



**The author(s) shown below used Federal funding provided by the U.S. Department of Justice to prepare the following resource:**

**Document Title:** Developing and Implementing a Tool to Evaluate and Improve Underage Drinking and Driving Policies

**Author(s):** Eduardo Romano Ph.D., Michael Scherer, Ph.D., Eileen Taylor, M.S.

**Document Number:** 250438

**Date Received:** December 2016

**Award Number:** 2012-AH-FX-0005

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# Developing and Implementing a Tool to Evaluate and Improve Underage Drinking and Driving Policies

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**Final Report**  
**September 12, 2016**  
**Grant # 2012-AH-FX-0005**

Prepared by:

Pacific Institute for Research and Evaluation

For

U.S. Department of Justice  
Office of Justice Programs

This project was supported by Grant # 2012-AH-FX-0005 awarded by the Office of Juvenile Justice and Delinquency Prevention, Office of Justice Programs, U.S. Department of Justice. The opinions, findings, and conclusions or recommendations expressed in this publication/program/exhibition are those of the author(s) and do not necessarily reflect those of the Department of Justice.

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# Developing and Implementing a Tool to Evaluate and Improve Underage Drinking and Driving Policies

## ABSTRACT

The benefits of the minimum legal drinking age of 21, graduated driver licensing, zero-tolerance, and blood alcohol concentration per se laws to curb teens' drinking and driving combined with driving have been clearly established. Despite the benefits associated with these laws, teen drinking and driving remains a problem. Variations in enactment and enforcement of these laws across states and their implementation under a variety of local economic and cultural environments contribute to reducing policy efficacy. Policy makers and officials in each community face the difficult problem of assessing which legal, regulatory, and enforcement efforts would be the most efficient (i.e., achieve results at a minimum cost) to curb teen drinking and driving.

To address these issues, we built a data-based model (SIM-DUI) that combines scientific knowledge with specific laws to help policy makers in different communities and states explore policy changes and forecast alternative outcome scenarios in terms of reduced crashes and lives saved. SIM-DUI is an Excel-based modeling tool that allows users to simulate how changing existing laws or implementing new laws and policies in their jurisdiction may impact underage alcohol-related crashes (fatal and non-fatal) among teens aged 15 to 20 years.

This 2-phase effort built a user friendly tool (Phase I) and tested it in San Diego County, CA (Phase II).

PIRE is in the process of developing a website so that interested parties can use the model themselves or ask for assistance. <http://www.pire.org/preview/SIM-DUI/>

## BACKGROUND

### Alcohol Policies and Underage Drinking and Driving

To reduce the prevalence of impaired driving and other alcohol-related problems among teens in the U.S., states have passed a battery of laws, including the graduated driver licensing (GDL) law, which requires an extended period of driving with adult supervision and additional periods of driving during which teen passengers and nighttime driving is prohibited, and the zero-tolerance (ZT) law, which makes it an offense to drive with any alcohol in the body. Both of these laws strengthen the effect of the minimum legal drinking age 21 (MLDA-21).

Evidence shows that these laws have greatly reduced the involvement of underage drivers in alcohol-related fatal crashes (Shults et al., 2001; Voas, Tippetts, & Fell, 2003). Despite the availability of these legal instruments, impaired driving remains a devastating source of risk for teens in the U.S. In 2008, vehicle crashes were the leading cause of death for teens. Approximately one third of drivers aged 15 to 20 years who were killed in crashes had a blood alcohol concentration (BAC) of .01 grams per deciliter (g/dL) or higher; about one quarter had a BAC of .08 or higher (National Highway Traffic Safety Administration [NHTSA], n.d.). Clearly, the effectiveness of these laws needs to be improved. State officials need information that can guide them through what they can do. However, providing such guidance is not straightforward. The overlapping effect of several laws on teen drinking and driving, coupled with provisions that vary from state to state and levels of enforcement threatened by budget constraints, makes the

evaluation of current policies very difficult. Furthermore, recent research has cast some doubt on the broad effectiveness of some of these policies (e.g., GDL, MLDA-21).

### Scope of the Problem: A Complex Array of Traffic Laws and the Stubborn Persistence of Underage Impaired Driving

The laws and regulations aimed at reducing the likelihood that teens in the U.S. drink and drive were not enacted simultaneously and differ from state to state.

#### *Minimum Legal Drinking Age of 21*

Perhaps no alcohol safety measure has attracted more research and public attention or shown more consistent evidence for its effectiveness than the MLDA-21 (Toomey, Rosenfeld, & Wagenaar, 1996). Enacted in 1984, it was the first law for which the U.S. Congress, under the Highway Safety Act, imposed a sanction on states that did not enact a MLDA-21 law by withholding federal highway construction funding. NHTSA estimated that MLDA-21 laws save up to 1,000 lives per year in traffic fatalities alone (Jones & Lacey, 2002), and substantial evidence shows that ZT laws are saving additional lives (Blomberg, 1992; Hingson, Heeren, & Winter, 1994; Voas & Marques, 2003).

The public generally assumes that the MLDA-21 is embodied in a single law, and therefore, all states have essentially the same law. In reality, the MLDA-21 has multiple provisions targeting outlets that sell alcohol to minors, adults who provide alcohol to minors, and underage persons who purchase or attempt to purchase, possess, or consume alcohol. Additionally, companion laws provide for lower BAC limits for underage drivers, graduated driver licensing, and other legislation, such as keg registration and prohibitions against advertising to youth. These diverse laws vary considerably from state to state and their effectiveness to curb teens' impaired driving is unclear.

Despite favorable evidence, criticism of the MDLA-21 laws has surfaced. A group of former college presidents introduced the "Amethyst Initiative," which proposed lowering the MLDA from 21 to 18 years (Amethyst Initiative, 2011). The proponents argued that binge drinking among college students has been exacerbated by some students (mostly juniors and seniors) being legally allowed to drink, while others (mostly freshmen and sophomores) are not (Martinez, Muñoz García, & Sher, 2009). An intense and ongoing debate followed (60 Minutes, 2010, March 10), including a series of debates organized on several U.S. college campuses between John McCardell, the Amethyst Initiative's leader, and James Fell, from the Pacific Institute for Research and Evaluation (PIRE). Supporters of the Amethyst Initiative argue that by allowing transitional access to alcohol at much younger ages than in the United States (typically 18 years, but 16 years or even younger for some), most countries in the world have reduced the levels of binge drinking among their college student population yet have kept them safe from drinking and driving. Some evidence—showing that European and Australasian college students are engaged in drinking patterns similar to those in America—negates that argument (Karam, Kypri, & Salamoun, 2007; Kypri, Langley, & Stephenson, 2005). Furthermore, even if drinking and driving among 18- to 21-year-olds was much less of a problem in some countries other than the United States, that might be due to stricter enforcement of underage drinking-driving laws, a reduced amount of driving, or both. Despite the current focus of the MDLA debate on college students, a reduction in the MDLA from 21 to 18 years would clearly affect all teens, college students or not.

### *Zero-Tolerance Laws*

As Lacey, Wiliszowski, and Jones (2004) pointed out, “the concept of zero-tolerance laws for youth is based on the following proposition: as it is illegal for persons younger than 21 to drink (or depending on the state, purchase or possess) alcohol, it should also be illegal for them to drive with any alcohol in their systems.” In 1995, federal legislation was enacted that established a BAC of .02 g/dL or higher as a national ZT standard for drivers younger than 21 years, and the U.S. Congress imposed a sanction on states that failed to pass legislation providing for ZT laws. In 2003, members of this research team used the Fatality Analysis Reporting System (FARS) to evaluate the simultaneous effect of MLDA-21 and ZT laws on fatal crashes (Voas et al., 2003). The authors credited MLDA-21 and ZT laws with a substantial reduction in the proportion of underage drinking drivers in fatal crashes. Currently, all 50 states and the District of Columbia have enacted ZT laws. Although more uniformly implemented than the MLDA laws, ZT laws vary across states depending on the type of penalties imposed—administrative and/or criminal. Examining these differences in penalties was one goal of this study. It is reasonable to expect that reducing the MLDA from 21 to 18 years—as proposed by the Amethyst Initiative—would affect the efficacy of the ZT laws to curb drinking and driving, particularly among those aged 18 to 20 years.

### *Graduated Driver Licensing*

There is ample evidence that young novice drivers present an elevated crash risk (Mayhew, Simpson, & Pak, 2003; McCartt, Shabanova, & Leaf, 2003; Subramanian, 2003). Learning to drive is a high-risk activity for teens aged 16 and 17 years, and the risk of being in a crash is at a lifetime high during the first 2 years of driving (National Safety Council, 2005). Williams (1999) found that the crash involvement rate for 16-year-olds was four times that of drivers in their 20s. To address this issue, many states have adopted graduated driver licensing systems that require a progression to full license privileges occurring in stages (Voas & Fell, 2010). The rationale for GDL is to extend the period of supervised driving, thus permitting beginners to acquire their initial on-the-road driving experience under lower-risk conditions.

As with other laws and policies, GDL laws have been enacted in different ways across states (e.g., age requirements, nighttime restrictions). In this effort, we examined these differences as they interact with other policies. Although the prevailing paradigm represents GDL programs as providers of benefits with no negative consequences, recent research suggests that might not be the case. Masten, Foss, and Marshall (2011) found evidence suggesting that although GDL laws have reduced fatal crash rates among drivers aged 16 and 17 years, they also are associated with increased fatal crash rates among those aged 18 years. As an explanation, the authors speculated that GDL laws could have induced some teens to delay their driving initiation until age 18, acquiring their full licensure when no longer subject to GDL requirements. Novice older drivers lacking the driving experience gradually provided by GDL laws, particularly those escaping parental supervision (e.g., college students), may be more vulnerable to impaired driving and alcohol-related motor vehicle crashes.

### *BAC Per Se*

In the 1970s, the Department of Transportation encouraged all states to enact laws that would make it a violation per se to drive with a BAC of .10 or higher. On June 15, 2000, the Senate passed H.R. 4475, which included a provision encouraging states to adopt .08 BAC per se laws.

Since then, the all 50 states and DC have enacted .08 BAC per se laws. Research—from this team and others—has also suggested that a reduction in the maximum BAC per se from .08 to .05 would further reduce the fatality tolls (Fell & Voas, 2006). Albeit *prima facie*, a discussion on the pros and cons of moving the BAC per se law from .08 to .05 would be relevant only to adult drivers. Yet the suggestion that MDLA-21 be reduced to MDLA-18 makes the BAC per se debate pertinent to the safety of drivers aged 18 to 20 years.

## Summary of Problem Statement

Despite the battery of policies and laws enacted to curb underage drinking, teen drinking and driving remains a problem. For state policy makers and stakeholders, learning the strengths and weaknesses of their legal weaponry is crucial to enhancing its effectiveness. However, as we have briefly reviewed, acquiring such knowledge is not straightforward. Variations on enactment and enforcement of these laws across states and their implementation under a variety of economic and cultural environments make such learning difficult. Furthermore, recent challenges to some of the extant policies will only add to the burden of policy makers trying to prioritize the destination of their political and economic resources.

Despite the inherent complexity, research has provided valuable information about the way the myriad of overlapping sets of laws and regulations independently affect underage drinking and drinking and driving. The overall benefits of the MLDA-21, GDL, ZT, and BAC per se laws are clearly established. However, states have enacted specific sets of interacting policies and regulations that are implemented under varying economic conditions (e.g., unemployment, price of gas, price of alcohol). Because policy makers and officials in each state face the difficult problem of assessing which legal, regulatory, and enforcement efforts should be the most efficient (i.e., achieve results at a minimum cost), they need a tool that can help them make effective decisions. This tool should be based on the currently available scientific knowledge, combined with legal and budgetary conditions specific to each state to explore policy changes and forecast alternative outcome scenarios. Such a tool should not only be rooted in scientific knowledge but also be simple enough to allow policy makers and community advocates to investigate policy options and interpret policy outcomes on their own.

## PHASE I

Phase I focused on the steps to building a user-friendly simulation model that predicted outcomes in terms of the number of annual crashes and fatalities based on changes to 20 MLDA laws and 4 underage drinking and/or driving laws.

### 1. Literature, Laws, and Database Searches

The Research Team first compiled articles on underage drinking laws using the PIRE library system, PsychInfo, PubMed, and Google Scholar. An Excel database was created to store search dates, keywords searched, author names, publication titles, and journal information, as well as links to abstracts and article summaries.

Guided by an internal Advisory Group—Dr. Robert Voas, Dr. Harold Holder, and Mr. James Fell—as well as by the findings of the literature review, the Research Team initially created a list of 16 MLDA laws with proven impact on teen impaired driving. In late 2013, we added four additional laws of interest for a total of 20 MLDA laws.

Each of the 20 identified MLDA laws have merits for inclusion in a simulation model. In addition, we also included other legislation that has been shown effective in reducing adverse alcohol-related driving outcomes in prior literature, for a total of 24 alcohol- and/or driving-related laws in the final model.

#### MLDA Laws

1. Possession
2. Purchase
3. Consumption
4. Internal Possession
5. Use and Lose
6. Use of Fake Identification among minors
7. Zero-Tolerance
8. Graduated Driver Licensing with nighttime restrictions
9. Furnishing/Selling
10. Age of On-premise Alcohol Sellers/Servers
11. Age of On-premise Bartenders
12. Age of Off-premise Alcohol Sellers/Servers
13. Keg Registration
14. Responsible Beverage Service Training
15. Retailer Support for Fake Identification
16. Dram Shop Liability
17. Social Host Civil Liability
18. Social Host Prohibition
19. Transfer/Production of Fake Identification
20. State Control of Alcohol

#### Other laws

21. Minimum Legal Drinking Age 18 and 21
22. Automatic License Revocation
23. Seat Belt Safety
24. BAC per se

Examination of the literature yielded an interesting finding that forced us to revise some earlier versions of the model. Research has shown that although GDL laws have benefited novice drivers aged 16 to 17 years, it may have increased the crash risk of novice drivers aged 18 years. Researchers hypothesize that such a pattern relates to teens delaying their driving licensure to after the GDL period. Although the reasons for such a delay do not seem exclusive to the GDL program,<sup>1</sup> the delay nevertheless resulted in an increased number of teens aged 18 to 19 years hitting the roads while still inexperienced and prone to risk-taking. We decided to account for this pattern in the simulation model, and therefore, the observed new age-related patterns of risky driving have been incorporated into the model.

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<sup>1</sup> Besides avoiding the restrictions imposed by the GDL program, reasons suggested for the delay in licensure include economic and financial hardships (related for instance to access to a vehicle, car insurance, price of gas, etc.) and the rise of social media, which has reduced teens' need to socialize in person.

Based on advice from the Advisory Panel, we added the following data elements to the model: measures of population composition, beer consumption, vehicle miles traveled, and employment. The inclusion of these measures of driving exposure and alcohol consumption allowed the model to achieve more accurate predictions of driving under the influence (DUI) outcomes. Further, to account for the role of law enforcement on DUI outcomes, we also added a variable that measures the presence or absence of sobriety checkpoints.

Access to sound and reliable data was crucial to the model. It is difficult to find sound databases on the variety of topics needed for the model that were collected on the same regions and covered similar time frames. Guided by the Advisory Group, as well as by the findings of the literature review and past experience in the field, we were able to identify promising resource databases suitable for modeling that included fairly consistent data across years and had the most important variables needed to stratify by gender and age. The stratification of the data by gender and age was also crucial as the model targets specific age groups.

For a solid test of the model, we initially focused data gathering from one state that had all the needed data elements over a suitable period of years: California. The plan was first to develop a sound model for California then to adjust the model to all states. Using the California Statewide Integrated Traffic Records System (SWITRS) database, we developed an initial model. In testing this model, we found that preliminary analyses with data up to the year 2009 predicted the occurrence of fatal crashes in the state in 2010 and 2011 to within 8% accuracy (i.e., were able to “predict” the fatal crashes observed in the state compared to FARS data). We also were able to predict non-fatal crashes up to 2011, albeit with a bit less accuracy than the model for fatality crashes (within about 20% to 30% variance). This difference was caused by the data source for non-fatal crashes; SWITRS data is less comprehensive than FARS is for fatal crashes.

We then tried to collect reliable non-fatal crash data on all states to add to the model. Unfortunately, the set of data we needed was not available for the vast majority of states. Further, we also found that for states that did have data, there was great variation in how the data were collected, making it difficult to expand the model to all other states.

*Table 1. Databases used for California*

Data	Data source
Underage drinking laws	Alcohol Policy Information System
Annual fatal crash data	FARS
BAC .08/.10 laws	NHTSA Digest of Impaired Driving and Selected Beverage Control Laws, DOT HS 811-796
Administrative license revocation or suspension laws	Insurance Institute for Highway Safety
Seat Belt safety laws	NHTSA Summary of Vehicle Occupant Protection Laws
Sobriety checkpoints	Governors Highway Safety Association
Beer consumption	National Institute on Alcohol Abuse and Alcoholism's Alcohol Epidemiologic Data System
Alcohol outlet density	California Department of Alcohol Beverage Control
Vehicle miles traveled	Federal Highway Administration
Alcohol and gasoline tax	Tax Foundation
Unemployment rates	U.S. Bureau of Labor Statistics
DUI rates among drivers	California Department of Motor Vehicles—DUI Management Information System
Sworn police officers	San Diego Association of Governments

## 2. Classification and Coding of Laws and Policies

Policies and laws tend to vary sharply by state. Developing classification of laws and policies that could be incorporated into the model was key to the project. The Research Team was able to take advantage of previous work already completed by PIRE Advisory Group member, Jim Fell—the classification of 16 underage drinking laws and policies in place as of 2006.

Staff updated the legal provisions of the 16 underage drinking laws through 2012 and added 4 additional laws for a total of 20. A data set was created that not only informs about where and when each of the laws and policies of interest were enacted but was coded for the strength of enforcement provisions. Measuring the strength of each law required the development and implementation of a scoring system designed to assign points for provisions of laws that should deter young people from using alcohol and to deduct points for provisions that limit the effectiveness of the law or make enforcement difficult. Assessments of core and expanded laws were based on empirical evidence, where it existed, and/or reasoned theoretical arguments. The scoring system was also reviewed by legal and traffic safety experts. It was designed so that a value of zero corresponds with a state not having a law (or having a law with so many restrictions as to make the law unviable) and higher values represent stronger laws. The scoring system used in the law structures of the simulation model were drawn from prior research conducted by Mr. Fell and his collaborators (Fell, Fisher, Voas, Blackman, & Tippetts, 2008) then updated, refined for use in the current grant, and published in an empirical journal (Fell, Thomas, Scherer, Fisher, & Romano, 2015).

A detailed and updated description of the coding scheme used was completed for each law updated through 2012. This scoring system will allow community leaders to explore the consequences not only of enacting new policies but also of strengthening those in place.

## 3. Building an Operational Simulation Model

Variables were selected for inclusion in the model based on a review of the underage drinking literature and examination of policy concerns. Once variables were identified, the Research Team met with the Advisory Group to create a preliminary conceptual model. Data from multiple sources were chosen to measure each of these constructs to allow for more accurate and detailed model construction. The data were analyzed using Structural Equation Modeling (SEM) techniques with Analysis of Moment-Based Structures (AMOS v.21), an SPSS-based statistical software package. SEM is a statistical technique frequently used to estimate causal relationships based on qualitative assumptions represented in a path diagram. SEM allows for confirmatory and exploratory modeling of both observed variables or latent variables derived from combinations of other observed variables, and as such, was deemed appropriate for the current research. With the intent of creating a more user friendly interface, variable relationships obtained using SEM were then entered into a macro-enabled 2010 Microsoft Excel program.

## 4. Feedback on the Model

To assess the validity and usefulness of the model, we began seeking comments and suggestions from potential users and stakeholders. We started this process with our in-house experts. In early 2014, we presented the simulation model to three PIRE staff who were dedicated to the OJJDP Enforcing Underage Drinking Laws (EUDL) project. The feedback we received was very useful and adjustments were made. The three participants were enthusiastic about the program, indicating that it would become an important tool for practitioners and policy makers in the field.

We also received feedback from other potential model users via three conferences, which included poster presentations, a handout at the Lifesavers Conference (Appendix A) and a demonstration of the model with a laptop computer:

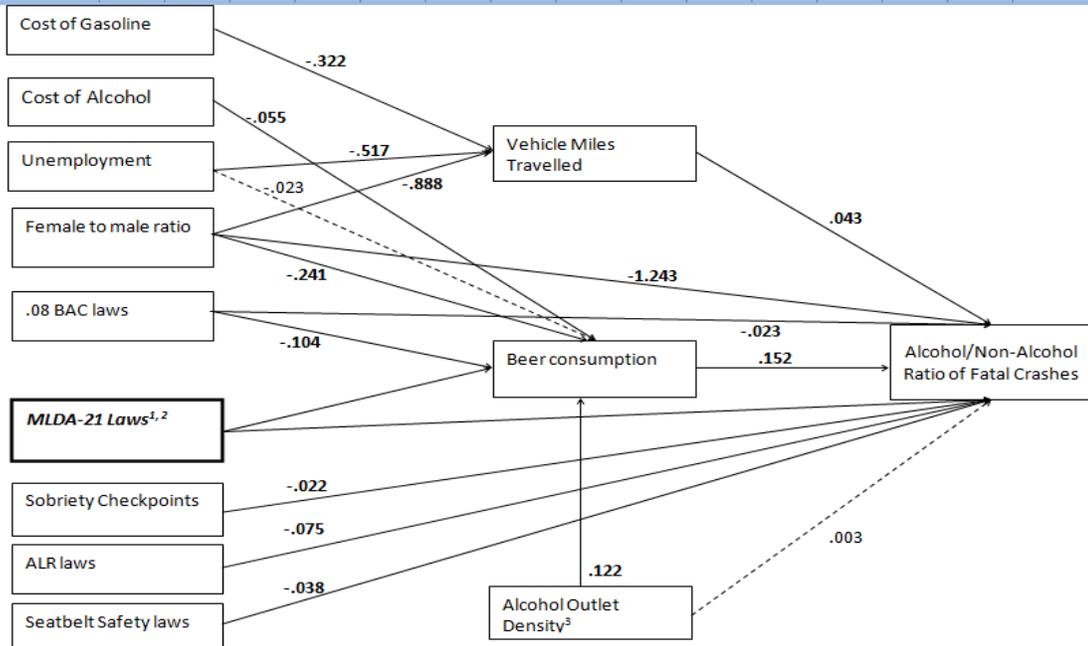
- ▶ Research Society on Alcoholism (RSoA) Scientific Meeting, June 21 to 25, 2014 (Poster, Appendix B- *SIM-DUI: A Model Simulation Predicting the Impact of Laws on Alcohol-Impaired Driving Fatal and Non-Fatal Crashes Among Underaged Drivers*)
- ▶ Lifesavers Conference, March 15-17, 2015 (Poster, Appendix B- *SIM-DUI: A Simulation Model Predicting the Impact of Laws on Alcohol-Impaired Driving Fatal and Non-Fatal Crashes Among Underaged Drivers*)
- ▶ Alcohol Policy Conference 16, April 6-8, 2016 (Poster, Appendix B- *SIM-DUI San Diego: A Simulation Model Predicting the Impact of Laws, Media, Taxation, Law Enforcement and Alcohol Availability on Underage DUI/DWI Rates*)

The model was well received by conference participants, who demonstrated a high level of enthusiasm both for the project in general and the model specifically. We received encouraging and supporting comments from all types of visitors, including researchers, community advocates, and clinicians. We were asked about future expansions of the model, with many people showing interest in looking at the impact of policies and programs on marijuana use and drugged driving among teens. We also received one criticism from a supporter of the Amethyst Initiative. Based on this exposure, a list of contacts was assembled of individuals and groups that want to be updated as the model progresses so they may gauge its utility in their own work.

## 5. Impact of Laws on Reducing Alcohol-Related Crashes Among Teens

After multiple iterations based on feedback and trial and error, we finalized the SIM-DUI model (Figure 1).

Figure 1. Final SIM-DUI model diagram



<sup>1</sup> indicates "MLDA-21 Laws" consist of the following laws: Possession, Purchase, Consumption, Internal Possession, Use and Lose, Fake Identification – minor, Zero Tolerance, Graduated Driver's License with nighttime restrictions, Furnishing, Age of servers, Age of Bartenders, Age of Sellers, Keg Registration, Retail Beverage Service Training, Fake Identification – retail, Social Host Prohibition, Dram shop, Social Host Civil Liability, Fake Identification – production, State control of alcohol.

<sup>2</sup> indicates the regression weights are removed from the current model for purposes of clarity. To see regression weights for these variables, see Table 2.

<sup>3</sup> indicates data for Alcohol Outlet Density was only available for the State of California and was run as a separate regression equation.

The national model examined the role of laws, law strengths, and demographic and socioeconomic factors associated with alcohol-related fatal and non-fatal crash rates among drivers in three age groups: 15 to 17 years, 18 years, and 19 to 20 years. Though many laws and socioeconomic and demographic factors had a significant impact on underage fatal and non-fatal crash ratios in the structural model, Possession and Purchase laws had the most notable decrease on underage alcohol-related crash ratios (-11.8%,  $p < .001$ ) for all age groups. GDL laws were highly contingent upon age groups; drivers who were aged 15 to 17 years demonstrated a decrease in alcohol-related crash ratios (-17.2%,  $p < .001$ ) while drivers aged 18 to 20 years demonstrated an increase in alcohol-related crash ratios (+18.7%,  $p < .001$ ). Other factors significantly associated with alcohol-related crash ratios included ratio of male to female drivers (+4.4%,  $p = .007$ ), driving safety laws (-7.9%,  $p < .001$ ), keg registration laws (+6.2%,  $p < .001$ ), and consumption laws (-14.4%,  $p < .001$ ). Though many of the factors examined in the national model were not able to be used in the community model, the effects of changes in state-level and national legislation were still a vital component in the construction of the final simulation. Including these elements from the national model allowed users of the community model to examine the potential impact of changes in legislation at the state or national level (e.g., if the national drinking age is lowered or if the State of California adopts new laws).

PIRE is in the process of developing a website so that interested parties can use the model themselves or ask for assistance. <http://www.pire.org/preview/SIM-DUI/>

## PHASE II: SAN DIEGO MODEL

During Phase II, SIM-Dzui was demonstrated with data from San Diego County, California. The goal was to explore if the model works effectively for a local community to predict increases or decreases in rates of Driving Under the Influence (DUI) citations among drivers younger than 21 years.

The Global Institute for Public Strategies (GIPS) partnered with PIRE for the collection of local data for Phase II. GIPS is a nonprofit organization located in San Diego County, CA, that focuses on promoting data-oriented research on alcohol-related problems and the training and dissemination of appropriate countermeasures (<http://publicstrategies.org/>). Taking advantage of their expertise and knowledge of the area, GIPS was charged with gathering of data on three essential components of community programs: (1) media exposure, (2) local regulations and policies, and (3) local law enforcement efforts. Further, GIPS was also instrumental in helping us fine tune the model to better reflect the needs of the community. Once a first version of the model was operational, GIPS called a community meeting during which we had the opportunity to present the model. Participants provided input on the utility of the model as a tool for community members and policy makers.

Based on the experience we gained from the national model and with the data provided by GIPS, a simulation model was created to predict the impact of laws, media, taxation, law enforcement, and alcohol availability on underage DUI/DWI rates. GIPS provided these data sets to populate the model for San Diego County:

- ▶ ABC TRACE reports, San Diego County and the State of California, 2006-2011\*
- ▶ San Diego County, all jurisdictions, Social Host policy matrix\*\*
- ▶ San Diego County, all jurisdiction RBSS policy matrix, 2011\*\*\*
- ▶ DMV DUI Database 2007-2011, San Diego County (by gender & age)

- ▶ San Diego County Media Campaigns related to Social Host, 2007-2008
  - ▶ San Diego County, Emergency Department Discharge Database—HHS, PHS, 2014 by age group, by subregion, 2011 & 2012
  - ▶ Analyzed and compiled media and community campaigns, 2007-2010 for DUI, Social Host, RBSS policies and media, and Alcohol Beach Ban policies, media and campaigns countywide
  - ▶ Media and community campaign data compilation for 2011
  - ▶ RBSS policy matrix (updated 10/2014) for all San Diego County jurisdictions
  - ▶ Number of sworn law enforcement agency personnel by jurisdiction. Between all four reports you will find the consecutive years, 2006-07, 2007-08, 2008-09, 2009-10, 2010-11, 2012-13, 2013-14. Source cited (SANDAG, San Diego County and Cities' Actual Expenditures)
- \* TRACE—Target Responsibility for Alcohol Connected Emergencies, California Alcoholic Beverage Control Program
- \*\* Social Host matrix provides the following information: Municipal Code, Municipality, Ordinance Definitions, Prima Facie, Duties to Inspect, Penalty, Host—misdemeanor, infraction, or civil and/or administrative, Minor Consumption Penalty, Cost Recovery Options, Reservation of Legal Options, Parent-Juvenile Cost Recovery, Adopted Date, Amended Date
- \*\*\* Responsible Beverage Service and Sales (RBSS) matrix provides the following information: Municipal Code, Municipality, Training Mandates, Alcohol license off-sale/on-sale, Training type, New-Hire Grace Period, Certification Period, RBSS included in a CUP, Nuisance Provision, Penalties, Cost Recovery, Training Verification, Appeals Process, Date Passed

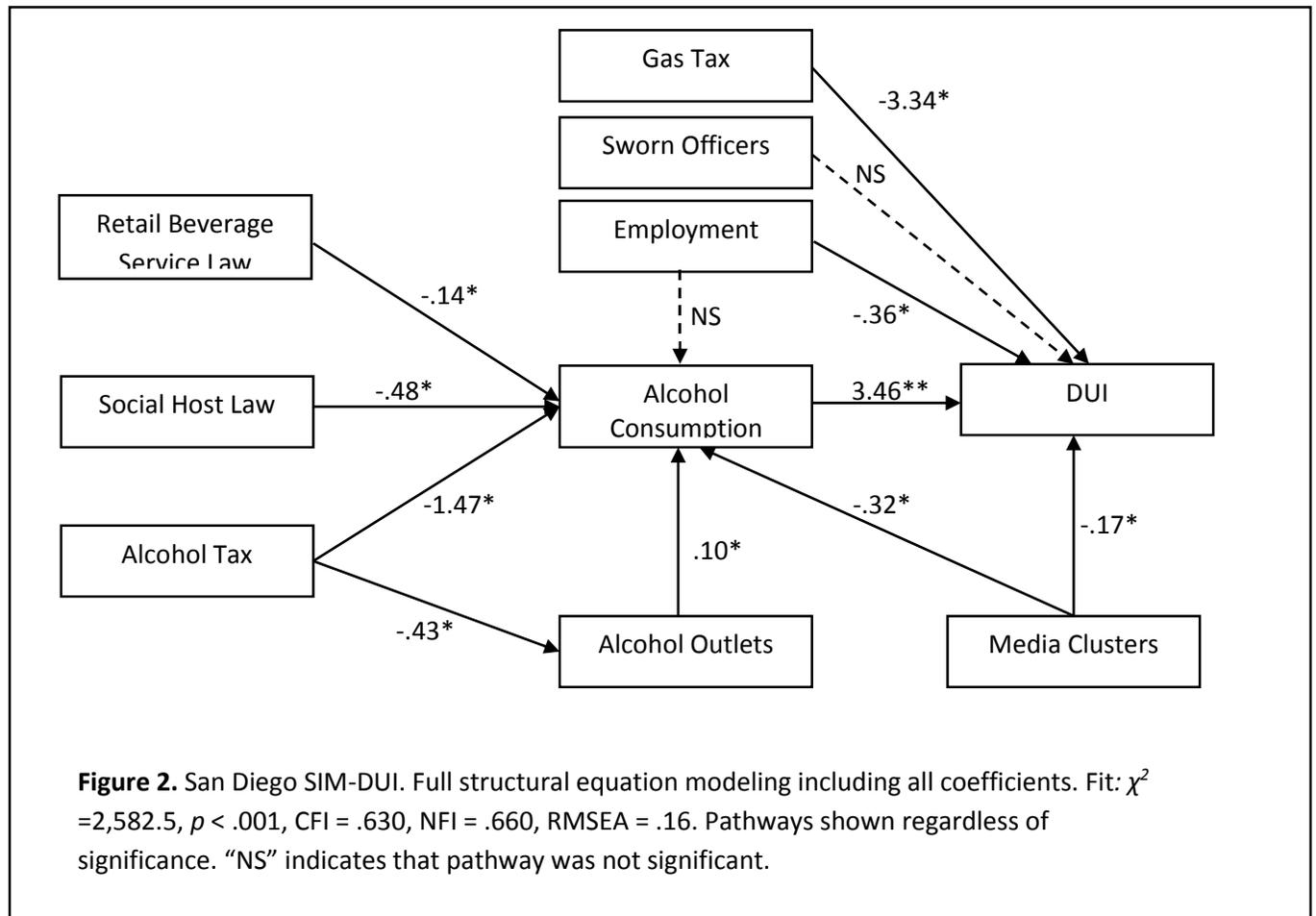
## Building the Model

As mentioned, the aim of the San Diego SIM-DUI model was to predict the impact of local policies while simultaneously taking statewide laws into account as well as the impact of specific demographic and economic local features. Our previous research found that the State of California had implemented 15 of the 20 MLDA-21 laws. However, of those laws, Responsible Beverage Service (RBS) and Social Host (SH) laws had notable variability between cities allowing for a more in-depth analysis. The San Diego model was able to capitalize on the differences within cities allowing users to examine the effect of enacting (or removing) provisions to these laws as well as implementing the laws themselves. This improves the utility of the San Diego model within this community. In addition, RBS and SH received considerable media attention in San Diego County—more so than other MLDA-21 laws. This allowed for a detailed analysis of the impact of media on law effectiveness. These variables were also incorporated into the final model.

A structural model was designed to examine the effectiveness of both RBS and SH laws on rates of DUI/DWI citations for underage drivers. These laws were examined in conjunction with media coverage of both the laws themselves and high profile alcohol-related stories as well as enforcement of these laws—two vital elements to consider when examining the effectiveness of the laws. Using SEM, the current research found that RBS laws, SH laws, and alcohol taxation rates had the greatest impact on alcohol consumption, which in turn reduced rates of DUI/DWI.

Figure 2 presented below demonstrates the direct effects of each variable on a series of outcomes. Direct effects refer to the direct impact of a predictor variable on an outcome without the use of moderators or mediators and are commonly displayed using regression estimates. Significant regression estimates indicate that a single unit increase in the predictor variable would result in a change in the outcome variable. For example, media clusters were found to significantly impact DUI rates with a regression estimate ( $\beta$ ) of  $-0.172$ . This indicates that for every unit increase in the predictor variable (media clusters), there was a corresponding 17.2% decrease in the outcome

variable (DUI/DWI rates). All regression estimates and  $p$ -values for the current model are displayed in Figure 2.



*Intermediate Variable: Alcohol Outlet Density.* As demonstrated in Figure 2, alcohol tax rate had a significant negative impact on alcohol outlet density. This indicates that as alcohol tax rates increased, alcohol outlet density decreased ( $\beta = -.432$ ,  $p < .001$ ).

*Intermediate Variable: Alcohol Use.* Figure 2 also shows that a number of variables had an impact on rates of alcohol consumption among underage drivers. Specifically, both local RBS laws and local Social Host laws had a significant negative impact on alcohol consumption ( $\beta = -.144$ ,  $p < .001$  and  $\beta = -.483$ ,  $p < .001$ , respectively). Similarly, alcohol tax rates and media clusters also demonstrated a significant decrease in rates of alcohol consumption ( $\beta = -1.472$ ,  $p < .001$  and  $\beta = -.322$ ,  $p < .001$ , respectively), while no significant change was detected due to unemployment rates ( $\beta = -.011$ ,  $p = .491$ ).

*Outcome Variable: DUI Rates.* Increases in DUI rates among underage drivers were significantly associated with a direct increase in underage alcohol consumption ( $\beta = 3.459$ ,  $p < .001$ ), while media clusters ( $\beta = -.172$ ,  $p < .001$ ), gas tax rates ( $\beta = -3.337$ ,  $p < .001$ ), and unemployment rates ( $\beta = -.360$ ,  $p < .001$ ) were all associated with a decrease in DUI rates. No significant change was detected due to number of sworn officers ( $\beta = -.030$ ,  $p = .082$ ).

## San Diego County Community Test and Feedback

In June 2016, Dr. Michael Scherer presented the SIM-DUI model to six community members:

- ▶ Two traffic sergeants from the San Diego Sheriff's Department (Lemon Grove and Imperial Beach Districts);
- ▶ Institute for Public Strategies Alcohol and Other Drug Program Manager/Retired Chula Vista Police Department/Chair of Chula Vista Police Activities League;
- ▶ GIPS Senior Prevention Specialist/Board Member for Community Clinics;
- ▶ Community advocacy leader, Chair of the North Park Community Planning group/former substance abuse counselor; and
- ▶ Community advocacy leader, U.S. Air Force Sector Leader/San Diego Alcohol Policy Panel Member (South Bay).

Laptops were available to participants so that they could practice using the model.

Day 1: SIM-DUI demonstration for community leaders (06/15/16)

Feedback to Dr. Scherer included:

1. Show percentage changes on charts for easy comprehension. Sometimes it's hard to understand exactly what the graph means in practical terms. A percentage change would give users a single number associated with their changes.
2. Examining concurrent substance use would be very interesting in future versions of the model. As it is, it is an extremely potent tool for policy around alcohol use and enforcement.
3. The inclusion of the media component is very helpful in highlighting sources of intervention other than just having more police or more laws.
4. The model is extremely easy to use. The inclusion of the Frequently Asked Questions along the way and all the pop-up messages really make it intuitive and easy.
5. Include proportion of on-site vs off-site alcohol outlets. Anecdotally, there is an enormous difference in the amount of alcohol-related incidents these two types of establishments contribute to. Tracking how many of each there are could be an important indicator.
6. Show the name of the city you're working with on each page. People who deal with multiple cities might forget which one they are working with halfway through.
7. The model is an excellent tool for helping to highlight the increased need for law enforcement. It could inform city funding allocations to put more resources where needed.
8. The model could be extremely useful for law makers considering a change in legislation.

Day 2: SIM-DUI demonstration for Institute for Public Strategies staff (06/16/16)

Feedback included:

1. Include variable demonstrating rates of RBS training that happens outside of the law (i.e., private vendors that specialize in RBS training).
2. The model is very useful and has applicability for more than just policy makers, but also community advocacy groups and funders.
3. Incorporate cost-benefit analysis. Including the amount of dollars saved (or lost) from reduction in DUIs/DWIs could be a powerful incentive for funding agencies.

4. The model could be used to justify other future studies to funding agencies. It could improve funding chances if a simulation shows that the law in question could have favorable outcomes.
5. Model sometimes refers to “drinking and driving” and “DUI/DWI” interchangeably. They are not. Revise to be consistent.
6. Including a button that allows the user to instantly get to the results page on each screen would prevent them from having to click through all the pages if they just made a single change early on in the simulation.
7. More specificity on the data sources would be helpful.
8. The potential for tweaking the model to look at other substances and/or jurisdictions is a particular strength. Every community could benefit from something like this.

Changes made to the model based on community group feedback

Based on the feedback from the community group, we implemented the following changes to the model:

- ▶ Revised model to use consistent wording throughout;
- ▶ Improved navigation throughout model;
- ▶ Included percentages on output to enable easier interpretation of results;
- ▶ Provided more detail in methodology of data sources;
- ▶ Expanded on media component in model; and
- ▶ Made a series of minor changes to improve general flow of the model.

After these changes were implemented, a final version of the San Diego SIM-DUI model has become operational. A short User’s Manual was developed to accompany the excel model file. Appendix C – San Diego SIM-DUI User’s Manual.

Suggested changes that would require additional funding

As mentioned, each time we presented the SIM-DUI, the model was received with enthusiasm. At each of these encounters, we made efforts to elicit comments and suggestions on how we could make the model more useful to the interested users. The previous section illustrates many of these comments as they were already applied to improving the model under the extant budget. The following are suggestions users gave us about potential improvements for the model that would require additional funding:

- ▶ Examining substances other than only alcohol;
- ▶ Examining concurrent substance use with alcohol;
- ▶ Including a cost-benefit analysis of implementing new legislation;
- ▶ Include other alcohol-related outcomes (i.e., alcohol-related violence, public intoxication) in the model;
- ▶ Examine on-site versus off-site alcohol outlet sales proportions; and
- ▶ Examine additional contributors to law enforcement (i.e., time officers spent on DUIs, priority of impaired driving enforcement within police stations, amount of money spent on DUI enforcement).

## PUBLICATIONS

Central to the project was the need to obtain scientific validation for the model. In this regard, we made efforts to publish the key elements of the model in peer-reviewed journals. The abstracts for the three publications resulting from this study are provided below.

**Fell, J. C., Thomas, S., Scherer, M., Fisher, D. A., & Romano, E. (2015). Evaluating the strengths and weaknesses of underage drinking laws in the United States. *World Medical and Health Policy*, 7, 28-58.**

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4469195/>

Several studies have examined the impact of a number of minimum legal drinking age 21 (MLDA-21) laws on underage alcohol consumption and alcohol-related crashes in the United States. These studies have contributed to our understanding of how alcohol control laws affect drinking and driving among those who are under age 21. However, much of the extant literature examining underage drinking laws uses a “Law/No law” coding, which may obscure the variability inherent in each law. Previous literature has demonstrated that inclusion of law strengths may affect outcomes and overall data fit when compared to “Law/No law” coding. In an effort to assess the relative strength of states’ underage drinking legislation, a coding system was developed in 2006 and applied to 16 MLDA-21 laws. The current article updates the previous endeavor and outlines a detailed strength coding mechanism for the current 20 MLDA-21 laws.

**Romano, E., Scherer, M., Fell, J., & Taylor, E. (2015). A comprehensive examination of U.S. laws enacted to reduce alcohol-related crashes among underage drivers. *Journal of Safety Research*, 55, 213-221.**

<https://www.ncbi.nlm.nih.gov/pubmed/26683563>

**Introduction:** To effectively address concerns associated with alcohol-related traffic laws, communities must apply comprehensive and well-coordinated interventions that account for as many factors as possible. The goal of the current research article is to examine and evaluate the simultaneous contribution of 20 underage drinking laws and 3 general driving safety laws, while accounting for demographic, economic, and environmental variables. **Methods:** Annual fatal crash data (1982 to 2010), policies, and demographic, economic, and environmental information were collected and applied to each of the 51 jurisdictions (50 states and the District of Columbia). A structural equation model was fit to estimate the relative contribution of the variables of interest to alcohol-related crashes. **Results:** As expected, economic factors (e.g., unemployment rate, cost of alcohol) and alcohol outlet density were found highly relevant to the amount of alcohol teens consume and therefore to teens' impaired driving. Policies such as those regulating the age of bartenders, sellers, or servers; social host civil liability laws; dram shop laws; internal possession of alcohol laws; and fake identification laws do not appear to have the same impact on teens' alcohol-related crash ratios as other types of policies such as those regulating alcohol consumption or alcohol outlet density. **Conclusions:** This effort illustrates the need for comprehensive models of teens' impaired driving. After simultaneously accounting for as many factors as possible, we found that in general (for most communities) further reductions in alcohol-related crashes among teens might be more rapidly achieved from efforts focused on reducing teens' drinking rather than on reducing teens' driving. Future efforts should be made to develop models that represent specific communities. Practical applications: Based on this and community-specific models, simulation

programs can be developed to help communities understand and visualize the impact of various policy alternatives.

**Scherer, M., Romano, E., Caldwell, S., & Taylor, E. The impact of retail beverage service training and social host laws on adolescents' DUI rates in San Diego County, California.** (To be submitted to a journal.)

**Introduction:** Driving Under the Influence (DUI) citations among underage drivers and have been shown to be related to increased risk of fatal and non-fatal crashes. While numerous studies have evaluated the policies enacted to address this concern, still there is a need for comprehensive policy evaluations. Previous research examined the impact of 20 MLDA-21 laws in the state of California, as they impacted alcohol-related crash rates among drivers under 21 years of age while accounting for a host of covariates. The current research seeks to expand this evaluation to the county level (San Diego, County). More specifically, we evaluate the impact of measures subject to County control such as Retail Beverage Service (RBS) laws and Social Host (SH) laws, media coverage, city employment, alcohol outlet density, law enforcement, and alcohol and gas taxation to determine the most effective point of intervention for communities seeking to reduce underage DUI citations. **Methods:** Annual DUI citation data (2000 to 2013), RBS and SH policies, and city-wide demographic, economic, and environmental information were collected and applied to each of the 18 cities in San Diego County, California. A structural equation model was fit to estimate the relative contribution of these variables to DUI citation rates. **Results:** Alcohol consumption and alcohol outlet density both demonstrated a significant increase in DUI rates, while RBS laws, SH laws, media clusters, taxation and unemployment rates demonstrated decreases in DUI rates. **Conclusions:** At the county level, although RBS, SH laws, and media efforts were found to contribute to a reduction in DUI rates, the largest contributor to reducing DUI rates were alcohol and gas taxation rates. **Practical Applications:** Policy makers interested in reducing DUI rates among teenagers, should examine these variables within their specific communities and consider conducting community-specific research to determine the best way to do so.

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# Appendices

APPENDIX A – LIFESAVERS CONFERENCE HANDOUT

APPENDIX B – CONFERENCE POSTERS

APPENDIX C – SAN DIEGO SIM-DUI USER’S MANUAL

# APPENDIX A – LIFESAVERS CONFERENCE HANDOUT

A Simulation Model Predicting the Impact of Laws On Alcohol-Impaired Driving Fatal And Non-Fatal Crashes Among Underaged Drivers

## **A SIMULATION MODEL PREDICTING THE IMPACT OF LAWS ON ALCOHOL-IMPAIRED DRIVING FATAL AND NON-FATAL CRASHES AMONG UNDERAGED DRIVERS.**

E. Romano, M. Scherer, J. Fell, & E. Taylor. Pacific Institute for Research & Evaluation, Calverton, MD

Supported by a grant from the Office of Juvenile Justice and Delinquency Prevention (OJJDP), and developed as a tool for researchers, advocates, and policy makers, Simulated Driving While Intoxicated (SIMDUI) is a model aimed at predicting the impact of implementing and/or altering alcohol-related community and state laws, policies, and programs targeting underage drinking and driving. The idea behind SIMDUI is that it will serve as a tool for decision makers in large or small communities to estimate the impact that the adoption of alternative policies would have on underage drinking and driving crashes, given the current status of the problem in their community.

More specifically, SIMDUI is a no-cost Excel-based modeling tool that allows users to simulate how changing existing laws or implementing new laws, policies, and programs in their jurisdiction may impact underage alcohol-related crashes (fatal and non-fatal) among teens aged 15 to 20 years old over the next 10 years. Though anyone may find SIMDUI to be informative, the program was designed specifically as a tool for researchers, advocates, and policy makers to aid in determining what laws and policies may be most beneficial in their jurisdiction. Laws targeting underage drinking and driving impact males and females differently and impact various age groups differently, so no single set of laws and policies may be appropriate for every jurisdiction. Based on historical data, the model allows users to see how their modified laws may impact projected rates of fatal and non-fatal alcohol-related crashes impact males and females both in total or broken down by age groups. Although in all states it is currently illegal for anyone under the age of 21 to possess or consume alcohol in any form, research has shown that certain existing laws, policies, and programs have a significant impact on drinking among all ages. There are however, other factors not accounted for in the model, which might influence crash rates such as a comprehensive drunk driving prevention program.

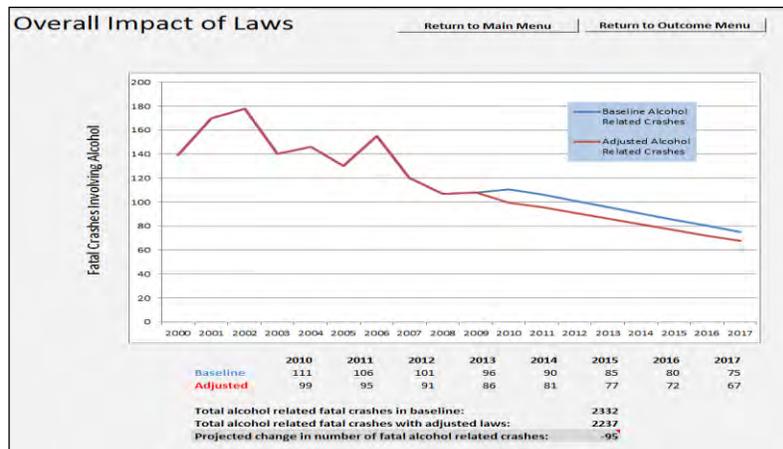
SIMDUI is still under development, but is designed to examine a series of laws and other factors that have demonstrated in the empirical literature to impact underage drinking and/or underage drinking and driving, including:

<b>Laws Examined in SIM-DUI</b>	<b>Other Factors Examined in SIM-DUI</b>
Administrative License Revocation Laws	Alcohol Outlet Density
Age of Off-premise Alcohol Sellers/Servers	Alcohol Prices
Age of On-premise Alcohol Sellers/Servers	Driver Age
Blood Alcohol Content	Driver Sex
Consumption of Alcohol	Gas Prices
Graduated Driver's License Laws	Licensed Drivers
Keg Registration	Sobriety Checkpoint Utilization
Minimum Legal Drinking Age	Teen Alcohol Use
Possession of Alcohol	Unemployment Rates
Purchase of Alcohol	Vehicle Miles Traveled

Responsible Beverage Service Training  
 Retailer Support for False Identification  
 Seatbelt Safety Laws  
 Social Host Liability  
 State Control of Alcohol  
 Transfer or Production of False Identification  
 Use and Lose Laws  
 Use of False Identification  
 Zero Tolerance

As a default, SIMDUI automatically provides information based on legal research about which of these laws are already in place in the user's state of choice as well as what sanctions, exemptions, or policies are associated with each law. Users may then elect to include new laws, remove existing laws, or manipulate the sanctions, exemptions, or policies associated with each law to determine how these changes may impact fatal and non-fatal crashes in future years among underage drivers in their jurisdiction. Similarly, users may opt to manually enter information for their jurisdiction of interest rather than let the model populate the information automatically.

Results are displayed in a series of easy-to-understand summary graphs and number of estimated lives saved and lost each year as a result of changing existing laws or implementing new laws or policies (See Sample). Graphs can be examined overall as demonstrated in the sample, or broken down by sex and/or age groups. The SIMDUI modeling tool is under development by the Pacific Institute for Research and Evaluation for the Office of Juvenile Justice and Delinquency Prevention and is currently scheduled to be released to the public by the January 2016.



**Sample Graph.** Sample screenshot from SIMDUI model showing outcome of changing laws in a jurisdiction. The unchanged crash rates are shown in blue, while the projected crash rates with the newly adjusted laws and policies are shown in red. In this example, the changes made by the user saved an estimated 93 lives in fatal crashes over the

duration of the model. An expansion of the model to serve other states and one specific community (San Diego, CA) is under development.

For more information contact: Eduardo Romano, Pacific Institute for Research and Evaluation, [romano@pire.org](mailto:romano@pire.org).

This project was supported by Grant No. (2012-AH-FX-0005) awarded by the Office of Juvenile Justice and Delinquency Prevention, Office of Justice Programs, U.S. Department of Justice. Points of view or opinions in this document are those of the author and do not necessarily represent the official position or policies of the U.S. Department of Justice.

## APPENDIX B – POSTERS

RESEARCH SOCIETY ON ALCOHOLISM (RSOA) SCIENTIFIC MEETING, JUNE 21 TO 25, 2014,  
SIMDWI: A MODEL SIMULATION PREDICTING THE IMPACT OF LAWS ON ALCOHOL-IMPAIRED  
DRIVING FATAL AND NON-FATAL CRASHES AMONG UNDERAGED DRIVERS

LIFESAVERS CONFERENCE, MARCH 15-17, 2015, SIMDWI: A SIMULATION MODEL  
PREDICTING THE IMPACT OF LAWS ON ALCOHOL-IMPAIRED DRIVING FATAL AND NON-FATAL  
CRASHES AMONG UNDERAGED DRIVERS

ALCOHOL POLICY CONFERENCE 16, APRIL 6-8, 2016, SIM-DWI SAN DIEGO: A SIMULATION  
MODEL PREDICTING THE IMPACT OF LAWS, MEDIA, TAXATION, LAW ENFORCEMENT AND  
ALCOHOL AVAILABILITY ON UNDERAGE DUI/DWI RATES



# SIMDWI: A Model Simulation Predicting the Impact of Laws on Alcohol-Involved Fatal and Non-fatal Crashes Among Underage Drivers

Eduardo Romano & Michael Scherer, Pacific Institute for Research and Evaluation, Calverton, MD, USA



## Introduction

To reduce the prevalence of impaired-driving and other alcohol-related problems among underage Americans, states have passed a battery of laws which have reduced the involvement of underage drivers in alcohol-related fatal crashes. Despite this, limited research has examined the impact of extant laws on underage alcohol-related crashes while examining the impact of laws and regulations not specific to traffic such as factors limiting the availability of alcohol.

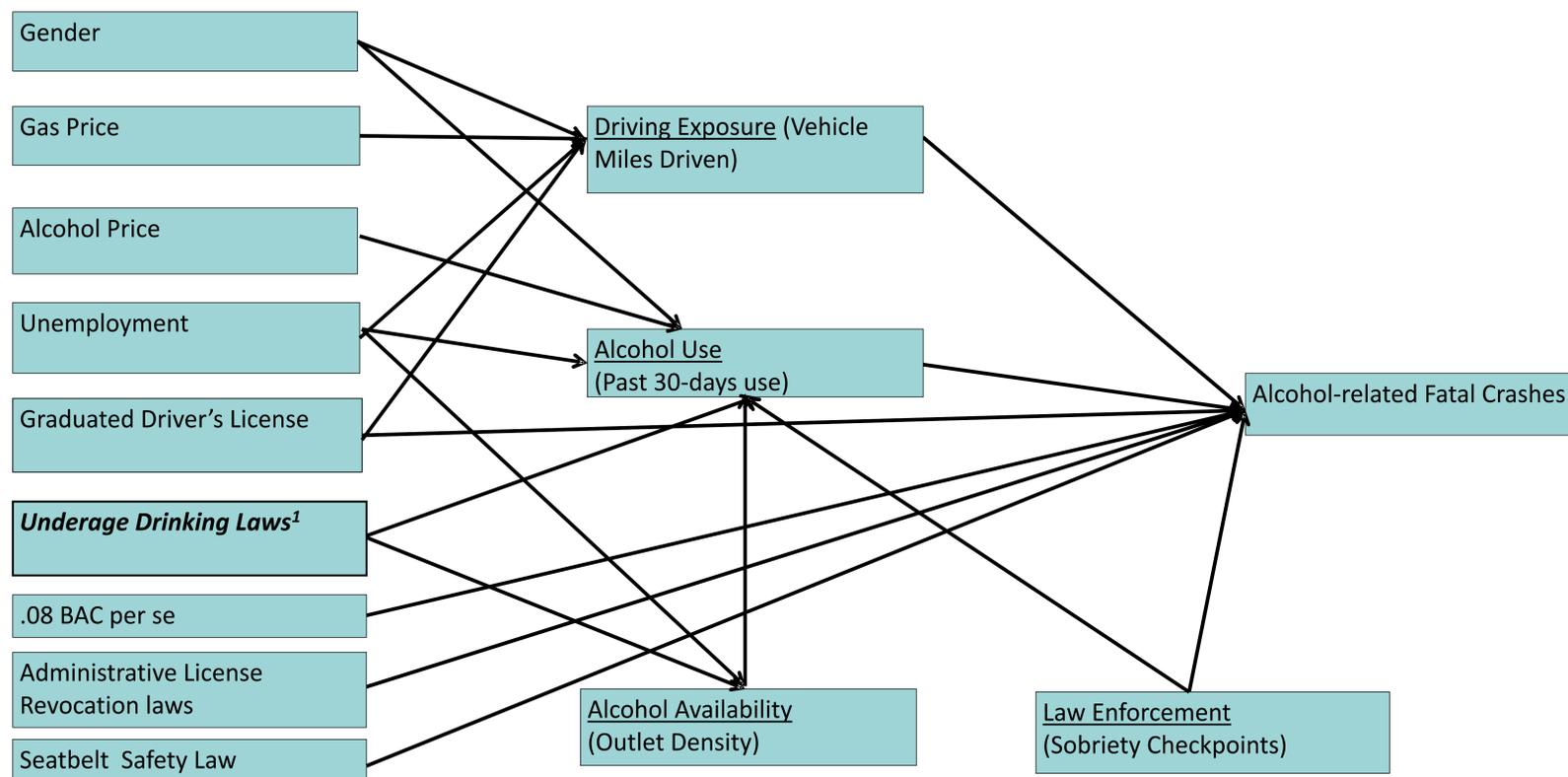
Developed as a tool for researchers, advocates, and policy makers, SIMDWI is a model aimed at predicting the impact of implementing and/or altering alcohol-related community and state laws, policies, and programs targeting underage drinking and driving. SIMDWI is a simulation model that (1) fully addresses the underage impaired driving problem, (2) helps evaluate the expected impact of the alternative policy changes, and (3) informs policy makers and community stakeholders on where and how to allocate resources. In this presentation we introduce the methodological approach we used to develop the model, showcase a beta version of the model, and investigate model accuracy based on data collected for the State of California.

## Methods

Outcome data for the current model came from the Fatal Accident Reporting System (FARS) and Statewide Integrated Traffic Records System (SWITRS). The model examined and incorporated (1) 16 MDLA laws drawn from the Alcohol Policy Information System (APIS), (2) three alcohol impaired driving laws (0.08 legal limit, 0.10 legal limit, and ALR), (3) use of sobriety checkpoints, (4) three variables determining economic strength (unemployment, vehicle miles travelled, gas prices), (5) teen alcohol use, (6) alcohol outlet density, (7) alcohol taxes, (8) ratio of male to female drivers, (9) seatbelt safety laws and (10) ratio of fatal and non-fatal alcohol-related incidents in FARS and SWITRS among individuals 20 years of age and younger (see Figure 1). Each of the 16 MDLA laws was given a strength coding as described in Fell et al. (2014). Though the model could conceivably be used for any jurisdiction, for purposes of evaluation the current endeavor used data collected for the State of California from 2000 to 2010.

The data were analyzed using SEM techniques to establish regression estimates and effect sizes. SEM was used in the current analysis to more accurately account for simultaneous effects of laws on multiple outcomes and alcohol use, driver exposure and alcohol outlet density were modeled as intervening variables rather than only a predictors.

Figure 1. Structural Model Predicting Alcohol-related Crashes in Underage Drivers



<sup>1</sup>indicates "Underage Drinking Laws" consist of the following laws: Possession, Purchase, Consumption, Use and Lose, Use of Fake ID, Zero Tolerance, Age of Servers and Sellers both on-premise and off-premise, Furnishing, Keg Registration, Responsible Beverage Service Training, Retailer support for Fake IDs, Social Host criminal, Transfer/Production of False ID, Minimum Legal Drinking Age and State Control of Alcohol Laws

## Results

Model fit was comparable to previous models examining the impact of laws on underage drinking and driving and was subsequently deemed acceptable. Consistent with previous research, on the national level, Possession and Purchase laws had the most notable decrease on underage alcohol-related crash ratios (-11.8%, p<.001) for all age groups, while GDL laws were highly contingent upon age groups. Drivers who were 15-17 years of age demonstrated a decrease in alcohol-related crash ratios (-17.2%, p<.001) while drivers age 18-20 demonstrated an increase in alcohol-related crash ratios (+18.7%, p<.001). Other factors significantly associated with alcohol-related crash ratios included ratio of male to female drivers (+4.4%, p = .007), driving safety laws (-7.9%, p<.001), Keg Registration laws (+6.2%, p<.001) and alcohol impaired driving laws (-14.4%, p<.001).

## Conclusions

For communities wanting to curb underage impaired driving the inherent complexity of the problem constitutes a barrier to overcome. Advocates for the creation or strengthening of laws should carefully consider the potential impact such decisions may have on the underage drinking and driving problem. Stronger laws were not necessarily associated with reductions in alcohol-related FARS or SWITRS. This may demonstrate the necessity for policy makers and advocates to carefully explore the impact of altering existing laws or introducing new laws into their jurisdiction. We conclude that SIMDWI is a valid tool to examine decisions involving the impact of passing and/or strengthening of alcohol-related laws, policies, and programs targeting underage drinking and driving.

**Acknowledgment:** This project was supported by Grant No. (2012-AH-FX-0005) awarded by the Office of Juvenile Justice and Delinquency Prevention, Office of Justice Programs, U.S. Department of Justice. Points of view or opinions in this document are those of the author and do not necessarily represent the official position or policies of the U.S. Department of Justice. The research for this presentation was also supported by a grant from the National Institute of Alcohol Abuse and Alcoholism (R21 AA019539).



Contact Info:  
romano@pire.org



Using your smartphone, scan the above barcode to access this poster via the Web.

# SIMDWI: A Simulation Model Predicting the Impact of Laws on Alcohol-Related Driving Fatal and Non-Fatal Crashes Among Underaged Drivers

## SIMDWI



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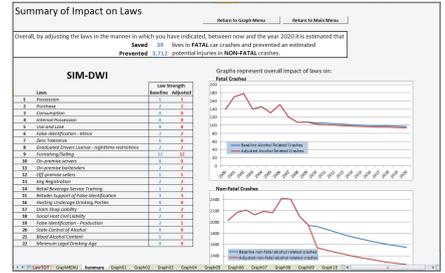
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Keq Registration	Sobriety Checkpoint Utilization
Minimum Legal Drinking Age	Teen Alcohol Use
Possession of Alcohol	Unemployment Rates
Purchase of Alcohol	Vehicle Miles Traveled
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Retailer Support for False Identification	
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Social Host Liability	
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Transfer or Production of False Identification	
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Use of False Identification	
Zero Tolerance	

form, research has shown that certain existing laws, policies, and programs have a significant impact on drinking among all ages. There are, however, other factors not accounted for in the model, which might influence crash rates such as a comprehensive drunk driving preventive program.

As a default, SIMDWI automatically provides information based on legal research about which of these laws are already in place in the user's state of choice as well as what sanctions, exemptions, or policies are associated with each law. Users may then elect to include new laws, remove existing laws, or manipulate the sanctions, exemptions, or policies associated with each law to determine how these changes may impact fatal and non-fatal crashes in future years among underage drivers in their jurisdiction. Similarly, users may opt to manually enter information for their jurisdiction of interest rather than let the model populate the information automatically.

Results are displayed in a series of easy-to-understand summary graphs showing the number of estimated lives saved and lost each year as a result of changing existing laws or implementing new laws or policies. Graphs can be examined overall as demonstrated in the sample, or broken down by sex and/or age groups. The SIMDWI modeling tool is under development by the Pacific Institute for Research and Evaluation (PIRE) for the Office of Juvenile Justice and Delinquency Prevention and is currently scheduled to be released to the public by January 2016.



## SIMDWI: A unique tool for those interested in evaluating DWI policies

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## Laws Examined in This Effort

Law	Description	Provisions <sup>1</sup>
Possession	Prohibits the possession of alcoholic beverages by those younger than 21 years.	There are three location exemptions possible, including private locations, private residence, and parents' home. Additionally, there is an exemption for parental/spousal presence.
Purchase	Illegal for minors to purchase alcoholic beverages.	There is a provision that allows youth to purchase alcohol for law enforcement purposes.
Consumption	Prohibits the observed consumption of alcohol by minors.	There are three location exemptions possible, including private locations, private residence, and parents' home. Additionally, there is an exemption for parental/spousal presence.
Internal Possession	Illegal for minors to have evidence of alcohol in their body (i.e., by breath test, urine, etc.).	There are three location exemptions possible, including private locations, private residence, and parents' home. Additionally, there is an exemption for parental/spousal presence.
Use and Lose	License sanctions against minors found drinking, purchasing, or in possession of alcoholic beverages.	Provisions if the law extends to purchase and possession laws, and if it is mandatory or voluntary. There are additional provisions increasing the length of suspension and an exemption placing the upper age limit at 21 years.
Use of Fake Identification Among Minors	The use of false identification by a minor.	Provisions for whether there are administrative procedures, judicial procedures, or both.
Zero Tolerance	Illegal for minors to drive with any measurable level of alcohol in their systems.	Provisions for whether administrative and criminal sanctions are mandatory or discretionary as well as the length of the sanction for each.
Graduated Driver's License (GDL)	A system in which beginning drivers are required to go through three stages of limited driving privileges.	Implementation and length of nighttime and/or passenger restrictions.
Furnishing/Selling	Illegal to furnish alcoholic beverages to minors.	There are three location exemptions possible, including private locations, private residence, and parents' home. Additionally, there is an exemption for parental/spousal presence.
Age of On-premise Alcohol Sellers/Servers	Prohibition of those younger than 21 years to serve alcoholic beverages.	Minimum service age for all three beverage types (beer, wine, spirits) and the presence of a manager when alcohol is being sold.
Age of Bartenders	Prohibition of those younger than 21 years from bartending.	Minimum service age for all three beverage types (beer, wine, spirits) and the presence of a manager when alcohol is being sold.
Age of Off-premise Alcohol Sellers/Servers	Prohibition of those younger than 21 years to sell alcoholic beverages.	Minimum selling age for all three beverage types (beer, wine, spirits) and the presence of a manager when alcohol is being sold.
Keq Registration	Prohibits sale or at least requires wholesalers or retailers to attach an identification number to their kegs and collect identifying information from the keg purchaser.	Extension of the information required—including the purchaser's identification and the address where the keg will be consumed—the type of warning issued to a purchaser, and whether a deposit is required. Additionally, the state of Utah prohibits keg use entirely.
Responsible Beverage Service Training	Requirements for retail alcohol outlets to participate in programs aimed to prevent alcohol sales and service to minors and intoxicated persons, and train managers and servers/clerks to implement policies and procedures effectively.	Requirement of whether the program is mandatory or voluntary, who is trained by the program, incentives for having a program, and type of establishments and licensees covered.
Retailer Support for Fake Identification	State provisions to assist retailers in avoiding sales to potential buyers who present false identification (e.g., issuing distinctive driver licenses to minors).	Variations in provisions and/or extension of sanctions.
Social Host	Prohibitions against hosting underage drinking parties.	Provisions include general or specific statutes, type of actions triggering a violation, type of property covered, and knowledge standard for a violation. Additionally, there is also an exemption for preventive actions.
Dram Shop Liability	The availability of private action against commercial alcohol providers.	Type of law. Exemptions for who may be sued and the standards of proof necessary for a violation.
Social Host Civil Liability	Private cause of action against a non-commercial alcohol provider for injuries or damages by an intoxicated guest.	Type of law. Exemptions for who may be sued and the standards of proof necessary for a violation.
Transfer/Production of False Identification	Prohibits the production of false identification and/or the lending or transferring of identification to another person.	Variations in whether the law is criminalized.
State Control of Alcohol	The use of state-run retail distribution systems.	Variations on which kind of beverage is state run (beer, wine, spirits).

<sup>1</sup> For a detailed description of the laws, their strength coding, and the provisions/exemptions considered for each, see Fell, J. C., Thomas, S., Scherer, M., Fisher, D. A., & Romano, E. (in press). Scoring the strengths and weaknesses of underage drinking laws in the United States. *World Medical & Health Policy*.

Eduardo Romano [romano@pire.org](mailto:romano@pire.org)  
 Michael Scherer [mscherer@pire.org](mailto:mscherer@pire.org)  
 James Fell [fell@pire.org](mailto:fell@pire.org)  
 Eileen Taylor [taylor@pire.org](mailto:taylor@pire.org)



## What Is Behind SIMDWI? An Example Using National Data—Statistical Models

**Regression Weights and Significance Level for Direct Effects on Alcohol-Related Crash Rates and Teen Alcohol Use**

Predictor	Vehicle Miles Traveled		Beer Consumption		Teen Alcohol Crash Ratios	
	Estimate	p-value	Estimate	p-value	Estimate	p-value
Gas tax rate	-.322	.048	—	—	—	—
Alcohol tax rate	—	—	-.055	.037	—	—
Unemployment rate	-.517	<.001	-.023	.546	—	—
Ratio of female to male drivers	-.888	<.001	-.241	<.001	-1.243	<.001
.08 BAC laws	—	—	-.104	<.001	-.023	<.001
Sobriety checkpoints	—	—	—	—	-.022	<.001
ALR laws	—	—	—	—	-.075	<.001
Seat belt laws	—	—	—	—	-.038	<.001
<b>Underage Drinking Laws</b>						
Age of server laws	—	—	.021	.807	.029	.052
Age of bartender laws	—	—	-.050	.351	-.007	.457
Age of seller laws	—	—	.054	.402	-.018	.106
Consumption laws	—	—	.017	.771	-.007	.445
Dram shop laws	—	—	-.033	.573	—	—
Fake identification—Minor laws	—	—	-.028	.043	-.067	<.001
Fake identification—Production laws	—	—	.069	.271	-.008	.443
Fake identification—Retail laws	—	—	-.189	.049	-.078	<.001
Furnishing laws	—	—	-.117	.416	—	—
GDL nighttime laws	—	—	—	—	-.004	.779
Internal possession laws	—	—	.048	.701	-.030	.154
Keq registration laws	—	—	-.162	.122	.149	<.001
Possession laws	—	—	-.124	.107	-.032	.043
Purchase laws	—	—	-.047	.525	-.040	.040
Responsible beverage service laws	—	—	.059	.578	—	—
Social host civil laws	—	—	.021	.704	-.047	<.001
Social host prohibition laws	—	—	-.036	.708	.004	.825
State control of alcohol laws	—	—	-.043	.827	.006	.836
Use and lose laws	—	—	-.051	.688	-.085	<.001
Zero tolerance laws	—	—	-.007	.917	-.072	<.001
<b>Intermediate Variables</b>						
Beer consumption	—	—	—	—	.152	<.001
Alcohol outlet density	—	—	-.122	.002	.003	.233
Vehicle miles traveled	—	—	—	—	.043	.004

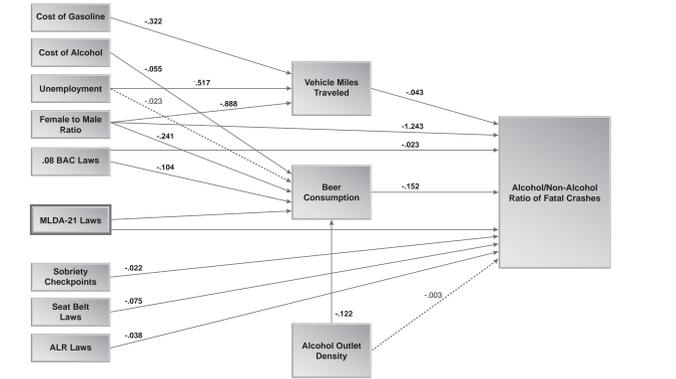
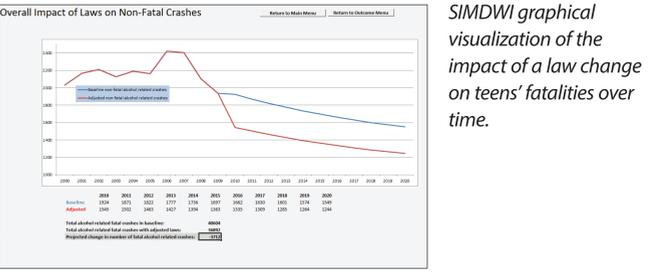
**Regression Weights and Significance Level for Total Effects on Fatal Crash Ratios**

Predictor	Total Effect Size
Age of bartender laws	-0.1%
Age of seller laws	+3.2%
Age of server laws	+3.2%
ALR laws	-7.0% *
Consumption laws	-0.5%
Dram shop laws	-0.5%
Fake identification—Minor laws	-7.2% *
Fake identification—Production laws	-1.0%
Fake identification—Retail laws	-10.5% *
Furnishing laws	-11.7%
GDL nighttime laws	-0.4%
Internal possession laws	-2.3%
Keq registration laws	+12.4% *
Possession laws	-6.4% *
Purchase laws	-4.9% *
Responsible beverage service laws	+0.9%
Social host civil laws	-4.4% *
Social host prohibition laws	-0.2%
State control of alcohol laws	+0.4%
Use and lose laws	-8.5% *
Zero tolerance laws	-7.3% *
.08 BAC per se law	-8.8% *
Seat belt laws	-3.8% *
Beer consumption	+15.2% *
Vehicle miles traveled	0.0%
Ratio of female to male drivers	-12.4% *
Sobriety checkpoints	-2.2% *
Alcohol tax rate	-1.0%
Alcohol outlet density	+3.4% *
Gas tax rate	-1.5%
Unemployment rate	-0.2%

These tables show that teens' drinking and driving and their propensity for impaired driving are influenced by a variety of interrelated factors, from the economy to legal and behavioral factors. Although all these factors influence teens' rates of alcohol-related crashes, they do so through different paths.

Based on the model below, we computed the direct and indirect effect the variables had on the outcome of interest (teens' alcohol-related crash rates), as well as on the intermediate variables (vehicle miles traveled, alcohol [beer] use). The data were analyzed using structural equation modeling (SEM) techniques with Analysis of Moment-Based Structures (AMOS v.21), an SPSS-based package (IBM SPSS Inc., Chicago, IL). SEM is a statistical technique frequently used to estimate causal relationships based on qualitative assumptions represented in a path diagram. Together with local crash and population data, the outcome of these models are used to feed SIMDWI.

## Structural Equation Model: How Factors Are Related

Please visit PIRE's booth for a close examination of SIMDWI.



# SIM-DWI San Diego: A Simulation Model Predicting the Impact of Laws, Media, Taxation, Law Enforcement and Alcohol Availability on Underage DUI/DWI Rates

Michael Scherer, Ph.D., Eduardo Romano, Ph.D., Susan Caldwell M.S. & Eileen Taylor, M.S.  
**Pacific Institute for Research and Evaluation**  
 Calverton, MD



## Abstract

Motor vehicle crashes continue to be the leading cause of death for people between the ages of 15 and 20 years in the United States. The impact of the laws created to curtail events of underage drinking and driving have been evaluated on the State and National level in prior research, but research examining this phenomenon on the local level has been limited. The current study presents a structural model designed to examine the effectiveness of two local laws: Responsible Beverage Service (RBS) and Social Host (SH) laws on rates of DUI/DWI citations among underage drivers. These laws are examined in conjunction with media coverage of both the laws themselves and high profile alcohol-related stories, and enforcement of these laws – two vital elements to consider when examining the effectiveness of the laws. Using structural equation modelling, the current research found that RBS laws, SH laws and alcohol taxation rates had the greatest impact on alcohol consumption, which in turn reduced rates of DUI/DWI.

## Introduction

Motor vehicle crashes (MVCs) remain the leading cause of death for young people aged 15 to 20 years in the United States. About 13% of all drivers involved in police-reported crashes were young drivers<sup>1</sup>. Young drivers aged 15 to 20 years make up between 8% and 9% of the U.S. population but only about 6% of licensed drivers. However, they are involved in 18% of the fatalities resulting from traffic crashes each year<sup>1</sup>. Drivers aged 16 years have crash rates that are three times greater than those for drivers aged 17 years, five times greater than drivers aged 18 years, and even two times greater than drivers aged 85 years<sup>2</sup>.

To reduce the prevalence of impaired driving and other alcohol-related problems among underage Americans, states have passed a battery of laws, such as minimum legal drinking age (MLDA), graduated driver licensing (GDL), and zero tolerance laws. Although it has been shown that these laws have greatly reduced the involvement of underage drivers in alcohol-related fatal crashes,<sup>3-5</sup> their efficacy varies from jurisdiction to jurisdiction, as these laws vary in both the number and type of provisions and exemptions they contain (Fell, Romano, & Voas, 2013; Voas & Fell, 2013). However, to adequately assess the impact of these laws, a variety of other factors must be considered. These included, but are not limited to – media coverage of the laws, how the laws are enforced and how much individuals can and do avail themselves of alcohol.

As such additional research is needed to determine the impact of variables on rates of DUI/DWI. The current research, is on effort to further elucidate the relationship between laws and adverse alcohol outcome among young drivers.

## Methods

The current study analyzes factors influencing DUI/DWIs among underage drivers. DUI data (2000 to 2013) was collected for each of 18 cities in San Diego County. Additionally, we collected data on demographic, economic, media, and law enforcement variables. These variables were then combined in a complex structural model. The following details the model we used as well as the data sources and analysis.

The structural model developed for the current study can be found in Figure 1. This model outlines the pathways by which each variable considered in the current study directly or indirectly impacts DUIs among drivers. Several variables are hypothesized to directly impact DUI rates among drivers. These variables include gas taxes, number of sworn police officers, and rate of alcohol consumption. Some variables are hypothesized to indirectly (i.e., the effect is regulated by an intermediate variable) impact DUI rates among drivers. These include the RBS law, the Social Host law, and alcohol outlet density. Finally, some variables are hypothesized to have both a direct and an indirect effect on DUI rates. These include National laws, employment rates and media clusters. The pathways hypothesized in the current model were drawn from prior research into related fields. The complete structural model as well as model fit statistics can be found in Figure 1.

Table 1. Total Effects of Predictors on DUI/DWI Rates

Predictor	Total Effect Size
<b>Local Laws</b>	
Responsible beverage service laws	-25.0% *
Social host laws	-62.1% *
<b>Local Variables</b>	
Alcohol consumption	345.9% *
Alcohol tax rate	-102.2% *
Alcohol outlet density	8.8% *
Sworn police officers	-3.0%
Media clusters	-36.6% *
Gas tax rate	-334.7% *
Unemployment rate	39.4% *

This resource was prepared by the author(s) using Federal funds provided by the U.S. Department of Justice. Opinions or points of view expressed are those of the author(s) and do not necessarily reflect the official position or policies of the U.S. Department of Justice.

Figure 1. Structural model

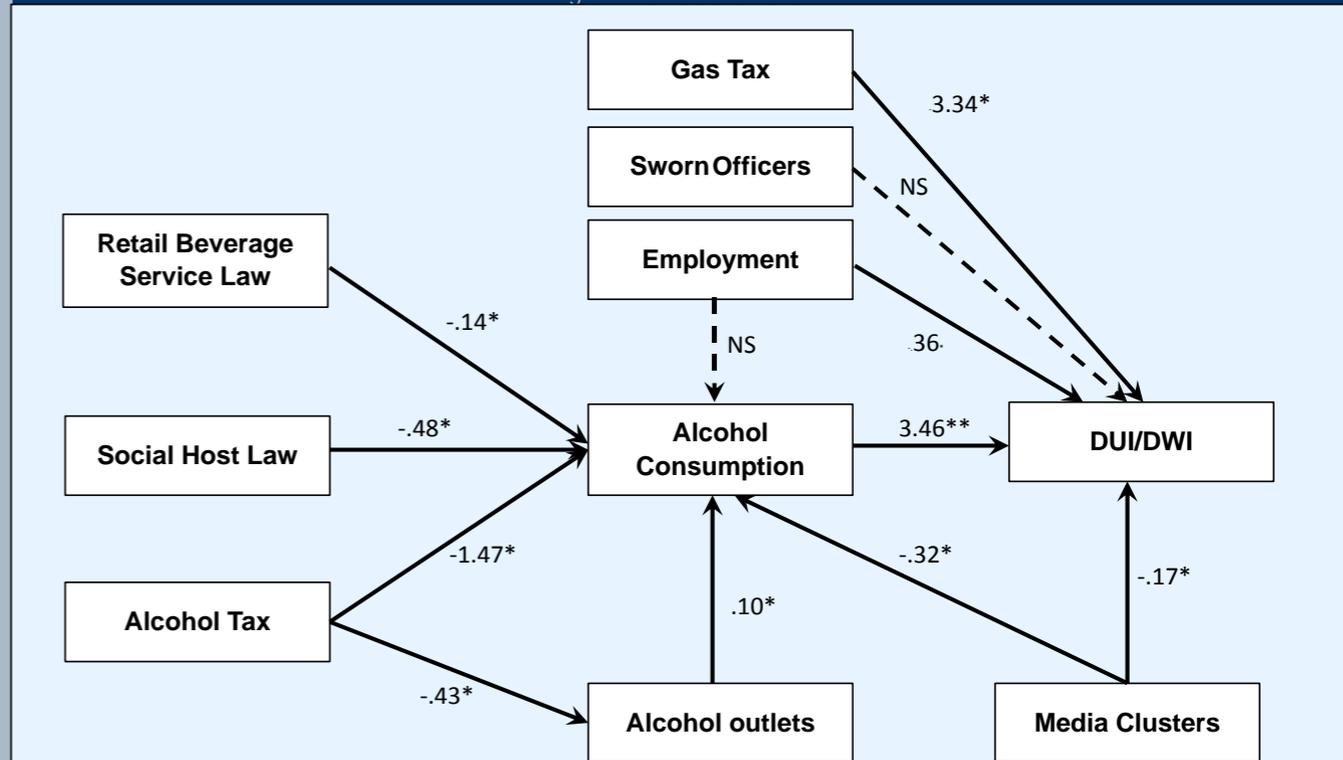


Figure 1. Full structural equation modeling including all coefficients. Fit:  $\chi^2 = 2,582.5$ ,  $p < .001$ , CFI = .630, NFI = .660, RMSEA = .16. Pathways shown regardless of significance. "NS" indicates not significant.

## Results and Discussion

Direct Effects are demonstrated in Figure 1. Alcohol tax rate had a significant negative impact on alcohol outlet density. This indicates that as alcohol tax rates increased, alcohol outlet density decreased ( $\beta = -.432$ ,  $p < .001$ ). Further, a number of variables had an impact on rates of alcohol consumption including RBS laws and Social Host laws ( $\beta = -.144$ ,  $p < .001$  and  $\beta = -.483$ ,  $p < .001$ , respectively). Similarly, alcohol tax rates and media clusters also demonstrated a significant decrease in rates of alcohol consumption ( $\beta = -1.472$ ,  $p < .001$  and  $\beta = -.322$ ,  $p < .001$ , respectively), while no significant change was detected due to unemployment rates ( $\beta = -.011$ ,  $p = .491$ ).

Increases DUI/DWI rates among underage drivers were significantly associated with a direct increase in underage alcohol consumption ( $\beta = 3.459$ ,  $p < .001$ ), while, media clusters ( $\beta = -.172$ ,  $p < .001$ ), gas tax rates ( $\beta = -3.337$ ,  $p < .001$ ), and unemployment rates ( $\beta = -.360$ ,  $p < .001$ ) were all associated with a decrease in DUI/DWI rates. No significant change was detected due to number of sworn officers ( $\beta = -.030$ ,  $p = .082$ ).

## Results and Discussion Cont.

To effectively address the concerns associated with alcohol-related traffic laws, communities must apply comprehensive and well-coordinated interventions that account for as many factors as possible<sup>6-7</sup>.

This effort illustrates the need for comprehensive models of teens' impaired driving. After simultaneously accounting for as many factors as possible, we found that in general (for most communities) further reductions in alcohol-related crashes among teens might be more rapidly achieved from efforts on reducing teens' drinking rather than on reducing teens' driving.

## References

- 1 National Center for Statistics and Analysis, 2015
- 2 McCartt, Shabanova, & Leaf, 2003
- 3 Fell, Fisher, Voas, Blackman, & Tippetts, 2008
- 4 Chen, Gruenewald, & Remer, 2009
- 5 Voas, Torres, Romano, & Lacey, 2012
- 6 Holder, Saltz, Treno, Grube, & Voas, 1997;
- 7 Voas, Holder, & Gruenewald, 1997

## Acknowledgments

The research and preparation of this manuscript were conducted under a grant from the Office of Juvenile Justice and Delinquency Prevention, U.S. Department of Justice (2012-AH-FX-0005). Points of view or opinions in this document are those of the authors and do not necessarily represent the official position or policies of the U.S. Department of Justice.

# APPENDIX C – SAN DIEGO SIM-DUI USER’S MANUAL



# San Diego

# SIM-DUI

A program modeling the impact of alcohol-related legislation and environmental factors on underage drinking and driving on cities in San Diego County.

## User's Manual



This project was supported by Grant No. (2012-AH-FX-0005) awarded by the Office of Juvenile Justice and Delinquency Prevention, Office of Justice Programs, U.S. Department of Justice. Points of view or opinions in this document are those of the author and do not necessarily represent the official position or policies of the U.S. Department of Justice.

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This manual was prepared for the Office of Juvenile Justice and Delinquency Prevention by Michael Scherer, Eduardo Romano, and Eileen Taylor of the Pacific Institute for Research and Evaluation.



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## Introduction

Although it is currently illegal for anyone younger than 21 years to possess or consume alcohol in any form nationwide, underage drinking and driving remains a serious problem. Teen rates of involvement in driving under the influence (DUI) are the result of a complex set of factors, including which types of laws are enacted, how they are enforced, the economic environment, and the presence of media campaigns. To assess the simultaneous impact of all of these various components, we have developed SIM-DUI. The SIM-DUI is a no-cost Excel-based modeling tool that allows users to simulate how changing existing laws, implementing new laws, altering taxes, creating media campaigns, and/or increasing law enforcement presence in their state/county/city may impact DUIs in their underage driving population.

Because the impact laws and policies targeting underage drinking and driving may vary depending on the characteristics of the jurisdictions in which they are applied, we have developed “San Diego SIM-DUI.” Stemming from a collaboration between the Pacific Institute for Research and Evaluation (PIRE) and the Global Institute for Public Strategies (IPS) and funded by a grant from the Department of Justice (DOJ) Office of Juvenile Justice and Delinquency Prevention (OJJDP), San Diego SIM-DUI is an application of the SIM-DUI model developed specifically for San Diego County, CA. Based on historical data as well as advanced statistical modeling techniques, the model allows users to predict the impact of changes in laws, regulations, taxes, law enforcement efforts, or media campaigns on projected rates of DUI among underage drivers (in total or broken down by age groups).

Though anyone may find the San Diego SIM-DUI model to be informative, the program was designed specifically as a tool for advocates, policy makers, county/city/state officials, and researchers to aid in determining how they may best curtail underage drinking and driving in a community. San Diego SIM-DUI is an evolving effort but is designed to examine a series of laws and other factors that have been empirically demonstrated to impact underage drinking and/or underage drinking and driving.

As a default, San Diego SIM-DUI automatically provides information based on which laws and environmental factors are already in place as well as what sanctions, exemptions, or policies are associated with each law. Users may then elect to include new laws, remove existing laws, or manipulate the sanctions, exemptions, or policies associated with each law, alter media exposure, and regulate alcohol or gas taxes as well as other factors to determine how these changes may impact the number of DUI arrests in future years among underage drivers in their city.

Results are displayed in a series of easy-to-understand summary graphs and number of estimated lives saved and lost each year as a result of changing existing laws or implementing new laws or policies (see Sample). Graphs can be examined overall as demonstrated in the sample or broken down by gender and/or age groups.



## Getting Started

Though anyone may find the program of interest, it was specifically designed for researchers, advocates, and policy makers who want to examine how various adaptations to media, law enforcement, or laws may impact drinking and driving in their city. As a default, the program automatically provides information about the city of choice. Users may then edit the data to determine the impact on DUI/driving while intoxicated (DWI) citations in future years.

To use the San Diego SIM-DUI, users must first download a copy of the simulation. The simulation can be obtained by contacting the developer at [romano@pire.org](mailto:romano@pire.org).

Once the user has a copy of the simulation, the program can be accessed using Microsoft Excel for Windows or compatible software. Microsoft programs can be downloaded from their website: <https://www.microsoft.com/en-us/download/office.aspx>.

Upon opening the program, users may be prompted to enable macros. Clicking “Yes” will allow users to use the built-in buttons for navigation throughout the model. Clicking “No” will simply deactivate the use of the buttons and require users to navigate through the pages using tabs at the bottom of the screen.

## Navigation

Upon initiating the program, users will see the welcome screen pictured below. This provides users with a brief description of the model and allows access to the Main Menu.





If macros have been enabled, users may simply click the “Main Menu” button to begin the program. If macros have not been enabled, users may navigate through the model using the tabs at the bottom of the screen.



### Using the Simulation

After clicking the “Main Menu” button, users will see the Title Page (see below). This allows access to begin the program (“Start a new program”), jump to a specific point in the model (“Program index”), read about the methodology and design of the model (“Program overview”), contact the developers of the program (“Contact developers”), or access frequently asked questions (“FAQ”). To begin the program, users must click “Start a new program.”





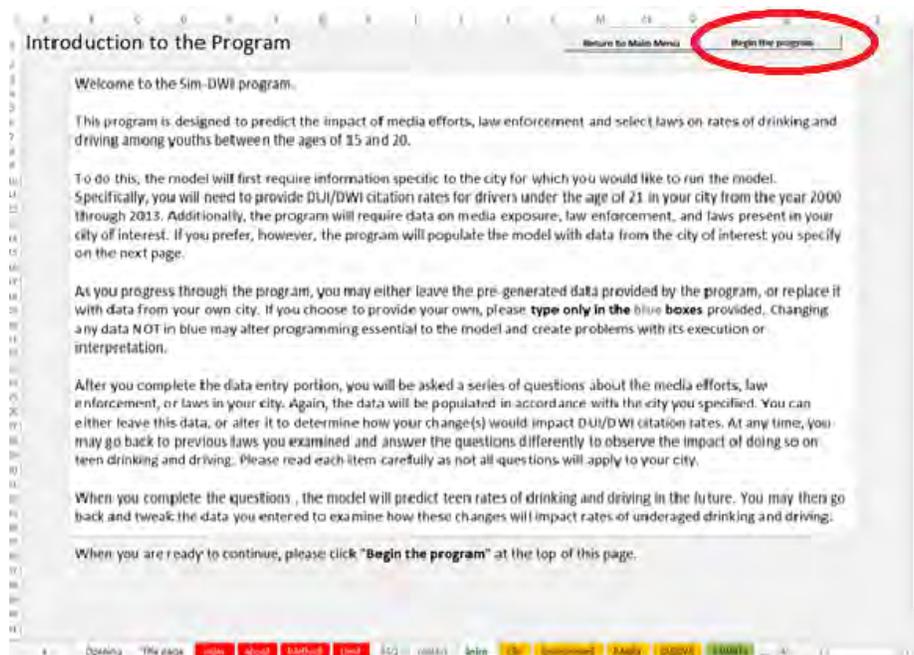
After clicking “Start a new program,” users will be taken to the introduction page (see below). The introduction page outlines the instructions for how to use the model itself.

The model will first require information specific to the city for which you would like to run the model. Specifically, you will need to provide DUI/DWI citation rates for drivers younger than 21 years in your city from 2000 through 2013. Additionally, the program will require data on media exposure, law enforcement, and laws present in your city of interest. However, if you prefer, the program will populate the model with data from the city of interest you specify on the next page.

As you progress through the program, you may either leave the pre-generated data provided by the program or replace it with data from your own city. If you choose to provide your own, please **type only in the blue boxes** provided. Changing any data NOT in blue may alter programming essential to the model and create problems with its execution or interpretation.

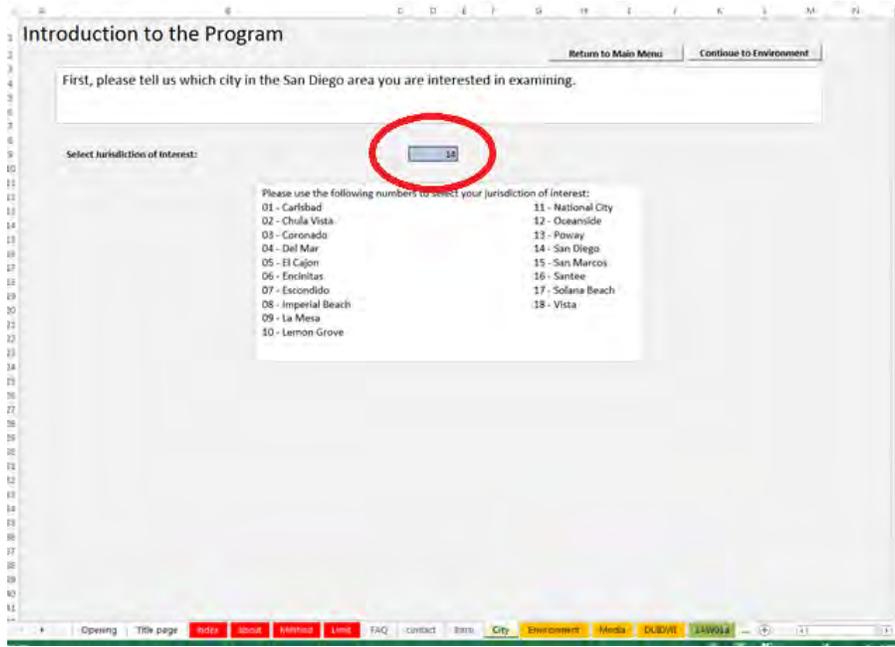
After you complete the data entry portion, you will be asked a series of questions about the media efforts, law enforcement, or laws in your city. Again, the data will be populated in accordance with the city specified. You can either leave this data or alter it to determine how your change(s) would impact DUI/DWI citation rates. At any time, you may go back to previous laws examined and answer the questions differently to observe the impact of doing so on teen DUI citation rates. Please read each item carefully as not all questions will apply to your city.

After carefully reading the instructions, users may click “Begin the program” at the top of the screen to continue. Users may click “Return to Main Menu” at any time to begin the model again.

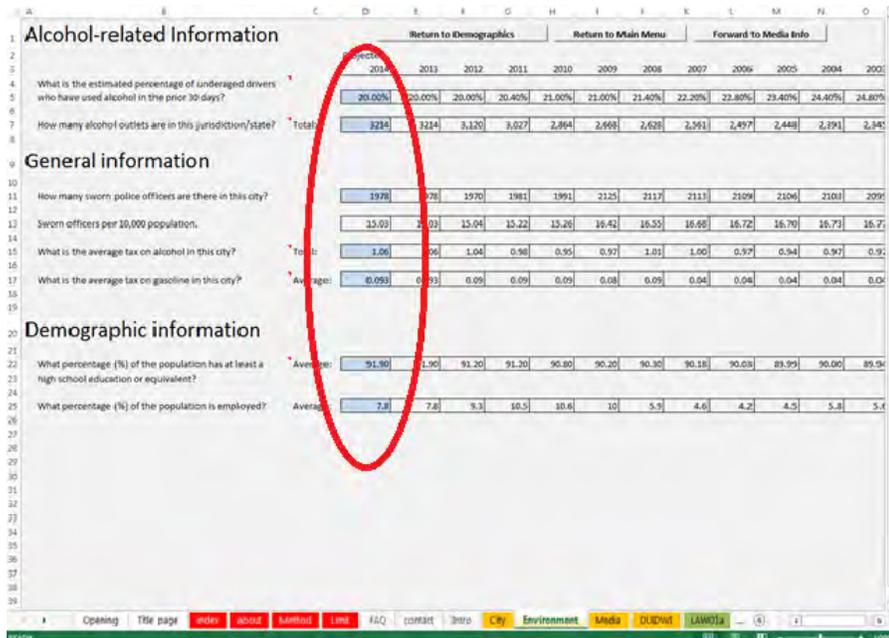




Users will then be prompted to select a city within San Diego County. (*The model currently only supports cities within San Diego County.*) The model will instantly populate all data for any of the cities supported by the simulation. The users must first enter the number that corresponds to the city in which they are interested. In the example below, we have selected the city of San Diego. After selecting the city, users click “Continue to Environment” at the top of the screen to begin the simulation.



On the following page—and throughout the simulation—users will be asked a series of questions. The data for the model has been automatically populated for the user based on the city selected in the prior screen. Users may now edit data in **BLUE CELLS** only. This will allow the model to simulate the impact (if any) on DUI/DWI rates among underage drivers. After the user is finished altering data in the **BLUE CELLS** (if any), click the “Forward” button at the top right of each page to move through the model.





Continue through the model until you reach the Overview of Law Strengths page (see below). This signifies the end of the data entry portion of the simulation. This page provides you with a summary of all law scores for the city you entered. Click “See Outcomes” at the top of the screen to see the outcomes of the changes you made to the model.

Page	Law	Score Range	Score	Effect Size DUI/DWI
<b>CITY LAWS</b>				
7	Retail Beverage Service (RBS)	0-31	0	0
8	Social Host (SH)	0-27	17	-0.351
<b>STATE LAWS</b>				
10	Possession	0-11	1	-0.001
11	Purchase	0-2	2	-0.037
12	Consumption	0-11	0	0
13	Internal Possession	0-11	0	0
14	Use/Lose	0-8	8	-0.063
15	Fake Identification	0-3	2	0.016
16	Zero Tolerance	0-10	6	-0.01
17	Graduated Drivers Licensing	0-3	2	-0.019
18	Furnishing/Selling	0-12	12	0.092
19	Age of on-premise servers	0-2	0	0
20	Age of on-premise bartenders	0-2	2	-0.031
21	Age of off-premise sellers	0-2	1	-0.028
22	Keg Registration	0-6	2	0.015
23	Retail Support for Fake Identification	0-5	3	-0.038
24	Drain Shop	0-3	2	-0.007
25	SHCL	0-1	2	-0.007
26	Transfer of FID	0-2	1	-0.028
27	State Control of Alcohol	0-3	0	0
<b>NATIONAL LAWS</b>				
29	Minimum Legal Drinking Age	0-1	0	0.15
30	Blood Alcohol Content	0-2	1	

### Interpreting the Outcomes

The Outcome Menu (see below) gives a brief overall statement of how changes made by the users impacted the outcome. In the example below, the changes made to the model resulted in 2,037 fewer DUI/DWI citations among drivers younger than 20 years through the duration of the model.

Overall, by adjusting the laws in the manner in which you have indicated, between now and the year 2030 it is estimated that you will see a change of **-2,037** DUI/DWIs in drivers under the age of 20 years.

**DUI/DWI Rates**

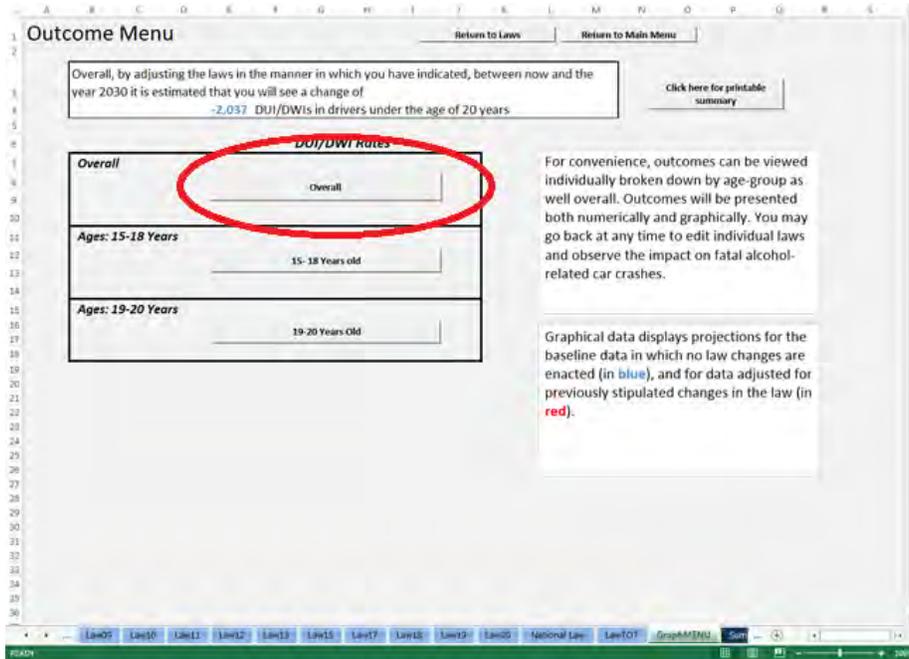
Category	Value
Overall	Overall
Ages: 15-18 Years	15-18 Years old
Ages: 19-20 Years	19-20 Years Old

For convenience, outcomes can be viewed individually broken down by age-group as well overall. Outcomes will be presented both numerically and graphically. You may go back at any time to edit individual laws and observe the impact on fatal alcohol-related car crashes.

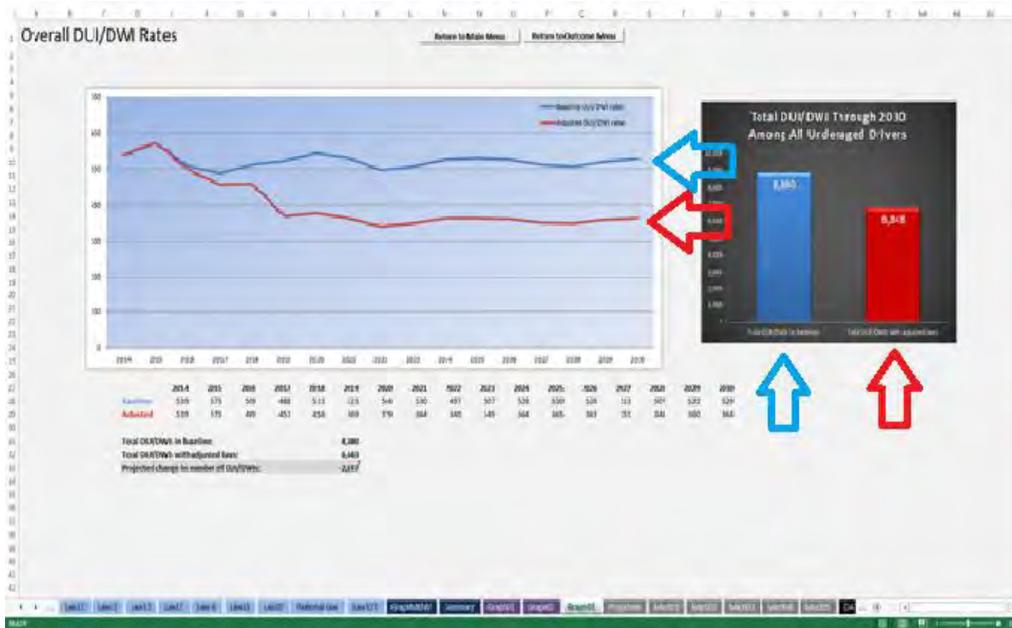
Graphical data displays projections for the baseline data in which no law changes are enacted (in blue), and for data adjusted for previously stipulated changes in the law (in red).



Users may then choose to see how the outcomes change over time. This may be done by selecting the age groups of interest. In the example below, we will examine the changes in DUI/DWI rates overall (i.e., meaning both the 15 to 18 year age group and the 19 to 20 year age group).

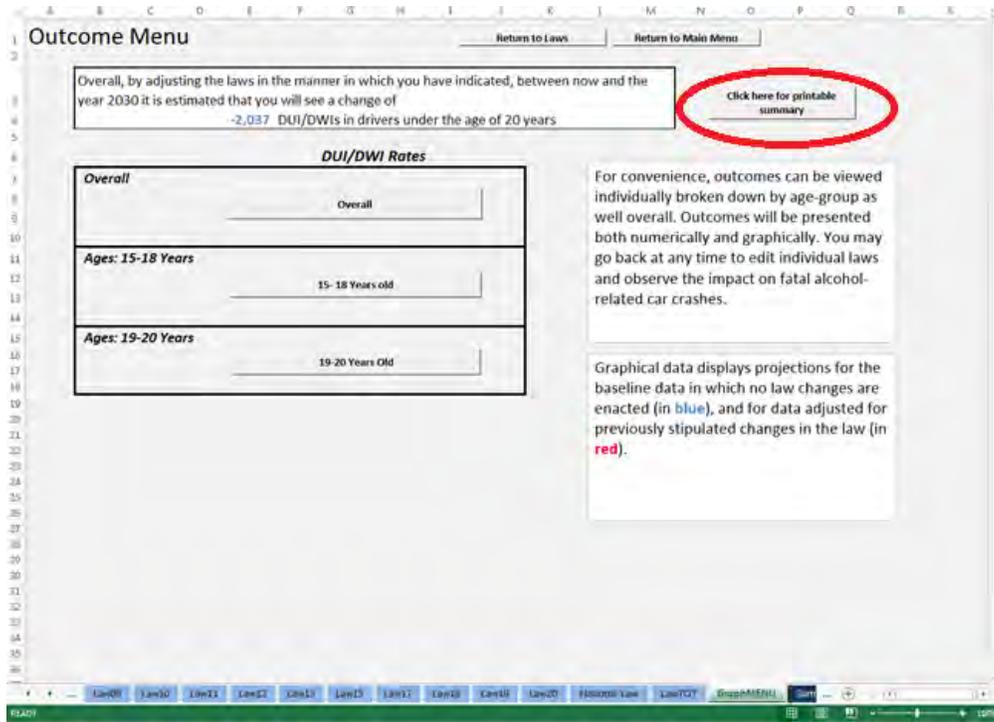


This will take users to the output screen similar to the one seen below. On the output screen, the blue line and blue bar represent the number of DUI/DWI citations if no changes had been made to the law, while the red line and red bar indicate the number of citations estimated given the changes the user made to the model in the data entry phase.

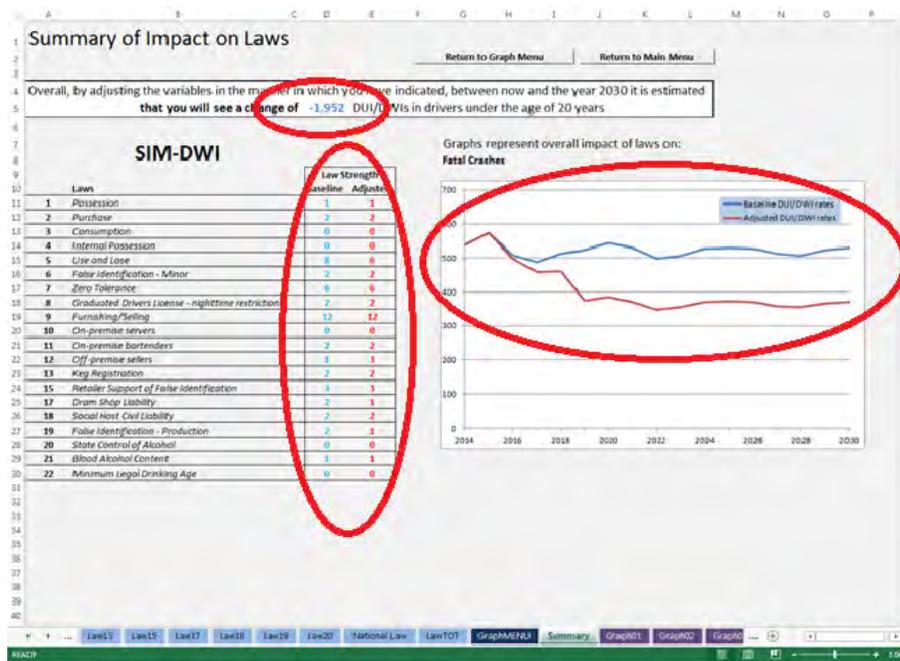




Users can also obtain a brief one-page printable version that describes the changes made to the laws and the effects on the DUI/DWI citation rates among young drivers. This may be done by clicking on “Click here for printable summary” on the Outcome Menu page.



The printable summary (see below) shows the overall decrease in DUI/DWI rates, the law strengths to show which law was changed, and a graph showing the overall change in DUI/DWI rates over the duration of the model.





Users may return to the Main Menu and run the program as many times as desired to determine what the most effective form of intervention would be in their community to reduce DUI/DWI rates among underage drivers. The simulation provides an easy-to-use tool to allow policy makers, advocates, researchers and other interested parties to examine the impact of specific changes in laws on their community.

### **Acknowledgements**

The current endeavor was only possible with a generous grant from the Office of Juvenile Justice and Delinquency Prevention. Grant No. (2012-AH-FX-0005) awarded by the Office of Juvenile Justice and Delinquency Prevention, Office of Justice Programs, U.S. Department of Justice. Points of view or opinions in this document are those of the author and do not necessarily represent the official position or policies of the U.S. Department of Justice.

Susan Caldwell, Senior Media and Communications Strategist from the Global Institute for Public Strategies, was vital to the completion of the San Diego SIM-DUI model.

### **Contact Information**

Questions about the simulation, inquiries about creating a similar model for a different community, or requests to create a model including other substances and/or outcomes should be directed to the Primary Investigator at:

Eduardo Romano, Ph.D.  
Pacific Institute for Research and Evaluation  
Romano@PIRE.org