

The Annual Economic Impact of Alcohol and Drug Use in Florida

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July 20, 2009



Extant research elucidates the pervasive detrimental effects of alcohol and drug use (AAD) on both the health of individuals and the health of communities. In spite of this, discourse regarding the consequences of AAD is still largely confined to the clinical sphere with very little emphasis placed on the ramifications to society as a whole. Though local, state, and federal government dollars are spent on substance use prevention and treatment programs, the consequences associated with AAD are not yet viewed through a macro-level lens; the reduction in the overall health and wellness of society consequent to AAD has been overlooked and left largely untreated (National Center on Addiction and Substance Abuse, 2009). Programs and policies aimed at mitigating the societal consequences of AAD remain scarce. It is now becoming increasingly evident that the escalating addiction problems prevalent in Florida pose a significant public health challenge. Research indicates that while individuals and families are certainly affected, entire neighborhoods and communities absorb the consequences of AAD as well (Centers for Disease Control and Prevention, 2008). The ancillary costs of AAD that spillover onto society occurs in the form of traffic collisions, illnesses, injuries, and crimes (CDC, 2008; Harwood, Fountain, and Livermore, 1998; Hedlund, 1994; Blincoe et al., 2002). Estimating the costs of these ancillary events allows for the quantification of the magnitude of a problem that is reducing society's overall health and functioning.

Identifying the comprehensive effects of AAD has proven to be problematic; data is limited and the few studies that are available are national or specific to a handful of communities and populations. While there are studies available that examine the clinical consequences of AAD, most studies elide over the economic and social consequences. The evidence that is available clearly evinces the need to address AAD through a public

health model, and thus examine the consequences of AAD from a societal framework. Researchers who examined economic costs of alcohol, drug use, and mental illness for the United States through a societal framework found that costs soared above \$85 billion (Rice, Kelman, & Miller, 1991). Other studies corroborated these findings. In 1992, Harwood et al., (1998) estimated the costs of alcohol abuse and alcoholism for the nation and determined that costs exceeded \$140 billion. To further exacerbate this problem, it was estimated that the government remunerated almost 40% of these costs (1998). Such studies emphasize the importance of measuring the consequences of AAD from a macro perspective and recommend garnering political support towards advancing efforts to develop and implement policies and programs that have been found efficacious in reducing the adverse consequences of alcohol and drug use (Rosen, Miller, and Simon, 2008).

Though national studies exist that estimate the costs of AAD, research available on a state-specific level is very limited; to date, such an analysis has only been done for a handful of states including Oregon and California (Rosen et al., 2008; Whelan, Josephson, & Holcombe, 2008). Researchers estimated the economic costs of alcohol use in California and found that it exceeded \$30 billion (Rosen et al., 2008). Researchers in Oregon determined that almost \$6 billion in 2006 is being lost due to adverse events attributed to alcohol and drug use; researchers also determined that the money collected in tax revenues in fiscal year 2006 from the sale of alcohol was far less than the amount spent due to alcohol abuse (Whelan et al., 2008).

To date, no such research has been conducted to determine the economic costs of AAD in Florida, the fourth most populous state in the country (U.S. Census Bureau,

2009). A confluence of factors exacerbates AAD in Florida. Florida's spatial location, its reputation as a tourist hotspot, and its designation as the "Gateway to the Americas" all place it at risk for greater frequency of AAD. Increased tourism has resulted in a booming nightlife scene, which in turn increases opportunities for AAD. Research suggests that entertainment cities tend to have a thriving culture of alcohol use, abuse, and illicit drug use (Anderson, Kavanagh, Bachman, Harrison, 2007; Holmberg, 2001; Berkey-Gerard, 2001). Despite the well documented addiction problem in Florida, the Department of Children and Families states they are only meeting approximately 30% of their funding needs to combat AAD (Florida Substance Abuse and Mental Health Corporation & Florida Alcohol and Drug Abuse Association, 2008). To further complicate matters, increased budgetary constraints continue to lead to a decline in resources and treatment services for consumers (2008). As other economic impact studies demonstrate, the consequences of untreated substance use trickle down to significantly impact other health and social systems including but not limited to: the healthcare system; the child welfare system; and the criminal justice system. Due to the nature of adverse events attributable to alcohol and drug use, these sectors are especially vulnerable to the repercussions of untreated substance abuse. This is likely the case in Florida. However, to date, it has been difficult to quantify the total burden placed on these sectors due to lack of research examining the total burden of alcohol and drug use in Florida.

An economic impact analysis of AAD in Florida allows for a baseline assessment of the problem by placing an economic value on the resulting consequences in Florida. This, in turn, may aid researchers, policy makers, and practitioners to oppose policies that are ineffective in curbing the societal consequences of alcohol and drug use and supplant

them with cost-effective strategies aimed at reducing both the clinical and societal effects of alcohol and drug use. Such an analysis may also prove useful in setting state-wide strategic goals, conducting program evaluations, and furthering advocacy efforts. An economic impact analysis is necessary to determine the extent of the problem and to develop policies and regulatory practices that may aid in reducing or containing the economic costs of AAD.

Methodology

This study estimated the costs of alcohol and drug attributable adverse events. Adverse events are defined by Rosen et al., (2008) as those incidents that cause harm to the individual, or to society. Broadly, four categories of harmful events were examined: illness, injury, crime, and traffic collisions. Methodology to isolate and estimate costs incurred by alcohol and drug use relied on previous studies (Rosen et al., 2008; Harwood et al., 1998; Miller, Levy, Cohen & Cox, 2006a; Miller, Levy, Spicer, Taylor, 2006b; Miller, Cohen, Wiersema, 1996; Burd, 2008; Blincoe et al., 2002). Though specific methods differed and are explained in more detail later, broadly, the total number of incidents were multiplied by the appropriate attributable fraction and then by cost per case. The sources of cases and attributable fractions are delineated in Table 1. Costs were assigned on a per case basis using published estimates. All costs were updated to 2008 dollars using the consumer price index.

Table 1: Source of Cases and Alcohol Attributable Fractions (AAFs)

| Categories of Harm-Alcohol | Source of Cases | Sources of AAFs |
|----------------------------------|---|---|
| Illness | AHCA | ARDI |
| Fetal Alcohol Spectrum Disorders | National Rates from Published Studies | 100% Attributable |
| Injury | Florida Department of Health Office of Vital Statistics | ARDI |
| Crime | Florida Department of Corrections Uniform Crime Database | Miller et al., 2006b Harwood et al., 1998 |
| Traffic Collisions | Department of Motor Vehicle Safety and Transportation | Department of Motor Vehicle Safety and Transportation |

Alcohol Attributable Adverse Events

Alcohol Attributable Health Conditions

We calculated the costs of alcohol attributed health conditions including partially attributable illnesses (such as hypertension, stroke), illnesses 100% caused by alcohol (such as alcohol dependence; alcohol abuse), work loss costs resulting from hospital inpatient stays due to alcohol use, and fetal alcohol spectrum disorders (FASD).

Generally, the same methodology outlined above was followed: *total # of hospitalizations x AAF x cost per case*; however, FASD and work loss costs were estimated differently due to limitations in data and the nature of the cost.

Hospitalizations: Inpatient and emergency hospitalizations were obtained from the Agency for Healthcare Administration (AHCA) (2008). AHCA collects information per hospital on total hospitalizations per year, average length of stay, average cost of illness, and total cost of illness. Illnesses shown to have a causal link with alcohol were obtained from the Centers of Disease Control and Prevention's (ARDI) Alcohol Related Disease

Impact Software (2008). Florida specific alcohol attributable fractions were also obtained from the same source. The ARDI software lists illnesses where a causal link with alcohol has been established; illnesses that are both partially or 100% attributable are listed (CDC, 2008). ARDI is based on the pooling of meta-analytical data and includes direct estimates for the proportions of acute and chronic conditions that are attributable to alcohol (2008). Indirect estimates are also utilized, especially for chronic conditions (2008). The ARDI software reports on health conditions resulting from low, medium, and high alcohol use (2008). For the purposes of this study, we only examined the consequences of medium and high alcohol use. ARDI defines medium alcohol use as having greater than 3 drinks a day for men and 1.5 drinks for women; high alcohol use is defined as having more than 4.4 drinks for men and 3 drinks for women (2008).¹

Medical costs were obtained in the form of hospital charges from AHCA (2008). Data for all ARDI listed illnesses were obtained from AHCA using ICD-9 codes. Costs were provided for all illnesses with the exception of very low costs/cases. For such instances, missing data for inpatient hospitalizations was filled by computing the average value of an illness and assigning this per case. For emergency department visits, the average value of an ED visit was utilized to fill for missing data. According to AHCA (2006), in 2004 the mean charge for an ED visit was \$619. In cases where no charges were provided, this was utilized to obtain an estimate of charges for ED hospital visits. Total workdays lost were obtained from the AHCA hospital inpatient data; work loss costs resulting from emergency room visits were not computed due to data limitations. Work loss costs were estimated for all inpatient hospitalizations. According to the

¹ More information on the cut points used to define low, medium, and high alcohol use can be found on the CDC's ARDI software: <https://apps.nccd.cdc.gov/ardi/AboutARDIMethods.htm>

Department of Labor, the average worker in Florida makes \$148.72 per day (Bureau of Labor Statistics, 2008b). This was utilized to estimate work loss costs. Quality of life costs were not estimated due to data limitations.

Fetal Alcohol Spectrum Disorders: Fetal Alcohol Spectrum Disorder (FASD) cases were computed using the prevalence and cost calculator (Burd, 2008). Following previous methodology, we assumed 2 cases of Fetal Alcohol Syndrome (FAS) per 1,000 live births (Harwood et al., 1998; Miller et al., 2006b; Rosen et al., 2008). Alcohol Related Neurobehavioral Disorders (ARND), were estimated at 8 cases per 1000 live births (Burd, 2008). Costs include medical treatment services, special education, juvenile justice services, residential care, and other supportive services for individuals with FASD.

Alcohol Attributable Fatal Injuries

Fatal injury cases were obtained from the Florida Department of Health (2006). A list of fatal injuries that are known to have causal relationship with alcohol were obtained from the CDC's ARDI software. Specifically, the following fatal injury categories were examined: suicide; drowning; fall; fire/flare; machinery; and poisoning. Alcohol attributable injuries were isolated using alcohol attributable fractions obtained from ARDI. Costs were assigned using the value of a statistical life (VSL). The VSL is based on published studies that estimate the dollar amount people spend to reduce their risk of death (Miller et al., 2006b; Rosen et al., 2008; Viscusi & Aldy, 2003). The VSL is utilized by federal agencies in conducting cost-benefit analysis and is grounded in the willingness to pay method (U.S. Department of Transportation, 2005). Published studies estimate that the VSL ranges from \$2.6 million to \$8.5 million (Miller, 2006b; Rosen, 2008; Viscusi & Aldy, 2003). Research indicates that the minimum VSL is at least \$4.3

million (Miller et al., 2006b; Rosen et al., 2008). We followed this recommendation and updated all costs to 2008 dollars.

Alcohol Attributable Crimes

Crime incidents were obtained from two sources: the Florida Department of Corrections Annual Report, 2006-2007 (2008) and the Federal Bureau of Investigation's Uniform Crime Reports (2008). Two types of crime costs were calculated: Incarceration costs and victim costs. Broadly, crime costs were estimated by obtaining the number of cases and isolating the alcohol attributable incidents by relying on AAF's utilized in previous studies (Miller et al., 2006a; Harwood et al., 1998).

AAFs for all violent crimes were obtained from Miller et al., (2006a); AAFs were based on surveys of prison inmates (1997 Survey of Inmates in State and Federal Correctional Facilities; 1996 Survey of Inmates in Local Jails; and 1995 Survey of Adults on Probation). Based on the pooled average of these surveys, researchers estimate that approximately 42% of homicides, 39% of rapes; 41% of assaults, and 33% of robberies are committed after at least one drink of alcohol. This is corroborated by other studies that estimate similar proportions of crime committed after alcohol use (Bureau of Justice Statistics, 2001). To determine which of these crime incidents were caused by alcohol, we followed previous assumptions by Harwood et al., (1998); Miller et al., (2006); Bureau of Justice Statistics, 2001) that 50% of violent crimes committed under the influence were causally linked to alcohol use. We also estimated that 5% of property crimes are committed due to alcohol use (Harwood et al., 1998).

Incarceration Costs: Incarceration data was obtained through the Florida Department of Corrections 2006-2007 Annual Report (2008). This report presents information on the

total number of inmates admitted into Florida's prisons annually, types of offenses, and average prison sentence. Alcohol attributable incarcerations were isolated using the same methodology as crime victim incidents described above. Alcohol attributable incarcerations were multiplied by the average length of prison sentences. Crime sentence research indicates that most prison sentences are not served in full; rather, inmates are usually released early due to a variety of reasons (Bureau of Justice Statistics, 2007). To account for this, we did not use the average prison sentence individuals were sentenced to provided by DOC; we utilized the mean # of years served for property and violent crimes (Bureau of Justice Statistics, 2007). Cost estimates were based on the Bureau of Justice Statistics Special Reports (2004). All cost estimates were updated to 2008 dollars.

Crime Victim Costs: Crime victim costs were estimated using the Federal Bureau of Investigation's Uniform Crime Reporting System (2008). One victim of crime was assumed for every incident of crime. Crime incidents attributable to alcohol use were isolated using alcohol attributable fractions as described earlier. Crime costs were assigned based on published estimates (Miller, Cohen, Wiersema, 1996). Crime victim costs are those incurred by victims or society as a result of an incident of crime that occurs due to alcohol. Crime costs include medical care, mental health care, police/fire services, social/victim services; property loss or damage, and quality of life. All costs were updated to 2008 dollars.

Alcohol Attributable Adverse Traffic Events

Incidents of adverse traffic events were obtained from the Florida Department of Highway Safety and Motor Vehicles' Traffic Crash Statistics Report (2008). This report provides annual information the total number of crashes in Florida, number of injuries,

and fatalities consequent to an adverse traffic incident. Incidents attributed to alcohol were isolated using alcohol attributable fractions obtained from the CDC's ARDI software. Alcohol attributable injuries and fatalities were then inputted into the National Highway Traffic Safety Administration's (2005) Crashcosts computer program. This program is utilized to estimate the costs of traffic fatalities and injuries for policy and evaluation purposes². Costs estimated are medical costs; emergency services; market productivity; household productivity; insurance administration costs; workplace costs; legal costs; travel delay; and property damage. In addition to the economic costs associated with alcohol attributed crashes, quality of life costs were computed for all fatalities using the value of a statistical life (VSL). We followed previous assumptions and set the VSL at \$4.3 million dollars per statistical life (2005 dollars)(Miller et al., 2006b). The quality of life costs were estimated by subtracting the economic cost per fatality by this value.

Drug Attributable Costs

The economic costs of drug use estimated within this study are health conditions resulting from drug use; the cost of crime due to drug use; and deaths due to drug toxicity.

Table 2: Sources of Cases and Drug Attributable Fractions (DAFs)

| Categories of Harm-Drugs | Source of Cases | Sources of DAFs |
|--------------------------|---|-------------------|
| Illness | AHCA | 100% attributable |
| Deaths | Medical Examiner's Report | 100% Attributable |
| Crime | Florida Department of Corrections Uniform Crime Database | Miller (2006a) |

² Specific details about this program can be found in: Blincoe, L.J (1994). Estimating crash costs in state or local jurisdictions. Washington, DC: US Department of Transportation, National Highway Traffic Safety Administration, Plans and Policy, report no. DOT-HS-808-135.

Drug Attributable Health Conditions

Adverse health conditions resulting from drug use are treated in both inpatient and emergency hospital settings. Due to lack of published DAF for illnesses that are partially caused by drug use, we only examined health conditions 100% attributable to drug use. Adverse health conditions 100% attributable to drug use include opioid dependence and abuse; cocaine dependence and abuse; cannabis dependence and abuse; amphetamine dependence and abuse; hallucinogen dependence and abuse; and other drugs dependence and abuse. Both emergency and inpatient data from AHCA (2008) were utilized to calculate costs. Missing data was inputted in the same manner missing data for alcohol attributable conditions was computed, using the mean cost of inpatient and emergency department hospitalizations. Costs are reported in the form of hospital charges.

Drug Attributable Crimes

Two types of Crime costs were computed: drug attributable victim crimes and drug attributable incarceration costs.

Drug Attributable Victim Costs: To estimate drug attributable crime victim costs, crime incidents were retrieved from the Federal Bureau of Investigation's Uniform Crime Reporting System (2008). Incidents were isolated using Miller et al., (2006a) drug attributable fractions. Cost estimates were based on previous studies (Miller et al., 1996; Miller, 2006a). Costs were estimated for crimes committed under the influence of drugs but not for drug money; for drug money but not under the influence of drugs; and under drug influence and for drug money. Crimes were classified according to violent or property crimes. Violent crimes include rape; robbery; assault; murder; child sexual

abuse; physical or emotional abuse; and serious child neglect. Property crimes include larceny, burglary and motor vehicle theft.

Crime costs attributable to drug use are expenses incurred by the victim or society. Similar to the way alcohol costs were computed, we assumed one victim of crime per incident of crime. Drug crime costs are comprised of: medical care (including: hospital and physician care payments, rehabilitation, prescription, other health services, medical devices, and insurance costs); mental health care (including: psychiatric services and insurance claims processing); property damage and loss (including stolen or damaged property, insurance costs); and public services costs (including police services, victim services, child protective services; and other social services). Quality of life costs are also included. This allows us to place an economic value on the lost quality of life that victims and families experience as a result of crimes committed due to drug use.

Drug Attributable Incarcerations: To estimate drug attributable incarcerations, the total annual number of incarcerations in Florida State prisons were retrieved from the Department of Corrections 2006-2007 Annual Report (2008). Similar to the way alcohol crime incarceration costs were computed, drug attributable fractions from Miller et al. (2006a) were utilized to isolate the proportion of incarcerations attributable to drug use. According to Miller et al. (2006a), crimes fall in three categories: under the influence of drugs/not for drug money, for drug money/not under influence of drugs, and under the influence of drugs/for drug money. The costs of incarcerations due to drug offenses were also computed; these crimes are 100% attributable to drug use. Incarceration costs per year were obtained from the Bureau of Justice Statistics (2004). Costs were assigned by multiplying the total number of drug attributable incarcerations by the average cost per

year of incarceration. This was then multiplied by the appropriate average length of prison sentence served.

Deaths Consequent to Drug Toxicity

We obtained the total number of deaths caused by drug use from the Florida Medical Examiner's Report (2008). This report provides information on deaths that were causally linked to drug use. The willingness to pay method was utilized to assign costs. Previous studies suggest that the value of a statistical life is at least \$4.3 million dollars (2005 dollars)(Miller et al., 2006b). All costs were converted to 2008 dollars.

Results

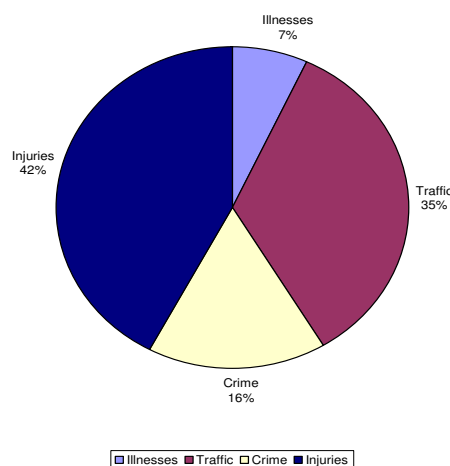
The total annual economic cost of alcohol and drug use is \$43,766,641,733.

Approximately 48% of costs are incurred due to alcohol use and 52% are incurred due to drug use. A detailed breakdown of costs is provided below.

Alcohol Attributable Costs

The total cost of alcohol attributable adverse events is \$21,085,357,042. The majority of these costs are due to fatal injuries, followed by adverse traffic events including injuries and fatalities. Crime costs account for 16% of total costs while illness accounts for 7% of total costs. Figure 1 depicts the percentage of costs per area of harm.

Figure 1: Annual Economic Cost of Alcohol Attributable Adverse Events in Florida



Over \$21 billion dollars are lost annually in Florida due to alcohol use. The bulk of this is lost due to alcohol attributed fatal injuries and adverse traffic events. As the chart below indicates, most harmful incidents were due to alcohol attributable adverse traffic events. However, most fatalities are due to fatal injuries. A detailed breakdown of results is presented in Table 3.

Table 3: Cost of Alcohol Attributable Adverse Events

| Areas of Adverse Events-Alcohol | Fatalities | Incidents | Costs |
|---------------------------------|--------------------|---------------------|-------------------------|
| Illness | 2,757 ³ | 68,818 | \$1,468,009,352 |
| Fatal Injuries | 1,904 | 1,904 | \$8,905,099,639 |
| Traffic Collisions | 1,051 | 82,303 | \$7,275,015,532 |
| Crime | 564 | 63,083 ⁴ | \$3,437,232,519 |
| Total | 6,276 | 216,108 | \$21,085,357,042 |

Alcohol Attributable Health Conditions

Alcohol attributable adverse health events comprised 7% of the total annual cost of alcohol in Florida; costs exceeded \$1.4 billion. The cost of adverse health conditions due to illnesses partially caused by alcohol amounted to an estimated \$1,443,067,075. 40% of costs incurred were due to illnesses caused entirely by alcohol; 30% of costs were due to illnesses partially caused by alcohol; and the remaining 30% of costs were due to FASD. The costliest illnesses were those that were 100% attributable to alcohol. These included: alcohol amnestic disorder; alcohol persistent dementia; alcohol withdrawal; alcohol induced sleep disorder; alcohol mental disorder; alcohol dependence; alcohol abuse; alcoholic polyneuropathy; alcoholic cardiomyopathy; alcoholic gastritis; alcoholic

³ This is not the actual fatality estimates for Florida; this is taken from CDC's ARDI software.

⁴ Only victim incidents are included to avoid double counting

fatty liver; alcoholic hepatitis; and alcohol poisoning⁵. The costliest illnesses that are partially caused by alcohol were digestive diseases. Table 4 provides more information.

Table 4: Hospitalizations and Illness Costs due to Alcohol

| Areas of Adverse Events- Alcohol | Hospitalizations | Medical Costs | Work loss |
|--|--------------------------|---------------|----------------|
| Digestive Diseases | | | |
| Acute Pancreatitis | 4,904.4 | \$158,043,103 | \$3,469,042.72 |
| Chronic Hepatitis | No information available | | |
| Chronic Pancreatitis | 1,394.4 | \$59,387,231 | \$1,210,134.64 |
| Gastroesophageal Hemorrhage | 3 | \$1,936 | |
| Liver Cirrhosis | 651 | \$54,316,536 | \$1,359,449.52 |
| Malignant Neoplasms | | | |
| Esophageal Cancer | 21.98 | \$1,804,646 | \$32,718.4 |
| Laryngeal Cancer | 20.29 | \$1,078,586 | \$30,338.88 |
| Liver Cancer | 45.91 | \$3,388,394 | \$72,277.92 |
| Oropharyngeal Cancer | 32.41 | \$4,012,387 | \$44,913.44 |
| Prostate Cancer | 56.64 | \$2,018,035 | \$20,225.92 |
| Breast Cancer | 39.97 | \$1,297,953 | \$15,466.88 |
| Cardiovascular Diseases | | | |
| Esophageal varices | No information available | | |
| Hypertension | 1743 | \$20,389,088 | \$358,861.36 |
| Portal hypertension | No information available | | |
| Stroke hemorrhagic | 418.56 | \$35,027,881 | \$619,121.36 |
| Stroke ischemic | 1540.84 | \$55,182,586 | \$1,047,434.96 |
| Supraventricular cardiac dysrhythmia | 74.7 | \$1,530,165 | \$21,415.68 |
| Skin Diseases | | | |
| Psoriasis | .93 | \$11,191 | \$446.16 |
| Other Illnesses Attributable to Alcohol | | | |
| Epilepsy | 2,766.15 | \$40,077,504 | \$683,517.12 |
| Spontaneous Abortions | 84.84 | \$770,959 | \$11,154 |
| Illnesses 100% caused by Alcohol use | 55,019 | \$572,683,320 | \$15,945,758.4 |

In addition, work loss costs incurred amounted to approximately \$24,942,277.

Work loss costs represented almost 17% of total illness costs. Work loss costs followed similar trends in that those illnesses 100% caused by alcohol had highest amount of work

days lost. Of those illnesses where alcohol is partially responsible, digestive diseases caused over 40,000 work days lost.

The total economic cost of alcohol attributable illness is an estimated \$1,468,009,352. Due to data limitations, the cost of illness mortality was not computed. However, the Center for Disease Control and Prevention estimates that 2,757 persons die due to an alcohol attributed fatal illness (CDC, 2008).

Alcohol Attributable Fatal Injuries

The estimated costs of alcohol attributable fatal injuries totaled \$8,905,099,640. Poisoning represented the majority of the costs with over 30% of injury costs consequent to poisonings. This was closely followed by alcohol attributable suicide which represented 29% of the total injury costs attributable to alcohol. Falls, drowning, fire/flame, and machinery injuries comprised the remaining injury costs attributable to alcohol use. Table 5 outlines results in detail.

Table 5: Injury Costs due to Alcohol Use

| Injuries | Incidents | Costs |
|--------------|--------------|------------------------|
| Drowning | 120 | \$561,245,776 |
| Fall | 533 | \$2,492,866,653 |
| Fire/Flame | 45 | \$210,467,166 |
| Machinery | 5 | \$23,385,241 |
| Poisoning | 648 | \$3,030,727,188 |
| Suicide | 553 | \$2,586,407,616 |
| Total | 1,904 | \$8,905,099,640 |

Alcohol Attributable Adverse Traffic Events

The direct economic costs of adverse traffic events totaled an estimated \$3,616,617,906. The majority or 65% of costs are due to nonfatal alcohol attributable injuries resultant of traffic accidents. The remaining or 35% of costs are due to alcohol

attributed fatalities. There were 63,713 reported injuries attributable to an adverse traffic incident caused by alcohol. This figure was adjusted for underreporting for a total of 81,252 incidents of injuries due to alcohol use. There were also 1,051 fatalities due to alcohol use in Florida. According to the CrashCost software, the unit cost per fatality was \$1,196,175.

Injuries are divided into the Maximum Abbreviated Injury Scale that rates injuries based on severity level (NHTSA, 2005). The majority of costs due to alcohol attributable injuries occur on the MAIS 1 scale with property damage costs and medical services costs comprising the bulk of total costs. For fatalities, the bulk of the costs arise due to losses in market productivity and household productivity. Table 6 explains in further detail.

Table 6: Traffic Injuries and Fatalities due to Alcohol Use

| Incidence | Total | Costs |
|---|---------------|------------------------|
| Injuries | | |
| MAIS 1 Injury | 71,875 | \$927,537,945 |
| MAIS 2 Injuries | 6,726 | \$550,948,320 |
| MAIS 3 Injuries | 1,942 | \$443,291,036 |
| MAIS 4 Injuries | 563 | \$240,914,060 |
| MAIS 5 Injuries | 146 | \$196,746,584 |
| Total Injuries | 81,252 | \$2,359,437,947 |
| Fatalities | 1,051 | \$3,658,397,626 |
| Quality of Life Costs for Fatalities | | \$1,257,179,959 |
| Total | | \$7,275,015,532 |

Quality of life costs for fatalities totaled \$3,658,397,626. Total traffic costs are estimated to be \$7,275,015,532. All costs are presented in 2008 dollars.

Alcohol Attributable Crimes

Crime costs were estimated to be \$3,437,232,519. Crime costs include those incurred due to incarceration of crimes committed under the influence of alcohol. Crime

costs also include those costs incurred by the victims or society as a result of a crime being committed under the influence of alcohol. Incarceration costs represent 12% of total crime costs consequent to alcohol use while victim costs represent the remaining 88% of total crime costs.

Incarceration costs totaled \$425,645,691. There were 2,607 incarcerations consequent to crimes committed due to alcohol use. The majority of these incidents were assault followed by murder and robbery. Murder represented the costliest incarcerations at \$162,185,639 due to the longer prison sentence. The table below explains in further detail.

Table 7: Incarceration costs due to Alcohol Use.

| Types | Incidents | Years in Prison | Total Cost |
|-----------------|------------------|------------------------|----------------------|
| Murder | 478 | 12.25 | \$162,185,639 |
| Assault | 1,023 | 5.08 | \$143,942,074 |
| Robbery | 350 | 5.08 | \$49,247,044 |
| Sexual Offenses | 333 | 5.08 | \$46,855,045 |
| Burglary | 234 | 2 | \$12,962,664 |
| Larceny | 146 | 2 | \$8,101,665 |
| Car Theft | 42 | 2 | \$2,351,560 |
| Total | 2,607 | - | \$425,645,691 |

Victim costs resultant of alcohol attributable crimes totaled \$3,011,586,828. Victim costs included costs to victims of crimes and to society as a result of an alcohol attributable crime. These included: lost productivity; medical care; mental health care; police and fire services; social and victim services; property loss and damage; and diminished quality of life. Broadly, there were greater incidents of property crimes than violent crimes; however, violent crimes were far more expensive, representing almost 98% of total victim costs. Within property crimes, the most frequent alcohol attributable incidents were larcenies while the costliest property crimes were car thefts. Assaults

presented as the highest frequency of violent crimes committed but this is tempered by the fact that homicide was the costliest, representing almost 84% of total violent crime costs. Table 7 explains in further detail.

Table 7: Victim Costs due to Alcohol Use

| Types | Categories | Incidents | Total Cost |
|--|---------------------|------------------|------------------------|
| Violent Crimes | Homicide | 564 | \$2,478,885,919 |
| | Robbery | 6,297 | \$75,417,280 |
| | Rape | 1,199 | \$155,378,530 |
| | Assault | 17,705 | \$248,181,785 |
| Total for Violent Crimes | | 25,765 | \$2,957,863,514 |
| Property Crimes | Burglary | 9,092 | \$19,377,325 |
| | Larceny | 2,4543 | \$13,426,248 |
| | Motor Vehicle Theft | 3,683 | \$20,919,741 |
| Total for Property Crimes | | 3,7318 | \$53,723,314 |
| Total for all alcohol attributable crimes | | 63,083 | \$3,011,586,828 |

Drug Attributable Costs

The total economic cost of drug attributable adverse events is \$22,681,284,691.

The majority of these costs are due to drug attributable deaths. It is estimated that almost 4,500 deaths occur annually due to drug use.

Drug Attributable Health Conditions

Drug attributable health conditions result in an estimated \$103,427,447 in hospital charges and work loss costs. The bulk of these costs are due to hospital charges. Work loss costs were only estimated for inpatient hospital stays and they represented 8% of all inpatient hospital costs. It is estimated that there were 16,740 incidents of hospitalizations due to drug use with the majority of incidents taking place in the form of emergency room visits. Emergency room visit work loss costs were not estimated due to data limitations.

Table 8: Hospitalization Costs due to Drug Use

| Type | Incidents | Costs |
|-----------|--------------------|--------------|
| Inpatient | 6,079 | \$68,480,590 |
| Emergency | 10,661 | \$28,622,390 |
| Work-loss | 42,526 (days lost) | \$6,324,467 |

Drug Toxicity Fatalities

Drug fatalities obtained from the Florida Medical Examiner’s Report (2007) resulted in approximately \$20,181,462,681 lost. Most deaths were a result of Opioid toxicity, followed by Benzodiazepines, and Cocaine. Table 9 illuminates in detail:

Table 9: Death Costs due to Drug Toxicity

| Type of Drugs | Incidents | Costs |
|-----------------------------|--------------|-------------------------|
| Opioids | 2,421 | \$11,323,133,523 |
| Benzodiazepine | 878 | \$4,106,448,258 |
| Methylated Amphetamines | 69 | \$322,716,321 |
| Cocaine | 843 | \$3,942,751,574 |
| Carisprodol/Meprobamate | 88 | \$411,580,235 |
| Other (including inhalants) | 16 | \$74,832,770 |
| Total | 4,315 | \$20,181,462,681 |

Drug Attributable Crimes

Drug attributable crimes totaled \$2,396,620,311. Incarceration costs comprised 47% of total crime costs while victim costs comprised the remaining 53% of costs. There were 161,957 incidents of victim crimes with the majority of incidents occurring for drug money and under the influence of drugs. There were 2,512 incarcerations as a result of or for drug use. Table 10 explains in further detail.

Table 10: Incarceration Costs due to Drug Attributable Crimes

| Incarceration Categories | Incident Type | Incidents | Costs |
|---|---------------------------|---------------|------------------------|
| Under influence of drugs/not for drug money | Homicide | 102 | \$34,472,931 |
| | Sexual Offenses | 154 | \$21,629,302 |
| | Robbery | 148 | \$20,870,897 |
| | Violent Personal Offenses | 299 | \$42,135,771 |
| | Burglary | 56 | \$3,109,377 |
| | Larceny | 146 | \$8,101,665 |
| | Car Theft | 14 | \$752,499 |
| | Total | 919 | \$131,072,442 |
| For Drug Money/Not under influence of drugs | Murder | 10 | \$34,472,93 |
| | Robbery | 106 | \$14,907,784 |
| | Burglary | 234 | \$12,957,124 |
| | Larceny | 176 | \$9,721,998 |
| | Car Theft | 8 | \$470,312 |
| | Total | 534 | \$41,504,511 |
| For Drug Money and Under Influence of Drugs | Murder | 41 | \$13,789,172 |
| | Robbery | 424 | \$59,631,135 |
| | Violent Personal Offenses | 50 | \$7,022,628 |
| | Burglary | 889 | \$49,237,073 |
| | Larceny | 351 | \$19,443,996 |
| | Car Theft | 51 | \$2,821,872 |
| | Total | 1,806 | \$151,945,877 |
| Drug Offenses | | 11,470 | \$794,240,150 |
| Total | | 14,729 | \$1,118,762,980 |

The highest frequency of attributable drug crime incidents as well as the costliest were incarcerations due to crimes committed both for drug money and under the influence of drugs. Overall, drug offenses dominated incarcerations with almost 78% of incarcerations due to a direct drug offense. Drug offenses were also the most costly, though the average prison term for a drug offense is shorter compared to the other crimes examined.

Table 11: Victim Costs due to Drug Attributable Crimes

| Types | Categories | Incidents | Total Cost |
|---|---------------------------|----------------------------|------------------------|
| Under the influence of Drugs/Not for Drug Money | Murder | 120 | \$527,862,069 |
| | Sexual Offenses | 554 | \$71,739,784 |
| | Robbery | 2,671 | \$31,993,891 |
| | Violent Personal Offenses | 5,182 | \$72,638,694 |
| | Burglary | 2,182 | \$4,650,379 |
| | Larceny | 2,454 | \$1,342,619 |
| | Car Theft | 1,178 | \$6,694,270 |
| Total | | 14,341 | \$716,921,706 |
| For Drug Money/Not under the influence of Drugs | Murder | 12 | \$52,786,207 |
| | Robbery | 1,908 | \$22,852,779 |
| | Burglary | 9,092 | \$19,377,325 |
| | Larceny | 29,451 | \$16,111,432 |
| | Car Theft | 737 | \$4,183,919 |
| Total | | 41,200 | \$115,311,662 |
| For Drug Money/Under the influence of Drugs | Murder | 48 | \$211,144,828 |
| | Robbery | 7,632 | \$91,411,118 |
| | Violent Personal Offenses | 864 | \$12,111,215 |
| | Burglary | 34,548 | \$73,630,425 |
| | Larceny | 58,903 | \$32,222,864 |
| | Car Theft | 4,419 | \$25,103,512 |
| Total | | 106,414 | \$445,623,962 |
| Total for All | | 161,957⁶ | \$1,277,857,330 |

Similar to incarceration cases, victim cases were highest for crimes committed both for drug money and under the influence of drugs with almost 68% of crime incidents. However, the costliest crime incidents occurred under the influence of drugs but not for drug money; this category accounted for almost 56% of total victim costs. Approximately 35% of costs originated from crimes committed for drug money and under the influence of drugs. The remaining 9% of costs were generated for crimes

⁶ Numbers may not add up exactly due to rounding

committed solely for drug money. Overall, 161,957 incidents of crime occurred due to drug use; the total cost of these crimes was an estimated \$1,277, 857, 330.

Discussion

The annual economic impact of AAD in Florida allows for a baseline assessment of the scope of the problem. The results have significant implications for the State of Florida, particularly in the current economic landscape that has led to a decline in resources across the public sector. It is necessary to note that costs reported within this study are not due to direct costs related to alcohol and drug prevention, treatment, or research, but rather are ancillary costs that are absorbed by other areas.

Our estimates veer away from previous studies in that the cost of fatal injuries is higher than any other alcohol attributable category of harm, and the cost of drug attributable deaths are higher than any other drug attributable category of harm. The reason for this is twofold. First, the VSL was utilized to compute the estimated costs of these fatalities. As such, these costs represent the comprehensive loss to society as opposed to distinct direct and indirect economic costs. Second, alcohol and drug attributable fatalities from health conditions were unavailable. This prevents the estimation of alcohol and drug attributable fatalities due to acute and chronic health conditions. The CDC (2008) estimates that 2,757 individuals die due to alcohol caused conditions. It is likely that if illness fatality incidents were available, the cost for health conditions would be significantly higher resulting in our study more closely aligning with other studies that have estimated the economic impact of alcohol and drug use across the nation.

Another important area of concern is the fact that most deaths attributable to drug use were due to opioid toxicity. According to the Medical Examiner's Report (2008), opioids comprised the majority of drug deaths in Florida with 2,421 deaths occurring due to opioid use in 2008. Only 93 of these deaths were due to illicit heroin. Our results follow a similar trend in that prescription drug use resulted in greater cost compared to other categories of illicit drug use. 2,328 deaths were a result of prescription opioids. The total cost of these drug deaths amounted to over \$10.8 billion dollars.

Other differences between our study and other economic impact studies are also present. For instance, quality of life years were not computed for any category, nor were quality of life costs computed for every area of harm. Specifically, quality of life costs were not computed for health conditions for both drugs and alcohol.

Limitations

Though economic costs presented are conservative estimates of alcohol and drug attributable adverse events, limitations in data availability occlude a comprehensive analysis of every harmful incident caused by alcohol and drug use. Specifically, this analysis does not include costs incurred due to alcohol and drug prevention programs, treatment programs, prescription costs, and research. It also excludes quality of life costs due to nonfatal injuries attributable to alcohol. For drug use, data availability is especially problematic as the illegal status of drugs creates a barrier to obtaining true estimates; it is suspected that current data available is underreported. The costs of fatalities resulting from drug use are reported within this study; however, fatalities are only reported if drug toxicity is present. It is likely that this leads to underreporting of fatalities caused by drug use. Other areas where a documented link with alcohol and drug use is present include

high risk sex, HIV transmission, and child abuse and neglect. The costs of these are not included in this study.

Other methodological limitations exist as well. The quality of life costs that estimate the lost quality of life for victims of alcohol and drug attributable crimes are based on previous research that utilizes jury verdicts to assign costs. This may be problematic as it is difficult to determine whether juries are adequately prepared to set a value for pain, suffering, and lost quality of life. This leads to another methodological limitation: using the value of a statistical life to compute costs. Though federal agencies utilize the VSL to determine the cost effectiveness of policies and programs, the question remains: Is it appropriate to set a value for a human life? To further complicate matters, the VSL has varied considerably ranging anywhere from \$2.6 million to \$8.5 million. The Department of Transportation (2008) utilizes \$5.8 million as the VSL. Published studies indicate that the VSL, as a minimum, should be set at \$4.3 million (Miller, 2006b; Viscusi, 2003). The broad range of the VSL poses a problem when comparing with other studies of a similar nature that may use differing values to assign costs based on the VSL.

Another limitation present in this study is the use of hospital data from AHCA. Hospital data poses some challenges for data analysis because hospitalization costs are presented as charges as opposed to the actual costs that may be negotiated between the hospitals and payers. Research indicates that hospitals frequently negotiate different costs with payers (Agency for Healthcare Administration, 2006). Another limitation is the use of attributable fractions to isolate the proportion of incidents attributable to drugs or alcohol use. For crime incidents especially, more research is needed to determine the degree of alcohol's role in causing a crime (Rosen et al., 2008). Additionally, attributable

fractions utilized to isolate the proportion of health conditions caused by alcohol may underestimate the role of alcohol in the development of health conditions. This is primarily due to the fact that the ARDI software does not take into account all illnesses that are linked with alcohol use (such as diabetes) (CDC, 2008; Mayo Clinic, 2009). Further, the lack of appropriate attributable fractions for drug use also poses a problem. No chronic conditions that develop partially due to drug use were examined in this study due to the lack of research on chronic illnesses caused partially by drug use.

Despite the limitations evident in this study, it is likely the economic costs presented for both drugs and alcohol are under estimated. This is due to the conservative approach taken within this study that minimizes variability and utilizes low cost estimates to assign costs.

Policy Implications

Research indicates the economic cost of AAD has created a tremendous economic burden within the United States (Harwood et al., 1998). As this analysis reveals, the same is true for Florida as over \$41 billion is spent on adverse events caused by AAD. The total economic costs of alcohol and drug use translate to over \$2,300 per capita and accounts for approximately 6% of Florida's Gross Domestic Product. The tremendous costs of alcohol and drug use cements substance abuse as a significant public health and safety challenge for Florida.

In addition to the widely cited healthcare concerns attributable to AAD, the high economic costs of social consequences such as crime evince the need to address alcohol and drug use through a public health model that emphasizes both the health and societal aspects of this illness. Since crime costs alone exceed \$5 billion across drug and alcohol

attributable crimes, it is necessary to not only invest in programs aimed to prevent alcohol and drug use, but also to develop more cost effective methods of handling individuals who commit crimes under the influence. Moreover, traffic costs due to alcohol attributable adverse events exceed \$7 billion dollars signifying the need to link early intervention, prevention, and treatment programs to safe driving programs.

Another pivotal issue to emerge from this report is the high costs of drug attributable deaths that occur due to prescription drug use. Researchers are only now beginning to notice the rise in prescription drug use, especially in Florida. According to the Florida Department of Law Enforcement, Medical Examiner's Report (2008), prescription drugs continue to have greater frequency of involvement than illegal drugs. The fact that deaths due to prescription drugs result in the loss of \$10 billion evinces the need to regulate and monitor prescription drug transactions, set strategies aimed at reducing overall drug use, and implement policies designed to curb off label use of prescription drugs

Despite the exorbitant costs of alcohol use in Florida, excise taxes on alcohol remain unchanged since 1999; this leads to a 23% decline in value due to inflation. According to the Brewer's Almanac, the brewing industry paid approximately \$2.6 billion dollars in taxes to both the federal and state government in Florida (Beer Industry of Florida, 2008). As this economic impact study indicates, this figure only covers approximately 12% of the expenses incurred due to alcohol use.

Table 12: Taxes paid by Alcohol Industry

Source: Beer Industry of Florida, 2008

| Type of Taxes | Taxes Paid |
|-----------------------------------|------------------------|
| Total Business and Personal Taxes | \$987,885,073 |
| Federal Excise Taxes | \$243,016,952 |
| Total State and Local Taxes | \$555,500,729 |
| Consumption Taxes | \$798,517,680 |
| Total | \$2,584,920,434 |

According to the Marin Institute (2009), a rise in taxes of only \$0.14 per gallon of beer, wine, and spirits would result in an additional \$72.5 million. Raising taxes may not completely alleviate the burden of alcohol use, but it may serve as a prohibitive strategy to curb alcohol consumption. Research indicates reducing access and placing restrictions on access to alcohol is especially efficacious in preventing alcohol attributable adverse events (Babor et al., 2003).

The National Center on Addiction and Substance Abuse at Columbia University (2009) estimated state spending on substance abuse and addiction in 2005 and found costs to be extremely high (2009). According to CASA (2009), each dollar spent towards addiction treatment and prevention by state governments results in an estimated \$59.83 spent in the public sector to deal with the ancillary costs of substance use. Given the high price tag of alcohol and drug attributable adverse outcomes demonstrated in this and other studies, it is vital to meet substance abuse prevention and treatment funding. Furthermore, to curb the societal problems resultant of AAD, it may also be prudent to invest in prevention programs, early intervention programs, and link these with safety and health programs. Macro level policies examining AAD from a societal framework may be especially valuable in limiting both the clinical and societal consequences associated with alcohol and drug use.

References

- Agency for Healthcare Administration (2008). Retrieved on November 12, 2008 from <http://www.floridahealthfinder.gov/researchers/researchers.shtml>
- Agency for Healthcare Administration (2006). Emergency Department Utilization Report. State Center for Health Statistics. Retrieved March 2, 2009 from www.floridahealthstat.com
- Anderson, T.L., Kavanaugh, P.R., Bachman, R., Harrison, L. (2007). Exploring the Drugs Crime Connection within the Electronic Dance Music and Hip Hop Night Scene. Retrieved in June 2009 from <http://www.ncjrs.gov/pdffiles1/nij/grants/219381.pdf>
- Babor, T.F., Caetano, R., Casswell, S., Edwards, G., Giesbrecht, N., Graham, K., Grube, J., Gruenewald, P., Hill, L., Holder, H., Homel, R., Osterberg, E., Rehm, J., Room, R. & Rossow, I. (2003). Alcohol: No ordinary commodity---Research and Public Policy. Oxford and London: Oxford University Press.
- Blincoe L., Seay, A., Zaloshnja, E., Miller, T., Romano, E., Luchter, S., Spicer, R.S. (2002). The economic impact of motor vehicle crashes, 2000, Report No. DOT HS 809 446. National Highway Traffic Safety Administration, Department of Transportation, Washington, DC.
- Blincoe, L.J (1994). Estimating crash costs in state or local jurisdictions. Washington, DC: US Department of Transportation, National Highway Traffic Safety Administration, Plans and Policy, report no. DOT-HS-808-135

Bureau of Labor Statistics (2008a). Consumer Price Index Inflation Calculator. Retrieved on January 15, 2009 from www.bls.gov/data/inflation_calculator.htm

Bureau of Labor Statistics (2008b) Florida Occupational Employment and Wages, 2008. Retrieved on January 13, 2009 from <http://www.bls.gov/oes/data.htm>

Bureau of Justice Statistics (2004). State Prison Expenditures, 2001. Retrieved on November, 2008 from <http://www.usdoj.gov>

Berkey-Gerard, Mark (2001). "Neighbors and Nightclubs." *Gotham Gazette*. Retrieved on July 1, 2009 from <http://www.gothamgazette.com/iotw/disco/>

Beer Industry of Florida (2007). Economic Benefits. Retrieved on December 15, 2008 from <http://floridabeer.org/benefits.html>

Beer Institute (2008). Brewer's Almanac. Retrieved from www.beerinstitution.org/statistics.asp?bid=200

Bureau of Justice Statistics (2001). Criminal Victimization in the United States, 1999: A national Crime Victimization Survey Report. U.S. Government Printing Office, Washington, DC.

Bureau of Justice Statistics (2007). State Court Sentences of Convicted Felons. Retrieved December 2008 from <http://www.ojp.usdoj.gov/bjs/pub/html/scscf04/tables/scs04110tab.htm>

Burd, L. (2008) Prevalence and Cost calculators. Retrieved on November 13, 2008 from www.online-clinic.com/content/materials/calculator.asp.

Centers for Disease Control and Prevention (2008). Alcohol and Disease Related Impact Software. Retrieved on December 12, 2008 from <http://www.cdc.gov/alcohol/ardi.htm>

Enterprise Florida Inc. (2009). Florida Gross Domestic Product and Income. Retrieved on December 29, 2008 from <http://www.eflorida.com>

Federal Bureau of Investigation (2008). Uniform Crime Reports. Retrieved on November 2008 from <http://www.fbi.gov/ucr/ucr.htm>

Florida Department of Corrections Annual Report, 2006-2007. Retrieved on November 2008 from <http://www.dc.state.fl.us/pub/annual/0607/index.html>

Florida Department of Health (2007). Florida Charts: Community Health Assessment Resource Tool Set: Population Estimates. Retrieved on November 15, 2008 from www.floridacharts.com/charts/censusdata.aspx.

Florida Department of Health (2006). DeathStat Database. Office of Vital Statistics, Office of Injury Prevention.

Florida Department of Law Enforcement (2008). Drugs Identified in Deceased Persons: Florida Medical Examiner's Report, 2007. Retrieved on January 3, 2009 from <http://www.fdle.state.fl.us/content/getdoc/036671bc-4148-4749-a891-7e3932e0a483/Publications.aspx>

Florida Department of Law Enforcement (2009). Drugs Identified in Deceased Persons: Florida Medical Examiner's Report, 2007. Retrieved July 13, 2009 from <http://www.fdle.state.fl.us/Content/getdoc/a37959db-85e0-42f9-b6d6-cdef532f22f8/2008DrugReport.aspx>

Florida Highway Safety and Motor Vehicles (2008). Traffic Crash Statistics Report, 2007 retrieved on November 2008 from www.flhsmv.gov

Florida Substance abuse and Mental Health Corporation, Florida Alcohol and Drug Abuse Association (2008). The Impact of Addiction on Florida's Economy.

- Harwood, H., Fountain, D., Livermore, G. (1998) *The Economic Costs of Alcohol and Drug Abuse in the United States*, 1992. NIH Publication No. 98-4327.
Department of Health and Human Services, Rockville, MD.
- Holmberg, Mark (2001). "US VA: Nightclubs in Alphabet Soup with ABC Cracking Down on X." *Richmond Times-Dispatch*.
- Hedlund, J.H. (1994). "If they didn't drink, would they crash anyway?" -- The role of alcohol in traffic crashes. *Alcohol, Drugs and Driving*, 110, 2, 115-125.
- Marin Institute (2009). Tax/Fee Revenue Calculator. Retrieved on July 12, 2009 from <http://www.marininstitute.org/site/index.php?Itemid=281>
- MayoClinic (2008). Type II Diabetes: Do Alcohol and Drug Use Increase the Risk of Diabetes. Retrieved on July 9, 2009 from www.mayoclinic.com
- Miller, T.R. (1990). The plausible range for the value of life—red herrings among the mackerels. *Journal of Forensic Economy*, 3, 17-39.
- Miller, T.R., Cohen, M.A., Wiersema, B. (1996). *Victim Costs and Consequences: A New Look*. National Institute of Justice.
- Miller, T.R., Levy, D.T., Cohen, M.A., Cox, K.L. (2006a) Costs of alcohol and drug-involved crime. *Prevention Science*, 7, 333-342.
- Miller, T.R., Levy, D.T., Spicer, R.S., Taylor, D.M. (2006b). Societal costs of underage drinking. *Journal of Studies on Alcohol*, 67, 4, 519-528.
- National Highway Traffic Safety Administration (2005). Crash-cost Software. Retrieved on January 2009 from <http://www.nhtsa.dot.gov/people/crash/MVS/>
- National Institute of Aging (2008). Alcohol use and abuse. Retrieved on December 18, 2008 from www.nia.nih.gov/healthinformation/publications/alcohol.htm.

- Rice, D.P., Kelman, S., Miller, L.S. (1991). Estimates of economic costs of alcohol and drug abuse and mental illness, 1985 and 1988. *Public Health Rep*, 106, 280-292.
- Sassi, F. (2006). How to do (or not to do). . . Calculating QALYs, Comparing QALY and DALY calculations. Oxford University Press.
- The National Center on Addiction and Substance Abuse (2009) Shoveling up: The impact of substance abuse on state budgets. Retrieved on July 12, 2009 from <http://www.casacolumbia.org/ViewProduct.aspx?PRODUCTID=3594d7eb-1e01-4c31-bf01-e363d92053ed>
- United States Department of Health and Human Services (2009). 2006-2007 State Estimates of Substance Use & Mental Health. Substance Abuse and Mental Health Services Administration, Office of Applied Statistics. Retrieved on December 17, 2008 from <http://oas.samhsa.gov/2k6State/Florida.htm>.
- United States Department of Transportation (2005). Treatment of the Economic Value of a Statistical Life in Departmental Analyses. Retrieved on March 15, 2009 from <http://ostpxweb.dot.gov/policy/reports/080205.htm>
- Rosen, S., Miller, T., Simon, M. (2008). The cost of alcohol in California. *Alcoholism: Clinical and Experimental Research*, 32, 11, 1-12.
- Viscusi, W.K., Aldy, J.E. (2003). The value of statistical life: a critical review of market estimates throughout the world. *Journal of Risk Uncertainty*, 27, 5-76.
- Whelan, R., Josephson, A., and Holcombe, J. (2008). The Economic Cost of Alcohol and Drug Abuse in Oregon. EcoNorthWest. Retrieved on March 12, 2009 from http://www.econw.com/reports/ECONorthwest_Costs-AlcoholDrugs.pdf