ENCYCLOPEDIA on Early Childhood Development

INJURY PREVENTION

Road Traffic Injury

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November 2010

Introduction

Road traffic injury (RTI) remains the leading cause of preventable death and injury after infancy in high income countries. The worldwide growth of vehicle fleets and road development has the unintended consequence of propelling an epidemic increase in road injuries, projected to be the fifth leading cause of years of life lost around the world by 2030.[1] Half of those who die in road traffic crashes are pedestrians, cyclists or other vulnerable road users struck by vehicle traffic. Children are overrepresented in this population, particularly in developing countries. Children are also injured as passengers and drivers, particularly in higher-income countries. There is an urgency to apply lessons and strategies learned over the past decades in order to ward off the anticipated growth of road injury as countries build needed transportation infrastructure.

Subject

RTI is defined as a collision or incident involving at least one road [motorized or unmotorized] vehicle in motion, on a road to which the public has right of access, and fatal injury including any person dying within 30 days as a result of an RTI. Encouragingly, there are well-studied and cost-effective prevention strategies which, if implemented, could save millions of lives. Data systems for measuring the burden of RTI are highly developed in some countries, while in others there is large-scale undercounting and underreporting of road traffic injury.

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Problems

Rates of RTI in childhood follow an inverted U-shaped curve. They are lower in poor countries with underdeveloped road infrastructure, rise sharply with the proliferation of motorized vehicles and roadways, and eventually begin to fall with the more widespread adoption of injury prevention strategies.[2] To reduce the number of children injured on roadways, research needs to address strategies to reduce the exposure to fast-moving vehicles, reduce risk factors for crashes, and continue to seek cost-effective ways to protect child occupants in a crash.

Research Context

Numerous studies have examined the epidemiology of RTI in high-income countries and increasingly in low- and middle-income countries. However, it is clear that no one strategy will prevent all RTI. Reviews of global RTI can guide deeper inquiry.[1,3] This review will touch on selected areas of progress and future research.

Key Research Questions

- What is the true magnitude of RTI, especially in low- and middle-income countries?
- Which new technologies improve vehicle occupant safety (child restraint devices, vehicle technology)?
- Which strategies can reduce high crash rates for young drivers and facilitate the development of driving skill?
- What are the long-term sequelae of nonfatal RTI?
- Which policies and strategies reduce the rate of unrestrained vehicle occupants, and which of these are effective in low-resource environments?
- What forms of public transportation can replace the riskier single-occupancy vehicle in order to reduce exposure to road traffic injury?
- Which public policy and legislative approaches can reduce the burden of RTI?

Recent Research Results

Among younger children, developmental immaturity puts them at high risk of pedestrian injury.[4] Reducing pedestrian injury for younger children requires parental supervision and better design

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for separating traffic from walkers. The recommended age at which children can safely cross the street by themselves is 10– much later than most parents realize. This is because of the complex cognitive skills required to cross safely: being able to refrain from an impulse to chase a ball, understanding the directions from which vehicles can approach, and gauging the amount of time for crossing, based on vehicle closing speed and distance.[5,6] Younger children may be able to recite instructions for crossing the street, but will not consistently cross safely under varied traffic conditions.

Walking is a great form of transportation and healthy exercise for children and adults alike. Finding safe ways to encourage walking is an important public health priority. There is an increasing realization that vehicles and people should be separated,[7] and car speeds must be slowed when coming into contact with pedestrians to reduce injury risk. Strategies being investigated include banning vehicle traffic from city centers, slowing vehicle speeds through traffic calming,[8] adding crossing islands and putting crosswalks only at locations where traffic is already forced to stop.[7,9]

One of the surest ways to reducing the risk of child RTI is to depend more heavily on public transportation. Most forms of public transportation are a precursor of a lower injury risk as well as less energy expenditure and significant environmental and urban planning benefits.[3] Achieving global targets for RTI will require a commitment to improve road traffic safety and provide alternatives to single vehicle commuting.

One of the most significant public health advances of the 20th century was the invention of safety belts and child restraint devices such as car seats and booster seats. Improvements in child restraint use have contributed to significant declines in child occupant mortality rates, with protection rates from 71% for rear-facing infant seats, and between 54% and 59% for child seats and booster seats.[10-12] Despite the proven effectiveness of child restraints, it has taken 30 years to raise U.S. seat belt use rates from approximately 10% to 85%.[13] More research is needed on how to close the remaining gap in restraint use, especially for groups at highest risk of injury.

Though impressive gains have been achieved with infant car seats, considerable efforts are needed to raise the use of child car seats and booster seats to similar levels. Recommendations for car seat use continue to evolve with the introduction of new technology and better studies (see, for example, American Academy of Pediatrics recommendations).[14] Studies from Sweden[15,16] and the U.S.[17] suggest that children are five times safer when in rear-facing positions up through

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two years of age. Children who have outgrown rear-facing restraints graduate to forward-facing harness seats as long as the seat will accommodate the child. The next step is to use a booster seat, which improves fit of the adult-size seat belt and improves seated height in order to take advantage of vehicle safety features. Current recommendations suggest that children should remain in a booster seat until the adult seat belt fits correctly, typically around 4'9" (145 cm) in height. Persuading parents to use child restraints is only a first step; seats must also be properly installed and used on every trip. Misuse rates remain high,[6] and critical areas of misuse, such as loose harness straps and lax attachment of the car seat to the vehicle, place children at increased risk of injury.[12,18]

Once children have graduated from booster seats, seat belts should be worn on every trip. Seat belt laws are cost-saving even in low resource settings,[19] leading many forward-looking developing countries to adopt legislation requiring seat belt use for all vehicle occupants. Challenges remain for adequate adoption and enforcement to support this critical safety measure.[20]

Drivers face a growing potential for in-vehicle distractions, and ironically these distractions are growing rapidly in high- and low-income countries alike.[21] The presence of friends, mobile phones, other electronic devices, grooming, and eating in the car, have been shown to increase driving risk for adults, and likely have a larger impact on adolescents who have not automated the complex physical and psychological tasks of driving.[22-25] Cohort studies suggest that the use of voice/text devices is associated with crash risks ranging from 4 to 24 times over baseline levels.[26]

Research Gaps

Studies are needed to estimate the magnitude and disability burden of RTI injury, especially in low- and middle-income countries. As the number of vehicles continues to grow, new strategies for reducing pedestrian injury, encouraging alternate forms of transportation, and advances in occupant safety are needed. Hand-in-hand with these advances is the need for translational research to understand how to implement known effective solutions which already can save lives. It is no longer farfetched to envision the elimination of road traffic deaths, and progress towards this goal is being made by countries at all levels of resource development.

Conclusions

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Parents should provide supervision until children are cognitively able to judge the safety of road crossing, typically around 10 years of age. Child restraint systems are highly effective at reducing injury in the vehicle, and a major source of preventable injury arises from inconsistent use of car seats, particularly on short trips and for older children. New research suggests that children are safest when riding rear-facing until two years of age, and then using harness-type forward-facing seats as long as the seat will allow. After children outgrow the harness, they should use booster seats until the adult seat belt fits properly. Families and society in general, should seek opportunities to reduce individual driving, the benefits of which extend beyond safety to a healthy lifestyle. Legislation, regulation and policies that support child safety include primary enforcement restraint laws, pedestrian-friendly planning, graduated driving legislation and laws to reduce drunk driving and distracted driving.

Implications

More than 1.3 million people die from road-traffic crashes each year and this number is expected to double by 2020.[1] Although more difficult to measure, 20 to 50 serious RTIs are estimated to occur for every road death. Globally, the health burden of road traffic injuries is similar to that of malaria and tuberculosis.[1] Children are particularly vulnerable as pedestrians, occupants and the newest generation of drivers. Proven programs exist to reduce the greatest risks of road traffic. If decisive action is taken, we have the means and opportunity to prevent tens of thousands, if not millions, of deaths and injuries in our own neighborhoods and around the globe.

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