



Fig. 4. Mobilization activities in public parks and the mobile home to explain home accidents that can be easily prevented.

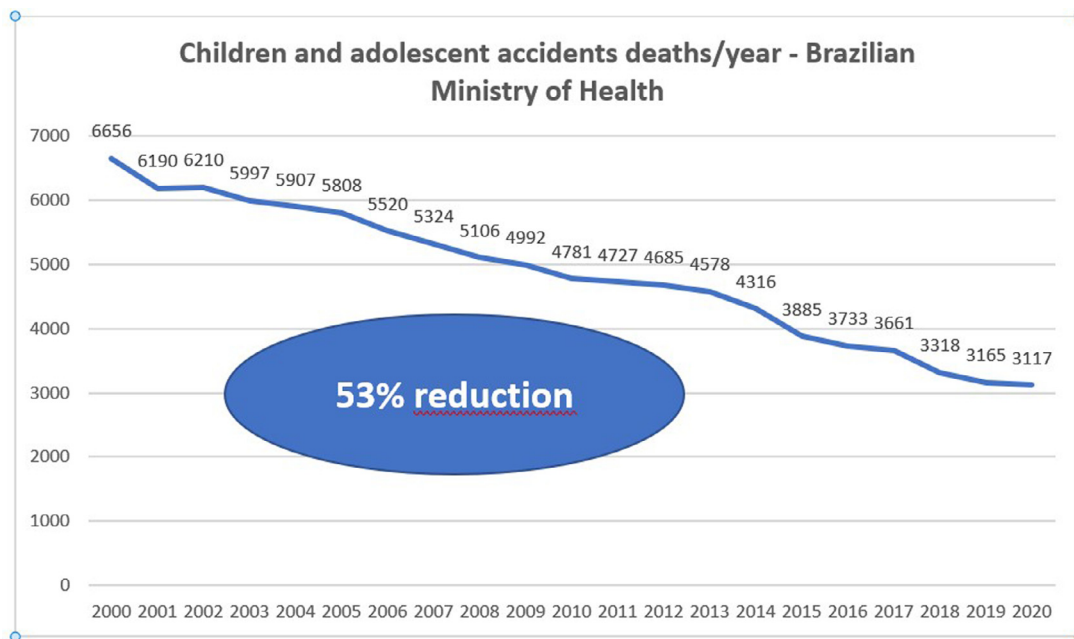


Fig. 5. Children and adolescent accidents. Deaths/year – Brazilian Ministry of Health (2000–2020).

- Partnership with certifying agency for childhood products
- Insertion of childhood safety in the highest level of the National Council of Childhood Rights in Brazil

To ensure that various products for children are safe, we participate in study committees at the Brazilian Association of Technical Standards (ABNT) such as: childcare, car seats, toys and playgrounds. By contributing with data on child deaths and hospitalizations and recommend best practices for preventing accidents with children, Criança Segura became a national reference on the subject. In a 20-year period of existence, we have reached a 53% decrease in childhood trauma deaths in the country (Fig. 5).

### 3. Audit of outcomes

We conducted the following pieces of research to have solid data to share both with the press and academic environment.

#### 1. Mothers' perception and behavior about prevention

500 interviews with mothers from all regions of Brazil. Three profiles were identified: Conformed: "It is impossible to prevent accidents"; Protective and forewarned: "I changed my whole house after my son was born" and Mouth-Out Super Mom: "No

one better than me to take care of my child", but there is no attitude of prevention.

2. **Children Safety Devices in Brazil—Why Do People Don't Use Them after the Law?** [13]
3. **Nonintentional injuries in children: prospective study of 5 hospitals in the city of São Paulo – social and educational profile, severity and prevention.** [11]

The typical profile of a traumatized child/adolescent profile is male, with an average age of 6.4 years, and living in a peripheral neighborhood. Accidents frequently occur inside the house, but also at school and on the street. Children were either alone or cared for another child at the time of the accident. Three in 10 children experienced repeated accidents. The family's monthly income is about US\$ 220. About 60% think that accidents could have been prevented in a simple way, but there is no adherence to the use of safety devices. Falls, pedestrian, and sport accidents were associated with increased severity, as well as having a male caregiver.

#### 4. Prevention

Children's relationships, learning and the right to play are essential for healthy growth and development. All are affected and

have lasting effects on society, especially for children who do not have access to safety measures. Well-educated children are excellent multipliers of correct concepts in their community, and they learn by the example of adults.

Every child has a value and the right, ratified in virtually every country in the world, to grow up in a safe and secure environment from injury and violence. Responsible institutions, especially health and safety institutions, must act so that these rights are ensured, as children are exposed to risks and dangers in their daily lives, and are vulnerable to various types of trauma. It is very healthy for children to explore their environment, but it is up to the adults responsible for them to provide a safe environment for them to do so.

However, physical, social, cultural, political, and economic differences create very different environments, which must certainly be considered when implementing any prevention program. Therefore, knowledge of the characteristics and particularities of each location is of paramount importance for the effectiveness of such programs.

More than 95% of deaths from unintentional injuries occur in underdeveloped or developing countries. The mortality rate in children from unintentional causes is 3.4 times higher in underdeveloped and developing countries than in developed countries, but there are wide variations according to the cause. For example, burns are 11 times more frequent, drowning 6 times more frequent and poisoning 4 times more frequent in these countries [27].

Although much more is known about prevention today than at other times, very little is converted into action. Globalization brings with it the possibility of rapid dissemination of knowledge between countries, but also motorization, changing existing transport systems and increasing traffic accidents by 67% in the world between 1990 and 2020 [14].

Children are not small adults. Their physical and cognitive abilities, degrees of dependence, activity and risk behaviors gradually change as they grow [15–22]. Young children do not have the knowledge, skills and concentration levels necessary to deal with the traffic environment, even less than very favorable conditions [23]. Such characteristics also impacts the occurrence of bicycle accidents and falls.

It is normal and necessary to take some risk for the child to grow and develop. But the child does not realize that it takes a complex set of decisions to avoid danger. Therefore, it is the responsibility of adults to understand the risks of children in traffic, their behavioral limitations and ensure their safety, with interventions appropriate to the developmental stage. It should be noted, however, that children learn by example. Thus, responsible adults must monitor their own attitudes and habits in traffic, to set a good example for children.

William Haddon, during the 1970s first developed a matrix to apply public health principles to traffic, which has been used to prevent accidents of various types. The matrix consists of characteristics related to the host, the agent/vehicle, the physical and social environment, and primary, secondary and tertiary prevention actions. Thus, one can identify strategies and priorities for prevention, including costs and effects; existing and necessary research; past and future resource allocation and their effectiveness [24–26].

Such criteria transposed for pediatric trauma prevention led to 10 strategies described below:

- Prevent creation of danger - ban the manufacture and sale of unsafe products
- Reduction in the amount of energy transferred - speed reduction
- Prohibition of drug packaging without child protection mechanisms

- Modify the distribution of energy from the source - use of safety belts and safety devices for the transport of children
- Separating people from danger in time or space - cycle paths, pedestrian crossings, changing school departure times so that they do not coincide with the time of greatest traffic
- Separate people from danger by putting up barriers - protection of windows and swimming pools
- Modify surface qualities, making them softer - playgrounds
- Health promotion, making the child more resistant to injuries
- Adequate initial care, once the injury is established
- Adequate stabilization, treatment, and rehabilitation.

In addition to these measures, it is essential that the child is accompanied by a well-informed and emotionally committed adult.

In 2010, based on the experience of the pilot study, an agenda of measures to increase development and research capacity was proposed [27], to be implemented especially in underdeveloped and developing countries, and includes the following aspects:

- Epidemiology: Sustainable surveillance system
  1. Periodic population and health surveys
  2. Databases focused on injury type
- Interventions: Research actions for development implementation
  1. Efficacy Studies
  2. Long-term impact studies
- Economics: Analysis of the costs of unintentional injuries to society
  1. Cost effective interventions
  2. Measuring investments for security
- Social Sciences: Attitudes and perceptions about the causes of accidents.
  1. Test marketing and communication strategies
  2. Health accident analysis policy
  3. Analysis of failures in public policies and national laws

**Criança Segura – Safe Kids Brasil** already works with most of these concepts on a national scale. A trustworthy database for a constant and efficient surveillance system, which can guide prevention actions, maximizing their effectiveness. We must learn from the successful experiences of countries that have good safety records [28,29], that have leadership in conjunction with cross-sectoral efforts across the country to promote physical and social environments that can reduce morbidity and mortality from injuries and to guide prevention actions. In addition, governmental will determines significant advances.

Institutions must participate in the development of public policies, as **Criança Segura – Safe Kids Brazil** has been doing. We acted definitively in the certification of car seats and in the law that makes their use mandatory for the safe transport of children. In addition, we have acted to change the law prohibiting the use of liquid alcohol as a cleaning product, in order to prevent burns.

Legislation is a powerful tool for prevention. So, we have campaigned in the areas of traffic environment for safety devices for transporting children such as seat belts, booster seats for infants and helmets for cyclists and motorcyclists. In the home environment, campaigns for prevention awareness, legislation on alcohol, and safety devices for children. In the leisure environment we have campaigned for fences to be put around swimming pools and other open stretches of water.

There are still obstacles to prevention, such as overcoming the concept that accidents occur “by chance”; the existence of many types of unintentional injuries; the quality of databases to convince governments of the need for change; the lack of understanding and commitment of governments; and difficulty in implementing prevention measures and lack of financial resources for this.

## 5. Recent changes and future perspectives

**Criança Segura** is now part of **Children's Villages**, an international organization that will be able to multiply the model through different countries and continue Criança Segura legacy in Brazil. We are also working on an intersectorial intervention to prevent nonintentional injuries in the East Zone of São Paulo, involving primary care, home safety check lists, schools and regional hospitals. Through Dr Hafeez Abdelhafeez, I had the great privilege to meet Prof Kokila Lakhoo, who opened the doors for me at **GICS (Global Initiative for Children's Surgery)** and at the **Global Children's Non-Communicable Diseases Group**. We have been working to establish a similar program in Zimbabwe, to be spread through African countries.

## 6. Conclusions

We have described many methods and strategies to influence the terrible results in children's trauma seen in Brazil at the turn of the millennium and itemized at the start of this paper. We believe that change has happened, and one of our main accomplishments was to change child safety laws in Brazil. Official data suggests that there has been a 53% decrease in childhood trauma-related mortality in its 20 years of existence. (Fig. 5)

## Acknowledgements

**Criança Segura – Safe Kids Brazil team:** Vania Schoemberner, Camila de Alvarenga Assis e Silva, Eduarda Marsili Chico, Fernanda de Souza Pereira, Luciana Silva, Palmira Petrocilli Barros, Paula Bueno dos Santos de Toledo.

**Criança Segura – Safe Kids Brazil Board:** Luciana de Almeida O'Reilly, Eduardo Pongrácz Rossi, Emerson Duran, Camilla Osborn Gomes Nogueira Frussa, Gabriela Guida de Freitas, Claudio Scatena, Simone de Campos Vieira Abib.

**Safe Kids Founder –** Dr Martin Eichelberger

**Childrens Villages SOS Brazil:** Erika Tonelli, Alberto Guimarães  
**Global Initiative for Children's Surgery:** Prof Kokila Lakhoo, Doruk Ozgediz, Abdelbasit Ali, Hafeez Abdelhafeez

**Global Children's' Non communicable diseases group:** Prof Kokila Lakhoo, Mr Noel Peter, Prof Godfrey Muguti, Dennis Mazingi, Simba Chinywoa, Sarah Davidson, Soham Bandyopadhyay

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