White Papers for: "*Toward Zero Deaths: A National Strategy on Highway Safety*"

—White Paper No. 2—

White Paper on Traffic Safety Culture

Prepared by:

Nicholas J. Ward

Jeff Linkenbach

Sarah N. Keller

Jay Otto

Western Transportation Institute

College of Engineering Montana State University

Under Subcontract to:

Vanasse Hangen Brustlin, Inc.

July 7, 2010

DRAFT

NOTICE

This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

The contents of this report reflect the views of the author, who is responsible for the accuracy of the data presented herein. The contents do not necessarily reflect the official policy of the Department of Transportation or other entity involved in the effort.

DISCLAIMER

The opinions, findings and conclusions expressed in this publication are those of the authors and not necessarily those of the (sponsor) or Montana State University. Alternative accessible formats of this document will be provided upon request. Persons with disabilities who need an alternative accessible format of this information, or who require some other reasonable accommodation to participate, should contact Kate Heidkamp, Communications and Information Systems Manager, Western Transportation Institute, Montana State University- Bozeman, PO Box 174250, Bozeman, MT 59717-4250, telephone number 406-994-7018, email: KateL@coe.montana.edu.

PREFACE

While many highway safety stakeholder organizations have their own strategic highway safety plans, there is not a singular strategy that unites all of these common efforts. The dialogue began towards creating a national strategic highway safety plan at a workshop in Savannah, Georgia, on September 2-3, 2009. The majority of participants expressed that there should be a highway safety vision to which the nation aspire; even if at that point in the process it was not clear how or when it could be realized. The Savannah group concluded that the elimination of highway deaths is the appropriate goal, as even one death is unacceptable. With this input from over 70 workshop participants and further discussions with the Steering Committee following the workshop, the name of this effort became "Toward Zero Deaths: A National Strategy on Highway Safety." The National Strategy on Highway Safety is to be data-driven and incorporate education, enforcement, engineering, and emergency medical services. It can be used as a guide and framework by safety stakeholder organizations to enhance current national, state, and local safety planning and implementation efforts.

One of the initial efforts in the process for developing a National Strategy on Highway Safety is the preparation of white papers that highlight the key issue areas that may be addressed as part of the process. Vanasse Hangen Brustlin has prepared nine white papers on the following topics:

1. Future View of Transportation: Implications for Safety
2. Safety Culture
3. Safer Drivers
4. Safer Vehicles
5. Safer Vulnerable Users
6. Safer Infrastructure
7. Emergency Medical Services
8. Data Systems and Analysis Tools
9. Lessons Learned from Other Countries

Experts in these areas were retained to prepare these papers. The authors were challenged to be thought provoking and offer strategies and initiatives that, if implemented, would move the country towards zero deaths.

To make a significant headway Towards Zero Deaths, we will need to adopt a culture of safety where individual citizens and officials will not accept fatalities from vehicle crashes as a price for mobility. In this paper, Professor Nicholas Ward and his associates from the Montana Transportation Institute examine this safety culture construct. They offer a common definition, a framework for operationalizing research and discuss the need to move beyond traditional change strategies and toward transformational approaches that examine underlying structures.

Hugh W. McGee, Ph.D., P.E.

Principal Investigator

TABLE OF CONTENTS

LIST OF FIGURES

EXECUTIVE SUMMARY

Traffic safety culture appears to be an intuitive and powerful concept with which to explain observed differences in international, regional, and demographic crash risk, as well as the propensity to commit high risk behaviors. If it is possible to define and apply this concept within a relevant social psychological theory of behavioral choice, it may be possible to develop a new paradigm for traffic safety interventions. Indeed, there are numerous examples of the effectiveness of traffic safety interventions predicated on the effect of culture on behavioral choice.

A culture-based approach is complementary to, but fundamentally different in form and philosophy from traditional traffic safety interventions including engineering, enforcement, and education. By treating the origin of risk behaviors (pathogens), cultural-based interventions are proactive and transformational in their treatment approach.

This paper describes the potential role of cultural transformations in our traffic safety system as well as identifying potential hazards and recommended strategies for implementing this traffic safety paradigm.

This paper estimates an annual savings of $28 billion in crash reductions and a $6 billion annual cost in implementation. The resulting cost to benefits ration of greater than 4:1 is encouraging.

CHAPTER 1. WHY ARE WE DISCUSSION TRAFFIC SAFETY CULTURE?

Fatal injury from traffic crashes represents a significant public health issue. Indeed, the World Health Organization (WHO) has estimated that traffic crashes will be the third leading cause of lost life and disability world-wide by the year 2020.(1) Within the United States, unintentional injury is the fifth leading cause of death. Within this morbidity category, traffic crashes represent the most common cause of death from unintentional injury, accounting for 41% of all injury-related deaths.(2) In response to this epidemic, many countries – including the U.S. – have set goals to significantly reduce traffic fatalities.(3)

Traditional strategies for reducing traffic fatalities focus on risk behaviors and their consequences by training safe behaviors (education), punishing risk behaviors (enforcement), or protecting drivers from the consequences of risk behaviors (road and vehicle design). Historically, these strategies have had some success at reducing the fatal crash rate as shown in Figure 1. Indeed, there are been notable improvements in traffic safety in recent years.[4] However, these strategies only address a subset of factors that affect the fatal crash rate. Accordingly, the rate of safety improvement has slowed in many jurisdictions as suggested by the reduced slope of the crash rate trend line in Figure 1. The slowing rate of improvement in traffic safety may be attributable to the pervasive effect on crash risk of factors not currently addressed by traditional traffic safety interventions.

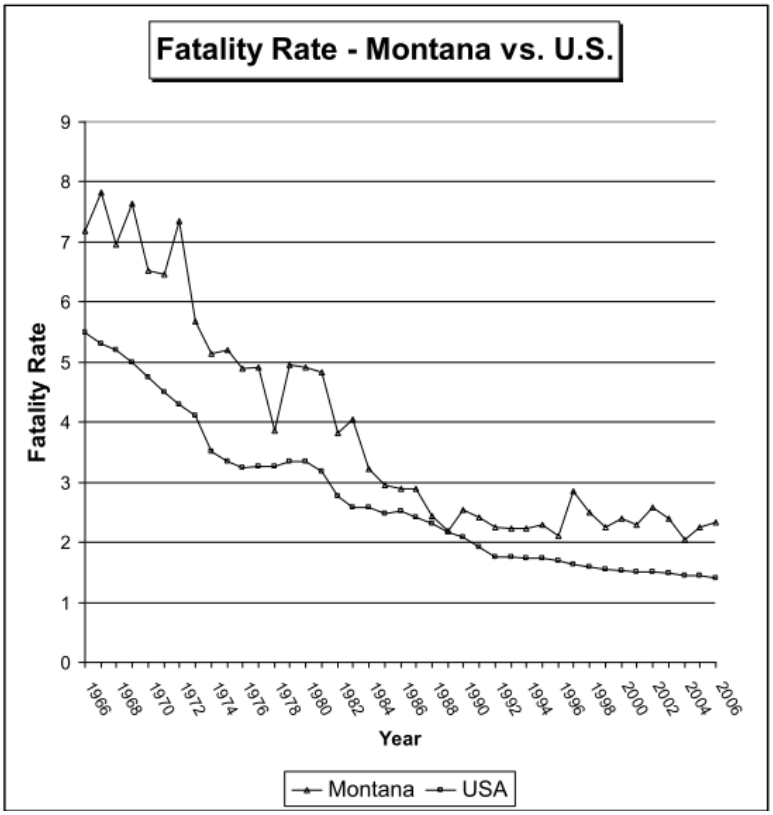


Figure 1. Crash fatality rate for Montana to illustrate safety asymptote.(5)

For example, one risk factor that is not currently addressed by most traditional traffic safety paradigms is the "culture" of the society defined by the driving population (and agencies that

govern transportation safety). That is, a culture that tolerates or engages in risk while resisting safety interventions will propagate dangerous behaviors and impede traffic safety policy. For example, Farmer and Lund recently examined fatal crash rate data for the United States by statistically removing the effect of vehicle model and vehicle age from the trend analysis over time.[6] As shown in Figure 2, this analysis suggests a significant improvement in traffic safety up to 1993, which Farmer and Lund attribute to changes in driver behavior such as increased seat belt use and reduced alcohol-impaired driving. Thereafter, traffic safety begins to deteriorate, presumably because of a change in conditions that discontinued prior trends for safe behaviors and increased dangerous behavior.[7] It is reasonable to speculate that part of this change in conditions included the manifestation of traffic safety culture that curtailed reductions in risk behaviors, inhibited safe behaviors, and impeded the success of traffic safety interventions.

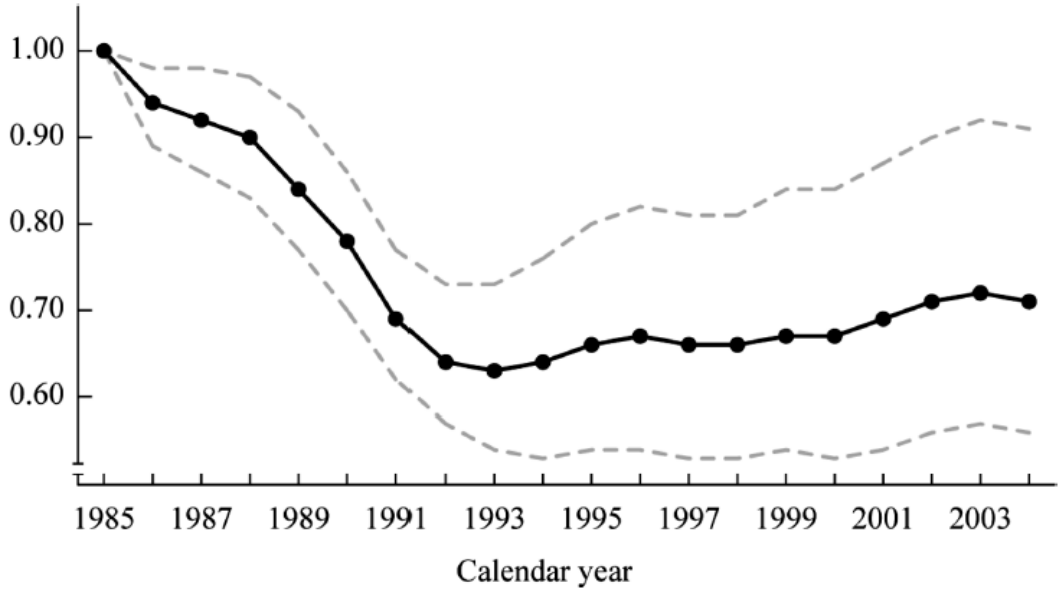


Figure 2. Driver fatality rate per million registered passenger vehicle with effect of vehicle design (model) and vehicle age removed.[8]

CHAPTER 2. WHAT IS TRAFIC SAFETY CULTURE?

As it emerges, the current use of the term "traffic safety culture" is ambiguous and colloquial. Arguably, the lack of specificity and standardization has lead to a lot of over-generalized use of this term. However, if we accept that there is sufficient evidence that an endogenous variable such as traffic safety culture can significantly influence risk behaviors and resulting crash rates, we are required to provide a definition for that construct that is applicable to developing effective traffic safety interventions. Scholars from a wide range of disciplines have called for increased attention to the cultures in which health and safety behaviors are embedded. (See references 9, 10, 11, 12 and 13). An applicable definition of traffic safety culture should specify (1) the elements that influence risk behaviors; and (2) the boundaries within which the construct operates. Such a definition is necessary to support standard, relevant and specific reference to this concept.

WHAT ARE THE ELEMENTS OF TRAFFIC SAFETY CULTURE?

Figure 3 presents a simplified model of three major facets of any culture. In this context, behaviors refer to actions that exemplify the culture such as ritual and ceremonial behavior, or actions taken to qualify for group membership or represent group membership. Artifacts are the symbols, expressions and tools of a culture, including the laws that dictate cultural compliance. Cognition is an important facet of culture that guides and motivates cultural-based behaviors. Aspects of cognition within a culture include (1) the virtues that are valued by the society; (2) beliefs about what behaviors are normal within the society; (3) expectations for violations of normative behaviors; (4) attitudes about the behaviors themselves (outcomes); and (5) the collective influence of theses cognitive factors on the decision-making process of the individual.

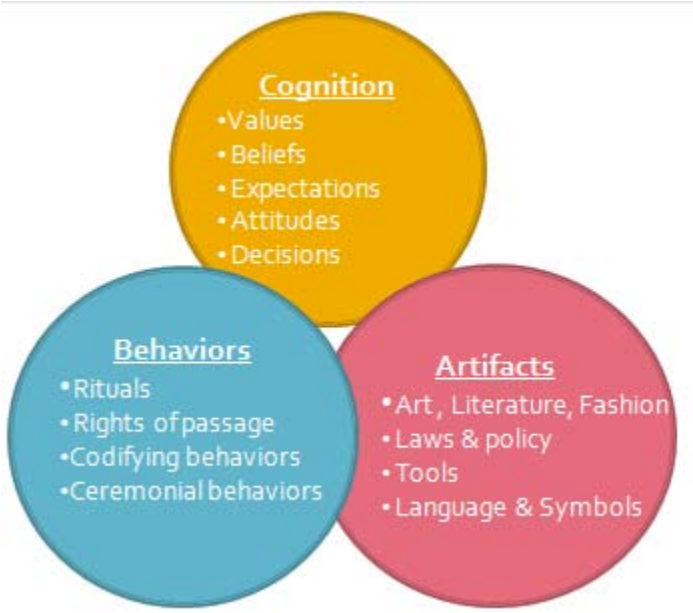


Figure 3. Simplified model of major facets that describe culture.

These cognitions in turn dictate and motivate behaviors that are deliberate reflections of the culture as shown in Figure 4. For example, Ward[(14)] argues that the belief structures embedded in the prevailing culture have a significant impact on the decision making process of the driver to

engage risky behavior and accept safety interventions. Specifically, attitudes toward that a behavior may be associated with high benefits and low costs may support decisions to engage that behavior.[15]

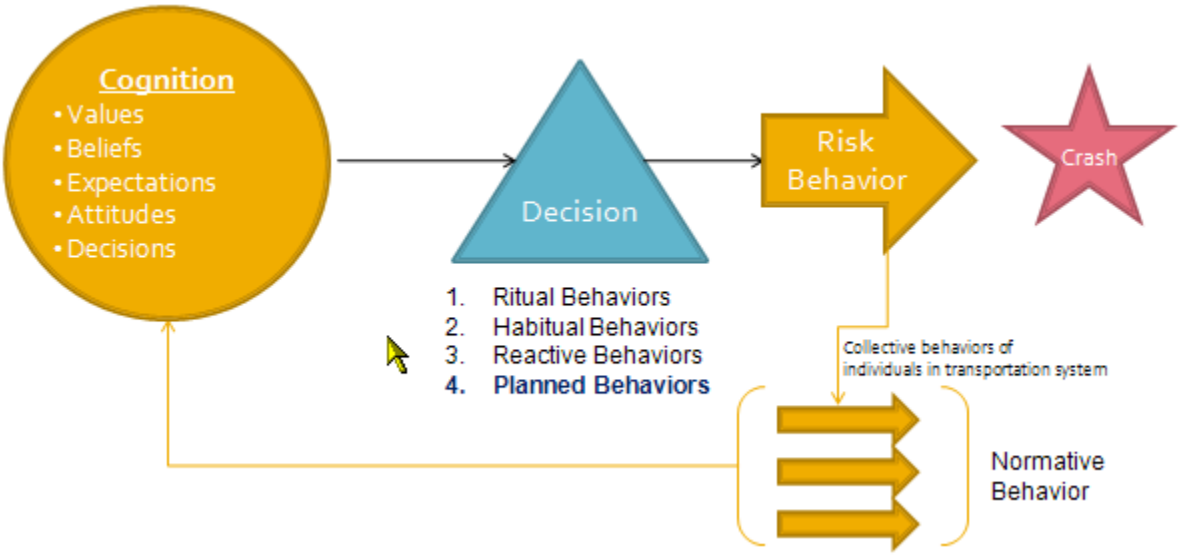


Figure 4. Proposed model for effect of cultural cognition on decision-making and risk behavior.

As will be discussed later, behaviors themselves have a reciprocal effect on cognition. For example, Lonero[16] asserts that driving behavior is powerfully influenced by driving culture, defined as "the common practices, expectations, and informal rules that drivers learn by observation from others in their communities." Thus, just as a change in culture may affect a change in normative behavior, the perception of that shift in behavioral norm will itself change the cognition of those behaviors (see Figure 4).

Finally, a culture includes artifacts that symbolize the cognitions of the culture and often enable the culture-directed behaviors. In the case of traffic safety, artifacts include traffic laws and policies that reflect the prevailing traffic safety culture.

Based on this simplified model, this paper advocates a *working* definition of traffic safety culture based on cultural cognition. Not only is the cognitive facet most representative of the endogenous nature of culture, but the cognitive factors represent the loci of behavior change which are the focus of any traffic safety intervention based on culture. In this regard, perceived norms govern all aspects of health and safety behavior, including driving behavior related to traffic safety.[17,18] Specifically, descriptive norms that describe the actual behavior that is typical for most people in their peer group. Similarly, there are injunctive norms that describe the actual attitudes held by the majority of people in a referent group about the value of that behavior. Behavioral choices are commonly based on idiosyncratic perceptions of these norms, leading to assumptions (which are commonly erroneous) about what most social referents think or do. To the extent that individuals misperceive traffic safety norms such that dangerous behavior is perceived to be normal and sanctioned, their own behavioral choices will be biased in the direction of assuming greater risk. *Thus, from a cognitive perspective, traffic safety culture can be defined as the perceptions people have about what behaviors are normal in their peer group and their expectations for how that group reactions to violations to these behavioral norms. In*

terms for traffic safety, this definition applies to behaviors that either increase crash risk (e.g., speeding) or are protective (e.g., wearing seatbelts), as well as behaviors related to acceptance or rejection of traffic safety interventions.

WHAT ARE THE BOUNDARIES OF TRAFFIC SAFETY CULTURE?

There are at least two important boundary distinctions regarding the definition of traffic safety culture. First, culture does not pervade all behavior. As highlighted in Figure 4, cultural cognition only impacts behaviors that require deliberation and planning. Those behaviors that are dictated by external doctrine (ritual), controlled subconsciously (habitual), or reactive to external events (reactive) are not subject to a decision-making process influence by the cognitive elements of a culture.

Second, traffic safety culture emerges and operates at different levels within society. In fact, Cooper[19] argues that operational definitions of safety culture to date have been overly narrow, focusing on individual attitudes and perceptions about safety at the expense of the holistic, multi-faceted nature of the concept of safety culture itself. A broader definition of safety culture includes the values, beliefs, and perceptions of organizations, communities and societies, not just individuals.[20] To understand the multiple levels of society and its impact on the emergence and operation of traffic safety culture, it is necessary to recognize the "social ecological perspective" of society.

Social Ecological Perspective

Culture and its influence operate at multiple levels. We need to not only recognize the attitudes and beliefs of the individual, but also the norms that are shared by a community. Importantly, it is not enough to focus just on the traffic safety culture of the driving population. It is also necessary to consider the culture of those agencies that propose and enforce traffic safety policy that can impact the driving population; the culture of governments that allocate resources to various traffic initiatives that may hinder or foster risk; the culture of communities that encourage or discourage risk-taking; and the culture of societies as they endorse or condemn risky driving.

Much has been written about the need to account for social problems by looking at society from a social-ecological perspective. Extensive research supports use of a social-ecological framework to understand risk behaviors such as adolescent substance use in which characteristics of the individual, as well as those of the family, peer, and community domains influence the likelihood of such involvement.[e.g., 21,22,23] One perspective shown in Figure 5 has been proposed by the U.S. Centers for Disease Control and Prevention in its approach to violence. This model considers the complex interplay between individual, relationship, community, and societal factors. It allows us to address the factors that put people at risk for experiencing or perpetrating any kind of risk behavior, including risky driving. According to this model, safety strategies that rely on culture should include a continuum of activities that address multiple levels:

- "Individual" level factors include biological and personal history factors that increase the likelihood of contributing to an unsafe driving culture. Some of these factors are age, education, income, or substance use.
- The "relationship" or "organizational" level factors include those that increase risk because of relationships with peers, co-workers, supervisors, and family members. A

person's closest social circle, e.g., peers and co-workers, influences their behavior and contributes to their range of experience.

- "Community" level factors include settings, such as schools, workplaces, and neighborhoods, in which social relationships occur and seek to identify the characteristics of these settings that are associated with a poor safety culture.
- "Societal" level factors help create a climate in which risk is encouraged or inhibited. These factors include social and cultural norms. Other large societal factors include the health, economic, educational and social policies that help to maintain economic or social inequalities between groups in society that may contribute to risk.

Figure 5. Social ecological perspective of culture.[24]

CHAPTER 3. WHAT EVIDENCE IS THERE OF "TRAFFIC SAFETY CULTURE"?

There are recognized differences in crash rates between countries, crash rates between regions, and crash rates between demographic groups. Each of these are explored in the following sections as evidence of the existence of traffic safety culture. This section also includes some examples of public health interventions targeted at safety culture, that had a demonstrated effect on behaviors.

INTERNATIONAL COMPARISON OF TRAFFIC SAFETY CULTURE

Page used a statistical regression technique to compare countries in terms of traffic fatality rates in order to deduce differences in endogenous variables such as culture.(25) Country fatality rate was first predicted based on measurable risk factors (exogenous) such as population size, vehicle fleet size, percentage of young and rural population, amount of public transit, and per capita consumption of alcohol. The fatality rate predicted by these exogenous variables was then compared to the actual rate. This comparison between the predicted and actual rates was used to infer the effect of unmeasured (endogenous) variables on fatality, such as the traffic safety culture of the driving population (e.g., attitudes toward hazardous driving behavior, acceptance of traffic safety interventions) and government agencies that are responsible for traffic safety policy and network improvements. In Figure 6, the result of this analysis is formulated as a percentage value that represents the relative influence of endogenous variables (including traffic safety culture) on the actual fatality rate. With this formulation, a negative percentage implies a risky traffic safety culture that is related to an actual fatality rate higher than the rate predicted by the exogenous variables. Page found differences between countries that were not explained by exogenous factors alone; she attributed the additional differences to country-specific safety culture, including "the ability of a road safety policy to be effective and the ability of a population to accept and respect this policy." (26)

This inferential analysis also reveals that the traffic safety culture of the United States is lower than that of most other developed countries and has changed little over several decades.

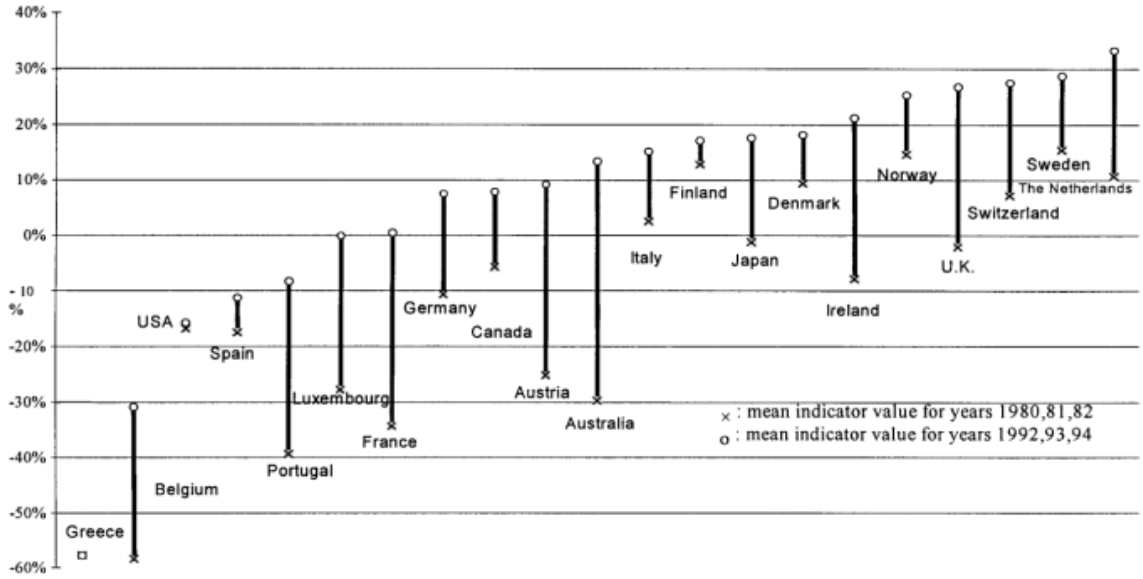


Figure 6. Inference of traffic safety culture for comparison countries.(27)

REGIONAL COMPARISON OF TRAFFIC SAFETY CULTURE

Regional comparisons of crash rates within a country can also suggest subcultural or geographic differences in traffic safety. Within the United States, an important distinction that is relevant to traffic safety exists between rural and urban regions. As shown in Figure 7, the risk to an individual of being killed in a car crash increases with the amount of rural driving exposure.[28]

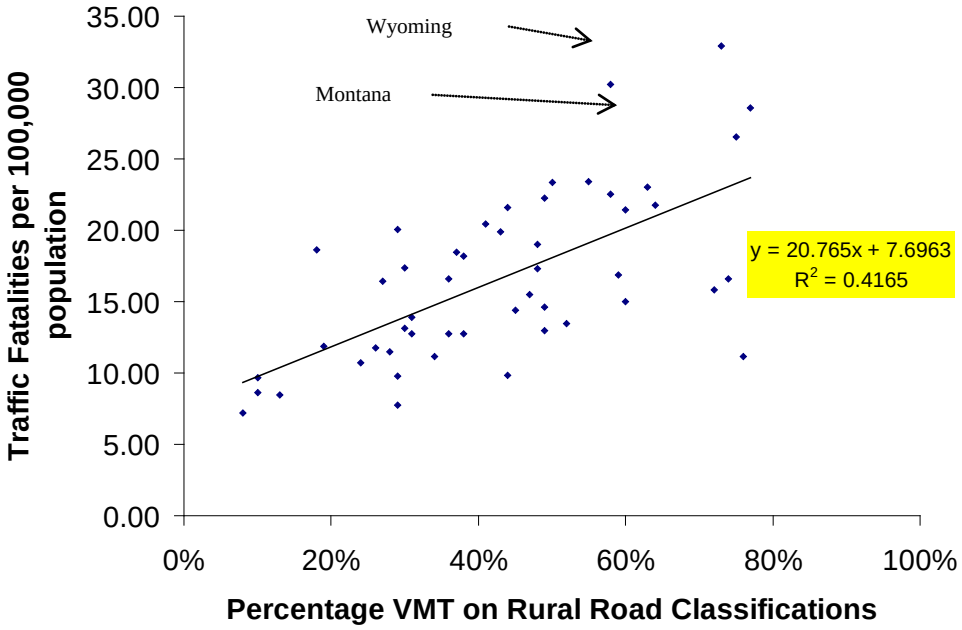
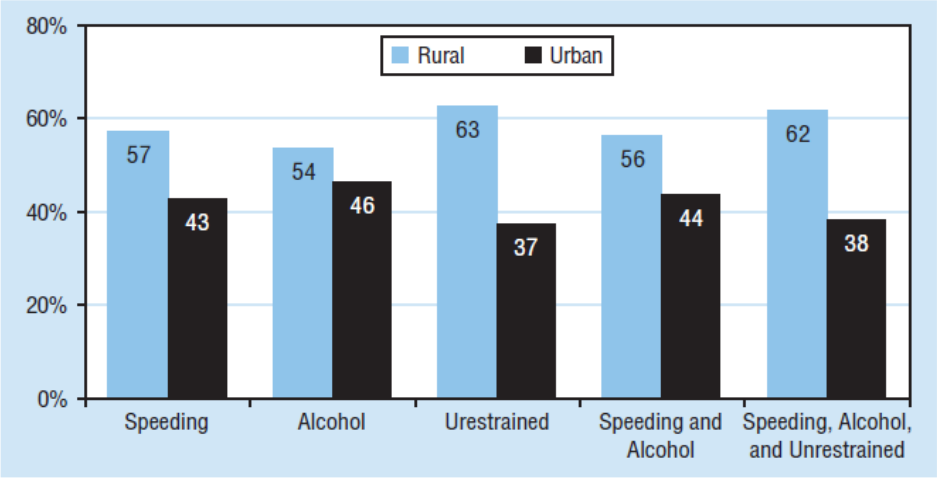


Figure 7. Relationship between rural VMT and fatal crash risk per capita for all age groups. [29]

This increased fatal crash risk in rural areas can be attributed to a number of factors that differentiate rural driving from urban driving.[30] Some of the differentiating risk factors for rural driving include geography, population density, and road design (including posted speed limits). These factors results in rural driving over long distances on hazardous roads that may increase the severity of crashes (e.g., roadside hazards, pavement edge drop offs, absence of median crash barriers) in remote areas where a crash may not be detected and emergency service recovery may be delayed. In addition, attitudes of rural communities toward traffic safety may contribute to dangerous driving behavior and rejection of traffic safety interventions. For example, Rakauskas, Ward and Gerberich[31] surveyed drivers in rural and urban counties of Minnesota and determined that rural drivers self-reported less frequent use of seat belts (notably amongst pickup truck drivers) related to a belief that not wearing seatbelts was less dangerous than perceived by urban drivers. As shown in Figure 8, certain behavioral risk factors such as unrestrained driving – in addition to speeding and alcohol – are more prevalent in rural than urban fatal crashes.[32] Rural residents also perceived less utility for most forms of traffic safety intervention (e.g., enforcement).



Note: Percent known land use.

Figure 8. Percentage of fatal crashes attributable to risk factors in rural and urban areas.[33]

DEMOGRAPHIC COMPARISON OF TRAFFIC SAFETY CULTURE

Age is one of the most fundamental demographic factors of fatal crashes that is suggestive of high risk traffic safety subcultures. Notably, Figure 9a shows that 15-to-20-year-old drivers have the highest rate of involvement in fatal crashes compared to all age groups.[34] Notably, 16-year-old drivers having the highest overall involvement rate in fatal traffic crashes as shown in Figure 9b. The high crash rate for young drivers is partly a function of novice driving skills and limited driving experience, but is also suggestive of a subculture that encourages risk engagement and acceptance of risk-taking. For example, (novice) teens have the highest rate of seat belt non-compliance, close car following, and speeding-related crashes.[35] Moreover, adolescents have been shown to use various cognitive perspectives to justify their decision to commit risky behavior.[36,37] One process is to self-justify risky choices by engaging in a "denial-like" process that negates the danger or consequences of dangerous behaviors.[38] For example, Lazarus found that adolescents engaging in reckless driving were less concerned about the health or safety consequences of driving recklessly. Generally, the cognitive strategy of not thinking about consequences of risky behavior will increase the propensity to engage in that risky behavior.

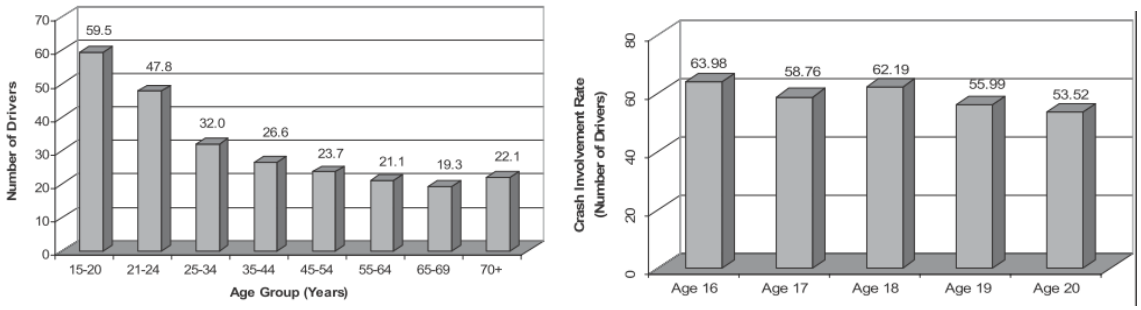


Figure 9. Involvement rate in 2005 fatal crashes per 100,000 licenses drivers (a) for all age groups; and (b) ages 16 to 20 years.[39]

RISK FACTORS AND TRAFFIC SAFETY CULTURE

According to the National Highway Traffic Safety Administration (NHTSA), speeding is one of the most prevalent risk factors contributing to approximately 30% of all fatal traffic crashes.(40) As noted in Figure 8, speeding is also a risk factor predominately associated with driving in rural areas. The prevalence of speed as a risk factor is sometimes used as evidence that our society is characteristic of a traffic safety culture that motivates and condones speeding. Specifically, it is presumed that U.S. traffic culture perceives speeding not as risky but as a behavioral norm. For example, Forward(41) used Theory of Planned Behavior to demonstrate the significant effect of perceived norms and attitudes toward speeding on actual speeding behaviors. Generally, Forward concluded that positive attitudes about the benefits of speeding were predictive of high rates of speeding behavior. Specifically, drivers who violated speed limits deliberately had positive beliefs about the outcomes of speeding, such as a pleasurable driving experience and shorter trip durations. Both deliberate and unintentional speeders were strongly influenced by perceived social norms condoning speeding as common and part of the driving ethos. Indeed, the perceived social norm that speeding is ubiquitous was used by drivers to rationalize their own illegal driving behavior. Forward recommends tailoring culture-based interventions to the distinct beliefs and attitudes of speeders.

In another study that examined the relationship between traffic safety culture and speeding, Conner et al.(42) found that intentions to speed and moral norms regarding the social acceptance of speeding predicted speeding behavior. Notably, intention to speed was itself determined by driver attitudes toward speeding, perceived social pressure to comply with speed limits, perceived social acceptance of speeding, perceived self-control over speeding behavior, and anticipated regret for violating speed limits. Conner et al. conclude that the consistent effects of moral norms on intentions and behavior may represent a target for culture-based interventions designed to change speeding behavior.

INTERVENTIONS BASED ON TRAFFIC SAFETY CULTURE

The significance of traffic safety culture as a factor in traffic risk can also be demonstrated by the success of recent safety interventions designed to impact culture. For example, the Arizona High School Seat Belt Campaign developed by researchers at Montana State University demonstrated that the traffic safety culture of teen drivers (measured as perceived and actual peer norms) has a significant influence on adolescent seat belt use.(43) Specifically, research supporting this campaign identified a number of factors that defined the risky traffic safety culture of teens who did not use seatbelts including attitudes toward the value of seatbelts, expectations of significant others (parents), and perceptions of peer use (normative behaviors).

The project used a high intensity social norms campaign to increase awareness of the importance (belief in the value of seatbelts) and general social desirability (perceptions of peer use, parent expectations) of consistent seatbelt use among high school students. Results showed unequivocally that the campaign improved the accuracy of the target audience's perceived norms; perceptions of peer seatbelt use increased dramatically at the treatment schools, while misperceptions of peer seatbelt use remained unchanged at the control schools. The study concluded that traditional interventions (involving policy change, parental and teacher education, and law enforcement) must be combined with cultural-based interventions involving changes in attitudes and perceptions of normative behaviors (using mass media and interpersonal

communication to correct misperceptions about social norms) at the individual and community levels.

As another example, a social norms marketing campaign developed by researchers at Montana State University used social norms theory to target drinking and driving in Montana.[44, 45] This social norms intervention was designed to reduce risky driving after drinking behavior. The targeted group were young adults aged 21-34 who are over-represented in alcohol-related crashes in Montana. An initial campaign survey found that, while only 20.4% of Montana young adults reported having driven within one hour of consuming two or more drinks in the previous month, 92% of respondents perceived that the majority of their peers do drive soon after drinking. This incongruence between perceived and actual normative behavior was the focal point of a 15-month media campaign funded by the NHTSA) and the Montana Department of Transportation (MDT). The campaign message conveyed by the media was a direct normative message ("MOST Montana Young Adults (4 out of 5) Don't Drink and Drive"). Using a quasi-experimental design, two levels of exposure were presented to different counties within the region. Counties received either a high or low dose of media coverage for this campaign. The attitudes and behaviors of young adults in response to this social norms message was then compared to an area of eastern Montana that served as a control area not exposed to the campaign. The results of these comparisons indicated that the media successfully reduced misperceptions that impaired driving amongst peers was common. This change in perceived norms was associated with a decrease in self-reported driving after consuming alcohol and an increase in acceptance of legal restrictions on impaired driving.

CHAPTER 4. HOW DOES TRAFFIC SAFETY CULTURE INFLUENCE BEHAVIOR?

A definition of traffic safety culture is necessary to establish the veracity of this concept. However, in order to apply that concept to the reduction of risk behaviors and crash rates, it is necessary to adopt a theoretical model of the mechanism relating this concept to engagement of risk behaviors. Such a model is necessary to guide the rational application and effective design of interventions based on traffic safety. Whereas a definition for traffic safety culture provides a standard description, an appropriate model provides the theoretical framework to guide the application of this concept in the improvement of traffic safety. The following section outlines three theories of social influence that may provide a framework to guide the application of traffic safety culture to change high risk behaviors: Social Cognition Theory, Theory of Planned Behavior, and the Social Norms Approach

SOCIAL COGNITIVE THEORY

Social Cognitive Theory (SCT) portrays human behavior as the result of the reciprocal interaction between the internal psychological factors of the person, and the external observation of the situation and behaviors.[46] Psychological factors include goals, expectations, and attitudes that function as cognitive antecedents to behavior. These psychological factors motivate certain behaviors to attain goals that a relevant to the situation. The consequences of these behaviors are evaluated in the context of the situation then fed back to the initial psychological factors. As shown in Figure 10, the theory posits that this relationship between psychological factors, behaviors, and the situation is reciprocal. Notably, the consequences of behaviors can change the psychological factors that govern future behavioral selections (e.g., behaviors with positive outcomes may be favored in future situations due to a positive attitude about the value of the behavior) and the observations of behaviors by others (modeling) can result in new behavioral repertoires, especially from the observations of others that are perceived by the observer to be similar to themselves.

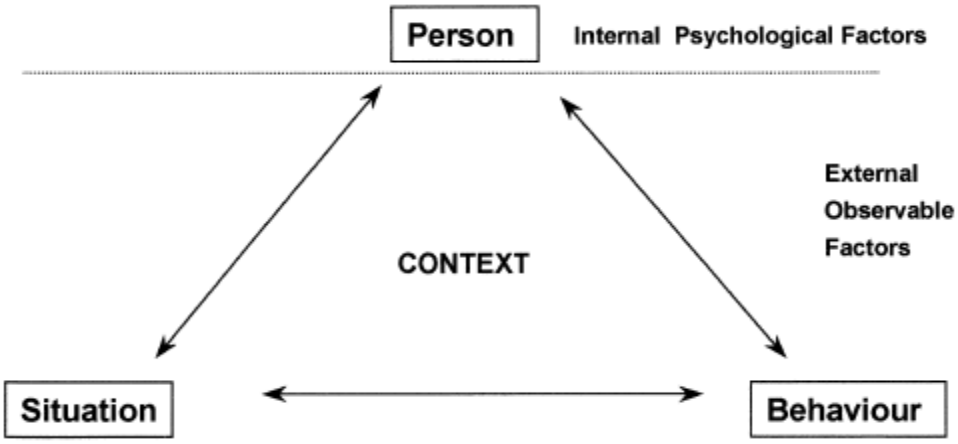


Figure 10. Illustration of reciprocal relationship between person, behaviors, and situation as defined by Social Cognition Theory.[47] (Source: Cooper, 2010).

Two important psychological factors in this theory are perceived self-efficacy and outcome expectations. Self-efficacy is defined as "people's beliefs that they can exert control over their motivation and behavior and over their social environment."[(48)] In other words, perceived self-

efficacy is what a person believes about their capability to perform a certain action in the context of the situation. Self-efficacy is a driving force of human behavior: "efficacy expectations are a major determinant of people's choice of activities, how much effort they will expend, and of how long they will sustain effort in dealing with stressful situations."[49] Outcome expectations refer the belief about the outcome that is associated with a certain behavior. According to Bandura, only when efficacy is high and outcome expectations are positive will people decide to perform certain behaviors.

Social Cognitive Theory has been used in a wide variety of interventions and evaluation efforts.[50,51] It was the theory used in the Stanford 5-Cities project to prevent heart disease and more recently has been used in several AIDS-prevention projects. Since Bandura first introduced the construct of self-efficacy in 1977, researchers have been very successful in demonstrating that individuals' self-efficacy beliefs powerfully influence their attainments in fields as diverse as life-course development, education, health, psychopathology, athletics, business, and international affairs.[52,53,54]

THEORY OF PLANNED BEHAVIOR

The Theory of Planned Behavior (TPB) is another theory that has been widely used to predict health risk behaviors, including driving violations.[55] This model states that behavioral intentions are based on attitudes towards the behavior, subjective norms, and perceived behavioral control.[56] Attitude is based on an evaluation of the consequences of a behavior and beliefs about the desirability of these consequences. “Subjective norms” in this model are defined as the perception of the individual about the opinion of others about the appropriateness of the behavior. The influence of social norms on behavioral decisions is related to the importance and similarity of the social referents, and the resulting motivation of the individual to comply with the expectations of the referents. Behavioral control is defined as the perception of an individual about the difficulty of performing a particular behavior and the degree of self-determination in deciding to engage the behavior. As shown in Figure 11, the Theory of Planned Behavior is structured as a conceptual framework to that specifies the cognitive antecedents of intention to engage a behavior and predict the conditions in which that behavior will be manifested. This theory predicts that individuals will form intentions to engage behaviors that are perceived positively and endorsed by important referents similar to themselves. Such intentions will result in manifest behaviors when the individual has volitional control and the required effort is perceived to be low.

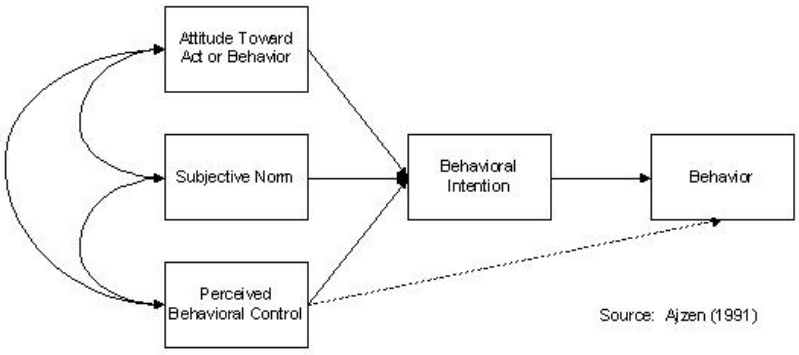


Figure 11. Model of behavioral intentions determined by attitudes, social norms, and perceived control as defined by the Theory of Planned Behavior.[57]

The Theory of Planned Behavior provides a framework within which to formulate health education messages to change high risk behaviors. Parker[58] tested TPB constructs as predictors of speeding, using experimental videos that attempted to change drivers' attitudes towards speeding using behavioral beliefs, normative beliefs, perceived behavioral control, or anticipated regret. The study found that intentions, PBC, moral norms and previous accidents were significant predictors of speeding behavior in driving simulators. For example, messages derived from this model have been applied to a number of health-related behaviors including campaigns about sexual practices and AIDS related-behaviors,[59,60] childbearing intentions,[61] testicular cancer prevention,[62] exercise in schoolchildren,[63] alcoholism,[64] cigarette smoking,[65] and many others.

SOCIAL NORMATIVE METHOD

The Social Normative Method is not itself a theory, but rather a framework that focuses on key processes represented in other theoretical models that are presumed to be the primary locus of behavioral change. Specifically, the Social Normative Method incorporates the notion from Social Cognition Theory that individuals perceive behaviors of others in a situation as a basis for deciding on their own behaviors along with the subjective norm concept from the Theory of Planned Behavior, whereby expectations about the reactions of (important) others toward a behavior influences intentions to act.

In the framework of this method, *perceived descriptive norms* are beliefs about the behaviors typically committed by members of the reference group. *Perceived injunctive norms* are beliefs about the attitudes that members of the reference group have about the commission (or omission) of those descriptive behaviors. In this framework, *traffic safety culture* is comprised of the perceptions regarding descriptive and injunctive norms that reference safe driving and those behaviors that affect traffic safety.[66,67,68] To the extent that drivers misperceive traffic safety norms such that dangerous behavior is perceived to be normal and sanctioned, their own behavioral choices will be biased in the direction of assuming greater risk. Thus, the social norm approach measures the perceptions of normal behavior and attitudes for behavioral compliance in comparison to actual behaviors and acceptance as shown in Figure 12. In effect, this methodology measures the gap between the two, and its influences on behavior.[69]

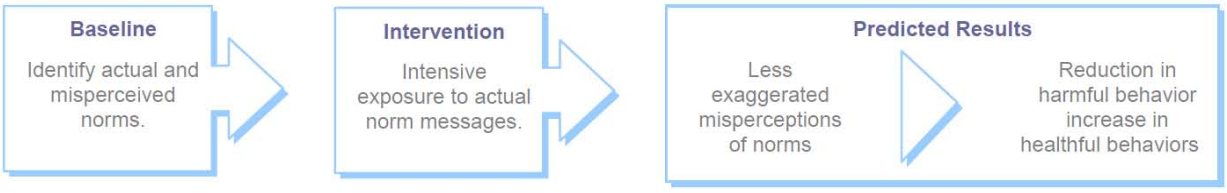


Figure 12. Framework of the social normative method.[70]

A wide range of studies demonstrate positive effects of interventions that employ social norms as a strategy. (See references 71, 72, 73, 74 and 75). Many researchers have declared the concept to be an essential strategy for changing human behavior.[76,77,78] Specific examples of interventions based on this method that were successful in increasing seatbelt use and reducing drunk driving were summarized above.

CHAPTER 5. IS TRAFFIC SAFETY CULTURE A NEW PARADIGM?

Traffic safety culture appears to be an intuitive and powerful concept with which to explain observed differences in international, regional, and demographic crash risk, as well as the propensity to commit high risk behaviors. If it is possible to define and apply this concept within a relevant social psychological theory of behavioral choice, it may be possible to develop a new paradigm for traffic safety interventions. A culture-based approach is complementary to, but fundamentally different in form and philosophy from, traditional traffic safety interventions including engineering, enforcement, and education. This difference can be summarized in relation to the goals and methods used to change driver behavior.

ENGINEERING INTERVENTIONS

Traditional engineering (road design) interventions involve infrastructure design solutions that either provide environmental features that control behavior (e.g., speed bumps) or physical barriers that protect drivers from the consequences of risky behaviors (e.g., median crash barriers) (see Figure 13). The inclusion of signing offers a method of identifying hazards and guiding behavior. Engineering solutions can also involve intelligent transportation systems that provide information to drivers about high risk behaviors (e.g., intelligent speed assistance) or adapt vehicles to improve drivers' control (e.g., electronic stability control). Common to all these manifestations of engineering interventions is a focus on behavior as something to be controlled or accommodated without consideration of the impetus for that behavior. In effect, engineering solutions treat behavior as a risk symptom without treating the underlying pathogen.

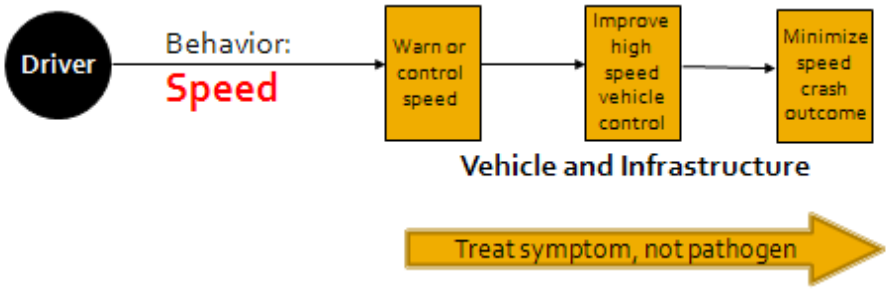


Figure 13. Illustration of design philosophy of traditional engineering traffic safety interventions.

ENFORCEMENT INTERVENTIONS

As shown in Figure 14, traditional enforcement interventions use laws to assign a surrogate risk (e.g., monetary fine, prosecution and jail) associated with a target behavior. When effective, drivers will choose to change their risk behavior to avoid a legally-enforced deterrent, not due to a change in attitudes about the behavior itself. Consequently, enforcement does not directly affect driver attitudes about risk behaviors. Therefore, enforcement should not be regarded as a direct intervention to affect traffic safety culture. However, enforcement strategies may have an indirect effect on traffic safety culture if the deterrent results in an observable shift in behavior that is perceived as normative. The process of adopting and complying with this new behavioral norm can itself revise attitudes about the behavior to reinforce its continued commission. However, similar to engineering strategies, enforcement focuses on the behavior and does not focus on the original impetus for that behavior. Instead, deterrents are themselves a form of

impetus that is introduced by an enforcement strategy to obfuscate the prior impetus for the target behavior.

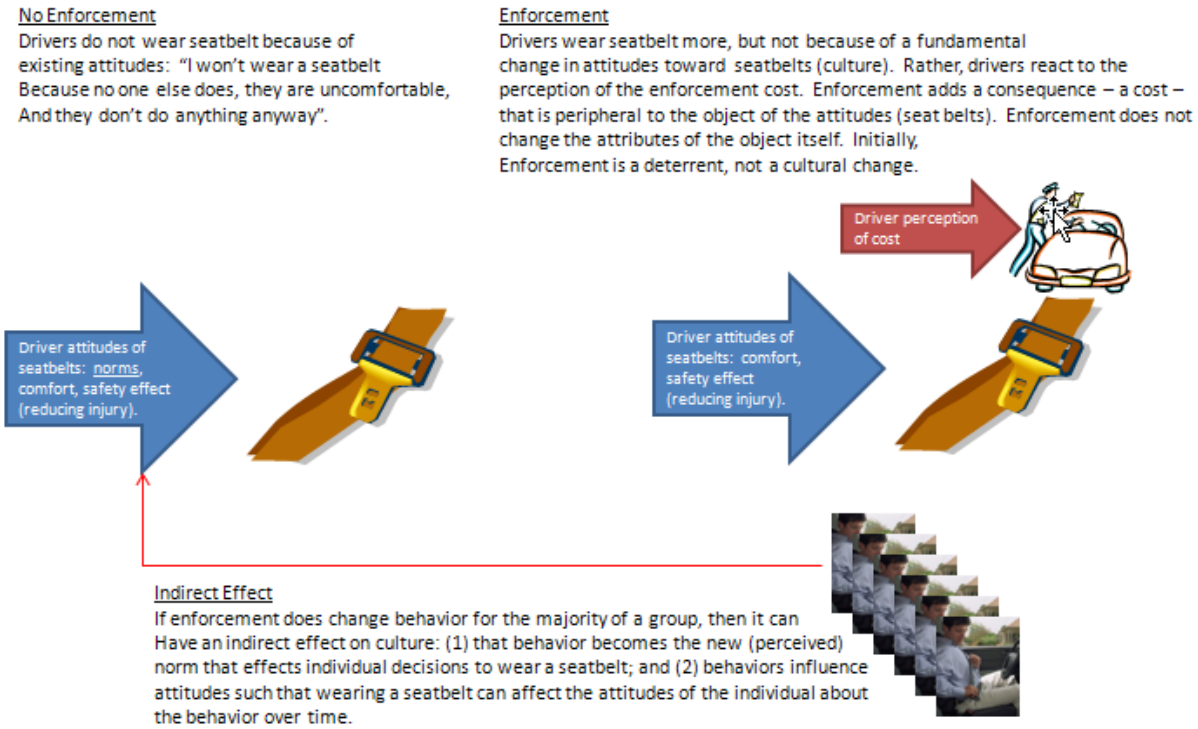


Figure 14. Illustration of design philosophy of traditional enforcement safety interventions.

EDUCATION INTERVENTIONS

Educational interventions can take many forms (see Figure 15). "Banking" or traditional education involves responses to perceived deficits in knowledge and skills necessary to perform a task.[79] These programs are designed to impart knowledge and train skills that are deemed necessary to achieve task goals. In the case of driver education programs, this approach would include teaching novice drivers knowledge about traffic laws and training them to acquire safety vehicle control and hazard perception skills. In contrast to engineering and enforcement strategies that focus on controlling, protecting or deterring behaviors, traditional educational programs are designed to provide skills and knowledge necessary to support new behaviors. However, as with enforcement and engineering, the banking form of education doesn't necessarily provide the impetus for sustaining such new behaviors. Although education is necessary to acquire safety information and skills for adopting new safety behaviors, education alone does not necessarily motivate the safe choice. By contrast, transformative education addresses the cultural attitudes, values and beliefs surrounding a set of behaviors, such as driving-related practices, and tries to motivate change by changing the culture itself.

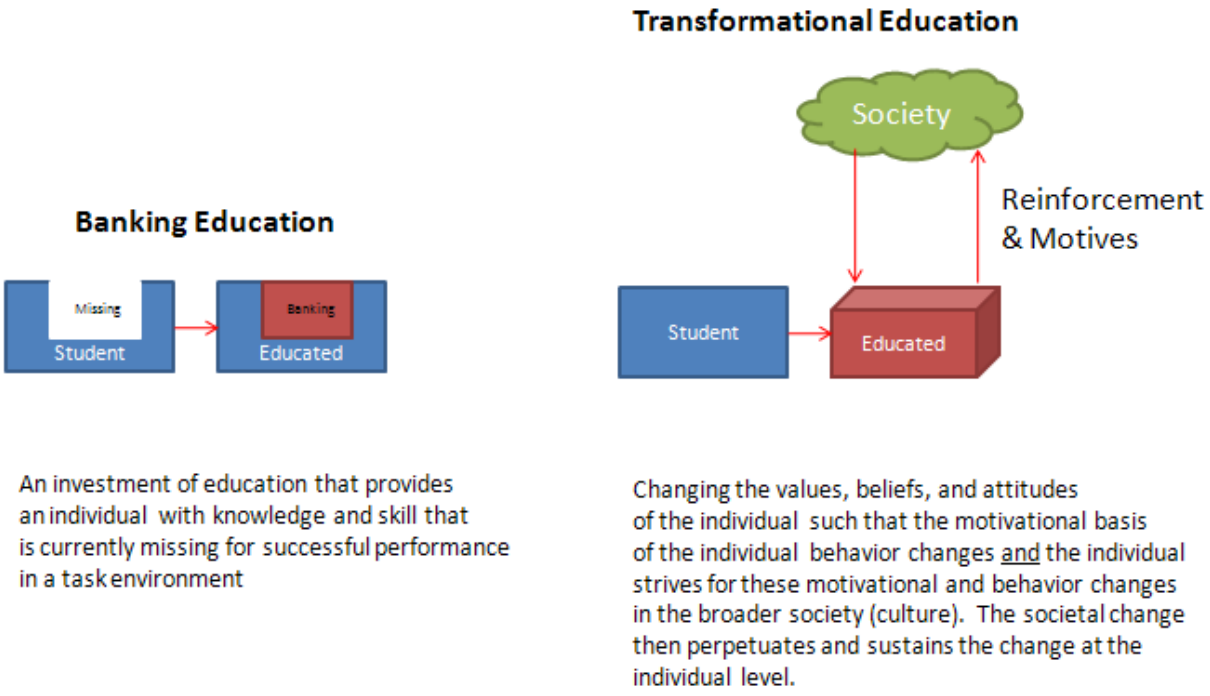


Figure 15. Illustration of design philosophy of traditional driver education programs.

TRAFFIC SAFETY CULTURE PARADIGM

Interventions can not merely rely on "banking education," [80] where information and skills are imparted within the current paradigm, without affecting underlying morals, attitudes and societal norms. Rather, a transformative approach is needed that will shift social thinking away from existing norms, assumptions and practices to shed our culture of risk-taking and embrace a new, healthier culture of safety. Thus, in regards to traffic safety, "we need to transform our culture, from a culture that accepts loss of life and limb as a price of mobility, to one in which elected officials, transportation professionals, and individual citizens expect safety, demand safety, and refuse to accept that an annual casualty count roughly equal to the population of Arkansas is a fair price to pay for mobility." [81]

The traffic safety culture paradigm is based on transformative learning as shown in Figure 16. Instead of responding to the behavior itself, this paradigm instead transforms the prevailing culture that is influencing the decisions to engage in those risky behaviors and reject traffic safety interventions. For example, instead of enforcing speeding behavior (Figure 14) or design roads to accommodate high speed crashes (Figure 13), the traffic safety culture paradigm examines and transforms the cultural cognition (see Figure 8) that influences the decision to speed or engage forms of driver impairment that are associated with speeding. That is, the focus is on analyzing and modifying the social and cognitive context of decisions as the impetus to behave. By treating the origin of risk behaviors (pathogens), culture-based interventions are pre-emptive, comprehensive, and transformational in their treatment approach. In this sense, interventions based on traffic safety culture are a form of transformative education (see Figure 15).

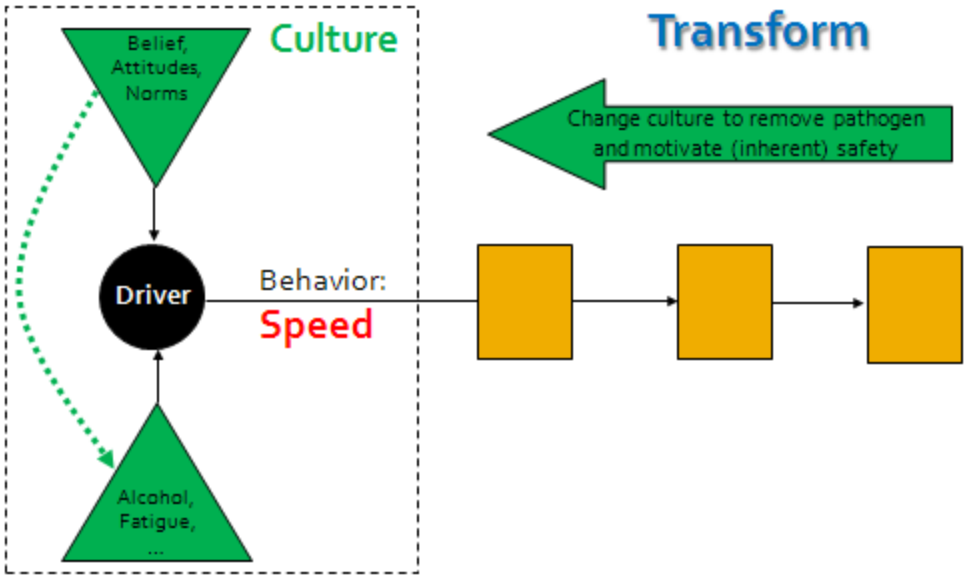


Figure 16. Illustration of design philosophy of traffic safety programs based on culture and transformational education.

Hart[82] argues that transformative education is based on the ability to question normative ideologies that sustain the status quo and especially their relation to power. The challenge to questioning [assumptive] normative ideologies resides with addressing the issue of power -- which includes who is defining "the problem" of traffic safety culture. Inglis [83] divides power into both empowerment—which is the capacity to operate within the existing ideology (normative ideology), and emancipation—which is resistance to and challenge of the existing normative ideology. We argue that an effective approach must address both change (empowerment) and transformation (emancipation) as discussed in this section. Moreover, a transformational model of traffic safety must recognize the need for transformation to occur at all levels of the socio-ecological continuum (see Figure 9).

Outcomes indicative of showing that transformation has occurred in a perceptual framework are related to three types of change: change in assumptions, change in perspective, and change in behavior.[84] All of these seem to be indicated in a shift of identity or as Boyd[85] claims, an outcome of transformative learning includes a change in self. It is precisely this "change of self" that must occur across the ecology in order to achieve lasting results through a changed public dialogue focused on what Mezirow[86] noted as the importance of critical reflection on assumptions, democratic dialogue, and reflective emancipator action (or praxis). Transformation is a proactive process that results in a shift of core assumptions and perceptions.

CHAPTER 6. HOW CAN TRAFFIC SAFETY CULTURE BE "TRANSFORMED"?

The preceding discussions provide compelling evidence that traffic safety culture is an endogenous variable that may have a significant impact on safety within our transportation system. Indeed, traffic safety culture may be the most resilient factor affecting the fatal crash rate because it is inherent to the social context of driving and embedded within the behavioral decision-making process if the individual. Accordingly, future improvements in traffic safety must incorporate a new paradigm to support interventions that can change the prevailing traffic safety culture to value safety, motivate safe behaviors, and accept safety policy. However, any short-term view of "using culture" as a "strategy" to quickly change behaviors is short-sighted. Instead, strategies for change that target culture must recognize that culture is bound by core assumptions that must be transformed. Culturally endorsed values are deeply seated and may not be ameliorated by experience and information alone.[87]

CHANGING THE PUBLIC NARRATIVE

As alluded to above, changing the public narrative concerning traffic safety issues is central to transforming the culture, and such a shift occurs through discourse and dialogue that play a major role in transformation.[88] "Discourse" is defined as a "dialogue involving the assessment of beliefs, feelings, and values.[89] Discourse is critical because people need others to help them break out of their frameworks of interpretation by reflecting their points of view back to them and acting as mirrors.[90]

This discourse involves facing and reinventing individual assumptions about traffic safety and the prevailing culture.[91] People have difficulty seeing how they construct the world they live in.[92] But as Merriam & Caffarella[93] point out, because reality is socially constructed, it can also be socially changed. The members of a society are thus actors and re-actors — they are shaped by their environments and social context but also act upon and transform them. Hence, in order to build a safer traffic culture, social and political leaders will need to initiate a process of public discourse and transformational learning that moves beyond individual-based behavior change strategies to engage communities at the macro level, and to move beyond simple transfers of knowledge to foster learning that engages audiences to build new attitudes, beliefs and values.[94]

An ultimate outcome of this type of learning is the awareness of "cultural assumptions governing the rules, roles, conventions, and social expectations which dictate the way that we see, think, feel, and act."[95] This process may shed light on the rules, roles and conventions that contribute to current traffic risk. It involves deep work that is triggered through some sort of a "disorienting dilemma" that then triggers a cycle of reflection where one revises "specific assumptions about oneself and others until the very structure of the assumptions becomes transformed."[96] The current discussion with regards to traffic safety culture in the United States has been triggered by the "disorienting dilemma" of staggering crash and fatality statistics nationwide.

TRANSFORMATIONAL LEADERSHIP

It will be a formidable challenge to involve great numbers of citizens in pursuing a positive traffic safety culture. True cultural transformation will require the active and consistent involvement of national leaders, including presidents, governors, congressional and state representatives, activists, professional athletes, celebrities, and other nationally known personalities. Traffic safety education should be incorporated into elementary and secondary

school curricula, and traffic safety activists should be everywhere, not just on the occasional television spot or billboard. As Dula and Geller[97] write:

> As more people are prompted to consider traffic safety issues, more will be inclined to examine how they can contribute to solving our ongoing national traffic tragedy. The point is again, that traffic safety must be elevated to a value at the societal level for progressive cultural change to come about.[98]

Key leaders frequently focus on the culture of others (e.g, individual drivers, the public, etc.) without understanding the role that they (themselves) play in maintaining the homeostasis of current views. For example, by continuing to pour precious resources into enforcement, traffic safety leaders may forsake education. What little education is conducted remains too narrow in scope. Traffic safety leaders, like many leaders, like people in general, are unaware of the cultural lenses they use to view the world, and how their own acculturation affects the way in which they set traffic safety policy.[99] When establishing goals, certain principles and values take precedence over others. Researchers have noted [100] that often these values go unexamined or are assumed to be held in common by both the policymakers and the recipients of an intervention. In fact, gaps often exist across the different levels of the ecological continuum whereby one set of values may be advanced in public rhetoric while quite another set may be put into practice.

NEED FOR GUIDING FRAMEWORK

Indeed, traffic safety policy directed at the issue of fatal crashes must encompass and reflect the defining characteristics of distinct cultures in order to be both effective and accepted within diverse cultural communities. Toward that end, we need to develop an appropriate conceptual framework to define culture and apply this definition to a model that relates cultural variables to safety outcomes (for example, Figure 8). A framework is needed in order to move the field forward in studying, measuring, and improving traffic safety outcomes. Although such a framework will not automatically provide answers, it will allow us to move forward to study the various elements of culture that most impact traffic risk, in order to learn what can be done about it.

Definitions

Cox and Cox[101] suggest that the broadness of the multiple definitions of safety culture that abound weaken its scientific utility, indicating that much greater precision – and more measureable outcomes -- are required. Cooper[102] suggests that by identifying outcomes that can be seen as products of safety culture, we can shift to a measureable set of parameters by which to improve the outcomes. Once identified and defined, such outcomes could be used as building blocks for a safety culture framework.

Cooper suggests that we measure safety culture by examining the observable examples of safe behavior, such as the degree to which people consistently confront others about their unsafe acts, the degree to which people report unsafe conditions, the speed with which individuals implement remedial actions, or the degree to which people give priority to safety over other concerns (such as arriving at a destination, or having a pleasurable driving experience).

Models

Bandura's reciprocal model of Social Cognitive Theory is one framework that could be used to analyze traffic safety culture (see Figure 11). The psychological, behavioral and situational elements of the model precisely mirror those of many accident causation relationships. Second, its dynamic nature suits the measurement of human and cultural systems that operate in dynamic environments. Third, it provides a triangulation view that allows researchers to take a multi-faceted view of safety culture, so that the reciprocal relationships between psychological, behavioral and situational factors can be examined with a view to establish antecedents, behavior(s), and consequence(s) within specific contexts.

Ecological Perspective

Current causal analysis tools are not designed to analyze the complexity of major accidents resulting from poor safety culture, which arise from the dynamic interactions among actors, attitudes, perceptions and environments.[103] A framework for measuring and improving traffic safety culture will need to incorporate a social ecological perspective (refer to Figure 9). Systems thinking, which attempts to understand systems holistically, emphasizes the circular nature of complex systems; new causal analysis tools and measures are needed to gain insight into such complex systems as safety cultures. Efforts to change people's behavior often do not take into account the determining effects of cultural, societal and organizational systems or people's attitudes. Change initiatives that disregard the interactive relationship between psychological, behavioral and situational factors when developing a safety culture are doomed to failure (for example, Figure 7).

Individuals: Socio-demographic and individual characteristics play an important role in shaping individual decisions to engage in any kind of risk behavior.[104] For example, adolescents are more likely than other age groups to engage in risk-taking such as substance use, alcohol abuse, and risky driving.

Objectives for individual-level changes might involve addressing the values, beliefs, and attitudes of individuals to impact individual traffic safety risk behaviors which reduce risk and increase protection. Specifically, safety culture promoters would correct misperceived norms (values, attitudes, and behaviors) around traffic safety; educate about risk and protection; and improve skills, such as driving behaviors (like 2-second rule for following).

Relationship/Organization: The social influences of the family and organizational domains are among the most frequently studied risk or protective factors associated with poor safety performance. For example, perceived parental disapproval is a known deterrent to adolescent risk-taking while driving.[105] Moreover, most adults spend a large portion of their waking hours at work, and the workplace represents a major social context in which social norms about a wide range of social behaviors can develop and be acquired. For example, Frone and Brown[106] found that social interaction at work leads to the development of norms regarding substance use and that these social norms may be related to employee substance use overall. Similarly, workplace norms may affect attitudes and behaviors related to traffic behavior, laws and policies.

Specific objectives of both relational and organizational safety culture might include: correcting misperceived norms (values, attitudes, and behaviors) and producing safety behavioral norms;[107] educating about risk and protection; skill improvement (like bystander intervention); and policy implementation (such as safety guidelines, workplace policies, etc.).[108] In order to

achieve a safe culture at the organizational or relationship (family) level, agency leaders (and parents or guardians) must be on board to ensure that safety issues receive the attention warranted by their significance,[109] and promote an agency-wide (or family-wide) commitment to safety.[110]

Community: Aspects of the contextual environment (i.e., neighborhood or community) influence attitudes and behaviors regarding a wide range of risk behaviors. For example, research has shown that such community-level characteristics are associated with substance use or related problem behaviors among adolescents.[111]

Community-level objectives might include addressing the values, beliefs, and attitudes of those in leadership positions and of those agencies and organizations impacting traffic safety at a community level (e.g., cities and states). Specifically, interventions might attempt to: correct misperceived norms (values, attitudes, and behaviors); improve skills (such as enforcement strategies, engineering and technology); implement safety policies (such as graduated licensing, sanctions and interventions for impaired drivers); and implement comprehensive prevention strategies to reduce risk and promote protection.

Society: Cultural transformation at the societal level involves transformational leaders who will establish the conditions and create the readiness for significant cultural change to occur. The societal level of culture also involves policies, political dialogue, shared cultural norms and media. By reframing the assumptions, values, beliefs and attitudes expressed within these realms, those in leadership positions can impact traffic safety at a national level.

Objectives for cultural transformation at the societal level might involve correcting misperceived norms (values, attitudes, and behaviors) of social leaders; supporting ongoing research and development to address strategies for building a positive traffic safety culture; and codifying best practices and strategies in appropriate laws and standards, with regards to vehicle safety standards, road safety standards, and commercial transportation standards.

CHAPTER 7. WHERE CAN TRAFFIC SAFETY CULTURE BE APPLIED?

People generally conform to their perceptions of the social groups to which they belong and to the expectations of those with whom they have a shared identity. The anticipation and meaning of rewards and punishments are also influenced by social group allegiances. A safety culture model has the potential to alter these perceptions and expectations and thereby shape the individual's response to laws, enforcement strategies, as well as motivational messages about driving safety. The cultural approach is important when addressing high risk groups that may have traffic safety sub-cultures that are especially high risk and resistant to traditional forms of traffic safety interventions.

REDUCING HIGH RISK DRIVING BEHAVIORS

Smith and Martin[112] identify intransigent cultural factors at the individual level that propagate high risk behaviors such as speeding, alcohol use, and seat belt non-compliance. There appears to be a misperception about the risk of a crash that is based on the infrequency with which a crash is experienced and the confidence in driving ability. This misperception may reflect a general reluctance—or even inability—of many drivers to assume responsibility for safe driving. Smith and Martin claim that this failure to recognize responsibility translates into a failure to adopt safe driving behavior, resulting in carelessness, lack of attention, failure to use safety belts, excessive speed, driving while talking on cell phones, and other dangerous habits. Evidence already presented in this paper demonstrates that these cultural beliefs can be "treated" with transformational strategies to reduce high risk behaviors such as alcohol use and seat belt non-compliance.

OVERCOMING RESISTANCE TO TRAFFIC SAFETY INTERVENTIONS

Some key barriers to generating a society-wide safety culture identified by Dula and Geller [113] include: a) lack of cultural support for any large-scale shift toward greater traffic safety, b) a vast number of relevant traffic intervention targets, c) the need to teach safety-specific behaviors to large numbers of people, d) public discomfort with acting on behalf of others (without receiving bystander training), and e) the potential for a backlash against top-down traffic safety interventions. Limited evidence shows that interventions that target cultural norms about safety can promote acceptance of safe traffic behaviors. For example, the Arizona High School Seat Belt Campaign developed by researchers at Montana State University demonstrated that the traffic safety culture of teen drivers (measured as perceived and actual peer norms) has a significant influence on adolescent seat belt use.[114] This campaign was able to shift teen attitudes in favor of seat belt use by addressing cultural norms through mass media and peer influence interventions.

ADDRESSING HIGH RISK SUBCULTURES

Traffic safety culture is neither static, nor uniform. Culture changes over time, and there are subcultures that may have a higher crash risk. It may be prudent to apply traffic safety culture transformation to these high risk subculture first to gain the most efficient and effective improvements in traffic safety. For example, Motor-vehicle crashes represent a significant public health issue for everyone in the United States, but they can pose a higher threat for certain subcultures, including adolescents and rural communities. Recent research in public health suggests that a wide range of health behaviors result from cultural factors operating at the

individual, subgroup, community and societal levels. Namely, researchers examining longitudinal behavior related to smoking, cardiovascular disease and obesity have found that risk behavior is transferred through social networks and social diffusions operating within cultural subgroups. The conclusion they draw is that interventions must alter social networks – or culture – in order to spread healthy lifestyles.(115)

MOTIVATING ORGANIZATIONAL CHANGE

To the extent that the safety of the driving public is determined by decisions and interventions by transportation agencies, it is also necessary to motivate these agencies to change their own culture toward emphasizing safety and accepting the paradigm shift of culture as the main factor influencing an individual's intrinsic motivation to choose safe behaviors over dangerous ones. Understanding the framework of safety culture will help organizational leaders understand the possible negative consequences of their decisions on safety culture and result in the design of more effective safety interventions. A cultural model of safety also helps to reduce the tendency to victimize or blame a particular group or organization for accidents and failures. However, an effective safety culture framework still requires people that use the framework for its full potential to be realized. Not only must the operational management be competent, there is a need for a new paradigm to be adopted.

CHAPTER 8. HOW MUCH CAN TRANSFORMING CULTURE BENEFIT SAFETY?

It is tempting to estimate the benefit of a traffic safety intervention based on the annual costs associated with a specific crash type or crash factor. This saving then represents a benefit that is compared to the cost for implement the intervention. Estimating the benefit of adopting a traffic safety culture paradigm to affect change within the ground transportation system is difficult.

First, traffic safety culture is not associated with a specific type of crash or crash factor. Rather, culture is presumed to have a general influence on all deliberations about risk behaviors (see Figure 8). That is, traffic safety culture is presumed to have some influence on all types of crashes and crash factors that are precipitated by a decision of the driver. For example, traffic safety culture may have a role in all speed-related crashes where the choice of speed was the result of a decision by the driver. Similarly, traffic safety culture has an impact on the decision to use seat belts that are known to reduce injury severity in crashes. Traffic safety culture may also predispose crash factors related to driver impairment where the instigation of the impairment was the result of a decision by the driver. Such deliberate cases of driver impairment would include drunk driving (deciding to drive after driving), distraction, (deciding to make or take a call while driving), and fatigue (deciding to continue driving and not stopping for a rest when tired). Although a specific cost saving from the implementation of a traffic safety culture paradigm cannot be directly estimated, it is very probable that such interventions would have a significant impact on traffic safety by virtue of its pervasive influence most driver-related crash factors. As a rough estimate, consider that crashes related to alcohol, speeding and seat belt non-use have an annual total cost of approximately $120 billion.[116] Even assuming that a transformation of the traffic safety culture affected safer decisions in 10% of the driving population, this could represent an annual savings of $12 billion dollars each year.

Second, the nature of traffic safety culture is such that it would not only affect a range of crash factors, but it would also influence the acceptance of other traffic safety interventions. In this case, the benefit of a traffic safety culture paradigm would be to establish an environment conducive to other existing and alternative forms of traffic safety intervention. In effect, a positive traffic safety culture can be synergistic with other intervention types – making all forms of intervention more effective by virtue of broader acceptance within the driving population. Consider the example of automated speed cameras that recent reviews indicate can reduce fatal crashes by about 40%.[117] If a transformed traffic safety culture resulted in the public embrace of this automated enforcement technology, then speed-related fatalities could be significantly reduced nationally. For example, with speed-related crashes costing approximately $40 billion per year,[118] a broadly accepted speed camera program with a presumed 40% effectiveness rate could save another $16 billion per year in reduced crashes above the earlier $12 billion related to a culture of reduced speeding.

Third, with so few culture-based interventions currently deployed – especially in the traffic safety domain, it is difficult to estimate the cost of implementing a national strategy to transform our traffic safety culture. With the assumption that an intervention to transform traffic safety culture would be predominately delivered though multiple media, it may be reasonable to look to other large national media campaigns. For example, it may be controversial, but informative, to reflect on the fact that nearly $6 billion is spent each year on tobacco advertising.[119] If for no other reason than to appear moral and credible to other media efforts that target unhealthy

behaviors, a health-focused campaign to change the national traffic safety culture should make a similar investment.

Even with these crude estimates of $28 billion annual saving in crash reductions and a $6 billion annual cost in implementation, we should be encouraged by the prospect that the new traffic safety culture paradigm may offer a cost-benefit ratio greater than 4:1.

CHAPTER 9. WHAT ARE THE BARRIERS TO CULTURE TRANSFORMATION?

Despite the potential for the transformation of our traffic safety culture to dramatically reduce crashes, increase safe behaviors, and support other forms of traffic safety intervention, the process of this transformation has a number of barriers that we collectively must overcome:

- **Isolation** -- Traffic safety is currently perceived in isolation from other public health issues. This is a barrier to adopting a synergistic approach to improving all health behavior, including traffic safety. This is also a barrier to collaboration among agencies broadly connected under public health. Any national effort to transform the traffic safety culture will need the collaboration of many agencies. And this transformation would be facilitated by a broader effort to achieve a positive "public health culture."
- **Tradition** -- Most responses to traffic safety problems reflect traditional approaches (engineering, enforcement, and education) that target behaviors rather than their impetus, focus on short-term change instead of long-term transformation, and confine themselves to a single level of the social ecological system (see Figure 9). Whereas some of these traffic safety interventions continue to be effective, the further improvements needed to achieve the Toward Zero Death goals require a new paradigm that focuses on the reasons for behavior and transforms culture across all levels of the social ecological continuum. To move forward with this new paradigm, we must adopt a social ecological perspective and recognize that our timeline for transforming our traffic safety culture will be longer than the short-term objectives of traditional intervention approaches.
- **Definition** -- Despite it ubiquitous reference, the current use of the term "traffic safety culture" is often colloquial, inconsistent, and vague. Such ambiguity is a barrier to convergent understanding and unification of effort. Its intuitive meaning fosters a comfort of use. However, its ease of use belies the need for a standard and precise definition to foster a common understanding and focus for synergistic efforts.
- **Omission** -- Even with a standard definition, there is currently not sufficient consideration of a theoretical model to account for the process by which traffic safety culture influences individual driver behavior. The omission (absence) of a model is a barrier to the design and deployment of effective interventions based on traffic safety culture. An appropriate model must (1) provide a framework for measuring traffic safety culture, (2) identify pathways to influence behavior, and (3) specify a process to sustain cultural transformations.
- **Direction** -- Currently, there is not enough research to support the development and direction of a transformational traffic safety culture program that could be deployed nationally. The research available can provide direction to begin the process, but much additional research needs to be adapted from other domains and new research is needed to support the transformation process related to traffic safety.

CHAPTER 10: HOW CAN WE MOVE TRAFFIC SAFETY CULTURE FORWARD?

Recognizing the barriers to transforming our traffic safety culture, there are some primary recommendations that can be drawn from this paper to support the process of adopting a new paradigm for traffic safety culture:

- **We must challenge core assumptions** -- Assumptions create our perceptual frames and then beliefs, attitudes and norms about traffic safety. Transforming our national safety culture means we must critically reflect and engage in dialogue to fundamentally revise our values and priorities to support the Toward Zero Death goals.
- **We must think ecologically** -- We must recognize that traffic safety culture operates at many levels within the social ecological system. Our interventions, funding and policy decisions must reflect systemic thinking and be designed to operate across various ecological levels. Individual drivers are only one part of a very complex system which also includes families, organizations, communities, sub-cultures and social norms.
- **We must focus long-term** – Culture and transformation are long-term dynamics. It is insufficient to speak of and apply traffic safety culture as a short-term process. Results-oriented agencies may often choose immediate (reactive) results and campaigns over the sustained development of a new paradigm. A proactive, long-term focus is needed to cultivate and sustain transformation.
- **We must envision cultural health** – It is critical that the public conceive of traffic safety culture as part being part of a larger conversation whereby safe driving is one part of a culture of healthy behavior and livable communities. This process begins with envisioning healthy community cultures.
- **We must be dynamic** – It is important that we recognize that traffic safety culture changes dynamically in response to the environment and social norms. As such, we must continuously revise and update our assumptions and strategies based upon new information and data.
- **We must customize strategies** – Traffic safety culture, like any ecological system is comprised of a myriad of numerous specific subcultures and subsystems. We must research the salience of different reference groups and generate customized strategies to meet local needs.
- **We must create dialogue** -- The transformation process occurs through critical reflection by guiding the emergence of the traffic safety solution from within a community rather than by dictating an intervention from outside. Engaged dialogue of concerned citizens is the key to any successful social movement.
- **We must engage transformational leaders** – Leaders must be engaged who understand national traffic safety perspective and can move the new paradigm forward through transformational learning strategies. These leaders must be bold, visionary and understand the process of fostering critical reflection and dialogue amongst local citizens.

As a practical recommendation, in order to move traffic safety culture forward as a national strategy with the conceptual needs listed above, it would be necessary as a first step to develop an umbrella agency to develop and manage this strategy. Such an agency would include leaders from all transportation agencies responsible for traffic safety policy at least at the national level, but eventual would need to have links to the state and community level. Two important features of this new agency would be that (1) it is headed by a transformation leader that can champion

and drive this strategy forward; and (2) the agency resides within the NIH (or CDC) to ensure that the agency efforts are framed and synergistic with a broader emphasis on public health. In order to be effective, this agency would need to integrate traffic safety culture across all levels of our transportation system and operate through pervasive methods of community based research and social communication.

REFERENCES

[1] Peden, et al., 2004.

[2] WISQARS (2010). Office of Statistics and Programming, National Center for Injury Prevention and Control, Centers for Disease Control and Prevention. Retrieved June 9, 2010 from http://www.cdc.gov/injury/wisqars/fatal.html.

[3] Peden et al., 2004.

[4] Sivak, M. & Schoettle, B. (2010). Toward understanding the recent large reductions in US road fatalities. UMTRI (UMTRI-2010-12).

[5] MDT (2008). *Traffic problem identification* (FF2009). Helena, MT: State Highway Traffic Safety Bureau, Montana Department of Transportation.

[6] Farmer, C.M., & Lund, A.K. (2006). Trends over time in the risk of driver death: What if vehicle designs had not improved? *Traffic Injury Prevention*, 7, 335 – 342.

[7] Farmer & Lund, 2006.

[8] Farmer& Lund, 2006.

[9] May, J. (1998). Safety since Piper Alpha. *Offshore International*, 125-127.

[10] Rosen, M. (1997). Towards a global nuclear safety culture. *Nuclear Energy*, 36, 287-289.

[11] Payer, H. (1998). ISM Code: The future impact. *Safety at Sea*, 350, 12-14.

[12] Cooper, S. D. (2000). Towards a model of safety culture. *Safety Science*, 36, 111-136.

[13] AAA, 2007.

[14] Ward, 2007.

[15] Wilde, J.G.S. (1994). *Target risk.* Kingston, ON: PDE Publications.

[16] Lonero, L. P. (2007). Finding the next cultural paradigm for road safety. In AAA Foundation for Traffic Safety (Ed.), *Improving traffic safety culture in the United States: The journey forward*. Washington, DC: AAA Foundation for Traffic Safety, p. 7.

[17] Beck, K. H., Shattuck, T., Raleigh, R., & Hartos, J. (2003). Does graduated licensing empower parents to place greater restrictions on their newly licensed teens' driving? *Health Education & Behavior*, 30, 695–708.

[18] Hartos, J. L., Beck, K. H., & Simons-Morton, B. G. (2004). Parents' Intended limits on adolescents approaching unsupervised driving. *Journal of Adolescent Research*, 19, 591-606.

[19] Cooper, 2000.

[20] Conti, G.C. & Fellenz, R.A. (1990). *Cultural influences on adult learning*. Bozeman, MT: Center for Adult Learning Research, Montana State University, p. 6.

[21] Hawkins, J. D., Catalano, R. F., & Miller, J. Y. (1992). Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. *Psychological Bulletin*, 112, 64–105.

[22] Petraitis, J., Flay, B. R., Miller, T. Q., Torpy, E. J., & Greiner, B. (1998). Illicit substance use among adolescents: A matrix of prospective predictors. *Substance Use and Misuse*, 33, 2561–2604.

[23] Scheier, L. M. (2001). Etiologic studies of adolescent drug use: A compendium of data resources and their implications for prevention. *Journal of Primary Prevention*, 22, 125–168.

[24] Dahlberg, L. L., & Krug, E. G. (2002). Violence-a global public health problem. In: Krug E, Dahlberg LL, Mercy JA, Zwi AB, Lozano R, (Eds.). *World report on violence and health*. Geneva, Switzerland: World Health Organization, 1-56.

[25] Page, 2001.

[26] Page, 2001, p. 372.

[27] Page, 2001.

[28] Traffic Safety Facts (2002). *Rural / Urban comparisons*. DOT HS 809 739. Washington, DC: National Highway Transportation and Safety Administration.

[29] Traffic Safety Facts (2002). *Rural / Urban comparisons*. DOT HS 809 739. Washington, DC: National Highway Transportation and Safety Administration.

[30] Ward, 2007.

[31] Rakauskas, M., Ward, N., & Gerberich, S. (2009). Identification of differences between rural and urban safety cultures. *Accident Analysis and Prevention*, 41, 931-937.

[32] Traffic Safety Facts (2006). *Rural / Urban comparisons*. DOT HS 810 812. Washington, DC: National Highway Transportation and Safety Administration.

[33] Traffic Safety Facts, 2006.

[34] Compton, R. P., & Ellison-Potter, R. P. (2008). *Teen driver crashes: A report to congress*. DOT HS 811 005. Washington, DC: NHTSA.

[35] Centers for Disease Control (2010). Retrieved July 6, 2010 from http://www.cdc.gov/MotorVehicleSafety/Teen_Drivers/teendrivers_factsheet.html.

[36] Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford, CA: Stanford University Press.

[37] Gerard, M., Gibbons, F. X., Reis-Bergan, M., & Russell, D. M. (2000). Self-esteem, self-serving cognitions and health risk behavior. *Journal of Personality*, 68, 1177-1200.

[38] Lazarus, R. S. (1983). The costs and benefits of denial. In S. Breznitz (Ed.), *The denial of stress* (pp. 1-30). New York: International Universities Press.

[39] Compton & Ellison-Potter, 2008.

[40] Traffic Safety Facts (2004). *Speeding*. DOT HS 809 915. Washington, DC: NHTSA.

[41] Forward, S. (2010). Intention to speed in a rural area: Reasoned but not reasonable. *Transportation Research: Part F*, 13, 223-232.

[42] Conner, M., Lawton, R., Parker, D., Chorlton, K., Manstead, A. S. R., & Stradling, S. (2007). Application of the theory of planned behavior to the prediction of objectively assessed breaking of posted speed limits. *British Journal of Psychology*, 98, 429-453.

[43] NHTSA (2008). *Evaluation of the Most of Us Arizona High School Seatbelt Campaign*. Washington, DC: U.S. Department of Transportation, National Highway Traffic Safety Administration [NHTSA].

[44] Linkenbach, J.W., & Perkins, H.W. (2005). *MOST of Us prevent drinking and driving: A successful social norms campaign to reduce driving after drinking among young adults in Western Montana.* DOT HS 809 869. Washington, DC: National Highway Traffic Safety Administration—U.S. Department of Transportation.

[45] Perkins, H. W., Linkenbach, J. W., Lewis, M. A., & Neighbors, C. (in press). Effectiveness of social norms media marketing in reducing drinking and driving: A statewide campaign. *Addictive Behaviors*.

[46] Cooper, 2000.

[47] Cooper, 2000.

[48] Bandura, A. (1989). Perceived self-efficacy in the exercise of control over AIDS infection. In V.M. Mays, G.W. Albee, & S.S. Schneider (Eds.), *Primary prevention of AIDS: Psychological approaches* (pp. 128 - 141). Newbury Park, CA: Sage, p. 128.

[49] Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice-Hall, p. 194.

[50] Bolt, M. A., Killough, L. N., & Koh, H. C. (2001). Testing the interaction effects of task complexity in computer training using the social cognitive model. *Decision Sciences* 32(1), 1-20.

[51] Glanz, K., Rimer, B.K. & Lewis, F.M. (2002). *Health behavior and health education. Theory, research and practice*. San Francisco: Wiley & Sons.

[52] Stajkovic, A. D., & Luthans, F. (1998). Self-efficacy and work-related performances: A meta-analysis. *Psychological Bulletin*, 124, 240-261.

[53] Bandura, 1977.

[54] Pajares (2002). Overview of social cognitive theory and of self-efficacy. Retrieved September 4, 2009, from http://www.emory.edu/EDUCATION/mfp/eff.html.

[55] Elliott, M. A., Armitage, C. J., & Baughan, C. J. (2003). Drivers' compliance with speed limits: An application of the theory of planned behavior. *Journal of Applied Psychology,* 88, 964–972.

[56] Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes,* 50, 179–211.

[57] Ajzen, 1991.

[58] Parker, D. (2002). Changing drivers' attitudes to speeding: Using the theory of planned behaviour.

In D. Rutter & L. Quinne (Eds.), *Changing health behaviour* (pp. 138–152). Buckingham: Open University Press.

[59] Fishbein, M., & Middlestadt, S. E. (1989). Using the theory of reasoned action as a framework for understanding and changing AIDS-related behaviors. In V. M. Mays, G. W. Albee, & S. S. Schneider (Eds.), *Primary prevention of AIDS: Psychological approaches* (pp. 93-110). Newbury Park, CA: Sage.

[60] Fishbein, M., Middlestadt, S. E., & Hitchcock, P. J. (1991). Using information to change sexually transmitted disease related behaviors: An analysis based on the theory of reasoned action. In J.N. Wasserheit, S.O. Aral, and K. K. Holmes (Eds.), *Research issues in human behavior change and sexually transmitted diseases in the AIDS era* (pp. 243-257). Washington, DC: American Society for Microbiology.

[61] Crawford, T.J., & Boyer, R. (1985). Salient consequences, cultural values, and childbearing intentions. *Journal of Applied Social Psychology*, 15, 16-30.

[62] Brubaker, R.G., & Wickersham, D. (1990). Encouraging the practice of testicular self-examination: A field application of the theory of reasoned action. *Health Psychology*, 9, 154-163.

[63] Ferguson, K. J., Yesalis, C. E., Pomrehn, P. R., & Kirkpatrick, M. B. (1989). Attitudes, knowledge, and beliefs as predictors of exercise intent and behavior in schoolchildren. *Journal of School Health*, 59, 112-115.

[64] Fishbein, M., Ajzen, I., & McArdle, J. (1980). Changing the behavior of alcoholics: Effects of persuasive communication. In I. Ajzen & M. Fishbein (Eds.), *Understanding attitudes and predicting social behavior.* Englewood Cliffs, NJ: Prentice-Hall.

[65] Norman, N. M., & Tedeschi, J. T. (1989). Self-presentation, reasoned action, and adolescents' decisions to smoke cigarettes. *Journal of Applied Social Psychology*, 19, 543-558.

[66] Perkins et al., in press.

[67] Paicheler, 1976.

[68] Pepitone, 1976.

[69] Perkins, H. W., & Berkowitz, A. D. (1986). Perceiving the community norms of alcohol use among students: Some research implications for campus alcohol education programming. *International Journal of the Addictions*, 21, 961–976.

[70] Perkins, H. W. (Ed.) (2003). *The social norms approach to preventing school and college age substance abuse: A handbook for educators, counselors, and clinicians*. San Francisco, CA: Jossey-Bass.

[71] Agostinelli, G., Brown, J. M., & Miller, W. R. (1995). Effects of normative feedback on consumption among heavy drinking college students. *Journal of Drug Education*, 25, 31-40.

[72] Haines, M. P. & Spear, S. F. (1996). Changing the perception of the norm: A strategy to decrease binge drinking among college students. *Journal of American College Health*, 45, 134-140.

[73] Neighbors, C., Larimer, M. E., & Lewis, M. A. (2004). Targeting misperceptions of descriptive drinking norms: Efficacy of a computer delivered personalized normative feedback intervention. *Journal of Consulting and Clinical Psychology*, 72, 434–447.

[74] Linkenbach, J. & Perkins, H. W. (2003a). Most of Us are tobacco free: An eight-month social norms campaign reducing youth initiation of smoking in Montana. In H. W. Perkins (Ed.), *The social norms approach to preventing school and college age substance abuse: A handbook for educators, counselors, and clinicians.* San Francisco, CA: Jossey-Bass.

[75] Linkenbach, J. & Perkins, H. W. (2003b). Misperceptions of peer alcohol norms in a statewide survey of young adults. In H. W. Perkins (Ed.), *The social norms approach to preventing school and college age substance abuse: A handbook for educators, counselors, and clinicians*. San Francisco, CA: Jossey-Bass.

[76] Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.

[77] McKirnan, D. J. (1980). The conceptualization of deviance: A conceptualization and initial test of a model of social norms. *European Journal of Social Psychology*, 10, 79-93.

[78] Pepitone, 1976.

[79] Freire, P. (1970). *Pedagogy of the oppressed.* New York: Seabury Press.

[80] Freire, 1970.

[81] AAA, 2007, p. ii

[82] Hart, M. (1990). Thematization of power, the search for common interests, and self-reflection: Towards a comprehensive concept of emancipatory education. *International Journal of* Lifelong Education, 4(2), 119-134.

[83] Inglis, T. (1997). Empowerment and emancipation. *Adult Education Quarterly, 48*(1), 3-17.

[84] Cranton, P. (2008). *Understanding and promoting transformative learning: A guide for educators of adults.* San Francisco: Jossey-Bass.

[85] Boyd, R.D. (1989). Facilitating personal transformation in small groups, Part I. Small Group Behavior, 20(4), 459-474.

[86] Mezinrow, J. (1981). A critical theory of adult learning and education. *Adult Education, 32*(1) 3-27.

[87] Riggio, R. E., Murphy, S. E., & Pirozzolo, F. J. (2002). *Multiple intelligences and leadership*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc., Publishers.

[88] Cranton, 2008.

[89] Mezirow, J. (2003). Transformative learning as discourse. *Journal of Transformative Education*, 1, 58-63.

[90] Brookfield, S. (1991). *Developing critical thinkers: Challenging adults to explore alternative ways of thinking and acting.* San Francisco: Jossey-Bass.

[91] Dirkx, J. M. (1997). Nurturing soul in adult learning. In P. Cranton (Ed.). *Transformative learning in action: Insights from practice.* San Francisco, CA: Jossey-Bass.

[92] Cunningham, P.M. (1988). The adult educator and social responsibility. In R.G. Brockett (Ed.), *Ethical issues in adult education*. New York: Teachers College Press.

[93] Merriam, S.B. & Caffarella, R.S. (1991). *Learning in adulthood*. San Francisco, CA: Jossey-Bass.

[94] Mezirow, J. (1981). A critical theory of adult learning and education. *Adult Education*, 32, 3-27.

[95] Mezinrow, 1981, p. 13.

[96] Mezirow, 1981, p. 8.

[97] Dula, C. S., & Geller, S. (2007). Creating a total safety traffic culture. In AAA Foundation for Traffic Safety (Ed.). *Improving traffic safety culture in the United States: The journey forward*. Washington, DC: AAA Foundation for Traffic Safety.

[98] Dula & Geller, 2007, p. 191.

[99] Riggio, Murphy & Prizzolo, 2002.

[100] Merriam & Caffarella, 1991.

[101] Cox & Cox, 1996.

[102] Cooper, 2000.

[103] Goh, Y. M., Brown, H., & Spickett, J. (2010). Applying systems thinking concepts in the analysis of major incidents and safety culture. *Safety Science*, 48, 302-309.

[104] Petraitis et al., 1995.

[105] Beck, Shattuck, Raleigh & Hartos, 2003.

[106] Frone, M. R., & Brown, A. (2010). Workplace Substance-Use Norms as Predictors of Employee Substance Use and Impairment: A Survey of U.S. Workers. *Journal of Studies on Alcohol Drugs*, 71, 526-534.

[107] Uttal, B. (1983). The corporate culture vultures. *Fortune Magazine*, October 17.

[108] Turner, B.A., Pidgeon, N., Blockley, D., Toft, B., 1989. *Safety culture: its importance in future risk management.* Position paper for the Second World Bank Workshop on Safety Control and Risk Management, Karlstad, Sweden.

[109] IAEA (1991). *Safety Culture* (Safety Series No 75- INSAG-4). Vienna, Austria: International Nuclear Safety Advisory Group, International Atomic Energy Authority.

[110] HSC (1993). *ACSNI Study Group on Human Factors*. 3rd Report: Organizing for Safety. London: Health and Safety Commission, HMSO.

[111] Jessor, R., Donovan, J. E., & Costa, F. M. (1991). *Beyond adolescence: Problem behavior and young adult development*. New York: Cambridge University Press.

[112] Smith, K., & Martin, J. W. (2007). A barrier to building a traffic safety culture in America: Understanding why drivers feel invulnerable and ambivalent when it comes to traffic safety. In AAA Foundation for Traffic Safety (Ed.). *Improving traffic safety culture in the United States: The journey forward*. Washington, DC: AAA Foundation for Traffic Safety.

[113] Dula & Geller, 2007.

[114] NHTSA, 2008.

[115] Dixon, J., & Banwell, C. (2009). Theory driven research designs for explaining behavioral health risk transitions: The case of smoking. *Social Science & Medicine*, 68, 2206-2214.

[116] NHTSA (2000). *The economic impact of motor vehicle crashes 2000*. Washington, DC: U.S. Department of Transportation and the National Highway Transportation and Safety Administration.

[117] Insurance Institute for Highway Safety (2010). Retrieved July 6, 2010 from http://www.iihs.org/research/qanda/speed_lawenf.html.

[118] Traffic Safety Facts, 2004.

[119] Answers.com (2010). *Advertising of unhealthy products*. Retrieved July 6, 2010 from http://www.answers.com/topic/advertising-of-unhealthy-products.