Needs Statement 569 – Yielding to Pedestrians: Literature Search

Monday, June 24, 2019

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Resources searched: Library catalog, ASCE Database, TRID, Rip, Transport Database, Web

Summary: Results are compiled from the databases named above. Links are provided for full-text, if applicable, or to the full record citation. I completed my searches using the following terminology: driver, yield, pedestrian, speed, speeding. The listed results below are categorized by most and least relevant.

Most Relevant Results

Library Catalog

Evaluation of R1-6 gateway treatment alternatives for pedestrian crossings: follow up report

- Creator: Van Houten, Ron.
- Contributor: Hochmuth, Jonathan. ; University of Minnesota. Center for Transportation Studies. ; University of Minnesota. Roadway Safety Institute. ; Western Michigan University. Department of Psychology.
- Description: Monthly follow-up data confirmed that permanent in roadway installations of the R1-6 gateway treatment led to an increase in the percentage of drivers yielding to pedestrians at midblock and multilane urban and suburban locations from 15% to 70% and that these increases endured without any decrement over the spring, summer and fall of 2016. Speed data collected at each site showed 4 to 5 mph reduction in mean when motorists traversed the crosswalk when pedestrians were absent. These speed changes persisted over time. An additional study showed that placing the signs between 5, 10, 20, 30, and 50 ft in advance of the crosswalk were equally effective and they enticed drivers to yield further ahead of the crosswalk. Data on sign survival showed that signs mounted on a curb type mount with a flexible rubber attachment all survived while only 58% of the flush mounted signs with a pivoting base survived. Data showed that none of the signs mounted on top of the edge of a curb on a refuge island or median island, curb extension, or the curb on the edge of the roadway under FHWA permission to experiment were destroyed or damaged.

https://conservancy.umn.edu/handle/11299/189957

Transport Database

Result 2.

Title Effects of median refuge island and flashing vertical sign on conspicuity and safety of unsignalized crosswalks.

Source Transportation Research Part F: Traffic Psychology and Behaviour. 2019/1. 60(0) pp 427-439 (Figs., Photos., 92 Refs., Tabs.)
Abstract: Pedestrian crossings are critical points in terms of road safety because they tend to be characterized by high accident rates. Pedestrian safety at zebra crossings depends mainly on vehicles' speed. In this study the effects of median refuge island and "Yield here to pedestrians" flashing vertical sign on pedestrian crossing conspicuity were assessed with a before-after analysis of both speed and visual behaviour of drivers approaching to crosswalks. The elements of the pedestrian crossing that were more salient and how drivers' visual behaviour was related to speed were assessed analysing drivers' eye movements. The intervention significantly increased the fixation time to the zebra markings and the addition of the flashing light increased conspicuity and fixation time to the vertical sign. The median refuge island was glanced by 60.7% of the drivers. Distance of first-fixation of the crosswalk increased by 44.7%. Notwithstanding mean and V85 speed parameters were lower after the intervention, the effects on crosswalk visual attention were higher than on speed.

Publication Year: 2019

Title: Pedestrians' Crossing Behavior at Marked Crosswalks on Channelized Right-Turn Lanes at Intersections.

Source: Procedia Computer Science. 2017. 109 pp 233-240 (Figs., Photos., Refs., Tabs.)

Abstract: Unsignalized marked crosswalks are problematic locations from pedestrians' safety perspective. Although the priority rule at such locations is clear; pedestrians have the absolute right of way over vehicles, driver often compete with pedestrians over the right of way which risks pedestrian safety and impose extra delays on pedestrians. In developing countries, as concluded in many previous studies, vehicles usually do not give right of way to pedestrians, leaving them with the only choice to wait until an accepted gap is available. In Gulf Cooperation Council (GCC) countries where vehicles are the predominant mode of travel, pedestrians are receiving lesser priority. Drivers usually hijack the right of way from pedestrians which often causes safety threats. Therefore, pedestrians loose the reason for crossing at these designed locations pushing them to cross at arbitrary locations increasing their safety risk. This paper investigates influencing factors on the crossing behavior of pedestrians at marked crosswalks located on dedicated right-turn lanes. A study site from Doha, Qatar was selected for video recording and data analysis. A sample of 235 pedestrian observations was used for waiting behavior, crossing speed, accepted gaps, and driver yielding behavior analysis. The results showed that the waiting behavior was independent of pedestrian characteristics and relied only on the traffic characteristics. In addition, the average crossing speed was 1.43m/s and the gender, distraction, and group significantly affected the crossing speed. Beside, the distracted pedestrians and pedestrians crossing in groups accepted significantly larger gaps compared to undistracted and individual pedestrians. Moreover, about 15% of drivers yielded for
pedestrians, yielding was irrespective of gender and mainly affected by the crossing direction. Consequently, innovative strategies in terms of engineering measures and awareness are needed to improve pedestrian safety at these locations.

**Title**  
Pedestrian-driver communication and decision strategies at marked crossings.

**Source**  
Accident Analysis & Prevention. 2017/5. 102 pp 41-50 (Figs., Photos., Refs., Tabs.)

**URL**  
http://dx.doi.org/10.1016/j.aap.2017.02.018

**Abstract**  
The aim of this work is to describe pedestrian-driver encounters, communication, and decision strategies at marked but unsignalised crossings in urban areas in the Czech Republic and the ways in which the parties involved experience and handle these encounters. A mixed-methods design was used, consisting of focus groups with pedestrians and drivers regarding their subjective views of the situations, on-site observations, camera recordings, speed measurements, the measurement of car and pedestrian densities, and brief on-site interviews with pedestrians. In close correspondence with the literature, the authors' study revealed that the most relevant predictors of pedestrians' and drivers' behaviour at crossings were the densities of car traffic and pedestrian flows and car speed. The factors which influenced pedestrians' wait/go behaviour were: car speed, the distance of the car from the crossing, traffic density, whether there were cars approaching from both directions, various signs given by the driver (eye contact, waving a hand, flashing their lights), and the presence of other pedestrians. The factors influencing drivers' yield/go behaviour were: speed, traffic density, the number of pedestrians waiting to cross, and pedestrians being distracted. A great proportion of drivers (36%) failed to yield to pedestrians at marked crossings. The probability of conflict situations increased with cars travelling at a higher speed, higher traffic density, and pedestrians being distracted by a different activity while crossing. The findings of this study can add to the existing literature by helping to provide an understanding of the perception of encounter situations by the parties involved and the motives lying behind certain aspects of behaviour associated with these encounters. This seems necessary in order to develop suggestions for improvements. For instance, the infrastructure near pedestrian crossings should be designed in such a way as to take proper account of pedestrians' needs to feel safe and comfortable, as well as ensuring their objective safety. Thus, improvements should include measures aimed at reducing the speed of approaching vehicles (e.g. humps, speed cushions, elevated crossings, early yield bars, and narrow lanes), as this would enhance yielding by motor vehicles. Other measures that specifically rely on the subjective perception of different situations by the parties involved include the education and training of drivers, the aim of which is to promote their understanding and appreciation of pedestrians' needs and motives.
Result 6.

Title  Investigating the Effects of Rectangular Rapid Flash Beacons on Pedestrian Behavior and Driver Yielding on 25 Mph Streets: A Quasi-Experimental Field Study on a University Campus.


URL  http://dx.doi.org/10.1016/j.trf.2016.05.004

Abstract  Rectangular Rapid-Flash Beacons (RRFBs) are safety measures that have become popular in recent years in the USA. Such equipment has demonstrated effectiveness in reducing vehicle speed and conflicts among road users, and increasing drivers' yielding to pedestrians. However, RRFB effects on pedestrian behaviors are less well documented, and perhaps could produce contraindicated effects in crossing behavior. Specifically, RRFBs may give pedestrians a feeling of protection and induce them to more risk-taking when crossing the road. The current study was designed to investigate drivers and pedestrians' reactions to a RRFB system installed at a university campus located in Virginia, USA. The authors deployed (a) field observation, using a multiple pretest/posttest non-equivalent control group quasi-experiment design and (b) interviews of students throughout the project's multiple time periods. In total, 2454 pedestrians and 1312 drivers were observed and 265 students were interviewed. RRFB installations did not distinguish driver yielding likelihood between sites with or without RRFBs. However, driver yielding overall increased linearly over the five rounds of the study. Whether this was the result of the general presence of RRFBs on campus from the third round to the end of the fifth round is unknown. There is evidence from person interviews that students perceived increased safety for pedestrians over time. Being a RRFB chosen site or actual activation of the RRFBs did not have a significant relationship with pedestrian looking behavior either. The potential consequences of these results as well as the context of RRFB use on a university campus and generally low-speed roads are discussed.

Publication Year  2016

Result 7.

Title  Evaluation of a pedestrian-activated warning system at crosswalks: "SeeMe" (Evaluering av et fotgjengeraktivert varslingssystem i gangfelt: left-pointing-double-angle SeeMe right-pointing-double-angle ).


Abstract  SeeMe is a warning system with automatic pedestrian detection that is mounted on crosswalk signs. Amber flashing lights are activated when pedestrians are approaching or crossing the crosswalk. The aim is to attract motorists' attention, to improve yielding
behavior and to reduce conflicts. A before-after study with a matched control group has been conducted in the Norwegian municipality of Trondheim. Video observations were made at eight crosswalks (four of which were equipped with SeeMe in the after period) of 1825 pedestrian-motorist interactions. Yielding rate increase by a statistically significant 14% when all crosswalks are taken together. The results are however inconsistent between crosswalks. Yielding rates increased by 39% at two of the crosswalks (statistically significant) and decrease by 4% at the other two crosswalks (not statistically significant). Differences between crosswalks with increased and unchanged yielding rates were initial yielding rates (below vs. above 80%), placement of crosswalk signs (immediately at vs. at some distance from the crosswalk) and false alarm rates (30% vs. 57% on average). The number of crosswalks included in the study is however too small to generalize these differences. The results do not indicate that SeeMe has negatively affected pedestrian behavior or increased the number of conflicts. It is concluded that SeeMe may be effective in increasing motorist yielding rates at crosswalks with similar characteristics - two lane roads in residential areas with speed limits of 50 kph or below - and that high initial yielding rates and high rates of false alarms may limit its effectiveness.

Publication Year 2016

Result 8.

Title Analysis of dilemma zone for pedestrians at high-speed uncontrolled midblock crossing.

Source Transportation Research Part C: Emerging Technologies. 2016/9. 70 pp 42-52 (Figs., Refs., Tabs.)

URL http://dx.doi.org/10.1016/j.trc.2016.04.012

Abstract Pedestrians are vulnerable to accidents and are at risk whenever they share road space with vehicular traffic. The risk to pedestrians is especially high in countries like India where a large number of pedestrians are seen on roads with vehicular traffic not yielding to their needs. Therefore, it is not surprising that many of the victims of road accidents in India, particularly in urban areas, are pedestrians. One of the primary reasons for accidents at pedestrian crossing (when drivers do not yield to pedestrians) lies in the inability of pedestrians to judge the safe gap while crossing a road. Often pedestrians are in a state of confusion/dilemma while making a decision on whether to accept or reject a gap. Under these circumstances, decision making for pedestrians during road crossing is a tough task. This paper aims at analyzing and quantifying the dilemma zone for crossing pedestrians at high-speed uncontrolled midblock crossings. A field study was undertaken in which crossing pedestrians and through-moving vehicles were recorded by placing video cameras at selected midblock road sections, having marked pedestrian crossing. Total of 1107 pedestrian lags/gaps were extracted and studied with consideration of both temporal and spatial lags/gaps for analysis. Dilemma zone was determined by using different methods such as the gap cumulative distribution method, the binary logit method, the support vector machine and the probabilistic method. For the selected midblock sections, dilemma zone started at 49 m
and ended at 62 m upstream from the marked pedestrian crossing. The upper and lower boundaries of dilemma zone can be further used to develop a pedestrian assistance system at mid-block crossing for the safe movement of pedestrian.

Publication Year 2016

Result 9.

Title Critical Gap Estimation for Pedestrians at Uncontrolled Mid-Block Crossings on High-Speed Arterials.

Source Safety Science. 2016/7. 86 pp 295-303 (Refs.)

URL http://dx.doi.org/10.1016/j.ssci.2016.03.011

Abstract This paper aims to explore pedestrian temporal and spatial gap acceptance at uncontrolled mid-block street crossings, where vehicles do not yield to pedestrians and pedestrians have to choose safe gap on their own. This results in complex interactions between pedestrians and vehicles. Analyzing the interactions is important from both safety and performance evaluation of pedestrian crossings. The paper reports the applicability and generality of driver's gap acceptance models to the pedestrian's gap acceptance. Temporal and spatial critical gaps are estimated using both deterministic (Raff's and Ashworth's method) as well as probabilistic approaches (Maximum Likelihood method and Logit method). The data collected using video camera at two uncontrolled marked mid-block crossings resulted in 1107 lag/gap observations. The analysis found that (a) temporal and spatial gaps follow lognormal distribution, (b) speed of the conflicting vehicle has significant effect on the spatial gap acceptance, (c) critical gap values by deterministic methods are smaller than those by probabilistic methods, (d) temporal and spatial critical gaps by different methods vary between 3.6-4.3 s and 60-73 m respectively. These values are much lower than the widely accepted values calculated using HCM 2010. The analysis can be used in developing methodologies for safety and level of service evaluation of uncontrolled pedestrian crossings.

Publication Year 2016

Result 10.

Title Effects of safety measures on driver's speed behavior at pedestrian crossings.

Source Accident Analysis & Prevention. 2015/10. 83 pp 111-124 (Refs.)

URL http://dx.doi.org/10.1016/j.aap.2015.07.016

Abstract This paper reports the results of a multi-factorial experiment that was aimed at the following: (a) analyzing driver's speed behavior while approaching zebra crossings under different conditions of vehicle-pedestrian interaction and with respect to several safety measures and (b) comparing safety measures and identifying the most effective
treatment for zebra crossings. Three safety countermeasures at pedestrian crossings (curb extensions, parking restrictions and advanced yield markings) and the condition of no treatment (baseline condition) were designed on a two-lane urban road and implemented in an advanced driving simulator. Several conditions of vehicle-pedestrian interaction (in terms of the time left for the vehicle to get to the zebra crossing at the moment the pedestrian starts the crossing) were also simulated. Forty-two drivers completed the driving in the simulator. Based on the recorded speed data, two analyses were performed. The first analysis, which focused on the mean speed profiles, revealed that the driver's speed behavior was affected by conditions of vehicle-pedestrian interaction and was fully consistent with previous findings in the literature and with the Threat Avoidance Model developed by Fuller. Further analysis was based on variables that were obtained from the speed profiles of drivers (the speed at the beginning of the deceleration phase, the distance from the zebra crossing where the deceleration began, the minimum speed value reached during the deceleration, the distance from the pedestrian crossing where the braking phase ended and the average deceleration rate). Multivariate variance analysis (MANOVA) revealed that there was a significant main effect for safety measures and for pedestrian conditions (the presence and absence of a pedestrian). The results identified that the curb extension was the countermeasure that induces the most appropriate driver's speed behavior while approaching the zebra crossing. This conclusion was also confirmed by outcomes of the questionnaire on the countermeasure's effectiveness. More than 80% of the drivers perceived that the curb extensions were effective, which indicates that when this countermeasure was present, the drivers were more willing to yield and that the visibility of the pedestrian crossing was better. For this countermeasure, the lowest number of interactions in which the drivers did not yield to a pedestrian was also recorded.

Publication Year 2015

Title Pedestrian and motorists' actions at pedestrian hybrid beacon sites: findings from a pilot study.

Source International Journal of Injury Control and Safety Promotion. 2015/4. 22(2) pp 143-152 (Refs.)

URL http://dx.doi.org/10.1080/17457300.2013.857694

Abstract This paper focuses on an analysis of pedestrian and motorists' actions at sites with pedestrian hybrid beacons and assesses their effectiveness in improving the safety of pedestrians. Descriptive and statistical analyses (one-tail two-sample T-test and two-proportion Z-test) were conducted using field data collected during morning and evening peak hours at three study sites in the city of Charlotte, NC, before and after the installation of pedestrian hybrid beacons. Further, an analysis was conducted to assess the change in pedestrian and motorists' actions over time (before the installation; 1 month, 3 months, 6 months, and 12 months after the installation). Results showed an increase in average traffic speed at one of the pedestrian hybrid
beacon sites while no specific trends were observed at the other two pedestrian hybrid beacon sites. A decrease in the number of motorists not yielding to pedestrians, pedestrians trapped in the middle of the street, and pedestrian-vehicle conflicts were observed at all the three pedestrian hybrid beacon sites. The installation of pedestrian hybrid beacons did not have a negative effect on pedestrian actions at two out of the three sites. Improvements seem to be relatively more consistent 3 months after the installation of the pedestrian hybrid beacon.

Publication Year 2015

Result 13.

Title Pedestrian Safety at Crosswalks - Examining Driver Yielding Behavior at Crosswalks with GM1 and OF Systems.


Abstract Pedestrian crossing control is one of the most critical elements in providing a safe pedestrian network. This paper evaluates and compares the safety of pedestrians at crosswalks with side-mounted passive signs (GM1 systems) and crosswalks with overhead flashing devices (OF systems) by examining driver yielding behavior in Winnipeg. Past research indicates that driver yielding at uncontrolled marked crosswalks (similar treatments to GM1 systems) tends to be low, as these crosswalks do not have flashing lights or other devices that provide the driver with information about when they need to stop. Previous research on crosswalks with overhead flashing beacons (similar treatments to OF systems) has shown that flashing beacons increase driver awareness, yet exhibit a wide range of driver yielding rates. Furthermore, there is limited research on pedestrian safety at crosswalks in winter, which is a concern for Winnipeg during almost half of the year. This paper presents results of a collision analysis, environmental scan, and field investigations on driver yielding behavior to evaluate the safety of pedestrians at crosswalks with GM1 or OF systems in Winnipeg. The collision analysis reflects City of Winnipeg police-reported collision data from 2001 to 2010. The data was analyzed to identify temporal trends and collision frequency by traffic control type and severity. The environmental scan includes a review of literature on driver yielding behavior at crosswalks with similar treatments to GM1 and OF systems, as well as a survey of major Canadian jurisdictions regarding the design and implementation of GM1 and OF systems. The field investigation involved collecting data during off-peak hours on driver yielding behaviour at eight crosswalks with GM1 or OF systems on roadways with two lanes per direction and a raised refuge. The data was analyzed to compare driver yielding at GM1 and OF crosswalks and evaluate the effect of weather and site specific characteristics on driver yielding behavior. TAC's Pedestrian Crossing Control Guide (PCC Guide) recommends that OF systems be implemented on roadways with two lanes per direction and a raised refuge for a range
of traffic volumes and speed limits; however, GM1 crosswalks are still widely used across Canada under these circumstances. This paper provides evidence of a significant difference in driver yielding behavior and ultimately pedestrian safety at crosswalks with OF systems compared to crosswalks with GM1 systems, supporting the PCC Guide's recommendation that OF systems be implemented on roadways with two lanes per direction and a raised refuge.

Result 14.

Title Event-Based Modeling of Driver Yielding Behavior at Unsignalized Crosswalks.

Source Journal of Transportation Engineering. 2011/7/1. 137(7) pp 455-465 (4 Figs., Refs., 5 Tabs.)

URL http://dx.doi.org/10.1061/(ASCE)TE.1943-5436.0000225

Abstract This research explores factors associated with driver yielding behavior at unsignalized pedestrian crossings and develops predictive models for yielding by using logistic regression. It considers the effect of variables describing driver attributes, pedestrian characteristics, and concurrent conditions at the crosswalk on yield response. Special consideration is given to "vehicle dynamics constraints" that form a threshold for the potential to yield. Similarities to driver reaction in response to the amber indication at a signalized intersection are identified. The logit models were developed from data collected at two unsignalized midblock crosswalks in North Carolina. The data include before and after observations of two pedestrian safety treatments, an in-street pedestrian crossing sign and pedestrian-actuated in-roadway warning lights. The analysis suggests that drivers are more likely to yield to assertive pedestrians who walk briskly in their approach to the crosswalk. In turn, the yield probability is reduced with higher speeds, with deceleration rates, and if vehicles are traveling in platoons. The treatment effects proved to be significant and increased the propensity of drivers to yield, but their effectiveness may be dependent on whether the pedestrian activates the treatment. The results of this research provide new insights into the complex interaction of pedestrians and vehicles at unsignalized intersections and have implications for future work toward predictive models for driver yielding behavior. The developed logit models can provide the basis for representing driver yielding behavior in a microsimulation modeling environment.

Result 16.

Title Double-Red Signal Reduces Crashes at Crosswalks.

Source Status Report. 2010/9/28. 45(10) p 7 (1 Photos., 1 Refs.)
Abstract

This article describes a relatively new type of crosswalk signal that is showing promise as a strategy to reduce crashes at intersections where a full-fledged traffic signal is not necessary. The High-Intensity Activated Crosswalk (HAWK) beacon consists of 2 red lights over 1 yellow and is typically marked with large pedestrian crossing signs. When a pedestrian presses a button, the signal flashes yellow, then switches to solid yellow. Then both red lights shine and pedestrians can start crossing. Finally, the device switches to flashing red, meaning drivers can proceed as soon as pedestrians have cleared the lane. These HAWK signals were developed in Tucson, Arizona in the late 1990s and are now in use at more than 100 sites. These HAWK signals are also known as a pedestrian hybrid beacon. Less expensive than full signals, HAWKs have been shown to be effective in getting drivers to yield to pedestrians on major streets with multiple lanes or high speeds and the flashing red phase allows vehicle traffic to resume quickly. The article briefly reports on accident studies that show how successful these HAWK lights can be in preventing crashes and injuries. Readers are referred to the full study by K. Fitzpatrick and E.S. Park (Transportation Research Record, No. 2140/2009).

Publication Year

2010
**ABSTRACT**

Conflicts between vehicles and pedestrians are common phenomenon at uncontrolled intersections. When conflict happens, pedestrians, or drivers will change their movements to prevent accidents, which is called conflict yielding behavior of pedestrians or drivers. The conflict yielding behavior of pedestrians has a very important impact on traffic safety at intersection crossings. This paper studied the characteristics of pedestrian conflict yielding behavior at uncontrolled intersections. First, we took the Jiansheda-Jiansheer Road intersection in Guangzhou as the observation point and procured behavior samples. Second, factors that have influence on pedestrian conflict yielding behavior are discussed. Last, a relationship model between pedestrian conflict yielding behavior and influencing factors is proposed. The analysis results show that according to the overall situation, most pedestrian choose to wait, decelerate, or keep speed. The proposed results can help engineers understand pedestrian behaviors at uncontrolled intersections and provide supports to improve pedestrian facilities and safety policies, improving pedestrian safety.

**Pedestrian Safety at Signalized Intersections**

**T&DI Congress 2014: Planes, Trains, and Automobiles** (458 - 466)

Abstract

Nationwide, more than 47,000 pedestrians were killed between 2000 and 2009, representing about 12% of the total highway traffic fatalities. In addition, nearly 700,000 pedestrians were injured over the same period. In Florida, one in every five traffic-related fatalities is a pedestrian, making pedestrian safety a top priority for safety improvements. This paper focuses on the analysis of pedestrian safety at signalized intersections. Since pedestrian crashes are rare and often severe, mere analysis of pedestrian crash summary records is not adequate. The underlying pedestrian crash patterns and causes were identified by reviewing police reports. During 2008-2010, police reports of a total of 2,951 pedestrian crashes that occurred at signalized intersections on state roads in Florida were reviewed. The review focused on collecting detailed crash specific information, such as identifying at-fault road user, presence and type of crosswalk at crash location, etc.

**Analysis of Factors Influencing Pedestrian Injury Severity in Pedestrian-Vehicle Crashes**

**T&DI Congress 2014: Planes, Trains, and Automobiles** (448 - 457)

Abstract

Pedestrian movement highly influences the traffic operation in the entire road network, meanwhile pedestrian safety issues have been more considered nowadays. Pedestrians' behaviors include "crossing" and "walking", both of which interact with motorized vehicle mode. As one of the main traffic crash types, it is necessary to analyze the factors that affect the severity of pedestrian injury of a Pedestrian-Vehicle Crash (PVC) and differentiate them from "crossing" and "walking" pedestrian behaviors. Pedestrian, driver, vehicle, environment, and crash characteristics in specific PVC event
are discussed. Ordered Probit models are developed in both scenarios to reflect the influencing factors of pedestrian injury severity in PVCs in terms of crossing and walking behaviors. Data from 2008 FDOT crash database are used to build such predictive models. Given the models themselves with the similarities and differences in two scenarios, suggestions and countermeasures based on findings will be provided to reduce pedestrian injury severity along with crash occurrence in order to improve pedestrian safety level.

Research in Progress

Evaluation of Sustained Enforcement, Education, and Engineering Measures on Pedestrian Crossings

Abstract. Pedestrian fatalities and injuries represent a growing percentage of all traffic fatalities and injuries. For example, pedestrian fatalities comprised 10.9% of all traffic deaths nationwide in 2004, but 14.5% in 2013. A behavioral approach to safety culture would suggest changing one safety target area at a time. If one changes a number of safety-related behaviors in a specific area such as pedestrian safety and speeding, one should expect changes to transfer to untreated safety-related behaviors. A recent study supported by the NHTSA demonstrated that an element of the driving culture could be changed on a citywide basis using a multifaceted program that systematically applied psychological behavioral principles on a community level. The objective of this study is to review the City of St. Paul's effort to improve pedestrian safety and investigate whether a similar program to the NHTSA-supported study could be applied to changing the driving culture related yielding to pedestrians and speed compliance on arterial and collector roads on a citywide basis. The multifaceted activities will be planned and implemented in St. Paul together with city traffic engineers and enforcement officers. This study will add value to developing livable communities by: 1) analyzing effectiveness of previous and implemented countermeasures to change two significant targets (yielding to pedestrians and speed reduction); 2) investigating whether effectiveness could be transferred to other safety areas; and 3) examining long-term maintenance of the behavior changes produced by program implementation.

Record Type: Project
Supplemental Notes: MP-17(003)
Language: English

Project
Contract Numbers: 1003325 WO#26
Status: Active
Funding Amount: 177,226.00
Sponsor Organizations:
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Least Relevant Results

Library Catalog


- **Contributor:** National Research Council (U.S.). Transportation Research Board.
- **Description:** "TRB's Transportation Research Record: Journal of the Transportation Research Board, No. 2316 consists of 15 papers that explore gap acceptance behavior; driving behavior in emergency situations; driver anticipation; phase transition models; integrated lane change models; models for pedestrian-vehicle interactions at road crossings; midblock pedestrian crossings; exit choice decisions during pedestrian evacuations of buildings; pedestrian movements in crowded networks; congestion effects on risk by experienced drivers; shared car, bicycle, and pedestrian zones; and numerical analysis for adaptive traffic simulation."--publ. info.
Minh Tan, Wael K. M. Alhajyaseen, Miho Asano and Hideki Nakamura -- Numerical Analysis for Adaptive Traffic Simulation / Ye Tian and Yi-Chang Chiu

Availability and location:
- MnDOT Library Transportation Research Board TE5.3.H5 A31 no. 2316

Pedestrians, 2013.

- **Contributor:** National Research Council (U.S.). Transportation Research Board.
- **Description:** TRB's Transportation Research Record: Journal of the Transportation Research Board, No. 2393 consists of 20 papers that examine an analysis of pedestrian performance in shared-space environments; using a smartphone application to support visually impaired pedestrians; pedestrian-vehicle traffic conflicts; automated classification of pedestrian gender and age; driver compliance with pedestrian yield right-of-way laws; and development of the Canadian Pedestrian Crossing Control Guide. This issue of the TRR also explores how social paths can improve pedestrian accessibility to light rail; evaluation of pedestrian weaving zones; pedestrian safety issues; improving cyclist and pedestrian environment while maintaining vehicle throughput; the effect of left-turn operational mode on pedestrian safety; pedestrian crash hot spots and risk factors for injury severity; and pedestrian red-time crossing behavior. In addition, issues covered in this TRR include integrating bicycling and walking facilities into urban infrastructure; the cost of complete streets; effect of advance yield markings and symbolic signs on vehicle-pedestrian conflicts; effectiveness of audible and tactile heading cues at complex intersections; results from roadway design survey of San Francisco Bay area pedestrians, drivers, bicyclists, and transit users; pedestrian crash risk on boundary roadways; and sight distance for disabled pedestrians at crossings."--Publisher's description.

Availability and location:
- MnDOT Library Transportation Research Board TE5.3.H5 A31 no. 2393
- MnDOT Library Transportation Research Board X

Human performance, infrastructure, information systems, and simulation.

- **Contributor:** National Research Council (U.S.). Transportation Research Board.
- **Description:** TRR no. 2069 includes 11 papers that explore run-off-the-road crashes involving overcorrection, effect of fog on car-following performance, signalized intersection approach decision dilemma zone, and two-way stop-controlled intersections on divided highways, left-turn warnings. This issue of the TRR also examines auditory road safety alerts, wireless communication and entertainment devices' effect on driving, warning messages and variable speed limits, right-turning vehicles and pedestrians approaching from the right side, traveler information delivery mechanisms, and use of pretrip public transport information.

Availability and location:
Minnesota Department of Transportation:
- Available:
  - MnDOT Library Transportation Research Board

Transport Database

Result 17.

**Title**
Evaluating ITS-Based Countermeasures: How Effective Are They in Enhancing Pedestrian Safety?
This paper summarizes an evaluation of the effectiveness of Intelligent Transportation Systems (ITS) based countermeasures installed in Las Vegas, Nevada as part of a Federal Highway Administration sponsored pedestrian safety project. ITS related countermeasures considered for evaluation include 'ITS No Turn on Red' sign, automatic pedestrian detection devices and smart lighting, and portable speed trailer. The evaluations are based on field observations of pedestrian and driver behaviors 'before' and 'after' installation of countermeasures at selected locations in Las Vegas, Nevada. The effectiveness of 'No Turn on Red' sign at intersections was evaluated using percent of signal cycles in which call button has been pushed, percent of drivers making right turn on red (RTOR) that come to a complete stop, percent of drivers violating the no RTOR (when pedestrians present), percent of drivers violating the no RTOR (when pedestrians NOT present), average pedestrian delay and average vehicle delay. On the other hand, the effectiveness of automatic pedestrian detection device and smart lighting at midblock locations was evaluated using pedestrians who looked for vehicles before beginning to cross, pedestrians who looked for vehicles before crossing 2nd half of the street, drivers yielding to pedestrians, distance driver stops/yields before the crosswalk, pedestrian delay and vehicle speed as measures of effectiveness. Results show statistically significant reduction in vehicle speeds due to installation of speed trailer. Also, driver yielding behavior improved due to installation of the above countermeasure. The findings from this study could be used to enhance pedestrian safety by influencing driver behavior on arterial roads in other cities with similar demographic characteristics and traffic conditions.

Publication Year
2010

Result 18.

Title
San Francisco PedSafe II Project Outcomes and Lessons Learned.

Source

URL
http://pubsindex.trb.org/orderform.html

Abstract
This paper presents the project outcomes and lessons learned from San Francisco PedSafe, a comprehensive pedestrian safety planning and engineering project funded by the Federal Highway Administration. It evaluates the effectiveness of the Phase I pedestrian safety plan targeted to higher-injury areas and the Phase II implementation of a range of mostly low-to-moderate-cost innovative safety improvements. A total of 13 countermeasures (comprised of nine general engineering countermeasures and four Intelligent Transportation Systems (ITS) countermeasures) were implemented by the
San Francisco Municipal Transportation Agency (SFMTA) and evaluated by the University of California Berkeley Traffic Safety Center (TSC) over a three-year period (2004-2007). Regarding the effectiveness of the 13 countermeasures, six were considered generally successful; three were considered less successful; and four were considered inconclusive. The six most successful countermeasures included: flashing beacons (with automated and push button actuation), in-street pedestrian signs, video detection to adjust signal timing, pedestrian head starts (leading pedestrian intervals), portable changeable message speed limit signs, and ‘oeTurning Traffic Must Yield to Pedestrians’ signs. A summary of countermeasure evaluation results is also reported. This paper describes the methodology of countermeasure evaluation, including video data, tools used in data analysis, the advantages and limitations of this method, and possible improvements. In addition, general lessons learned of countermeasure implementation, as well as recommendations for further research is also described.

Publication Year 2009

ASCE Database

A Pilot Study on Interactions between Drivers and Pedestrian Features at Signalized Intersections—Using the SHRP2 Naturalistic Driving Study Data

Bridging the East and West: Theories and Practices of Transportation in the Asia Pacific (70 - 77)

Abstract

This paper aims to assess driver behaviors at signalized intersections with four identified pedestrian features (“Stop Here on Red,” “No Turn on Red,” “Turning Vehicles Yield to Pedestrians,” and “Right on Red Arrow after Stop”) via a pilot study by using an innovative safety data: Strategic Highway Research Program 2 (SHRP2) Naturalistic Driving Study (NDS) data. The major findings from the pilot study include: (1) “No Turn on Red” has the highest rate of compliance (70%), followed by “Right on Red Arrow after Stop” (67%), “Turning Vehicles Yield to Pedestrians” (67%), and “Stop Here on Red” (55%); (2) compared to control group (without pedestrian features), three features (“Stop Here on Red,” “No Turn on Red,” and “Right on Red Arrow after Stop”) increased the likelihood of compliant behaviors; and (3) mid-aged drivers (25-59) showed the highest percentage of compliance at feature sits (83%), followed by older drivers (60+, 69%) and young drivers (16-24, 61%).

Vehicle-Pedestrian Interaction Analysis in Mixed Traffic Condition

ICTIS 2011: Multimodal Approach to Sustained Transportation System Development: Information, Technology, Implementation (552 - 559)

Abstract

The interaction between motor and non-motor traffic participators has been increasing dramatically. So far, traffic safety is always measured as the number and severities of traffic collisions which occur. Time to Collision (TTC) is one major parameter to reflect the possibility of such collisions. It can also be applied to the pedestrian involved analysis, but cannot reflect the pedestrian safety precisely. Therefore, time Difference to Collision (TDTC) is defined accordingly as a variation of TTC to describe the pedestrian-vehicle (P&V) interaction. One hundred groups of P&V interaction cases were collected. The comparison was made based on the cases between Vehicle-Pass-First (VPF) and Pedestrian-Pass-First (PPF) and among different safety scenes. The results show that the distance and speed values are obviously different from the cases between VPF and PPF, and the TDTC values are related to safety. It may provide some guidance
to describe and analyze the **driver-pedestrian** interaction behavior. The participators’ interaction behavior can be discussed further in the future.

**Prioritizing Safety Projects with Confidence Using Two-Step Spatial Screening**  

**Abstract**  
Being able to pinpoint locations on the roadway network that have abnormally high frequency of severe crashes is the first step in developing a strategic plan that ensures high returns on safety investments. This paper presents a refined two-step spatial screening method that can quickly narrow down statewide crash data into a few 0.25 -square-mile areas that have the highest crash frequencies or cost for a selected type crash. The locations identified after the 2-step process are small and specific enough to afford detailed crash causation analysis. The process is simple and intuitive and quickly reveals the spatial trends of the crashes. This paper illustrates the methodology using statewide crash data from Washington, with examples of identifying high value locations in total crashes, rural area crashes, crash costs, and crashes involving teenager drivers.

**TRID Database**

**Effects of Speed-Control Measures on the Safety of Unsignalized Midblock Street Crossings in China**  
Wang, Chao; Ye, Zhirui ; Wang, Xinyi; Li, Wenting

**Abstract.** The primary objective of this study was to evaluate the effects of different speed-control measures on the safety of unsignalized midblock street crossings. In China, it is quite difficult to obtain traffic crash and conflict data for pedestrians using such crossings, mainly due to the lack of traffic data management and organizational issues. In light of this, the proposed method did not rely on such data, but considered vehicle speed, which is a leading contributing factor of pedestrian safety at mid blocks. To evaluate the speed reduction effects at different locations, the research team utilized the following methods in this study: (1) testing speed differences—on the basis of the collected data, statistical analysis is conducted to test the speed differences between upstream and crosswalk, upstream and downstream, and downstream and crosswalk; and (2) mean distribution deviation—this value is calculated by taking the difference in cumulative speed distributions for the two different samples just mentioned. In order to better understand the variation of speed reduction effects at different distances from speed-control facilities, data were collected from six types of speed-control measures with a visual range of 60 m. The results showed that speed humps, transverse rumble strips, and speed bumps were effective in reducing vehicle speeds. Among them speed humps performed the best, with reductions of 21.1% and 20.0% from upstream location (25.01 km/h) and downstream location (24.66 km/h) to pedestrian crosswalk (19.73 km/h), respectively. By contrast, the speed reduction effects were minimal for stop and yield signs, flashing yellow lights, and crossings without treatment. Consequently, in order to reduce vehicle speeds and improve pedestrian safety at mid blocks, several speed-control measures such as speed humps, speed bumps, and transverse rumble strips are recommended to be deployed in the vicinity of pedestrian crosswalks.

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