

# **TRAFFIC SAFETY CULTURE**

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# **TRAFFIC SAFETY CULTURE: DEFINITION, FOUNDATION, AND APPLICATION**

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# Preface

Barry Watson, Nicholas John Ward, and Katie Fleming-Vogl

## *The Global Traffic Safety Crisis*

The World Health Organization (WHO) estimates that there over 1.25 million people killed every year on the world's roads, with as many as 50 million other people injured (WHO, 2015). Without action, annual road fatalities are predicted to rise to around 1.9 million by 2030 – becoming the seventh leading cause of death (WHO, 2013). It's also important to recognize that the impact of road crashes is disproportionate across countries and different road user groups. The WHO (2015) estimates that 90% of the world's road fatalities occur in low- and middle-income countries, even though these countries only account for 53% of the world's motor vehicles. Besides the enormous human suffering caused by traffic crashes, they represent a major economic burden. Indeed, the economic losses due to road fatalities and injuries are estimated to represent 3% of GDP globally, and up to 5% of GDP in low- and middle-income countries (WHO, 2015).

In response to this global crisis, the United Nations established the *Decade of Action for Road Safety (2011–2020)*. Besides representing the first truly global response to the issue, it was supported by a Global Plan that specified a road fatality reduction target and established a framework for action around five pillars involving 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 (UNRSC, undated). Encouragingly, international recognition of the problem was further reinforced in 2016 when the United Nations included traffic safety within the Sustainable Development Goals (SDGs), the framework designed to drive global development efforts up to 2030 (UN Sustainable Development Platform, undated). In particular, a specific stand-alone target was included in the SDGs: *By 2020, halve the number of global deaths and injuries from road traffic accidents.*

The key strategic framework underpinning the *Global Plan for the Decade of Action for Road Safety* is the Safe System Approach (Watson, 2016). This framework is increasingly being recognized as the leading strategic perspective in road safety, underpinning the road safety strategies of many of the best-performing countries. Central to the Safe Systems Approach is the recognition of the vulnerability of humans to injury and that they inevitably make mistakes. As a consequence, the road transport system needs to be transformed to better account for human limitations and to reduce the impact of human error. At a practical level, this requires a holistic and comprehensive approach involving

improvements to vehicle safety for occupants and pedestrians, improvements to road environment safety through assessing and treating poor roads, encouraging widespread compliance with road rules and other safe behaviors, and optimizing interactions between vehicles and road users, particularly through the management of vehicle speeds. Importantly, the Safe System Approach is increasingly being recognized as the means by which countries and communities can achieve the long-term vision of zero fatalities and serious injuries on the roads.

### ***The Need to Consider the Role of Culture in Traffic Safety***

Traditional approaches to traffic safety have tended to focus on teaching safe behavior (education), punishing risky behavior (enforcement), or designing the environment to minimize crashes and/or the injuries resulting from them (engineering). However, over recent years there has been a growing awareness of the need to understand how the prevailing culture in a country influences both behavior on the roads and the way governments and the community respond to the traffic safety problem. In this respect, it can be argued that the Safe System Approach still tends to focus our traffic safety efforts too narrowly on roads, vehicles, and road users. Indeed, some researchers have argued that it needs to be strengthened by integrating it with contemporary developments in systems theory to provide a better account of the complex nature of the road transport system and the interactions involved (Salmon & Lenne, 2015). Moreover, Johnson (2014, p. 1175) has argued that:

[...] that critical elements of the safe system model are in discord with behavioural mores in the cultures of many western motorised nations and that this hampers the adoption of the most effective safety programs within key institutions and within political systems.

He argued that a systematic examination of car use and safety cultures is required to strengthen contemporary safe system thinking.

Therefore, the opportunity exists to augment both traditional and safe system approaches to traffic safety by incorporating a stronger focus on the role of culture. From a practical perspective, it offers a means of both better understanding the complex range of factors influencing behavior on the roads and of identifying innovative strategies to bring about change at the personal, community, and institutional level.

### ***Toward a Traffic Safety Culture Paradigm***

Over recent years, efforts to better understand the role of culture in traffic safety have coalesced under the umbrella term of Traffic Safety Culture (TSC). While this concept appears to have received the most attention in the United States, it is attracting growing international attention. However, the research and policy development falling under this umbrella remains relatively diffuse. It is a

relatively new area and has not yet developed a robust theoretical foundation or amassed a large body of research. Moreover, those traffic safety strategies that have applied culture-based approaches have seldom included comprehensive evaluations to validate effectiveness.

In this context, the purpose of this reference book is to provide traffic safety researchers and practitioners with an international and multidisciplinary compendium of theoretical and methodological concepts relevant to the research and application of TSC as an important step toward establishing it as a new paradigm in the field. The aim is to promote great understanding of the definitions, theoretical perspectives, research methods, and applied tools underpinning the approach.

### ***Structure of the Book***

Consistent with the above aims, the book is divided into three sections addressing:

- (1) key issues involved in conceptualizing, defining, measuring, and analyzing TSC;
- (2) foundational concepts for understanding and harnessing the role of TSC as an important part of the traffic safety system; and
- (3) examples of strategies, methods, and tools for applying TSC to bring about traffic safety improvements.

The information presented is intended to provide practitioners with a common language and shared vision for the role of traffic safety culture to achieve a safe traffic system devoid of fatalities and serious injuries. For the academic, this information is expected to provide a theoretical framework and methodology that can support continued research to understand the various concepts underlying traffic safety culture and its use as a method to improve traffic safety. Together, we hope this book will provide readers with new insights into the way that culture can be conceptualized as both a determinant of traffic safety and engine for change.

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Although safety culture is not a new concept, traffic safety culture is an emerging topic in the traffic safety field. The editorial team would like to recognize traffic safety practitioners and traffic safety organizations who have invested effort and resources toward traffic safety culture research and strategies. Their leadership in traffic safety, dedication to safe roads, and innovative approaches have moved traffic safety culture forward from theory into practice. Such investments will continue to expand the body of knowledge for traffic safety culture and further improve roadway safety for all.

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## **DEFINITION**

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## Chapter 1

# **Building a Culture of Safety: Contributions from Public Health**

*David A. Sleet*

### **Abstract**

Building a culture of safety in transportation is not dissimilar from building a culture of safety in health. Public health is widely known for protecting the public from diseases through milk pasteurization and chlorination of drinking water, and from injuries by implementing environmental and occupational safeguards and fostering behavioral change. Lifestyle and environmental changes that have contributed to the reductions in smoking and heart disease can also help change driving, walking and cycling behaviors, and environments. Stimulating a culture of safety on the road means providing safe and accessible transportation for all. The vision for a culture of traffic safety is to change the public's attitude about the unacceptable toll from traffic injuries and to implement a systems approach to traffic injury prevention as a means for improving public health and public safety. Framing the motor vehicle injury problem in this way provides an opportunity for partnerships between highway safety and public health to improve the culture of safety.

*Keywords:* Public health; safety culture; motor vehicle; injury; traffic injury; CDC

*Today we can prevent, treat, or cure most of the deadliest diseases known to humankind—yet more than a million people around the world (still) die every year from traffic injuries.*

—Sleet, Dinh-Zarr, and Dellinger (2007)

## **Introduction**

Dramatic changes have occurred in the health of Americans since the turn of the century. In 1900, the leading causes of death were respiratory infections and diarrheal diseases. Other infectious diseases, such as smallpox, were a constant source of dread. Public health and medical advances during the first half of the twentieth century led to a dramatic fall in infectious diseases. Today, widespread immunization programs have virtually eliminated the threat of diseases, such as polio, diphtheria, and measles. As public health began to control infectious diseases, chronic diseases and injuries emerged as leading causes of death. Among the most important of these were injuries related to motor vehicle travel.

This chapter describes the public health perspectives on motor vehicle safety, outlines current efforts to integrate traffic safety and public health activities in the context of a culture of safety, and discusses future research needs as public health and transportation professionals collaborate to build a culture of safety.

## **What Is Public Health?**

Public health is the science and practice of protecting and improving health. By definition, public health is not about an individual's health; it is about a population's health. Public health takes a social ecological approach to preventing disease and improving health – one that recognizes the importance of the social environment and social determinants in bringing about change (Allegrante, Hanson, Sleet, & Marks, 2010). The approach incorporates intrapersonal, interpersonal, community, institutional, and policy factors as influencers of health and behavior. Public health focuses on the continuous monitoring of health, on identifying, preventing, and managing diseases and conditions affecting health, with the aim of maximizing benefits for the entire population. By necessity, public health draws from many disciplines, such as epidemiology, health services, health promotion, behavioral science and health education, statistics, economics, and medical sociology

Public health priorities arise from the convergence of a disease threat, public awareness of the threat, demand for proper protection from the threat, and a body of scientific literature to support the effectiveness of prevention and protection. Life expectancy in the US has increased by 30 years since 1900, and 25 of those years have been attributed to advances in public health (Ward & Warren, 2007). Public health takes credit for 900,000 fewer cases of measles from 1941 to 1996, for 42 million fewer smokers from 1965 to 1996, and for saving millions of Americans who might otherwise have died from chronic diseases or injury (Association of Schools and Programs of Public Health, 2006).

Traffic injuries have also declined, despite the dramatic increase in the number of drivers, vehicles, and miles traveled. For example, the annual death rate declined from 18 per 100 million vehicle miles traveled (VMT) in 1925 to 1.7 per 100 million VMT by 1997 – a 90% decrease (CDC, 1999). Because of the phenomenal progress made to reduce traffic injuries and deaths, the Centers for

Disease Control and Prevention (CDC) declared motor vehicle safety one of 10 public health achievements of the twentieth century (CDC, 1999).

## **Defining Traffic Safety as a Public Health Problem**

Motor vehicle injuries remain an enormous public health problem, and preventing injuries related to motor vehicle crashes (e.g., alcohol-impaired driving, safety belt use, pedestrian, bicycle and motorcycle safety) is seen as an increasing responsibility of the health sector (Haegerich et al., 2014; Institute of Medicine, 1985). In the United States alone since 1913, about 3.7 million persons died from traffic injuries on public roads and highways (<https://injuryfacts.nsc.org/motor-vehicle/historical-fatality-trends/deaths-and-rates/>). Currently, traffic injuries are the leading cause of death for children and adolescents and a major cause of death among most other age groups (Ballesteros, Sleet, & Williams, 2018; Centers for Disease Control and Prevention, 2018a).

Preliminary estimates from the US National Safety Council indicate motor vehicle deaths in 2017 claimed 40,100 lives. If the estimate holds, it will be the second consecutive year that motor vehicle deaths topped 40,000, indicating a leveling off of the steepest two-year increase in more than 50 years. About 4.57 million people were injured seriously enough to require medical attention in motor vehicle crashes in 2017, and costs to society totaled an estimated \$413.8 billion (National Safety Council, 2018).

In 1900, motor vehicle travel was a novelty with an estimated 8,000 registered automobiles in the US; however, the risks to health and safety were largely ignored. At the time, the motor vehicle was a major improvement over other modes of personal travel and subsequent improvements in manufacturing made cars more affordable, benefiting commerce and personal mobility. By 1950, the number of automobiles had grown to 50 million. This figure mushroomed in the subsequent decades, and by the first quarter of 2018, there were 272 million registered vehicles and 222 million licensed drivers in the US (Statista, 2018). This rapid “motorization” of America has brought with it increased exposure to risks for crashes and injuries. As more drivers traveled the roads with greater frequency, death rates and injuries on the road rose from 1.0 motor vehicle death per 100,000 population in 1900 to a peak of 31.0 deaths by 1937. By 2016, however, the death rate plummeted to 11.6 (National Safety Council, 2017).

Traffic safety is often considered a transportation concern and not the purview of public health. But as the World Health Organization (WHO) attests, road safety should be viewed as a shared responsibility and not the exclusive purview of any single agency (Peden et al., 2004). Traffic crashes affect not only transportation systems but also economic systems, health systems, jobs, families, and civil society. Dellinger and Sleet (2012) trace the development of public health approaches to traffic safety and conclude that the health sector has done much to foster this shared responsibility and elevate the importance of taking a public health approach to motor vehicle injury prevention.

## **A Vision for Traffic Safety Culture**

The vision for a culture of traffic safety is to change the public's attitude about the unacceptable toll from traffic injuries and, as a result, elevate the priority of a systems approach to traffic injury prevention as a means for improving public health and public safety. A culture of safety implies a systematic commitment by institutions, agencies, organizations, and individuals to recognize and address the unacceptable road toll and apply the best prevention strategies known to reduce it, from wherever those strategies might arise. Initiatives to achieve a renewed vision for traffic safety and traffic safety culture are already being pursued globally by the WHO and the United Nations (Baldwin & Sleet, 2011; United Nations, 2016; WHO, 2017).

“Vision Zero,” an approach that aspires to reduce traffic deaths and injuries to zero, began in Sweden in the 1990s and quickly spread to other countries, including the US. In the United States, the “Toward Zero Deaths National Strategy” was launched in 2014 and adopts a zero-focused imperative along with a strong commitment to creating a safety culture, in part, by creating a transportation system that can accommodate human error. The strategy has since been adopted by many US states (National Safety Council, 2016). Vision Zero, with its focus on developing safe systems, where the entire system of roads, vehicles, environments, and behaviors are considered integral parts of the traffic safety problem, will bring new energy to traffic safety efforts. The approach is a potentially powerful tool for achieving the changes necessary to achieve a culture of safety and reach zero roadway deaths.

## **The Role of Public Health**

The public health model for disease prevention has been applied to a wide variety of infectious and chronic diseases with remarkable success. Although many scientific disciplines, such as engineering, environmental health, and emergency medicine, have advanced our understanding of motor vehicle injury – its causes and consequences – public health has introduced new tools for injury surveillance and scaling, intervention applications, evaluation methods, treatment options, and systems-thinking needed to help reduce the motor vehicle injury toll (Dellinger, Sleet, Shults, & Rinehart, 2007; Sleet, 1987). Public health's uniqueness is in its ability to approach a problem like traffic injuries through a coordinated health system of prevention and care at the population level.

These characteristics are embedded in the public health culture and can be successfully applied (or adapted) to the “disease” of traffic injury and to the promotion of safety. Health ministries and state health departments charged with protecting public health use their tools, resources, and access to vulnerable populations to promote traffic safety.

One important tool in the fight against traffic injuries has been the use of the classic epidemiological triad introduced by Gordon (1949) to characterize the causal nexus of disease. This same epidemiological approach can be used to characterize the causal nexus for injuries. This triad of host (the person affected),



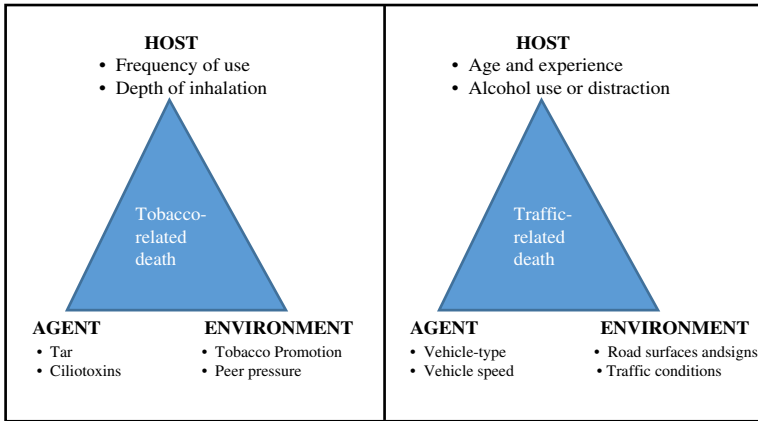


Figure 1: Interaction of Factors in the Epidemiological Triad Contributing to Smoking and Traffic-related Deaths. *Source:* Adapted from Sleet and Gielen (1998).

agent (the causative element and the vehicle or vector carrying it), and the environment (conditions in which the host and agent find themselves) can be used to explain many infectious diseases like malaria or chronic diseases like those attributed to tobacco use.

Figure 1 illustrates how traffic injuries result from interaction between injury-producing *agents* (e.g., kinetic energy transferred to the host when a speeding car crashes), *host* factors (a young, inexperienced driver or drinking driver), and the *environment* (road surfaces, signs, weather). Intervening on the host (changing behaviors to reduce risk), on the agent (changes in vehicle design to reduce energy transfer), or on the environment (installing dividing barriers and guardrails) can singly, or in combination, reduce the likelihood of both a crash and the injuries that result.

## Public Health Efforts in the US

Beginning 39 years ago, the US Department of Health, Education, and Welfare in its policy framework *Healthy People, and Objectives for the Nation* included traffic injury prevention and control as a primary national health objective. Begun in 1979, it identified motor vehicle trauma as one of a number of public health threats and set measurable 10-year objectives to improve health (U.S. Department of Health, Education, and Welfare, 1979). Subsequent efforts every 10 years since have set revised goals aimed to improve health and reduce injuries, including motor vehicle injuries. *Healthy People 2020* is a set of national goals developed and includes a number of specific objectives related to decreasing motor vehicle, motorcycle, and pedestrian-related deaths; reducing alcohol-impaired driving; increasing the use of safety belts, child restraints, motorcycle and bicycle helmets; and implementing graduated driver licensing laws, among others (U.S. Department of Health and Human Services, 2018). These objectives

appear right alongside objectives addressing chronic and infectious diseases, noncommunicable diseases, and environmental health.

Not to be ignored is the role early public health leaders in the US played in approaching motor vehicle injury and injury prevention from a public health perspective. A public health physician and epidemiologist, William Haddon, Jr, MD, was the first Administrator of the National Highway Safety Bureau (later named the National Highway Traffic Safety Administration) (NHTSA). He brought a systematic public health approach to the prevention and control of motor vehicle–related injury prevention through a framework known as the “Haddon Matrix” (Haddon, 1968). Haddon’s concept was built upon the work of John E. Gordon, MD, who suggested that injuries behaved like classic infectious diseases and were characterized by epidemic episodes, seasonal variation, and long-term trends. “Most important, each injury, like each disease outbreak, was the product not of one cause, but of forces from at least three sources which are the host...the agent itself, and the environment in which host and agent find themselves” (Gordon, 1949).

Using this framework helped orient the public and the culture toward viewing traffic injury as predictable and preventable and away from the fatalistic attitude that traffic deaths and injuries are “accidents.” Several physicians since Haddon’s time subsequently have led the NHTSA, including Dr Jeff Runge, Dr Ricardo Martinez, and Dr Sue Bailey. Many have used Haddon’s framework as a backdrop to the Agency’s work.

### ***The Centers for Disease Control and Prevention***

Promoting a culture of safety at the Federal level in the US got a boost when, in 1986, as a result of the National Academy of Sciences report titled *Injury in America* (Institute of Medicine, 1985). As a result of this report, which noted the health consequences and impact of injuries, Congress authorized funding to establish the National Center for Injury Prevention and Control (NCIPC) at the US Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia. CDC brought a public health framework and an epidemiological perspective to motor vehicle injury prevention. Figure 2 illustrates the four-step public health approach to prevention, which includes (1) documenting the magnitude of the problem using surveillance; (2) identifying risk and protective factors for crashes and injuries; (3) developing and testing interventions to reduce the risk factors; and (4) implementing and disseminating programs found to be effective.

This model has been directly applied to traffic safety programs with an emphasis on moving in a sequential manner, from defining the magnitude of the problem to identifying risk factors, developing interventions, and disseminating effective strategies to encourage widespread adoption.

CDC/NCIPC also funds Injury Control Research Centers (ICRCs) to conduct injury prevention research, with many of the Centers focusing on motor vehicle–related research. In addition, CDC funds states through cooperative agreements to improve surveillance and implement motor vehicle injury prevention programs (Sleet et al., 2012).