

associations between laws and transfers using Exponential Random Graph Models applied to this valued directed geographic network.

**Results** A total of 178,712 interstate firearms were transferred between the 48 contiguous US states for 2015 to 2017. After accounting for network structure and population characteristics, additional firearm laws in origin states were associated with 12% fewer traced firearm transfers (IRR=0.88; 95%CI: 0.83, 0.93,  $p<0.001$ ), whereas additional firearm laws in destination states was associated with 10% more traced firearm transfers (IRR=1.10; 95%CI: 1.06, 1.15,  $p<0.001$ ).

**Conclusion** Weak firearm laws affect firearm availability in states with strong firearm laws due to illegal flow across state lines.

**Significance/contribution to Injury and Violence Prevention Science** Firearm homicide disproportionately affects minority and otherwise disadvantaged individuals, groups, and neighborhoods. Preventive intervention to reduce health disparities related to firearm homicide must consider human mobility.

## Motor vehicle crashes: epidemiology and interventions

### 62 SOBRIETY CHECKPOINTS REDUCE ALCOHOL-INVOLVED MOTOR VEHICLE CRASHES; DO CHECKPOINT SIZE AND DURATION MATTER?

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**Statement of Purpose** Sobriety checkpoints have strong empirical support as an intervention to reduce alcohol-related motor vehicle crashes. This study examined whether checkpoint size (number of police officers) and checkpoint duration (amount of time in operation) affect associations with alcohol-related crashes.

**Methods** Queensland Police Service provided latitude-longitude coordinates and date and time data for all breath tests and alcohol-related motor vehicle crashes in the Australian city of Brisbane from January 2012 to June 2018. Hierarchical cluster analysis identified checkpoints as clusters of  $\geq 25$  breath tests conducted by  $\geq 3$  breath testing devices over a duration of 3 to 8 hours. Checkpoints and alcohol-related crashes were aggregated as counts per week. Generalized linear autoregressive moving average models related crashes to the number of checkpoints conducted within each week, as well as 1 week prior and 2 weeks prior. Models controlled for seasonality and other theoretically relevant covariates (e.g. precipitation, public holidays).

**Results** A total of 3,420 alcohol-related crashes occurred and 2,069 checkpoints were conducted in Brisbane over the 6.5-year (339-week) study period. Checkpoints included a mean of 266.2 breath tests (SD=216.3), 16.4 devices (SD=13.7), and were 286.3 minutes duration (SD=104.2). Each 10 additional checkpoints were associated with a 5% decrease in crash incidence at a lag of 1 week (IRR= 0.95; 95%CI: 0.91, 1.00). We detected no differential effects according to checkpoint size or duration.

**Conclusions** Sobriety checkpoints are associated with fewer alcohol-related motor vehicle crashes for around 1 week. Checkpoint size and duration do not appear to affect this association.

**Contribution to Injury and Violence Prevention Science** Disadvantaged populations have greater incidence of alcohol-related motor vehicle crashes. Police departments can use the results of this study to maximize injury prevention and reduce health disparities while minimizing operational costs by conducting shorter checkpoints with fewer officers.

## Motor vehicle injuries and policy

### 65 EXAMINING IMPACTS OF CONGESTION PRICING POLICIES ON ROAD SAFETY OUTCOMES USING A SYSTEM DYNAMICS APPROACH

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**Purpose** Congestion pricing policies (CPPs) are a travel demand management strategy designed to reduce peak-period traffic volumes by financially encouraging road users to use alternate transport modes, eliminate trips, or travel at different times. Several U.S. cities are considering CPPs, and New York City (NYC) plans to implement a CPP in 2021. While researchers have explored traffic flow and air pollution impacts of these policies, little is known about road safety impacts. We examined potential pedestrian safety impacts of NYC's proposed CPP.

**Methods** Integrating data from 1) multidisciplinary group model building sessions focused on pedestrian fatality trends, 2) a robust review of the CPP literature, and 3) NYC-specific data from the Metropolitan Transportation Authority, Department of Transportation, and American Community Survey, among others, we built a system dynamics simulation model with a time horizon of 2005–2035. The model structure represents alternate dynamic hypotheses about interrelated mechanisms underlying the impact of CPP on NYC mode-specific travel and pedestrian safety trends.

**Results** Key dynamic feedback mechanisms contributing to safety trends included demand for and, ultimately, use of specific travel modes (e.g., personal vehicle, metro, walking), which affected overall attractiveness of a given mode (e.g., due to congestion, crowding, perceived safety), and then further affected demand for corresponding modes. CPP revenue allocation to support use of specific modes by increasing numbers of metro cars and pedestrian/cyclist infrastructure may improve long-term safety trends, but delays in purchasing and improving infrastructure could negatively impact short-term safety trends.

**Conclusions** CPPs affect several, interrelated transportation and injury outcomes. Cities considering these policies should assess the status of and need for critical injury prevention strategies, such as safe and equitable infrastructure for all travelers, prior to implementation.

**Contribution** System dynamics models are an important tool for exploring the interrelated factors and ripple effects that determine transportation policy impacts.