Accident Analysis and Prevention 67 (2014) 7–13

Contents lists available at ScienceDirect

Accident Analysis and Prevention

journal homepage: www.elsevier.com/locate/aap

# Active transportation: Do current traffic safety policies protect non-motorists?

Emily M. Mader[a,*], Cathleen D. Zick[b]

[a] Department of Family Medicine, SUNY Upstate Medical University, 710 Irving Ave., Suite 200, Syracuse, NY 13210, United States
[b] Department of Family and Consumer Studies, University of Utah, 225 South 1400 East, Rm. 228, Salt Lake City, UT 84112, United States

ARTICLE INFO

*Article history:*
Received 4 November 2013
Received in revised form 28 January 2014
Accepted 28 January 2014
Available online 4 February 2014

*Keywords:*
Active transportation
Traffic safety
Non-motorist
Pedestrian
Motor vehicle crashes

ABSTRACT

*Objective:* This study investigated the impact that state traffic safety regulations have on non-motorist fatality rates.
*Methods:* Data obtained from the National Highway Traffic Safety Administration (NHTSA), the Federal Highway Administration (FHWA), and the National Institute on Alcohol Abuse and Alcoholism (NIAAA) were analyzed through a pooled time series cross-sectional model using fixed effects regression for all 50 states from 1999 to 2009. Two dependent variables were used in separate models measuring annual state non-motorist fatalities per million population, and the natural log of state non-motorist fatalities. Independent variables measuring traffic policies included state expenditures for highway law enforcement and safety per capita; driver cell phone use regulations; graduated driver license regulations; driver blood alcohol concentration regulations; bike helmet regulations; and seat belt regulations. Other control variables included percent of all vehicle miles driven that are urban and mean per capita alcohol consumption per year.
*Results:* Non-motorist traffic safety was positively impacted by state highway law enforcement and safety expenditures per capita, with a decrease in non-motorist fatalities occurring with increased spending. Per capita consumption of alcohol also influenced non-motorist fatalities, with higher non-motorist fatalities occurring with higher per capita consumption of alcohol. Other traffic safety covariates did not appear to have a significant impact on non-motorist fatality rates in the models.
*Conclusion:* Our research suggests that increased expenditures on state highway and traffic safety and the initiation/expansion of programs targeted at curbing both driver and non-motorist intoxication are a starting point for the implementation of traffic safety policies that reduce risks for non-motorists.


## Introduction

Active transportation refers to sustainable, multimodal transportation solutions that connect people to where they need to go using "active" modes of transport, such as walking, cycling and taking public transit (Insall, 2013). In recent decades, transportation planners, public health officials, and environmental advocates have all begun to place substantial emphasis on the benefits of active transportation as they relate to improvements in health and reductions in both traffic congestion and greenhouse gas emissions (Berrigan et al., 2006; Frank et al., 2010; Furie and Desai, 2012; Giles-Corti et al., 2010; Insall, 2013; ODOT, 2013; Wanner et al., 2012).

Identifying those factors that affect non-motorist safety is an important research endeavor based on safety considerations alone. However, the growing interest in promoting active transportation makes our current investigation even more timely and salient. Recent research has found that active transportation, including the act of walking or bicycling to public transit, can substantially contribute to physical activity levels among individuals of various demographic backgrounds, and can positively impact some of the leading health issues in the United States, including cardiovascular disease and overweight/obesity (Berrigan et al., 2006; Frank et al., 2010; Furie and Desai, 2012; Litman, 2013b). While no firm conclusions regarding causality can be drawn from these studies, they have served as a catalyst for the growing emphasis on incorporating active transportation options into transportation planning. Active transportation has also been shown to reduce greenhouse gas emissions, congestion and noise (Frank et al., 2010; Williams, 2013). A recent assessment published by the Victoria Transport Policy Institute found that active transportation may present an effective means of reducing vehicle traffic congestion due to short

* Corresponding author. Tel.: +1 315 464 7010.
*E-mail addresses:* madere@upstate.edu (E.M. Mader), zick@fcs.utah.edu (C.D. Zick).

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http://dx.doi.org/10.1016/j.aap.2014.01.022

trips in urban areas, and that there is a monetary benefit to this reduction (Litman, 2013a). Additionally, an assessment conducted by the California Department of Health concluded that active transportation can help contribute to real reductions in carbon dioxide emissions from vehicle traffic (Maizlish et al., 2011).

Despite the potential implications for congestion, health, and the environment, safety for those engaging in active transportation remains a substantial issue. Encouraging individuals to use active transportation, including walking and bicycling, brings with it a societal obligation to protect commuters as they engage in these modes of travel. In fact, a failure to increase the feeling of security individuals have as they use active transportation will place limits on any increase in these modes of travel; this feeling of security derives from both crime prevention and protection from motor vehicle contact (Cohen, 2012; Jacobsen et al., 2009). Yet, little is known about how current traffic safety regulations affect non-motorist safety. Consequently, this study investigated the impact of existing traffic safety regulations on non-motorist safety.

### *Non-motorists commuters*

Non-motorists are defined as persons not in or upon a motor vehicle and consist of walking pedestrians, bicyclists, individuals in wheel chairs or motorized personal conveyances, skateboarders and others (NHTSA, 2012b,c). Non-motorists are a vulnerable segment of the traveling public. Pedestrians and bicyclists involved in collisions with motor vehicles lack a protective structure, and differences in mass heighten their injury susceptibility (Williams, 2013). The National Highway Traffic Safety Administration (NHTSA) reported that 618 bicyclists were killed and 512,000 were injured in motor vehicle crashes in 2010; in the same year, 4280 pedestrians were killed and 70,000 were injured in motor vehicle crashes (NHTSA, 2012b,c).

While protecting non-motorists from motor vehicle crashes is a challenge, the United States seems to be making progress in reducing non-motorist fatalities. Fig. 1 shows that both median non-motorist fatalities per state and mean non-motorist fatalities per million people in a state trended downward between 1999 and 2009. Historically, road systems in the United States were built for motor vehicles, with little attention in design for non-motorists who may wish to travel on or alongside roads, cross them, or change direction at intersections. Recent advancements in urban planning that incorporate non-motorists into roadway designs may be responsible for some of the decline in non-motorist fatalities; however, older existing roadway networks continue to present issues for non-motorist safety (Williams, 2013). Investigations into factors impacting non-motorist safety on roadways have generally concluded that, in addition to roadway design, driver and non-motorist inebriation, low-light conditions, and increased vehicle speed have detrimental effects on non-motorist safety (Lee and Abdel-Aty, 2005; Moudon et al., 2011; NHTSA, 2012b,c; Vivoda et al., 2008; Williams, 2013). In this literature, little attention has been given to the potential impact of state-level traffic safety regulations as they relate to non-motorists' safety.

### *Focus of investigation*

With the increasing focus placed upon travelers using active transportation, the question of whether current traffic safety regulations provide any benefit to non-motorist traffic becomes salient. There exist several strategies to prevent non-motorist collision with motor vehicles. Laws and regulations targeting pedestrian and cyclist interactions with motor vehicles, as well as enforcement and education of those laws, are one such avenue of prevention (Williams, 2013). Laws designed to curb auto-related traffic accidents may also lead to a reduction in accidents that involve non-motorists. In this study, operationalized measures of laws and regulations targeting both motorists and non-motorists were created and their impact on non-motorist fatality rates analyzed in an effort to understand how these laws and regulations impact non-motorist safety, separate from the general trend toward incorporating non-motorist traffic in to roadway designs.

## Methodology

### *Data*

This study utilized data from the Fatality Analysis Reporting System (FARS) data set from 1999 to 2009, which is made publicly available by NHTSA. Due to methodological changes in the reporting of FARS data, the data collected from years prior to 2010 cannot be compared to data from 2010 or later (NHTSA, 2011). Thus, the data years utilized in this study account for the most recent period of comparable data. Non-motorist injury data were unavailable for this 11-year period. FARS collects information at the individual crash level; PROC SQL in SAS was utilized to convert the unit of analysis to the state-year. Through this conversion, crash-level measures were converted into summary count measures per state in a given year. The rate of non-motorist fatalities per million people in the state was computed using population data from the Federal Highway Administration (FHWA).

### *Policy covariates*

Several variables capturing policy influences on non-motorist safety were operationalized in this study. The following list targeted regulatory influences on elements of traffic safety that may impact non-motorists. Many of the selected variables reflect regulations that have been evaluated and presented as pertinent traffic safety regulations in the existing literature – due either to an observable impact in traffic safety or a notable significance in public sentiment – but have not been assessed in terms of their impact on non-motorist safety.

Recent research indicates that wearing a bicycle helmet reduces the risk of traumatic brain injury during a crash (Borglund et al., 1999; Thompson et al., 1996). Several assessments of state laws targeting cyclist helmet use suggest that the presence of these laws do increase helmet use, translating into a change in the severity and frequency of head injuries to cyclists (Williams, 2013). To date, all of these state helmet laws mandate helmet usage only for individuals age 18 and younger and thus may have only limited effectiveness in increasing helmet usage among adult cyclists (IIHS, 2013b). Nevertheless, since a majority of bicycle-related head injuries and fatalities result from bicycle-motor vehicle collisions, we included a dichotomous variable accounting for the presence of a bicycle helmet use law in our analyses (Borglund et al., 1999; Noakes, 1995).

Three-stage graduated driver license (GDL) systems are designed to reduce the high crash risk of young and novice drivers (Fell et al., 2011). Components of GDL systems that have shown the greatest efficacy in reducing fatal-crash involvement of young, novice drivers include a learner permit period of at least six months, teen passenger restrictions, and nighttime driving restrictions (Ehsani et al., 2013; Masten et al., 2013). A dichotomous variable accounting for the implementation of supervised driving hours, nighttime driving restrictions and/or passenger restrictions for young, novice drivers was created to account for the effect GDL laws may have on non-motorist safety; most states have enacted regulations addressing each of the three stages in the GDL system at some point over the past decade (IIHS, 2013a).

Conclusions of recent research suggest that safety measures that make motorists feel safer may act as a mechanism for transferring risk and lead to an increase in risky driving behavior (Chirinko