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From Modest Beginnings to Winnable Battle: 20 Years of Road Safety Efforts at CDC's Injury Center

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1. Introduction

From the earliest development of the internal combustion engine, motor vehicle travel has always been tied to greater mobility and independence. Can we get where we want to go quickly and conveniently? This connection between independence and mobility has resulted in both positive and negative outcomes. For example, more roads, more vehicles and more drivers meant that we could travel farther for employment, school, commerce and social events. Greater mobility translated into increased options for health care, socialization, family gatherings, and the goods and services we required. Mobility is integral to the American lifestyle, and most trips are made in a motor vehicle. The average American spends an hour a day on our roads traveling as either driver or passenger. There are more than 200 million licensed drivers, who drive an average of 13,000 miles per year on 4 million miles of roads (Federal Highway Administration [FHWA], 2012; FHWA, 2011). In addition, we take 41 billion annual trips as pedestrians (FHWA, 2011). On the negative side, this much exposure to the travel environment comes with costs, in lives lost and medical care for the injured. Crashes resulted in nearly 33,000 deaths and millions of nonfatal injuries in 2010 (National Highway Traffic Safety Administration [NHTSA], 2012a). The monetary costs for medical care and lost productivity alone reached \$99 billion in 2005 (Naumann, Dellinger, Zaloshnja, Lawrence & Miller, 2010). Among children, teenagers and young adults in America, motor vehicle crashes are the leading cause of death (Centers for Disease Control and Prevention [CDC], 2012).

This article describes the Injury Center's response to this public health threat in three main sections, our beginnings as a small Center in 1992, current motor vehicle injury prevention priorities, and emerging road safety issues that will need attention in the future.

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2. Where We Started

2.1 Formation of the Injury Center

In 1986, congressional appropriations language for the US Department of Transportation, National Highway Traffic Safety Administration (NHTSA) included \$10 million to initiate a 3-year pilot project at the Centers for Disease Control (CDC). The result was the establishment of the CDC Division of Injury Epidemiology and Control (DIEC), within the National Center for Environmental Health and Injury Control. Included in the appropriations language was the requirement that one-half of the extramural funds (i.e., funds moved outside the CDC) were to be used for motor vehicle injury prevention (road safety) research. The 1988 evaluation of this investment by the National Research Council Commission on Life Sciences, in consultation with the Institute of Medicine, recommended the infusion of additional funding and the development of new priorities and areas of emphasis to expand DIEC's work (National Research Council, 1988).

The Third National Injury Control Conference Setting the National Agenda for Injury Control in the 1990s, held in 1991 by the U.S. Department of Health and Human Services (DHHS) subsequently recommended the establishment of a national center for injury control within the federal government (Department of Health and Human Services [DHHS], 1991); CDC's Injury Center was formally established in 1992 to meet this need. The establishment of the Center combined with the historical funding connection with the NHTSA facilitated CDC's work in road safety.

2.2 Road Safety as a Public Health Issue

Unlike other public health problems in the early 20th century, motor vehicle-related injuries and deaths were attributable to the development and rapid adoption of a new technology, the motor vehicle. The vehicle fleet quickly grew from a few thousand vehicles on our roads in 1900, to more than 250 million today; this represents an average of two vehicles (1.86) for every household in America (National Safety Council, 2011; FHWA, 2011). The rapid increase in the volume of vehicles, drivers, and trips, resulted in rapid increases in crashes, deaths, and injuries, which are now a formidable public health problem.

By definition, public health is not about individuals, it is about populations. This population focus distinguishes public health from medicine, for instance, which focuses more on the health of the individual patient. In the area of road safety, public health has traditionally focused on behaviors in populations rather than on better engineering of vehicles and roads. For example, public health efforts to increase seat belt use typically attempt to change the behavior of the vehicle occupant through education, policy or other strategies, and not through the use of vehicle-based equipment such as restraint reminder systems (e.g., vehicle chiming until the belt is clicked into place). More recently, public health has begun to press for changes in vehicles, roads, and travel environments that result in safety benefits for populations (<http://www.apha.org/advocacy/priorities/issues/transportation>). In general, public health uses education, public policy, environmental protection, product safety, and regulation to achieve population health goals (Association of Schools of Public Health, 2011), and these strategies are no less relevant in motor vehicle safety.

Public health approaches that work to prevent other health threats can also work to prevent road traffic injuries. A unique contribution to the road safety field was the application of a public health framework and epidemiological perspective to motor vehicle-related injury prevention. This systematic and linear approach to health problems ultimately identifies high risk groups and effective strategies that can then be efficiently adopted by the targeted population. In order to achieve widespread adoption of road safety behaviors, public health has framed crash deaths and injuries in the context of other preventable causes of death. The Injury Center follows this framework in its road safety work.

3. Current Efforts

3.1 Priority Areas

There are many known effective strategies in the road safety field that are under used. One of the challenges in public health is to have as great a health impact on the population as possible. For road safety this means preventing as many deaths as possible, preventing as many nonfatal injuries as possible and saving dollars spent on medical services. Prevention in road safety can be viewed at two levels, preventing crashes, and preventing deaths and injuries when crashes do occur. The current road safety priorities of the Injury Center address both of these levels while aiming to maximize our contribution to saving lives and preventing injuries through known effective interventions: increasing restraint use (seat belts, child safety seats and booster seats), decreasing alcohol-impaired driving with a focus on the use of ignition interlock devices, and increasing teen driver safety through strong graduated drivers licensing systems and enhanced parental involvement. Additionally, to address disparities in road safety, the Injury Center works with American Indian/Alaska Native (AI/AN) tribal communities in these same topic areas (restraint use, alcohol-impaired driving and teen driver safety). To further reduce the public health burden of these injuries, the Injury Center is working toward these goals:

- Every state, territory and tribal area in the United States has evidence-based public health programs and policies in place to prevent motor vehicle-related injury and death
- Every person in all seating positions is buckled up on every trip
- Every driver has a blood alcohol concentration (BAC) below the illegal limit on every trip
- All teen drivers are covered by the strongest graduated driver license (GDL) policies/practices and parental monitoring is ensured.

3.2 Using Communication Science to Increase Impact

Today advances in communication science are facilitating dissemination to academic and general audiences alike. Our goal is to fully integrate health communication and social marketing processes into how we conduct our road safety research and programs to give our work even more impact. This means that we know our audiences, know the best communications channels to reach them, know how to develop messages that will resonate with them, and know how to use this knowledge to promote and support behavior change to

improve road safety. One example of this integration is the Injury Center's Parents Are the Key (PATK) to Safe Teen Drivers communications campaign.

PATK is designed to help parents play a key role in their teen's driving safety. It provides practical steps for parents to take such as practicing driving with their teen as much as possible and creating a parent-teen driving agreement that sets up expectations for both parties. PATK also provides scientifically-based information about the risks teens face and how to address them; for example, the presence of teen passengers in the vehicle increases the likelihood a teen driver will crash, so restrictions on the number of teen passengers can be incorporated into the driving agreement. PATK offers free materials for the public in several forms such as fact sheets, posters, postcards, flyers, and social media materials such as badges, buttons, e-cards, podcasts, video, widgets, and a Facebook page:

www.facebook.com/cdcParentsAreTheKey. Finally, PATK has a tip sheet for pediatricians who see teen patients and/or their parents, and posters for their offices. This helps get the conversation about teen driver safety started and aid in the safety of their teen patients.

3.3 Global Road Safety

Global road safety is a current focus area with high burden and high potential for impact. An estimated 1.3 million people die each year as a result of road traffic crashes and 20–50 million people suffer serious non-fatal injuries. More than 90% of these deaths and injuries occur in low- and middle-income countries (World Health Organization [WHO], 2009). These crashes and injuries result in devastating economic, health, and social costs for families and for society. A United Nations resolution (A/64/L.44) unanimously adopted on March 2, 2010, declared 2011–2020 the Decade of Action for Road Safety (The Decade). The Decade is a worldwide effort to stabilize the growing burden and then reduce the forecasted level of road traffic deaths. During this period countries all over the world will seek to address their road safety issues in several areas including: building road safety management capacity, improving the safety of road infrastructure and broader transport networks, further developing the safety of vehicles, enhancing the behavior of road users, and improving post-crash care. If met, the ambitious targets of the Decade are projected to save 5 million lives, prevent 50 million serious injuries and save \$5 trillion (USD) (WHO, 2011).

The Injury Center's contribution to the Decade includes the domestic work in increasing the appropriate use of seat belts and child restraints, reducing alcohol-impaired driving, improving the outlook for teen drivers, and preventing motor vehicle-related injuries among AI/AN communities (see section 3.1 above). Advancing research and improving capacity through state programs are additional priorities. On the global front, CDC is building capacity through training in surveillance, data collection and interpretation, collaborative research, and program evaluation in several countries. In Botswana, for example, the Injury Center is working with the CDC office in Botswana, faculty from the University of Botswana, the Botswana police and the government of Botswana to assess alcohol-impaired driving crashes. Future planned studies include documenting the cost of road crashes and driver knowledge, attitudes and behaviors around road safety. In Cambodia and Uganda, we

are working to increase helmet use among drivers and passengers. Other examples of our global work in road safety can be found in the article by Mahendra and Roehler in this issue.

4. Looking Forward

Much has changed in the field of road safety over the last 20 years with many new issues on the horizon. In 1992 when the Center was officially established, seat belt use was 62%, today use is 84% (NHTSA, 2001; NHTSA, 2011a); in 1992 47% of traffic deaths were alcohol-related, compared with 31% in 2010 (NHTSA, 2003; NHTSA, 2012b). Behavior has changed and so have public attitudes about road safety. In a 2011 survey of more than 3,000 drivers, the AAA Foundation for Traffic Safety found that 86% of respondents considered it unacceptable (those answering “completely” plus those answering “somewhat” unacceptable) for a driver to drive without wearing their seat belt, 97% considered it unacceptable to drive when they may have had too much to drink, and 71% considered it unacceptable to talk on a hand-held cellular telephone while driving (AAAFTS, 2012). At the same time, many of these drivers report engaging in these self-assessed unacceptable behaviors.

Future challenges in road safety include making progress in areas that have been problems in the past such as seat belt use and alcohol-impaired driving, and new issues such as the increase in the number of older drivers, changes in technology, and a focus on the built environment and non-motorized, “active” travel.

4.1 Changes in the Age Distribution of the Population

According to the Pew Research Center, beginning in 2011 10,000 people in the US reach the age of 65 every day and this trend will hold for 20 years (<http://pewresearch.org/databank/dailynumber/?NumberID=1150>). The future older adult population will be larger, healthier, more active, and more racially and ethnically diverse than the older Americans of today. The changing age distribution of the population will result in many safety concerns, including those related to road safety. Older drivers are more likely to buckle up, more likely to restrict their driving in conditions such as bad weather, and less likely to drink and drive (NHTSA, 2011b; Naumann, Dellinger & Kresnow, 2011). On the other hand, older drivers have fatal crash rates that are higher than most other drivers (NHTSA, 2011b) likely due to their physical frailty among other considerations. Additional factors include the growing number of older licensed drivers; the proportion of all licensed drivers who are age 65 and older reached 16% in 2010 and will further increase in the coming decades (FHWA, 2012). Also, more older adults will be in the work force; the proportion of older adults who are in the labor force is expected to increase from 12.9% in 2000 to 22.6% in 2020 (Bureau of Labor Statistics [BLS], 2012). These factors will result in more exposure to the traffic environment among older adults.

4.2 Technological Advances

Historically, advances in technology have brought many safety benefits. From shatter-resistant windshields to air bags to electronic stability control, technology overall has made road travel safer. Other advances making their way into the market include lane departure

warnings to reduce run-off-the-road collisions, automatic braking to reduce frontal collisions, and ignition interlocks to reduce alcohol-impaired driving. All of these examples of technological advances were designed to improve safety. However, other technologies, not designed for safety purposes also have made their way into our vehicles, some as enhanced vehicle capabilities (navigation systems, access to email), and some carried into the vehicle by the driver (cellular telephones). While these technologies may have some safety benefits, for example, the ability to call for assistance if your vehicle has broken down, they also bring risks.

Driver distraction caused by electronic device use is a new focus in road safety. The NHTSA estimates that in 2009, 18% of all deaths in distraction-related crashes (995 deaths) contained reports of a cellular phone as a distraction (NHTSA, 2010). Electronic device use while driving has reached unprecedented levels. In observational surveys, 5% of drivers were seen holding a phone to their ear; this represents an estimated 660,000 vehicles driven by people using hand-held cellular phones during a typical daylight moment in 2010 (NHTSA, 2011c). In addition, 0.9% of drivers were speaking with visible headsets, and 0.9% were observed text-messaging or visibly manipulating hand-held devices (NHTSA, 2011c). Interest in the topic includes the highest levels of government. The US Secretary of Transportation has made distracted driving one of his priority areas, and President Obama issued an Executive Order for federal employees prohibiting the use of text messaging while driving on official business or while using government-supplied equipment (<http://www.whitehouse.gov/the-press-office/executive-order-federal-leadership-reducing-text-messaging-while-driving>).

Continued progress in driving safety will require effectively addressing this issue. One challenge will be changing attitudes and behaviors around electronic device use while driving. In a survey of more than 6,000 drivers, more than half (54%) said that talking on the phone made no difference in their driving, and one in four (25%) said sending text or e-mail messages made no difference in their driving. However, as passengers they saw the situation differently; nearly all (88%) thought it was very unsafe for a driver to send text or e-mail messages (NHTSA, 2011d). In a driver survey conducted by the AAA Foundation for Traffic Safety, 94% of drivers considered it unacceptable (13% “somewhat” and 81% “completely” unacceptable) for a driver to type text or e-mail messages while driving, yet 26% reported this behavior at least once in the past 30 days. Moreover, 87% supported having a law against reading, typing, or sending a text or e-mail message while driving (AAAFTS, 2012). In the NHTSA survey, when asked what the fine should be for texting or e-mailing while driving, 79% approved of fines of \$100 or more (NHTSA, 2011d). Legislation banning electronic device use is common. Talking on a hand-held cellular phone while driving is banned in 10 states and the District of Columbia (DC); all cellular phone use is restricted for novice drivers in 31 states and DC; and text messaging is banned for all drivers in 38 states and DC (IIHS, 2012). Evaluation research demonstrating the effectiveness of these bans is needed.

4.3 Built Environment

The introduction of the automobile changed the way we travel. Since it was an improvement over other modes of personal travel at the time in both speed and convenience, it was quickly adopted. The popularity of the automobile fueled the demand for more and better roads. The Federal-Aid Highway Acts of 1952 and 1956 authorized funding for the construction of the National System of Interstate and Defense Highways, the “Interstate System.” The goal of the 40,000-mile Interstate System was to connect the principal metropolitan areas, cities and industrial centers to serve the national defense, and to connect routes of continental importance in Canada and Mexico (FHWA, 2012). The result of more vehicles and more roads geared towards vehicle travel is that the automobile has dominated the way we build our national transportation system. In 2009, 91% of households reported having at least one vehicle available for use, and 23% reported having three or more vehicles. In addition, more than 80% of all the trips we make in a year are made in the privately owned vehicle (FHWA, 2011). After decades of focus on the personal vehicle, these “improvements” in mobility have brought health and safety problems of their own.

Motorized travel contributes to air pollution which affects asthma. Many of our roadways are not safe for bicyclists or pedestrians, yet active travel is an opportunity for regular physical activity, which has a variety of health benefits including reducing your risk of developing diabetes, dying of heart disease, and developing high blood pressure, among other health effects (DHHS, 2002). Road safety activities in the future will require a broader view of safety that includes all modes of travel, including personal vehicle, walking, bicycling, and public transportation. The government has begun to move in this direction by funding programs such as safe routes to school which focuses on facilitating walking and bicycling for school trips. Efforts to increase our use of public transportation (in 2009 2% of our all our trips were made by public transportation) can also reduce congestion and improve air quality (FHWA, 2011).

5. Conclusion

Exposure to the road environment brings with it injury risks for all road users: drivers, passengers, motorcyclists, pedestrians, and cyclists. Motor vehicle-related injuries are the leading cause of death in the first three decades of life (CDC, 2012). These preventable deaths and injuries situate road safety squarely in the public health domain.

For the past 20 years, the Injury Center has used science to better understand this problem, develop programs, and inform policies that will change behavior to help keep us safe as a nation, (CDC, 2001; Shults, et al., 2001; Elder, et al., 2004; Elder et al. 2005; Elder et al. 2011) at the state level, (St. Louis, et al., 2008) and for tribal nations (Piland, Berger & Naumann, 2010). While CDC’s programs are working on a variety of priorities, motor vehicle injury prevention has been identified as one of only six domestic and five global “Winnable Battles” (<http://intranet.cdc.gov/od/winnablebattles/>) for the agency. The term “Winnable Battles” describes public health priorities that have a large-scale impact on health, have evidence-based interventions that can be broadly implemented, and where intensive focus and effort can have a significant impact in a relatively short period of time.

The charge under Winnable Battles is to identify optimal strategies and to rally resources and partnerships to accelerate a measurable impact on health.

Through these efforts, more lives will be saved and more injuries prevented. From our modest beginnings to a winnable battle, CDC has helped motor vehicle safety achieve its rightful place among other public health initiatives intended to reduce death, injury, disability and health care costs to the nation. The Injury Center will continue its efforts to provide effective public health leadership to keep people safe on the road—every day.

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