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Nicole S.N. Yiu, N.N. Sze, Daniel W.M. Chan. *Implementation of safety management systems in Hong Kong construction industry – A safety practitioner's perspective*. Pages 1-9.

Introduction: In the 1980s, the safety management system (SMS) was introduced in the construction industry to mitigate against workplaces hazards, reduce the risk of injuries, and minimize property damage. Also, the Factories and Industrial Undertakings (Safety Management) Regulation was introduced on 24 November 1999 in Hong Kong to empower the mandatory implementation of a SMS in certain industries including building construction. Therefore, it is essential to evaluate the effectiveness of the SMS in improving construction safety and identify the factors that influence its implementation in Hong Kong. **Method:** A review of the current state-of-the-practice helped to establish the critical success factors (CSFs), benefits, and difficulties of implementing the SMS in the construction industry, while structured interviews were used to establish the key factors of the SMS implementation. **Results:** Results of the state-of-the-practice review and structured interviews indicated that visible senior commitment, in terms of manpower and cost allocation, and competency of safety manager as key drivers for the SMS implementation. More so, reduced accident rates and accident costs, improved organization framework, and increased safety audit ratings were identified as core benefits of implementing the SMS. Meanwhile, factors such as insufficient resources, tight working schedule, and high labor turnover rate were the key challenges to the effective SMS implementation in Hong Kong. **Practical applications:** The findings of the study were consistent and indicative of the future development of safety management practice and the sustainable safety improvement of Hong Kong construction industry in the long run.

- **Keywords:** Safety management system; Construction industry; Safety practitioner; Safety commitment; Safety audit

Yanyan Li, Toshiyuki Yamamoto, Guangnan Zhang. *The effect of fatigue driving on injury severity considering the endogeneity*. Pages 11-19.

Introduction: Fatigue driving is one of the most risky driving-related behaviors and represented a significant social and economic cost to the community. Several studies have already examined the relationship between fatigue driving behavior and traffic injury severity from different aspects. However, fatigue driving and injury severity in traffic crash may share some common influential factors. Ignoring the impact of these common factors will lead to endogeneity problem and result in biased parameter

estimation. **Method:** Based on 38,564 crash records during 2006–2011 in Guangdong province, China, we apply a bivariate endogenous binary-ordered probit model to examine the relationship between fatigue driving and injury severity considering endogeneity of fatigue driving. We also explore the difference of influential factors between commercial and non-commercial vehicle drivers. **Results:** This study identifies several common observed influential factors of fatigue driving propensity and fatal injury propensity and reveals a substantial and significant negative correlation of unobserved factors between them. **Conclusions:** The influence of fatigue driving on injury severity is significantly underestimated if the endogeneity of fatigue driving on fatal injury propensity is ignored. Factors such as vehicle insurance and road types not only affect fatal injury propensity, but also fatigue driving propensity. **Practical applications:** The findings in this study can help better understand how those factors affect fatigue driving and injury severity, and contributes to more efficient policy for preventing the harmfulness of fatigue-related crashes.

- **Keywords:** Fatigue driving; Endogeneity; Injury severity; Commercial vehicle driver

Cher Carney, Karisa K. Harland, Daniel V. McGehee. *Examining teen driver crashes and the prevalence of distraction: Recent trends, 2007–2015*. Pages 21-27.

Introduction: Teen drivers crash at a much higher rate than adult drivers, with distractions found as a factor in nearly 6 out of 10 moderate-to-severe teen crashes. As the driving environment continues to rapidly evolve, it is important to examine the effect these changes may be having on our youngest and most vulnerable drivers. **Method:** The purpose of this study was to identify types of vehicle crashes teens are most frequently involved in, as well as the distracting activities being engaged in leading up to these crashes, with a focus on identifying changes or trends over time. We examined 2,229 naturalistic driving videos involving drivers ages 16–19. These videos captured crashes occurring between 2007 and 2015. The data of interest for this study included crash type, behaviors drivers engaged in leading up to the collision, total duration of time the driver's eyes were off the forward roadway, and duration of the longest glance away from forward. **Results:** Rear-end crashes increased significantly (annual % change=3.23 [2.40–4.05]), corresponding with national data trends. Among cell phone related crashes, a significant shift occurred, from talking/listening to operating/looking (annual % change=4.22 [1.15–7.29]). Among rear-end crashes, there was an increase in the time drivers' eyes were off the road (β=0.1527, P=0.0004) and durations of longest glances away (β=0.1020, P=0.0014). **Conclusions:** Findings suggest that shifts in the way cell phones are being used, from talking/listening to operating/looking, may be a cause of the increasing number of rear-end crashes for teen drivers. **Practical applications:** Understanding the role that cell phone use plays in teen driver crashes is extremely important. Knowing how and when teens are engaging in this behavior is the only way effective technologies can be developed for mitigating these crashes.

- **Keywords:** Teen drivers; Distraction; Cell phone; Texting; Rear-end crashes

Øyvind Dahl, Trond Kongsvik. *Safety climate and mindful safety practices in the oil and gas industry*. Pages 29-36.

Introduction: The existence of a positive association between safety climate and the safety behavior of sharp-end workers in high-risk organizations is supported by a considerable body of research. Previous research has primarily analyzed two components of safety behavior, namely safety compliance and safety participation. The present study extends previous research by looking into the relationship between safety climate and another component of safety behavior, namely mindful safety practices. Mindful safety practices are defined as the ability to be aware of critical factors in the environment and

to act appropriately when dangers arise. **Method:** Regression analysis was used to examine whether mindful safety practices are, like compliance and participation, promoted by a positive safety climate, in a questionnaire-based study of 5712 sharp-end workers in the oil and gas industry. **Results:** The analysis revealed that a positive safety climate promotes mindful safety practices. **Conclusions:** The regression model accounted for roughly 31% of the variance in mindful safety practices. The most important safety climate factor was safety leadership. **Practical applications:** The findings clearly demonstrate that mindful safety practices are highly context-dependent, hence, manageable and susceptible to change. In order to improve safety climate in a direction which is favorable for mindful safety practices, the results demonstrate that it is important to give the fundamental features of safety climate high priority and in particular that of safety leadership.

Liangliang Shi, Yong Han, Hongwu Huang, Quan Li, Bingyu Wang, Koji Mizuno. *Analysis of pedestrian-to-ground impact injury risk in vehicle-to-pedestrian collisions based on rotation angles.* Pages 37-47.

Introduction: Due to the diversity of pedestrian-to-ground impact (secondary impact) mechanisms, secondary impacts always result in more unpredictable injuries as compared to the vehicle-to-pedestrian collisions (primary impact). The purpose of this study is to investigate the effects of vehicle frontal structure, vehicle impact velocity, and pedestrian size and gait on pedestrian-to-ground impact injury risk. **Method:** A total of 600 simulations were performed using the MADYMO multi-body system and four different sizes of pedestrians and six types initial gait were considered and impacted by five vehicle types at five impact velocities, respectively. The pedestrian rotation angle ranges (PRARs) (a, b, c, d) were defined to identify and classify the pedestrian rotation angles during the ground impact. **Results:** The PRARs a, b, and c were the ranges primarily observed during the pedestrian landing. The PRAR has a significant influence on pedestrian-to-ground impact injuries. However, there was no correlation between the vehicle velocity and head injury criterion (HIC) caused by the secondary impact. In low velocity collisions (20, 30km/h), the severity of pedestrian head injury risk caused by the secondary impact was higher than that resulting from the primary impact. **Conclusions:** The PRARs defined in this study are highly correlated with the pedestrian-to-ground impact mechanism, and can be used to further analyze the pedestrian secondary impact and to predict the head injury risk. **Practical applications:** To reduce the pedestrian secondary impact injury risk, passive and active safety countermeasures should be considered together to prevent the pedestrian's head-to-ground impacts, particularly in the low-velocity collisions.

- **Keywords:** Secondary impact; PRAR; Head injury risk; Multi-body system

Lidia P. Kostyniuk, David W. Eby, Lisa J. Molnar, Renée M. St. Louis, Nicole Zanier, Ted R. Miller. Potential effects of lowering the BAC limit on injuries, fatalities, and costs. Pages 49-54.

Introduction: Potential health and cost impacts of lowering the BAC limit for U.S. drivers below .08% were explored through analyses of reductions in crash incidence, injury severity, and costs based on five scenarios with varying assumptions about how the change to a .05% BAC limit might affect alcohol-impaired driving. **Methods:** Distribution of crashes by injury level and highest driver or non-occupant BAC levels for 2010, together with unit crash costs provided a base for comparison. Scenario 1 assumed all alcohol-impaired driving ceased; scenario 2 assumed all drivers obeyed the law, and scenario 3 assumed decreases in driver BAC levels would be limited to those who had been driving near the legal limit before the change. Scenario 4 was based on changes in driver BAC levels associated with a 08% to .05% BAC limit change in Australia, and scenario 5 was based on changes in alcohol-related crashes associated with the change to the .08% BAC limit in the United States. The number of casualties prevented in each

scenario was estimated using relative risks of crash involvement, and changes in societal costs were estimated using the unit costs. **Results:** Reductions ranging from 71% to 99% in fatalities, injuries, and costs related to alcohol-impaired driving were estimated in scenarios 1 and 2. Scenarios 3–5 produced smaller reductions ranging from 4% to 16% for alcohol-impaired fatalities, injuries, and costs. **Conclusion:** The wide difference between the outcomes of the two sets of scenarios reflects the sensitivity of BAC policy benefits to driver compliance behavior. **Practical application:** The quantification of the reduction in the number and costs of traffic crash casualties in the set of behavioral scenarios explored in this research can inform policymakers about the extent and limits of benefits achievable by lowering the BAC limits as they consider strategies to reduce alcohol-impaired driving.

- **Keywords:** Alcohol-impaired driving; BAC legal limits; Traffic casualties; Drinking and driving behavior; Cost impacts of BAC shifts

Paula Yuma-Guerrero, Rebecca Orsi, Ping-Tzu Lee, Catherine Cubbin. A systematic review of socioeconomic status measurement in 13 years of U.S. injury research. Pages 55-72.

Objective: The purpose of this review was to assess the impact of socioeconomic status (SES) on injury and to evaluate how U.S. injury researchers have measured SES over the past 13years in observational research studies. **Design & methods:** This systematic review included 119 US injury studies indexed in PubMed between January 1, 2002 and August 31, 2015 that used one or more individual and/or area-level measures of SES as independent variables. Study findings were compared to the results of a previous review published in 2002. **Results:** Findings indicate SES remains an important predictor of injury. SES was inversely related to injury in 78 (66%) of the studies; inverse relationships were more consistently found in studies of fatal injury (77.4%) than in studies of non-fatal injury (58%). Approximately two-thirds of the studies (n=73, 61%) measured SES along a gradient and 59% used more than one measure of SES (n=70). Studies that used a gradient measure of SES and/or more than one measure of SES identified significant relationships more often. These findings were essentially equivalent to those of a similar 2002 review (Cubbin & Smith, 2002). **Conclusions:** There remains a need to improve measurement of SES in injury research. Public health training programs should include best practices for measurement of SES, which include: measuring SES along a gradient, selecting SES indicators based on the injury mechanism, using the smallest geographic region possible for area-level measures, using multiple indicators when possible, and using both individual and area-level measures as both contribute independently to injury risk. Area-level indicators of SES are not accurate estimates of individual-level SES. **Practical applications:** Injury researchers should measure SES along a gradient and incorporate individual and area-level SES measures that are appropriate to the injury outcome under study.

- **Keywords:** Measurement of socioeconomic status; Injury research methodology; Injury; Socioeconomic Status; Measurement; Methodology; Systematic Review

Brian H.W. Guo, Tak Wing Yiu, Vicente A. González. *Does company size matter? Validation of an integrative model of safety behavior across small and large construction companies*. Pages 73-81.

Introduction: Previous safety climate studies primarily focused on either large construction companies or the construction industry as a whole, while little is known about whether company size has significant effects on workers' understanding of safety climate measures and relationships between safety climate factors and safety behavior. Thus, this study aims to: (a) test the measurement equivalence (ME) of a safety climate measure across workers from small and large companies; (b) investigate if company size alters the causal structure of the integrative model developed by Guo, Yiu, and González

(2016). **Method:** Data were collected from 253 construction workers in New Zealand using a safety climate measure. This study used multi-group confirmatory factor analyses (MCFA) to test the measurement equivalence of the safety climate measure and structure invariance of the integrative model. **Results:** Results indicate that workers from small and large companies understood the safety climate measure in a similar manner. In addition, it was suggested that company size does not change the causal structure and mediational processes of the integrative model. **Conclusions:** Both measurement equivalence of the safety climate measure and structural invariance of the integrative model were supported by this study. **Practical applications:** Findings of this study provided strong support for a meaningful use of the safety climate measure across construction companies in different sizes. Safety behavior promotion strategies designed based on the integrative model may be well suited for both large and small companies.

- **Keywords:** Safety climate; Construction safety; Small businesses; Measurement equivalence; Structural equation modeling

Melissa K. James, Mauricia C. Victor, Syed M. Saghir, Patricia A. Gentile. *Characterization of fall patients: Does age matter?* Pages 83-92.

Introduction: Evaluating age-specific fall characteristics is important for prevention programs. The aim was to characterize fallers who presented to our trauma center. We hypothesized that fall characteristics and outcomes would vary with age. **Methods:** Data were retrospectively collected from the trauma registry and electronic medical records during January 1st, 2014-December 31st, 2015. Data were analyzed by Chi-square test with Yates' continuity correction and one-way ANOVA with Bonferroni's multiple comparisons test. **Results:** There were 1541 fallers, 814 (52.8%) were male. Ages ranged from 11 months to 100years. The admission rate was high at 86%, with an average hospital stay of 5.7days. Patients in the 0-18 and 19-45age groups spent significantly less time in the hospital ($p<0.0001$). Elderly patients had the highest average injury severity score ($p<0.0001$). However, the youngest patients required surgery more often ($p=0.0004$). The overall mortality rate was 3.6% and 52.8% were male. The mortality rate increased with age, from 0% for the 0-18 age group to 6.9% for patients ≥65years of age. Remarkably, fallers in the 19-45 and 46-64age groups predominantly died from ground level falls even though the average fall height in these groups was the highest ($p<0.0001$). More fallers in the 19-45 and 46-64age groups tested positive for alcohol/drug use ($p<0.0001$). Middle-aged and elderly patients were more likely to be discharged to a skilled nursing or rehabilitation facility compared to younger patients who were discharged home. **Conclusions and practical applications:** Fall characteristics and outcomes varied with age. Data on age-specific characteristics, outcomes, and risk factors of falls will help in developing targeted interventions and may lead to better approaches to treat patients.

- **Keywords:** Falls; Indoor falls; Outdoor falls; Fall height; Fall outcomes

Monica L.H. Jones, Lisa Buckley, Sheila M. Ebert, Matthew P. Reed, Jason J. Hallman. *Evaluating an intervention to improve belt fit for adult occupants*. Pages 93-104.

Introduction: Previous laboratory studies have demonstrated that some drivers position their seat belts suboptimally. Specifically, the lap portion of the belt may be higher and farther forward relative to the pelvis than best practice, and the shoulder portion of the belt may be outboard or inboard of mid-shoulder. This study evaluated the performance of a video-based intervention for improving the belt fit obtained by drivers. **Method:** Twenty-nine adult drivers participated in this study. Belt fit was measured before and after the intervention in participants' vehicles and in a laboratory mockup. **Results:** Data from both the in-vehicle and laboratory belt measures found that 95% of participants sampled improved some aspect of lap belt fit. For the in-vehicle test conditions,

participants who lowered the lap belt location (Z) after the intervention showed an improvement of 26 mm on average. Among those participants who shifted the horizontal lap belt location rearward (closer to the pelvis), an average improvement of 36 mm was observed. No significant differences were observed between baseline and post-intervention shoulder belt fit. **Conclusions:** The results provide preliminary evidence that an intervention improves driver belt fit. More research is needed to establish what aspects of this intervention affected behavior and how effective such an intervention is in the context of public health. **Practical applications:** These findings can help better inform intervention initiatives to improve occupant belt fit.

- **Keywords:** Seatbelt fit; Intervention; Safety; Evaluation

Lisa Buckley, Monica L.H. Jones, Sheila M. Ebert, Matthew P. Reed, Jason J. Hallman. *Evaluating an intervention to improve belt fit for adult occupants: Promoting positive beliefs*. Pages 105-111.

Introduction: Seat belt use provides significant public health benefit, however, most public awareness campaigns have generally focused on seat belt use rather than encouraging adults to improve seat belt fit with belt placement. This study provides an evaluation of a video-based intervention to improve adult belt fit assessing whether a video-based intervention can target beliefs and knowledge of seat belt placement and be perceived as relevant by the target audience. **Method:** An intervention group of 29 adults (15 women and 14 men) and a comparison group of 99 adults (41 women and 47 men) participated. **Results:** The intervention group had significantly more favorable beliefs around belt fit than the comparison group related to Health Belief Model constructs of higher self-efficacy, greater benefits, and fewer barriers. The intervention group was also significantly better at accurately drawing belt fit than the comparison group. The video intervention was described as relevant, interesting, and the intervention group favored the provision of a diverse sample of models in the intervention. **Conclusions:** Overall, the study provides insight into relevant target beliefs for an intervention focused on belt fit and suggests that a brief video-based intervention in the style of a public service announcement may be effective in promoting positive beliefs and knowledge around belt fit. Future efforts should confirm these findings with a larger sample size spanning multiple geographic and demographic areas. **Practical applications:** These findings can help better inform intervention initiatives to improve occupant belt fit.

- **Keywords:** Seatbelt fit; Intervention; Safety; Evaluation

Jessica S. Jermakian, Rebecca A. Weast. *Passenger use of and attitudes toward rear seat belts*. Pages 113-119.

Objectives: This study sought to identify attitudes toward belt use in the rear seat and to gain insight into the experiences of rear-seat passengers. **Method:** A telephone survey conducted between June and August 2016 targeted adult passengers who had recently ridden in the rear and who did not always wear their seat belt when doing so. Respondents were questioned regarding their reasons for not buckling up and possible conditions under which they would be more likely to buckle up during rear-seat travel. **Results:** Of 1163 recent rear-seat passengers, 72% reported always using their seat belt in the rear. Full-time belt use was lower among passengers who primarily travel in the rear of hired vehicles compared with personal vehicles. The most common explanation for not buckling up was that the back seat is safer than the front. Four out of five agreed they do not buckle up because of type of trip; two-thirds forget or do not see the need; and two-thirds agreed with reasons related to design, comfort, or usability issues. Nearly 40% agreed that they sometimes do not buckle up in the rear because there is no law requiring it. **Conclusion:** Many reasons for not using belts in the rear are similar to reasons in the front, such as forgetfulness, inconvenience, or discomfort. One difference

is that many rear-seat passengers perceive using the belt is unnecessary because the back seat is safer than the front. More than half of part-time belt users and nonusers reported interventions such as rear seat belt reminders, stronger belt-use laws, and more comfortable belts would make them more likely to use their seat belt in the rear seat. **Practical applications:** This study identifies barriers to rear seat belt use that point to the need for a multi-faceted approach to increase belt use.

- **Keywords:** Rear seat; Belt use; Belt use laws; Survey

Zulqarnain H. Khattak, Mark J. Magalotti, Michael D. Fontaine. *Estimating safety effects of adaptive signal control technology using the Empirical Bayes method*. Pages 121-128.

Introduction: Adaptive signal control technology (ASCT) has long been investigated for its operational benefits, but the safety impacts of this technology are still unclear. The main purpose of this study was to determine the safety effect of ASCT at urban/suburban intersections by assessing two different systems. **Method:** Crash data for 41 intersections from the Pennsylvania Department of Transportation (PennDOT), along with crash frequencies computed through Safety Performance Functions (SPFs), were used to perform the Empirical Bayes (E-B) method to develop crash modification factors (CMF) for ASCT. Moreover, a crash type analysis was conducted to examine the safety impact of ASCT on a regional scale and the variation of safety among type of crashes observed. **Results:** The results from this study indicated the potential of ASCT to reduce crashes since the Crash Modification Factor (CMF) values for both ASCT systems (SURTRAC and InSync) showed significant reductions in crashes. Average CMF values of 0.87 and 0.64 were observed for total and fatal and injury crash categories at a 95% confidence level, and results were consistent between systems. While a reduction in the proportion of rear end crashes was observed, the change was not determined to be statistically significant. The overall distribution of crash types did not change significantly when ASCT was deployed. **Conclusion and practical application:** The results indicate that safety benefits of ASCT were generally consistent across systems, which should aid agencies in making future deployment decisions on ASCT.

- **Keywords:** Adaptive signal control technology; Intelligent transportation systems; Empirical Bayes method; Safety performance functions; Crash modification factors

Gayle Brewer, Barry Holt, Shahzeb Malik. *Workplace bullying in risk and safety professionals*. Pages 129-133.

Introduction: Previous research demonstrates that workplace bullying impacts the welfare of victimized employees, with further consequences for the organization and profession. There is, however, a paucity of information relating to the bullying directed at risk and safety professionals. The present study was conducted to address this issue. **Method:** Risk and safety professionals (N=420) completed the Negative Acts Questionnaire – Revised and Brief Cope, and reported the extent to which they had been pressured to make or amend a risk or safety based decision. **Results:** Those experiencing workplace bullying were more likely to engage in a range of coping behaviors, with exposure to work-related and personal bullying particularly influential. Workplace bullying also predicted pressure to make or change a risk or safety based decision. Work related and physically intimidating bullying were particularly important for this aspect of professional practice. **Conclusions:** Findings are discussed with regard to current practice and the support available to risk and safety professionals. **Practical applications:** Risk and safety professionals require additional support in relation to workplace bullying and specifically guidance to resist pressure to make or change a risk or safety based decision.

- **Keywords:** Workplace bullying; Physical health; Coping behaviors; Decision-making; Victimization

Peng Chen, Feiyang Sun, Zhenbo Wang, Xu Gao, Junfeng Jiao, Zhimin Tao. *Built environment effects on bike crash frequency and risk in Beijing*. Pages 135-143.

Introduction: Building a safe biking environment is crucial to encouraging bicycle use. In developed areas with higher density and more mixed land use, the built environment factors that pose a crash risk may vary. This study investigates the connection between biking risk factors and the compact built environment, using data for Beijing. **Method:** In the context of China, this paper seeks to answer two research questions. First, what types of built environment factors are correlated with bike-automobile crash frequency and risk? Second, how do risk factors vary across different types of bikes? Poisson lognormal random effects models are employed to examine how land use and roadway design factors are associated with the bike-automobile crashes. **Results:** The main findings are: (1) bike-automobile crashes are more likely to occur in densely developed areas, which is characterized by higher population density, more mixed land use, denser roads and junctions, and more parking lots; (2) areas with greater ground transit are correlated with more bike-automobile crashes and higher risks of involving in collisions; (3) the percentages of wider streets show negative associations with bike crash frequency; (4) built environment factors cannot help explain factors contributing to motorcycle-automobile crashes. **Practical Applications:** In China's dense urban context, important policy implications for bicycle safety improvement drawn from this study include: prioritizing safety programs in urban centers, applying safety improvements to areas with more ground transit, placing bike-automobile crash countermeasures at road junctions, and improving bicycle safety on narrower streets.

- **Keywords:** Bike-automobile crash; Frequency; Risk; Poisson lognormal random effects model; Built environment

Cunbao Zhang, Bin Zhou, Tony Z. Qiu, Shaobo Liu. *Pedestrian crossing behaviors at uncontrolled multi-lane mid-block crosswalks in developing world*. Pages 145-154.

Introduction: The gap acceptance theory was primarily used to study pedestrian crossing behaviors, in accordance to static gaps that are calculated in the light of the cross section of crosswalk. However, pedestrians will face a series of dynamic gaps (especially at any uncontrolled multi-lane crosswalk) when they decide to cross the street, thus, pedestrians' decisions are made based on the dynamic gaps of each lane. **Method:** Pedestrians' crossing behaviors at uncontrolled multi-lane mid-block crosswalk were investigated in this study. The lane-based gap (LGAP) was defined and five mid-block crosswalks were selected for observation in Wuhan, China. Pedestrians' behaviors and the corresponding traffic statuses were videoed as collected data, whose statistical analysis indicates that most pedestrians choose the rolling gap crossing strategy, which is different from existing research. Moreover, a logistic regression model was established to evaluate various influencing parameters (such as gender, age, waiting time and traffic volume) on the pedestrians' crossing strategy, whose accuracy is not satisfying. Therefore, the pedestrian dynamic gap acceptance (PDGA) model was put forward to describe pedestrians' crossing behaviors at any multi-lane crosswalk based on detailed analysis of the pedestrians' decision procedure. **Results:** The corresponding results show that its accuracy may be up to 88.6% to well describe pedestrians' crossing behaviors. **Conclusions:** The PDGA model is appropriate to analyze pedestrians' dynamic decision procedures at multi-lane mid-block crosswalks. **Practical application:** The findings of this study can be used for safety and performance evaluation of crosswalks at mid-block locations in developing countries like China and India.

- **Keywords:** Pedestrians' crossing behaviors; Crossing strategy; Mid-block crosswalk; Gap acceptance model; Lane-based gap (LGAP)

Yanyan Li, Toshiyuki Yamamoto, Guangnan Zhang. *Understanding factors associated with misclassification of fatigue-related accidents in police record*. Pages 155-162.

Introduction: Fatigue is one of the riskiest causes of traffic accidents threatening road safety. Due to lack of proper criteria, the identification of fatigue-related accidents by police officers largely depends on inferential evidence and their own experience. As a result, many fatigue-related accidents are misclassified and the harmfulness of fatigue on road safety is misestimated. **Method:** In this paper, a joint model framework is introduced to analyze factors contributing to misclassification of a fatigue-related accident in police reports. Association rule data mining technique is employed to identify the potential interactions of factors, and logistic regression models are applied to analyze factors that hinder police officers' identification of fatigue-related accidents. Using the fatigue-related crash records from Guangdong Province during 2005–2014, factors contributing to the false positive and false negative detection of the fatigue-related accident have been identified and compared. **Results:** Some variables and interactions were identified to have significant impacts on fatigue-related accident detection. **Conclusions:** Based on the results, it can be inferred that the stereotype of certain groups of drivers, crash types, and roadway conditions affects police officers' judgment on fatigue-related accidents. **Practical applications:** This finding can provide useful information for training police officers and build better criteria for fatigue identification.

- **Keywords:** Fatigue; Police report; Misclassification; Association rule; Logistic regression model