

Journal of Safety Research – rok 2012, ročník 43

Číslo 5-6 (December 2012)



S.J. Bertke, A.R. Meyers, S.J. Wurzelbacher, J. Bell, M.L. Lampl, D. Robins. *Development and evaluation of a Naïve Bayesian model for coding causation of workers' compensation claims. Pages 327–332.*

Introduction: Tracking and trending rates of injuries and illnesses classified as musculoskeletal disorders caused by ergonomic risk factors such as overexertion and repetitive motion (MSDs) and slips, trips, or falls (STFs) in different industry sectors is of high interest to many researchers. Unfortunately, identifying the cause of injuries and illnesses in large datasets such as workers' compensation systems often requires reading and coding the free form accident text narrative for potentially millions of records. **Metod:** To alleviate the need for manual coding, this paper describes and evaluates a computer auto-coding algorithm that demonstrated the ability to code millions of claims quickly and accurately by learning from a set of previously manually coded claims. **Conclusions:** The auto-coding program was able to code claims as a musculoskeletal disorders, STF or other with approximately 90% accuracy. **Impact on industry:** The program developed and discussed in this paper provides an accurate and efficient method for identifying the causation of workers' compensation claims as a STF or MSD in a large database based on the unstructured text narrative and resulting injury diagnoses. The program coded thousands of claims in minutes. The method described in this paper can be used by researchers and practitioners to relieve the manual burden of reading and identifying the causation of claims as a STF or MSD. Furthermore, the method can be easily generalized to code/classify other unstructured text narratives.

Highlights: ▶ Coding causation for millions of workers compensation claims was unfeasible ▶ A machine learning program was developed to aid in coding the causation of claims ▶ The program demonstrated the ability to code with about 90% accuracy ▶ This program can be generalized to categorize any set of unstructured text data.

- **Keywords:** Data-mining; Text-mining; Bayes; Accident narratives; Text classification

Anik Lambert-Bélanger, Sacha Dubois, Bruce Weaver, Nadia Mullen, Michel Bédard. *Aggressive driving behaviour in young drivers (aged 16 through 25) involved in fatal crashes. Pages 333–338.*

Introduction: We wished to determine the extent to which number of passengers, driver age, and sex were associated with aggressive driving actions (ADAs) in young drivers involved in a fatal crash. **Methods:** We used U.S. fatal-crash data from Fatality Analysis

Reporting System (FARS), 1991 –2008. Proxy measures of aggressive driving included ADA presence and speed differential (posted speed limit minus estimated travel speed). We examined the odds of an ADA and speed differential in young drivers (aged 16 to 25) by passenger status. Results: Compared to driving alone young drivers (aged 16) had increased odds of an ADA between 14% (OR: 1.14; 95% CI: 1.07; 1.22) and 95% (OR: 1.95; 95% CI: 1.40; 2.74) when accompanied by one and five passengers, respectively. Further, carrying a higher number of passengers was a stronger predictor of speeding in younger drivers. Conclusions: This study supports the use of graduated licensing approaches. Specifically, developing interventions to reduce aggressive driving appear imperative. Impact on Industry: While the results of our study support the use of graduated licensing approaches there is room for improvement. Our study indicates that tackling impaired driving is not sufficient to drastically reduce aggressive driving among the youngest drivers. Further research on young drivers is required to understand the influence of peers and the role of gender on driving behavior. Strategies to reduce aggressive driving behaviors among the youngest drivers may not only prevent crashes during their early driving careers but may also translate into a reduced crash risk over their lifetime.

Highlights: ▶ We examined the impact of passengers on young drivers committing aggressive driving actions prior to involvement in a fatal crash. ▶ The presence of passengers was associated with increased odds of a young driver (aged 16) committing an aggressive driving action between 14% (OR: 1.14; 95% CI: 1.07;1.22) and 95% (OR: 1.95; 95%CI:1.40;2.74) when accompanied by one and five passengers respectively. ▶ Further, carrying a higher number of passengers was a strong predictor of speeding in younger drivers. ▶ Novice drivers, especially males, had increased odds of driving aggressively in the presence of passengers compared to drivers with a few more years of driving experience. Not wearing a seat-belt was highly predictive of aggressive driving. ▶ The results of our study support the use of GLS and suggest that by age 25 young adults have drastically improved their driving habits.

- **Keywords:** Accidents; Traffic; Adolescents; Public Health; Graduated Licensing Systems

Shu-Hsuan Chang, Der-Fa Chen, Tsung-Chih Wu. *Developing a competency model for safety professionals: Correlations between competency and safety functions.* Pages 339–350.

Introduction: Personal competency is an important factor influencing individual performance. The objective of this study was to develop a competency model of safety professionals and investigate the factors contributing to their competency to achieve greater safety performance. Method: In this study, 299 participants (153 safety professionals and 146 safety educators) completed self-administered questionnaires. The response rate was 75%. Results: The results of exploratory factor analysis and cluster analysis revealed that the competency scale for safety professionals comprised five factors. Additionally, the factor "safety and health training and management" explained most of the variance in the competency. The multivariate analysis of variance (MANOVA) results showed that the respondents' perception of professional competency was significantly influenced by the following factors: occupation, age, job tenure, level of education, and work status. Additionally, the Pearson product-moment correlation coefficient analysis indicated that a safety professional's perceived competencies and safety functions were positively correlated. Impact on industry: This study discusses possible reasons for the influence of the factors previously mentioned and explains how the results can contribute to the development of safety competencies and curricula.

Highlights: ▶ We model the competencies of safety professionals. ▶ Factor analysis and cluster analysis explore and confirm the competency model. ▶ The professional competency scale comprised five factors. ▶ Safety training and management explained most of the variance in the competency. ▶ The perceptions of SPs and SEs regarding safety competencies differ significantly.

- **Keywords:** Safety competency; Safety curriculum; Safety function; Safety professional (SP); Safety educator (SE)

Lisa Buckley, Melissa S. Foss. *Protective factors associated with young passenger intervening in risky driving situations.* Pages 351–356.

Introduction: While the negative influence of passengers on driving is usually studied, young passengers may protect against young drivers' crash involvement by speaking out and trying to stop unsafe driving behavior. This study sought to examine psychosocial constructs of young passengers who are likely to intervene in their friends' risky driving. Method: University students aged 17 to 25 years who were single ($n = 123$) or in a romantic relationship ($n = 130$) completed an online survey measuring protective factors. Results: The combination of individual, friend and (for participants in a relationship) romantic partner protective factors predicted self-reported passenger intervening intentions. Impact on Industry: Since peer passengers often increase young drivers' crash risk, research on passenger intervening has significant implications for road safety strategies. The findings provide support for the operationalization of protective factors in strategies that target passenger intervening behavior.

Highlights: ▶ Protective factors predicted self-reported intended passenger intervention in risky driving situations ▶ Findings supported the protection-risk framework ▶ Romantic partner protective factors should be incorporated in future protection-risk research

- **Keywords:** Passenger intervention; Protective factors; Risky driving; Young adult; Protection-risk framework

Ryan P. Blood, Patrik W. Rynell, Peter W. Johnson. *Whole-body vibration in heavy equipment operators of a front-end loader: Role of task exposure and tire configuration with and without traction chains.* Pages 357–364.

Introduction. This study measured whole-body vibration (WBV) exposures in front-end loader operators, and evaluated the effects of traction chains and work tasks on their WBV exposures. Method: WBV exposures were measured and compared across three different front-end loader tire configurations: (a) stock rubber tires, (b) rubber tires with ladder chains, and (c) rubber tires with basket chains. The operators completed three distinct standardized tasks: driving on a city street, simulated plowing, and a simulated scooping and dumping task. A portable data acquisition system collected tri-axial time weighted and raw WBV data per ISO 2631-1 and 2631-5 standards. In addition, Global Positioning System (GPS) data were collected in order to compare loader speeds across tire conditions and the standardized tasks. Results: Relative to the stock rubber tires, both types of tire chains significantly increased WBV exposures with the ladder chains having substantially higher WBV exposures compared to basket chains. Additionally, there were task dependent differences in WBV exposures. During the driving task, the z-axis (up and down) was the predominant exposure; the plowing task had a more even distribution of exposure across all three axes; while during scooping and dumping task, the x-axis (fore and aft) had the highest WBV exposures. The GPS data indicated that there were significant speed differences across tasks but not between the basket and

ladder chain conditions. Conclusions: Tires with ladder chains increased the front-end loader operators' exposure to WBV above the ISO 2631-1 recommended eight hour action limit increasing risk for adverse health effects. Although more expensive, basket chains are recommended over ladder chains since they substantially lowered the front-end loader operator's exposures and may ultimately reduce vibration related wear and tear on the vehicle. Impact on Industry: In order to reduce a heavy equipment vehicle (HEV) operator's chances for developing low back pain, this study provides information that health and safety professionals can use to reduce whole-body vibration (WBV) exposures when operating front-end wheel loaders with traction chains.

Highlights: ▶ Whole body vibration (WBV) was measured among front-end loader operators (n=12). ▶ WBV exposures resulting from the use of ladder and basket chains were compared. ▶ Relative to basket chains, ladder chains significantly increased WBV exposures. ▶ Basket chains cost more but reduce the wear and tear on the operator & vehicle.

- **Keywords:** Ergonomics; Task exposure analysis; Low back pain; Traction chains; Injury prevention

Susana García Herrero, Miguel Ángel Mariscal Saldaña, Javier García Rodríguez, Dale O. Ritzel. *Influence of task demands on occupational stress: Gender differences.* Pages 365–374.

Introduction: Occupational stress is a common phenomenon in our society, and generates problems for both workers' health and the functioning of organizations. Over past decades numerous studies have examined occupational stress from the perspective of gender, offering somewhat contradictory results. Some of them found no differences and others indicated that either men or women suffer from greater amounts of occupational stress. Metod: The purpose of this study was to analyze gender differences in stress in situations that involve certain occupational demands. The data used were taken from a random sample population of 11,054 (5,917 men and 5,137 women) from the VI National Survey on Working Conditions (NSWC) which was conducted in Spain in 2007. To carry out this study, a probabilistic model was constructed using Bayesian networks, with the following variables related to task demands: working with tight deadlines, quick work, intellectually demanding work, complicated tasks, repetitive tasks, excessive work, and work demanding high attention levels. Results: The results of this study reveal that: the indicators studied significantly increased stress levels; women initially had higher stress levels than men; and when exposed to determined task demands, stress differences between genders tended to increase. Impact on Industry: Companies need to consider the gender of their workers when assigning tasks in high demand/stress jobs.

Highlights: ▶ Women display higher levels of stress than their male co-workers. ▶ Variables related to work task exacerbate symptoms of stress in both genders. ▶ Work-related mental fatigue from stress was more negative on women than on men.

- **Keywords:** Occupational stress; Gender; Working conditions; Job demands; Bayesian networks

Lori L. Travis, David E. Clark, Amy E. Haskins, Joseph A. Kilch. *Mortality in rural locations after severe injuries from motor vehicle crashes.* Pages 375–380.

Background: Mortality from traffic crashes is often higher in rural regions, and this may be attributable to decreased survival probability after severe injury. Methods: Data were obtained from the National Automotive Sampling System – General Estimates System (NASS-GES) for 2002–2008. Using weighted survey logistic regression, three injury outcomes were analyzed: (a) Death overall, (b) Severe injury (incapacitating or fatal), and (c) Death, after severe injury. Models controlled for (pre-crash) person, event, and county level factors. Results: The sample included 883,473 motorists. Applying weights, this represented a population of 98,411,993. Only 2% of the weighted sample sustained a severe injury, and 9% of these severely injured motorists died. The probability of death overall and the probability of severe injury increased with older age, safety belt nonuse, vehicle damage, high speed, and early morning crashes. Males were less likely to be severely injured, but more likely to die if severely injured. Motorists in southern states were more likely to have severe injuries, but not more likely to die if severely injured. Motorists who crashed in very rural counties were significantly more likely to die overall, and were more likely to die if severely injured. Conclusions: Motorists with severe injury are more likely to die in rural areas, after controlling for person- and event-specific factors.

Highlights: ▶ Mortality after incapacitating injury was analyzed in 2002-2008 NASS-GES data. ▶ Person, event-, and geographic-level predictive factors were considered. ▶ In multivariate models, injured persons were more likely to die in rural counties.

- **Keywords:** Mortality; injury severity; traffic; rural; NASS-GES

Antonio López Arquillos, Juan Carlos Rubio Romero, Alistair Gibb. *Analysis of construction accidents in Spain, 2003-2008. Pages 381–388.*

Introduction: The research objective for this paper is to obtain a new extended and updated insight to the likely causes of construction accidents in Spain, in order to identify suitable mitigating actions. Method: The paper analyzes all construction sector accidents in Spain between 2003 and 2008. Ten variables were chosen and the influence of each variable is evaluated with respect to the severity of the accident. The descriptive analysis is based on a total of 1,163,178 accidents. Results: Results showed that the severity of accidents was related to variables including age, CNAE (National Classification of Economic Activities) code, size of company, length of service, location of accident, day of the week, days of absence, deviation, injury, and climatic zones. Conclusions: According to data analyzed, a large company is not always necessarily safer than a small company in the aspect of fatal accidents, experienced workers do not have the best accident fatality rates, and accidents occurring away from the usual workplace had more severe consequences. Impact on the industry: Results obtained in this paper can be used by companies in their occupational safety strategies, and in their safety training programs.

Highlights: ▶ A large company is not always necessary more safe than a small company
▶ Accidents occurred away from the usual workplace had more severe consequences
▶ Accidents suffered by workers with 5-10 years experience had the worst results

- **Keywords:** Construction; Accidents; Severity; Rates; Variables

P. Geoffrey Willis, Karen A. Brown, Gregory E. Prussia. *Does employee safety influence customer satisfaction? Evidence from the electric utility industry. Pages 389–396.*

Problem: Research on workplace safety has not examined implications for business performance outcomes such as customer satisfaction. Method: In a U.S. electric utility company, we surveyed 821 employees in 20 work groups, and also had access to

archival safety data and the results of a customer satisfaction survey (n = 341). Results: In geographically-based work units where there were more employee injuries (based on archival records), customers were less satisfied with the service they received. Safety climate, mediated by safety citizenship behaviors (SCBs), added to the predictive power of the group-level model, but these two constructs exerted their influence independently from actual injuries. In combination, two safety-related predictor paths (injuries and climate/SCB) explained 53% of the variance in customer satisfaction. Discussion: Results offer preliminary evidence that workplace safety influences customer satisfaction, suggesting that there are likely spillover effects between the safety environment and the service environment. Additional research will be needed to assess the specific mechanisms that convert employee injuries into palpable results for customers. Impact on Industry: Better safety climate and reductions in employee injuries have the potential to offer payoffs in terms of what customers experience.

Highlights: ▶ We link workplace injury rates and customer satisfaction scores at the group level. ▶ Safety climate, mediated by safety citizenship, predicts customer satisfaction. ▶ These psychological constructs exert their influence independently from injuries. ▶ Better safety climate and reduced injury rates may improve customer satisfaction.

- **Keywords:** Workplace safety; Safety climate; Workplace injuries; Safety citizenship behavior; Customer satisfaction.

Bruce G. Simons-Morton, Marie Claude Ouimet, Rusan Chen, Sheila G. Klauer, Suzanne E. Lee, Jing Wang, Thomas A. Dingu. *Peer influence predicts speeding prevalence among teenage drivers. Pages 397–403*

Impact on Industry: Preventing speed-related crashes could reduce costs and improve efficiency in the transportation industry. Objective: This research examined the psychosocial and personality predictors of observed speeding among young drivers. Method: Survey and driving data were collected from 42 newly-licensed teenage drivers during the first 18 months of licensure. Speeding (i.e., driving 10 mph over the speed limit; about 16 km/h) was assessed by comparing speed data collected with recording systems installed in participants' vehicles with posted speed limits. Results: Speeding was correlated with elevated g-force event rates ($r = 0.335$, $p < 0.05$), increased over time, and predicted by day vs. night trips, higher sensation seeking, substance use, tolerance of deviance, susceptibility to peer pressure, and number of risky friends. Perceived risk was a significant mediator of the association between speeding and risky friends. Conclusion: The findings support the contention that social norms may influence teenage speeding behavior and this relationship may operate through perceived risk.

Highlights: ▶ Teenage speeding 10 mph over the speed limit was associated with elevated g-force event rates. ▶ Teenage speeding was associated with substance use, tolerance of deviance, and risky friends. ▶ The association between speeding and risky friends was mediated by perceived risk.

- **Keywords:** Adolescence; Risk taking; Motor vehicle crashes; Naturalistic; Social influence

Jennifer Butters, Robert E. Mann, Christine M. Wickens, Paul Boase. *Gender differences and demographic influences in perceived concern for driver safety and support for impaired driving countermeasures. Pages 405–411.*

Introduction: Driving safety, impaired driving, and legislation to address these concerns remain important issues. It is imperative countermeasures be targeted toward the most appropriate groups. This paper explores the potential relationship between gender and driving attitudes toward safety issues and impaired-driving countermeasures. Method: The data are from the 2007 Impaired Driving Survey commissioned by Transport Canada and Mothers Against Drunk Driving (MADD) Canada. The survey is a, stratified by region, telephone survey of 1,514 Canadian drivers 18 years of age and older with a valid driver's license who had driven within the past 30 days. Results: The findings illustrate a consistent impact of gender on these issues. Other variables were also identified as relevant factors although less consistently. Current findings suggest that strategies for building support for interventions, or for changing risk perception/concern for risky driving behaviors should be tailored by gender to maximize the potential for behavior change. Impact: This information may assist program and policy developers through the identification of more or less receptive target groups. Future research directions are also presented.

Highlights: ▶ We examine gender and concern for driving safety issues. ▶ We examine gender and support for impaired driving countermeasures. ▶ Concern and support of impaired driving countermeasures is greater for women. ▶ Tailor separate strategies for men and women to increase support for these programs.

- **Keywords:** Gender; Driving safety issues; Drinking-driving countermeasures; Targeted interventions; Driver attitude

David J. Grand, Thomas K. Eggin, William W. Mayo-Smith, John J. Cronan, Julie Gilchrist. *Injuries from ingesting wire bristles dislodged from grill-cleaning brushes — Providence, Rhode Island, 2009–2012. Pages 413–415.*

Foreign object ingestion is a common reason for visiting an emergency department; however, wire grill-cleaning brush bristles are an uncommon foreign object. This report describes a series of twelve cases identified in a single hospital system from July 2009 through June 2012. Patients included six males and six females; ages ranged from 11 to 75 (mean: 47 years). The patients all reported recent outdoor residential food grilling and use of commercially available wire grill-cleaning brushes. The severity of injury ranged from puncture of the soft tissues of the neck, causing severe pain on swallowing, to perforation of the gastrointestinal tract requiring emergent surgery. Before cooking, persons should examine the grill surface carefully for the presence of wire bristles that might have dislodged from the grill brush and could embed in cooked food. Alternative residential grill-cleaning methods or products might be considered.

Highlights: ▶ Wire bristles from grill-cleaning brushes may dislodge and be inadvertently ingested with food. ▶ Plain radiography and CT without oral contrast are mainstays of diagnostic workup. ▶ Surgery may be required in cases of gastrointestinal perforation.

- **Keywords:** Ingestion of food; Ingestion of objects; Grill-cleaning brushes; Imaging; Foreign body

Ruth A. Shults, Laurie F. Beck. *Self-reported seatbelt use, United States, 2002–2010: Does prevalence vary by state and type of seatbelt law? Pages 417–420.*

Problem: Motor-vehicle crashes are a leading cause of death in the United States. Seatbelts are highly effective in preventing serious injury and death in the event of a

crash. Not all states have primary enforcement of seatbelt laws. Methods: Data from the 2002, 2006, 2008, and 2010 Behavioral Risk Factor Surveillance System were used to calculate prevalence of seatbelt use by state and type of state seatbelt law (primary vs. secondary enforcement). Results and discussion: Self-reported seatbelt use among adults in the United States increased steadily between 2002 and 2010, with the national prevalence reaching 87% in 2010. Overall, seatbelt use in 2010 was 9 percentage points higher in the states with primary enforcement laws than in the states with secondary enforcement laws (89% vs. 80%). Impact on industry: Primary enforcement seatbelt laws and enhanced enforcement of seatbelt laws are proven strategies for increasing seatbelt use and reducing traffic fatalities.

Highlights: ▶ Primary enforcement seatbelt laws and enhanced enforcement of seatbelt laws are proven strategies for increasing seatbelt use. ▶ NHTSA estimated that nearly 450 additional lives would have been saved, 12,000 nonfatal injuries prevented, and \$1.6 billion in societal costs saved in 2009 alone if all states had primary laws. ▶ Seatbelt use in states with secondary laws continues to lag behind that of states with primary laws.

- **Keywords:** Seatbelt use; Primary enforcement; Secondary enforcement