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Developing Substance Abuse Policy: Perspectives from Around the World

In this edition of the Journal, the first of our two featured articles, *Why a 5 ng/ml THC limit is bad public policy - and the case for tandem per se DUID legislation* is by **Ed Wood**, founder of DUID Victim Voices. This very timely article reviews a current study and discusses the flaws in trying to set a DUID policy for marijuana based upon a level of THC in whole blood. There is not an easy method to determine THC impairment in the same manner that we do with alcohol, however Mr. Wood provides a sensible suggestion to address the escalating problems with drivers under the influence of drugs.

The second featured article, *Binge Drinking in the Oldest Wine Country: Evidence from the Noncommunicable Disease Risk Factor Surveillance* summarizes a very important study that quantifies the extent of the alcohol problem in the Republic of Georgia. The long-standing wine-making industry combined with the effects from economic upheaval and conflict with Russia, have all contributed to the rise of the problem. Ultimately, this study will help Georgian policymakers to address the public health epidemic and others can learn from it. The team of international authors and researchers include: **Manouchehr Mokhtari**, School of Public Health, University of Maryland - College Park; **Anthony Kondracki**, School of Public Health, University of Maryland - College Park; **Jacqueline Wallen**, School of Public Health, University of Maryland - College Park; **Lasha Kavtaradze**, International Black Sea University, Georgian University; ***Mamak Ashtari***, School of Public Health, University of Maryland - College Park; **Marina Topuridze**, Health Promotion Division, National Center for Disease Control and Public Health, Georgia; **Lela Sturua**, Non-Communicable Diseases Department National Center for Disease Control and Public Health, Georgia; **Gvantsa Piralishvili**, Center for Mental Health and Prevention of Addiction, Georgia; **Khatuna Todadze**, Medical State University, Center for Mental Health and Prevention of Addiction, Georgia; **Lasha Kiladze**, Center for Mental Health and Prevention of Addiction, Georgia; and **Nino Gachechiladze**, Analysis and Consulting Team, Georgia.

In our commentary, *Getting Serious about Substance Abuse Treatment Requires Adopting the Five-Year Recovery Standard*, **Robert L. DuPont**, MD, President of the Institute for Behavior and Health, describes lessons that can be learned from the state physician health programs (PHPs) which set the standards for long-term outcomes for substance use disorders. The U.S. healthcare system is now in the early stages of being transformed to focus intensely on serious chronic disorders including prevention, early intervention, effective treatment and long-term monitoring. Substance use disorders must be a part of this transformation of care management. Dr. DuPont recommends the use of five-year recovery as a standard measure for treatment outcomes.

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Why a 5 ng/ml THC limit is bad public policy - and the case for Tandem *per se* DUID legislation

Ed Wood

Summary

Legalizing marijuana, whether for medical use, for recreation, or for recreation under the guise of medicine, has raised concerns about stoned drivers imperiling the safety of other drivers. In response, legislators have set legal limits for THC (Delta-9 tetrahydrocannabinol), the primary psychoactive component in marijuana[1]. Legislators in Washington and Montana have set a THC *per se* limit of 5 ng/ml in whole blood. Legislators in Colorado have set a THC permissible inference level of 5 ng/ml in whole blood. None of these states have legal limits for drugs other than marijuana and alcohol. Other states from California to Maine and Florida are considering similar legislation.

Although well-intended, these and other efforts to set a 5 ng/ml THC legal limit are badly flawed.

The marijuana lobby has consistently attacked 5 ng/ml THC level as being too low. They claim that people who self-medicate on marijuana have residual blood levels of THC well above

[1] We follow the normal convention of referring to Delta-9 tetrahydrocannabinol as THC. THC's inactive metabolite is referred to as carboxy-THC or THC-COOH.

5 ng/ml without being impaired, that heavy users of marijuana develop a tolerance for marijuana's impairing effects, and that there is no scientific basis for a 5 ng/ml THC legal limit (Elliott, 2011).

Contrary to the marijuana lobby's stance, we assert that the 5 ng/ml THC level is far too high, but agree that there is no scientific basis for a 5 ng/ml THC legal limit. Furthermore, there is no scientific basis for any *impairment*-based THC *per se* limit. A THC *per se* limit may be established based on *public policy* beliefs, but not based upon proofs of *impairment*. A THC *per se* limit of 5 ng/ml is so high that it amounts to a license to drive stoned, since most marijuana-impaired drivers test well below 5 ng/ml THC in whole blood.

Understanding alcohol *per se* laws

States adopting or considering a 5 ng/ml THC limit seek to mimic the poorly understood .08 Blood Alcohol Content (BAC) alcohol *per se* limit.

The .08 BAC level now universal in the United States was not scientifically determined. It was politically determined, based upon input from science and a popular belief that it was a good number. Many countries have alcohol *per se* limits, ranging from .02 to .08, with most countries using .05 BAC. Yet all of these countries used the same scientific input to arrive at their *per se* limits. The fact that numbers vary so widely from one country to the next, all based upon the same scientific input is convincing evidence that these *per se* standards were set not by scientists, but rather by politicians to reflect their countries' concerns for public safety and beliefs in individual freedom and restraint.

Any *per se* limit cuts two ways. If someone tests above a *per se* limit, that person is guilty of a *per se* violation, even if no impairment has been proven or demonstrated. On the other hand, if someone tests below a *per se* limit, there is no *per se* violation, even if the defendant was demonstrably impaired. Officers make proactive DUI stops based upon observations of drivers or driving behavior. Further observations made by an officer after the stop can provide evidence of impairment. In these cases, a prosecutor may be able to prove the driver was driving under the influence, but they cannot prove DUI *per se* unless a biological sample is taken and the laboratory results demonstrate drug or alcohol levels above DUI *per se* limits. DUI and DUI *per se* are two separate issues. DUI requires proof of impairment, while DUI *per se* requires only a lab test above the limit. In some states, a DUI *per se* lab test also proves DUI.

Alcohol *per se* laws have been well-accepted. Some credit alcohol *per se* laws for the 25% drop in DUI fatalities from 1996 to 2013/2014. Actually, much of the credit for this drop in fatalities belongs to safer roads, safer vehicles and better enforcement, since the percentage of fatalities caused by DUI barely budged during this same period, dropping from 32.0% to 30.9% (NHTSA). Nevertheless, alcohol *per se* laws have become an established model of how to deal with DUI.

It is this established success that makes many people believe that the same approach can work for drugs like marijuana.

THC is not like alcohol

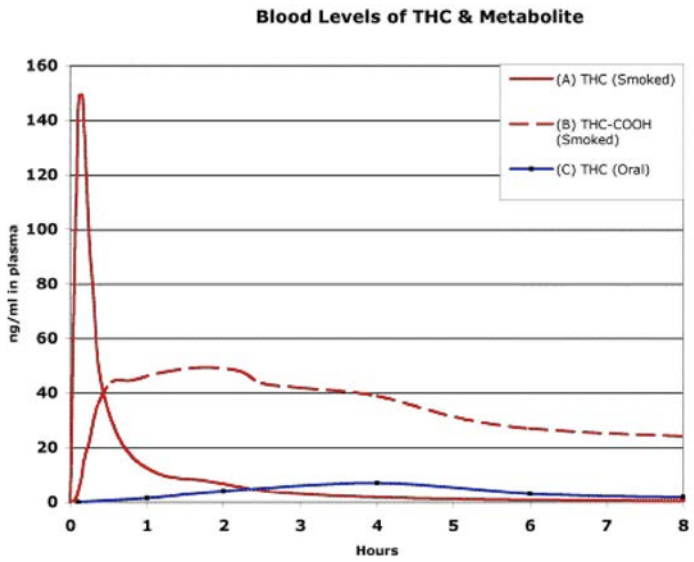
But marijuana's THC is unlike alcohol chemically, biologically, and metabolically. As a result, what works for alcohol does not necessarily work for THC. There is no level of THC in blood above which everyone is impaired and below which no one is impaired. This is not due to a lack of research. It is due to chemistry and biology. It is not due to politics. It is due to science.

Neither THC nor alcohol impairs blood, breath, urine, or oral fluid. These drugs impair the brain. We test for alcohol in blood as a surrogate for testing the brain. Blood tests are very easy, and breath tests are even easier. Testing the brain requires an autopsy which is far less convenient, to say the least. For alcohol, blood is an excellent surrogate because it is a small water soluble molecule that rapidly establishes a concentration equilibrium in highly perfused tissues throughout the body.

For some drugs, especially marijuana's THC that is of great popular concern, blood is a terrible surrogate to learn what is in the brain. That is because THC is not highly soluble in blood. THC prefers fatty tissues like the brain, heart, lungs and liver. THC is quickly removed from the blood stream as it is absorbed into the brain and other fatty organs and tissues. Even though the metabolic half-life of THC is estimated to be over four days, more than 90% of THC is cleared from blood within the first hour after smoking marijuana (Huestis et al. 1992; Toennes et al. 2008). See Figure 1. Furthermore, that clearance rate is so highly variable from one individual to another that retrograde extrapolation to estimate blood levels of THC at a prior time cannot be done reliably, as is commonly done with alcohol. One study showed that on average, 73% of

THC was cleared from blood within the first 25 minutes after smoking marijuana, but that number ranged from 3% to 90% from one subject to the next (Hartman, Brown et al. 2016).

Figure 1



Why blood levels of THC are forensically meaningless

1. ***We cannot test blood at the time of arrest or crash***

It typically takes slightly over an hour after a traffic stop before a blood sample is taken (Urfer et al. 2014). The time is even longer in cases of crashes that result in death or injury. The median time to draw blood in those cases is over two hours (Wood, Brooks-Russell and Drum, 2016). And if a warrant is required to draw blood, that time extends to well over three hours.

So even if we knew the THC blood level determined by forensic laboratories, this tells us absolutely nothing about the THC blood level at the time of the incident, whether that incident be a simple arrest or a crash that kills or maims innocent victims.

2. ***Blood levels of THC are lower than brain levels of THC***

Mura compared THC levels in blood and in the brain in a series of autopsies. There was more THC in the brain than in the blood in 100% of the subjects. Significant levels of THC were found in the brain even when none could be detected in the blood (Mura et al. 2005).

So even if we knew the blood level of THC at the time of the incident, this would tell us absolutely nothing about the drug level of THC in the brain, the only place where it really matters.

3. ***Tolerance results in varying levels of impairment at the same blood level***

Drug users say that they can build up a tolerance to some of the impairing effects of drugs. Buildup of tolerance is indeed a factor for many drugs, including alcohol, but can be more pronounced with non-alcoholic drugs. Scientists have shown that heavy users of marijuana have fewer cannabinoid receptors in their brain than non-users (Hirvonen, 2012). Heroin addicts on a methadone maintenance therapy can be unimpaired with a level of methadone in their body that would be lethal to someone that has not become habituated to it. But be aware that heavy users don't build up a tolerance to all of drugs' impairing effects. If they did, why would they continue using them?

So even if we knew the drug level in the brain, this tells us nothing about the level of impairment of the individual.

4. ***Polydrug impairment renders individual drug per se levels meaningless***

Most drug-impaired drivers responsible for vehicular homicide and assault are polydrug users (Wood and Salomonsen-Sautel 2016). That is, they have at least two drugs in their bodies at the same time. Drug combinations act differently than drugs individually, sometimes with additive effects, sometimes with synergistic effects, sometimes with complementary effects. For example, use of both cocaine and heroin in the popular "speedball" combines cocaine's stimulant effect with heroin's depressant effect. Alcohol extends the "high" experienced by cocaine users. Whereas studies confirm that alcohol impairment is much more dangerous than marijuana impairment, the combination of the two has been shown to be far more dangerous than either drug separately (Robbe & O'Hanlon 1999). The combined effect is at least additive and may be synergistic. Colorado has had cases of impaired drivers testing below .05 BAC and relatively low levels of THC (3-8 ng/ml), who have killed or maimed innocent victims. Due to Colorado's laws, these drivers were not convicted of DUI.

So even if we knew that levels of drugs *individually* in someone's brain were likely too low to cause impairment, combinations of those drugs can be profoundly impairing.

Similar problems are seen with testing a driver's oral fluid, sweat, or breath, all techniques currently in development or in limited use in the case of oral fluids. Primary benefits of testing substances other than blood are the reduction in delay time to take a biological sample, ease of collection, and lack of invasiveness. Another is that they provide nearly immediate drug presence results, rather than quantitative results many weeks later. All these developments merit further

investigation and adoption in some cases, but they don't solve all the problems of blood testing. Some also introduce cross-contamination problems not seen with blood testing.

Proving drug impairment

The best way to prove drug impairment is to focus on measurements of drug *impairment*, rather than measurements of drug *levels*. After all, impairment is what we're worried about, not lab tests. Impairment kills and maims people. Unfortunately, impairment measures are more subjective than laboratory tests.

The most common impairment measures are Standardized Field Sobriety Tests (SFSTs), a battery of three tests given primarily to suspected drunk drivers to determine impairment. A trained officer looks for 18 different clues of impairment during the testing sequence. Using SFSTs, properly trained and experienced officers can discriminate between drivers above and below .08 BAC over 90% of the time, according to studies in California and Florida (Burns, 1997, Stuster, 1998). Some of what might be termed failures in these studies may come from drivers who are impaired below .08 BAC, and some might come from drivers who are not impaired at levels above .08 BAC; tolerance is a very real factor with alcohol, just as it is with other drugs.

Although SFSTs are highly effective identifying and documenting alcohol impairment, they are less successful in doing the same for drug impairment (Papafotiou, 2005). This shouldn't be too surprising, since alcohol impairment symptoms differ from symptoms of impairment by THC, and only two of the three SFST tests have shown a significant correlation with THC impairment.

The International Association of Chiefs of Police is now studying possible modifications to SFSTs that might be more sensitive to drug impairment (Hartman, Richman et al. 2016).

Drug Recognition Experts, DREs, use a wider battery of tests to identify drug impairment and even to classify the type of impairment as coming from stimulants, depressants, opiates, hallucinogens, cannabinoids, inhalants, or dissociative anesthetics.

Nevertheless, DREs have their limitations also. Few officers can successfully complete the rigorous training and few law enforcement agencies can afford the expense of DRE training. The DRE process cannot be completed at the roadside, and during the lengthy time required to transport the driver to an evaluation location and to complete the evaluation, the driver's blood level of drugs and level of impairment diminishes. Currently, taking a blood sample is defined as the last step in the DRE process that typically takes 45 minutes. Individual responses to drugs vary. Combinations of drugs can mask some symptoms. These can lead to faulty conclusions. During a crash, both the impaired driver and innocent victims may be injured. Injuries can and do prevent officers from performing many kinds of impairment assessments. DREs are excellent, but neither they nor their tools can be perfect.

The above limitations of impairment assessments are part of what drives jurists to demand objective laboratory measures to either prove impairment or to establish a *per se* violation.

Drug *per se* laws – Zero tolerance

The most accepted drug *per se* laws are those that set zero tolerance for any illegal drugs in drivers, sometimes including prescription drugs that are used illegally. After all, the drugs are illegal, they do impair drivers, so why should *any* level be tolerated in drivers, thereby imperiling public safety? Eighteen states have one form or another of zero tolerance DUID laws. The federal Department of Transportation imposes zero tolerance drug standards on all commercial drivers in the U.S. Why should amateur drivers be held to a lesser standard?

Some legislators resist zero tolerance laws, claiming there is no evidence that any non-zero level of a drug causes impairment. This, of course, demonstrates their lack of understanding of the difference between a *per se* violation level and a level that proves impairment. A zero tolerance *per se* level is established not because it proves impairment, but simply because it is sound public policy.

Drug *per se* laws – Almost zero tolerance

A variant of zero tolerance is to set a *per se* limit at or close to the limits of quantification of competent forensic laboratories. This, for example, is the approach taken by Nevada, Ohio, and Virginia. These three states have established *per se* levels for a panel of impairing drugs, selecting those levels based upon standard laboratory quantification skills, rather than upon levels that demonstrate impairment. Nevada and Ohio chose 2 ng/ml of THC in whole blood for their THC *per se* limit. Virginia does not include THC in its panel of *per se* levels.

England and Wales recently did the same thing by establishing drug *per se* levels for a panel of drugs using two different criteria. For illegal drugs, such as marijuana's THC, they set the levels based upon laboratories' quantification abilities. For THC that was 2 ng/ml. For legal prescription drugs, they set the *per se* levels based upon impairment levels chosen by a panel of experts. They did not include opioids in their panel, which have a wide range of impairment levels, depending upon the level of tolerance a user has developed.

Drug *per se* laws – Impairment-based

Although some variation on zero tolerance is the preferred way of meeting the demands for drug *per se* levels, Washington, Colorado and Montana have taken the scientifically invalid approach of establishing what they believe are *impairment*-based *per se* levels.

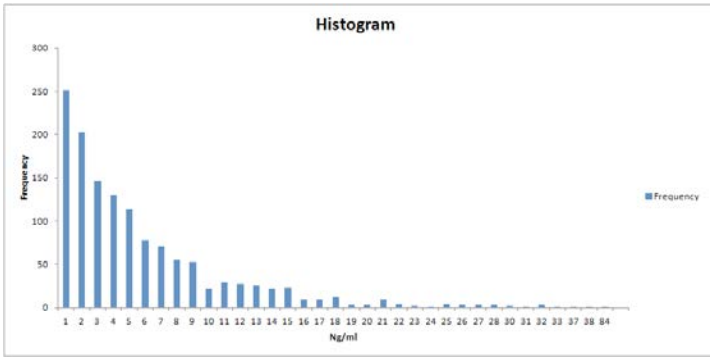
By ignoring all drugs other than marijuana, these states suggest a belief that drug-impaired driving is all about marijuana-impaired driving. Nothing could be further from the truth. For example, a court record study of Colorado's 2013 vehicular homicides and vehicular assaults due to DUI revealed that at least 30%, or 51 of those cases, involved drugs. Yet only three of those cases identified marijuana as the sole intoxicant. The other 48 cases involved other drugs or more commonly combinations of drugs, the most common of which was alcohol combined with marijuana (Wood & Salomonsen-Sautel, 2016).

Colorado, Washington and Montana ignore the chemical, biological, and metabolic differences between drugs and alcohol. They ignore the fact that scientific evidence does not support *impairment*-based *per se* blood levels of drugs.

They are insensitive to the tragic consequences of passing a 5 ng/ml legal limit for marijuana's THC: if a driver tests *below* 5 ng/ml, the prosecutor has an impossibly high hurdle to prove impairment. Few, if any, even attempt to do so.

Laboratories report that over 70% of all cannabinoid positive drivers arrested on suspicion of driving under the influence test *below* 5 ng/ml of THC. See Figure 2. With very few exceptions, these drivers will not be prosecuted for DUI. It's so difficult to prove impairment in the absence of a *per se* violation, and with so much of the jury pool believing (or perhaps hoping) that marijuana doesn't impair driving, it's simply a waste of judicial resources to prosecute this 70% of stoned driving cases.

Figure 2



Colorado Department of Health and Environment, 2012. 72% of the 2099 cannabinoid-positive cases below 5 ng/ml THC

As a result, any 5 ng/ml THC legal limit is simply a license to drive stoned.

Fallacies from 5 ng/ml THC supporters

1. ***We wanted zero tolerance, but 5 ng/ml is a good compromise, isn't it?***

It was undeniably a compromise. But few believe it was a good compromise. Toxicologists who testified at Colorado's Drug Policy Advisor Committee advocated for zero tolerance, saying that a 5 ng/ml was so high that many impaired drivers would be missed (Elliott, 2011). The marijuana lobby advocated for a standard at 15 to 20 ng/ml so that residual THC in heavy marijuana users would not trigger a violation.

Colorado's 5 ng/ml "compromise" satisfied neither the public safety constituency nor the marijuana lobby.

Only the following constituencies benefit from this poor compromise of 5 ng/ml limit:

1. THC-impaired drivers who test below 5 ng/ml
2. Legislators who can convince poorly educated constituents that they did something to address the problem of marijuana-impaired driving.
3. In a 5 ng/ml *per se* state, prosecutors benefit by being able to notch prosecution victories without needing to prove impairment.

Although 5 ng/ml was certainly a compromise, only a handful can claim it was a good compromise.

2. *At least we'll convict 30% of stoned drivers. That's better than today, isn't it?*

This claim for support for a 5 ng/ml law has many variants, including, "we wanted 2 ng/ml but at least we got something," or "it's better than nothing," and "we've got to start somewhere."

There may be merit to this argument, but we cannot know that without better data.

What is certain is that those drivers testing below 5 ng/ml will not be convicted of DUI, whereas at least in some cases, they were subject to conviction before passage of 5 ng/ml laws. For example, Stephen Ryan pled guilty to vehicular homicide due to DUI in Weld County, Colorado. Ryan's blood test result was 4 ng/ml THC, and no other impairing substance was found. His blood sample was drawn four hours after the crash that killed Tanya Guevarra and her infant son Adrian. This occurred before passage of Colorado's infamous 5 ng/ml THC permissible inference law.

Does a 5 ng/ml THC law convict more drivers of DUI than it exonerates? That's not likely since there are more stoned drivers testing below 5 ng/ml than those testing above 5 ng/ml. But we can't know the answer to this question unless we collect DUID data from citations through to judicial outcome as is recommended by the Governor's Highway Safety Association (Hedlund, 2015). Few states do so, and so far, Colorado has refused to do so.

3. *We'll start with 5 ng/ml, then move to a lower number, like we did with alcohol.*

This idea is based more on wishful thinking than an understanding of the issues. Indeed, Indiana's first .15 BAC permissible inference law for alcohol has now morphed into a

nationwide .08 BAC *per se* law. The politics behind that change was national shame over drunk driving led by Candace Lightner, who founded Mothers Against Drunk Driving (MADD) after losing her daughter to a drunk driver. The science behind that change is the exponential relationship between relative crash risk and BAC level.

The case-controlled study that quantified the relationship between crashes and drivers' blood alcohol content was first done by Robert Borkenstein in 1962. His work has since been replicated and refined by other researchers who have been able to correct for potentially confounding factors such as gender and age. These early studies were done when alcohol was the only impairing substance of consequence found in drivers, making acquisition of test subjects relatively easy.

Performing similar studies for THC today could likely only be done with difficulty, since polydrug use in drivers is so prevalent, creating a whole new layer of confounding factors. Additionally, subjects for such a study would need to be confined to deceased drivers. Only THC blood test results from deceased drivers would reflect actual THC blood content at the time of the crash, rather than a dramatically lower THC concentration in surviving drivers resulting from metabolism and/or redistribution before a blood sample is taken.

But even if such a study were to be done, the results could not guide setting impairment-based *per se* levels, as has been done for alcohol. The above-noted dramatic and inconsistent decline in blood THC levels after smoking would prevent this. This is not a problem with alcohol. Delays incurred between a fatal or serious injury crash and collecting a driver's blood sample are such

that, even if the driver had been smoking marijuana at the time of the crash, the level of THC of the tested blood could be not only below 5 ng/ml, but could be below a laboratory's limit of quantification (Wood, Brooks-Russell and Drum, 2016).

Carefully conducted experimental work using a sophisticated driving simulator found calculated THC blood levels that were equivalent to alcohol BAC levels of .05 and .08 BAC (Hartman, 2015). It is not known if the results are generalizable to different means of THC administration, different levels of THC potency, or different user experience levels. But even setting those questions aside, the authors cautioned that the results cannot be used to establish *per se* levels since THC levels at the time of an incident are much higher than those tested forensically.

Unless a means can be discovered to reliably perform retrograde extrapolation on laboratory-determined blood THC levels, it is difficult to see how any future epidemiological or experimental work could guide setting impairment-based THC *per se* levels, as was done with early alcohol *per se* levels. Without such scientific guidance, it is unlikely that once an impairment-based 5 ng/ml THC level is established, that it could be lowered.

Conclusion

Autopilot mentalities and a lack of scientific understanding have caused many state legislators to support scientifically-invalid 5 ng/ml THC *per se* laws. Impairment by other drugs is thereby ignored, as is polydrug abuse, including the more serious problem of alcohol combined with marijuana.

The American Automobile Association concluded, “The data do not support science-based *per se* limits for THC” (Logan, 2016). Fortunately, better measures are available to deal with drugged driving, including the above-mentioned zero tolerance *per se* approach.

The American Automobile Association proposed a two-component structure to deal with marijuana impairment: a positive test for recent marijuana use, and behavioral and physiological evidence of impairment (AAA, May 2016).

Dr. Barry Logan, principal author of one of AAA’s reports, supported this recommendation, but extended it to all drugs, not just marijuana (NMS, 2016). “Logan supports the AAA recommendation that drug impaired driving arrests should be made based on a trained police officer’s observations of signs of impairment including effects on speech, balance, coordination, and ability to follow instructions, as well as indicators like pulse and blood pressure. A positive lab test of the person’s blood or saliva for the presence of drugs can then be used to support or refute the officer’s opinion, regardless of the level.”

The AAA and Logan suggestions could lead to adoption of Tandem *per se* DUID legislation such as:

It is unlawful for person to drive under the influence of drugs. To be convicted of the offense of driving under the influence of drugs, there must be both:

1. *evidence that the person’s physical or mental ability to driver a vehicle has been impaired, such evidence to include, but not be limited to mental or physical signs of*

impairment, poor performance on one or more field sobriety tests, unsafe or inattentive driving, incriminating statements by the person, or testimony of other witnesses about the person's driving or sobriety, and

2. *proof that the person had any level of an impairing substance, other than alcohol, in his or her body at the time of arrest or within two hours thereafter.*

The term "Tandem *per se* DUID legislation" recognizes that two events must occur, one after the other. The first is evidence of impairment, the second is proof of drug presence.

There can be many alternative structures for the two clauses in the above Tandem proposal, but one thing must be clear. Clause 1 is not meant to replicate DUI definitions in existing state statutes. Existing statutes create a bar that must be met to convict a person of DUI. In contrast, clause 1 is meant to limit the application of clause 2 to those who provide admissible evidence of impairment; not proof of impairment, but admissible evidence of impairment. Replicating current DUI definitions can be counter-productive. If clause 1 were to require proof of impairment, not just evidence of impairment, the addition of clause 2 would make it more difficult to convict a drugged driver of DUID, since many drivers currently refuse to provide blood samples for testing.

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Conflict of interest statement

I declare that I have no proprietary, financial, professional or other personal interest of any nature or kind in any product, service and/or company that could be construed as influencing the position presented in, or the review of, the manuscript entitled *Why a 5 ng/ml THC limit is bad public policy - and the case for Tandem per se DUID legislation*.

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Binge Drinking in the Oldest Wine Country: Evidence from the Noncommunicable Disease Risk Factor Surveillance

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Abstract

Background: The country of Georgia is arguably the oldest producer of wine in the world. In Georgia, consumption of home-made alcohol defines interpersonal relationships and behavioral norms and expectations. Prevalence of binge drinking in Georgia may be fatal and costly for the society. This study examined the correlates and prevalence of binge drinking in Georgia providing an essential foundation for evidence-based policy making.

Methods: This was a cross-sectional study using a nationally representative sample of the adult population ages 18-65 obtained from the WHO Georgia STEPS Survey 2010 database. Primary measurements in the study included frequencies of binge drinking and a number of sociodemographic correlates obtained from the database. Multiple logistic regression analyses were used to estimate the odds of binge drinking in adult men and women.

Results: In 2010, the prevalence rate of binge drinking in Georgia among the adult population was almost three times higher than in 2003 (30% vs. 11%), and five times higher in males than in females. Georgians appear to have higher odds of binge drinking than other ethnic groups living in Georgia. The likelihood of binge drinking was directly related to smoking, education, occupation, and unemployment; however, the strongest positive association was found among binge drinking and smoking. The odds of binge drinking among smokers in the general population were 5.30 (95% CI 4.35- 6.46), for males the odds were 3.09 (95% CI 2.41- 3.97), and for female smokers the odds were 3.00 (95% CI 1.84- 4.89).

Conclusions: Our study has important implications for future research and informing policy makers pointing to the magnitude of binge drinking in Georgia. Policies that influence distribution and taxation on alcoholic beverages, education programs and public interventions focusing on harmful effects of excessive drinking and smoking to discourage these unhealthy behaviors, deserve further consideration by the authorities in the country of Georgia.

Keywords: Alcoholism-Binge Drinking-Smoking-Risk Factors-Georgia

Introduction

The country of Georgia is arguably the oldest producer of wine in the world and, currently, a major producer of alcohol among the Former Soviet Republics. Similar to many other countries, alcohol consumption defines interpersonal relationships and behavioral norms and expectations in the country of Georgia (Otiashvili et al., 2012; Rehm et al., 2010). However, as a former Soviet state, Georgia has had to endure the upheaval and psychological distress of economic

reforms and significant conflicts with its larger neighbor, Russia (Robert et al. 2014; World Bank 2013). The early 1990s and the late 2000, secessionist movements in Georgia led to almost a half million internally displaced persons (IDPs) in a country with less than 4 million. By 2013, almost 270,000 IDPs remained affected by lingering upheavals related to 2008 war with Russia (World Bank, 2013). Georgia's wine culture and the country's recent tumultuous history, which play important roles in the amount and pattern of alcohol use in the population, deserve further studies (de Jong, 2002; de Jong et al., 2003; IASC, 2007; Johnson, 1996; Porter & Haslam, 2005; Steel et al., 2009; UNHCR, 2013; UNHCR WHO, 2008; Robert et al., 2014). Nonetheless, promoting the wine industry and raising wine exports are official policy priorities in Georgia (Anderson, 2013). Wine, food and tobacco add up to 46% in rural and 39% in urban total household expenditures (Anderson, 2013).

There have been no systematic studies to date examining binge drinking in Georgia, despite a history of wine culture, excessive alcohol use, two decades of tumultuous transitions from a Soviet state to a market economy, and a large number of IDPs. In this respect, our study using the 2010 World Health Organization's (WHO's) Noncommunicable Disease Risk Factor Survey provides a unique opportunity to fill this void and shed light on the problem of binge drinking in Georgia. Policy makers, concerned with the consequences of excessive alcohol use, face numerous dilemmas related to their inherent interest in the above mentioned historical objectives. Substantive studies that rely on detailed survey data of binge drinking are of significant interest to the national policy makers. While alcohol abuse is a well-known cause of higher rates of morbidity and mortality, country-specific studies of alcohol use are fundamental

for instigating policy designs that may curtail alcohol abuse in the underlying society (NIAAA, 2015; Bouchery et al., 2006; Rehm et al., 2010; Hingson & Zha, 2009; Otiashvili et al., 2013). Binge drinking is defined as an excessive alcohol drinking on one occasion (or within a two-hour period), consisting of five or more standard drinks for men and four or more standard drinks for women (CDC, 2014; NIAAA, 2015). A standard drink in the US is 14 grams of pure alcohol found in 12 ounces of regular beer or 5 ounces of wine, and 1.5 ounces of distilled spirits (NIAAA, 2015). It may lead to alcohol poisoning, injuries, sexually transmitted diseases, unintended pregnancy, cardiovascular and liver disease, neurological problems, and poor diabetes control, which are fatal and costly for any society (CDC, 2014; Kanny, et al., 2015; WHO, 2012). In 2012, the World Health Organization (WHO) estimated that 5.9% (3.3 million) of all deaths worldwide were related to alcohol use, and the burden of alcohol related diseases, injuries and disability was 5.1% in disability-adjusted life years (139 million DALYs) (WHO 2014).

In 2010, per capita alcohol consumption in the country of Georgia (henceforth, Georgia) was 7.7 liters of pure alcohol, which exceeded the reported worldwide average consumption of 6.2 liters of pure alcohol per person aged 50 and older, as well as consumption in the two other neighboring countries in the Caucasus region, Armenia (5.3 liters) and Azerbaijan (2.3 liters) (WHO, 2014). Georgians consume 24% more alcohol per person than the average person worldwide, 45% more than Armenians and 335% more than Azerbaijanis (WHO, 2014). Recent studies on alcohol use in Georgia, which limited their samples to the Internally Displaced Persons (IDPs) or students, found that a growing number of Georgians have alcohol-use related disorder (Baramidze et al., 2009; Robert et al., 2014). Our study, based on a representative

sample of the population, has a unique opportunity for studying pervasive alcohol consumption and binge drinking problem in the greater Georgian society.

In the United States, one in ten adults (aged 20–64 years) die because of excessive alcohol use, and alcohol poisoning from binge drinking has been identified as a major culprit in more than half of all deaths and in three fourths of all economic costs (Kanny et al., 2015). A comparison of the CDC analyzed data for 2010–2012 from the US National Vital Statistics System show that alcohol related death rates in the US have increased from 3.2% in 2000 to 5.9% in 2012, raising the disease burden from 4% of DALYs in 2000 to 5.1% in 2012 (Kanny et al., 2015; WHO, 2014). In Georgia, given a substantial number of adults aged 18-65 drink on a monthly basis, alcohol use remains a serious public health problem (STEPS, 2012). Prevalence and other correlates of binge drinking among the population of Georgia that have been identified by research, constitute an actual step forward towards informing national policies and setting the stage for prevention strategies similar to those in the United States and in the other developed countries (National Prevention Council, 2011; Javakhishvili, et al., 2011). In the present study, we conducted a multivariate logistic regression analysis of data collected from the National WHO Survey implemented in Georgia in 2010.

The STEPS Noncommunicable Disease Risk Factor Survey, a part of the STEPwise Approach to Surveillance (STEPS) Project conducted by the WHO, is a survey methodology to help countries develop their own surveillance system to monitor and fight noncommunicable diseases (STEPS, 2012). The three steps incorporated in the STEPS methodology are: questionnaire, physical measurements and biochemical measurements, which include core items, core variables, and

optional modules. The database contains information on major themes covered by most surveys such as demographics, health status, and health behaviors, as well as socioeconomic, metabolic, nutritional, and lifestyle risk factors.

Methods

Study Data

Based on history and culture of drinking, there is a dearth of evidence on alcohol use coming from the countries located in the South Caucasus region, such as Armenia, Azerbaijan, and Georgia (Nichol, 2014). The STEPS database provided a representative sample to our study including primary observations and information on frequency and quantities (standard drinks) of consumed alcohol in addition to other sociodemographic facts. Sampling together with survey research is a commonly used approach in data collection, which later becomes the preferred source of evidence for statistical analysis, estimation and building models (STEPS, 2012). The STEPS provided behavioral information of interest about alcohol consumption during the life course, within the past 12 months, and the past 30 days. A multi-stage clustered sampling approach used in the STEPS, with a 95% participation rate in the final survey, ensures that the final sample is representative of the target population. The sample size n = 6,497 targeted men and women aged 18- 65 who lived in Georgia between August and December, 2010.

Statistical Analysis

The methods adopted in a sample analysis comprised of descriptive statistics on alcohol consumption by gender and the sampling design weights, which helped to calculate the weighted standard deviation (SD) and Chi-square for each reported estimate. Descriptive statistics

included ethnicity, household size, age, education, marital status, employment, income, and smoking habits of the survey respondents.

All statistical calculations were performed using specialized 'survey' commands in SAS software version 9.4 (SAS, Inc., Cary, NC. USA). The logistic regression analysis was conducted on the full sample (n = 6,497) and the sample broken down by gender, males (n = 1,887) and females (n = 4,610), to build models and to estimate the likelihood (odds) of binge drinking in Georgia. We used 95% Confidence Intervals (95% Cl) and the corresponding p-values < 0.05 for each estimated parameter. The analysis of the STEPS survey data provided a valuable opportunity in this study to gauge the prevalence and to identify the correlates of binge drinking among the adults aged 18-65 living in Georgia.

Results

Table 1 demonstrated descriptive statistics on alcohol consumption in the population, and Table 2 presented breakdown data by gender, ethnicity, household size, age, education, marital status, employment, income, and smoking habit of respondents. These tables also showed the weighted frequencies, the weighted standard deviations (SD), and Rao-Scott Chi-squared statistics. Reported Chi-squared tests in Table 2 show that apart from some cases related to the very low-income individuals (earning less than 200 GEL), other demographic correlates also achieve statistical significance (defined by $p < 0.05$). Table 3 provided estimated odds ratios of binge drinking in Georgia using multivariate logistic regression analysis.

Descriptive Analysis

Alcohol Consumption

Table 1 shows that 78% of sample respondents (78.47%, SD = 1.35) consumed alcohol (beer, wine, and other spirits) during their lifetime. Among them, 82% (81.57%, SD = 0.97), consumed alcohol within the past 12 months, and 65 percent (64.90%, SD = 1.55) in the past month (30 days). The proportion of those who drank alcohol in the past month was 42% (= 78% x 82% x 65%). Almost one-third of all the participants reported binge drinking (30.06%, SD = 1.34) as defined by five or more standard drinks for men, or four or more standard drinks for women, in a single drinking occasion during the last 30 days. While no measures of blood alcohol concentration were available, the pattern of heavy drinking seemed to be in line with the NIAAA recognition of binge drinking as drinking that brings a person's blood alcohol concentration (BAC) to 0.08 grams percent or above, which typically happens when men consume 5 or more drinks, and women consume 4 or more drinks in about 2 hours (NIAAA, 2004).

A breakdown by gender showed that about half of males (49.66%, SD = 2.09) and one-in-ten females (10.21%, SD = 0.88) engaged in binge drinking during the past 30 days. Hence, prevalence of binge drinking among male respondents was five times that of female respondents.

Ethnicity

More than one quarter (26.73%, SD = 1.32) of respondents who identified themselves as Georgians engaged in binge drinking (Table 2). Less than two percent of Azerbaijanis (1.94%, SD = 0.81) and Armenians (1.23%, SD = 0.52) reported binge drinking. A breakdown by gender,

showed that binge drinking among Georgian males (43%, SD=2.29) was more than four times higher than among Georgian females (9.81%, SD =0.86).

Household Size

Frequency of binge drinkers was the highest among three-member households (9.15%, SD = 0.74), and drinking among males (15.08%, SD = 1.26) and among females (3.15%, SD = 0.44) supported this finding.

Age

Younger age groups (18 -25 and 26 -35) had higher rate of binge drinking (7.18%, SD = 0.67 and 8.49%, SD =0.73 respectively) than older age groups. Prevalence of binge drinking was the highest for males (14.47%, SD = 1.37) aged 26 – 35 and for females (3.15%, SD = 0.47) aged 18 – 25.

Marital Status

The prevalence of binge drinking was higher among those who were married or cohabitating (19.71%, SD = 1.04) than among those who have never married (9.43%, SD = 0.75). The prevalence of binge drinking for males who were married/cohabiting (32.36%, SD = 1.73) or have never married (16.00%, SD = 1.39) was five times higher than for their female counterparts (6.89%, SD = 0.65 and 2.77%, SD = 0.44).

Smoking Status

One in three respondents (30.24%, SD = 0.97) reported smoking. More than half of male respondents (55.42%, SD =1.43) were smokers and only one-in-twenty female respondents (4.75%, SD = 0.53) smoked. Over half of smokers (17.97%, SD = 0.96) reported binge drinking. Prevalence of binge drinking was substantially higher among male smokers (34.65%, SD = 1.72) than among female smokers (1.07%, SD = 0.22).

Education

The highest prevalence of binge drinking was found among individuals who have completed high school (15.5%, SD = 1.06), and among the male respondents (25.77%, SD = 1.76) was five times higher than among the female respondents (5.18%, SD =0.58). College or higher educated males (19.98%, SD = 1.25) and females (4.04%, SD 0.52) showed higher prevalence of binge drinking compared to those with secondary or lower level of education.

Employment

Among unemployed, (10.92%, SD = 0.74) particularly in males (20.43%, SD = 1.43), the prevalence of binge drinking was the highest, but then female homemakers had the highest prevalence of binge drinking (4.28%, SD = 0.53). By occupation, non-paid workers had the lowest prevalence of binge drinking.

Monthly Household Income

By distribution of household income, about half of the respondents (52.22%, SD = 1.55) had earnings of 200 GEL (about $110) or less per month in the last quarter of 2010. (Georgian Lari,

GEL, is the official currency of the Republic of Georgia, and in October 2010 1 Lari = 0.55 US dollar). This group of low-income individuals had the highest prevalence of binge drinking (15.2%, SD 1.09), with 24.21% (SD = 1.66) among males and 6.15% among females (6.15%, SD =0.78). The statistics for individuals who fell in the higher income category invariably supported the lower prevalence of binge drinking.

Logistic Regressions Results

As depicted in Table 3, the logistic regression analysis took into account the sampling design weights in the final odds estimates and related statistics based on the full sample (n = 6,497), which included male (n = 1,887), and female respondents (n = 4,610). The percentage of concordance between observed and predicted values in the full sample was 77% (males 68%, and females 66%), which was fairly high and reflective of the goodness-of-fit and the rank correlation for the estimated models.

Total Sample

Table 3 showed that ethnicity, marital status, smoking, occupation, and income play a significant statistical role ($p < 0.05$) in binge drinking in Georgia. In particular, Russian ethnicity widowed, smokers, government employees, nongovernment employees, self-employed, students, unemployed, and those with an income within the range of 800- 1600 GEL were all statistically significant ($p < 0.05$) in their correlation with the likelihood (probability) of binge drinking. Ethnically Russians (odds = 0.24) had lower odds of binge drinking than Georgians (control group), widowed individuals (odds = 0.35) were less likely to binge drink than married or cohabiting couples. Smokers (odds = 5.30) were five times more likely than non-smokers to

engage in binge drinking. Government employees (odds = 2.20), nongovernment employees (odds = 3.06), self-employed (odds = 3.59), students (odds = 2.12), and unemployed (odds = 2.57) were two to three times more likely than homemakers to binge drink. Those with an income in the range of 800 - 1600 GEL (odds = 0.58) were half as likely to binge drink as those with an income of less than 200 GEL.

Male Sample

Binge drinking among males was significantly correlated ($p < 0.05$) with those who were smokers. Smokers (odds = 3.09) were three times more likely than non-smokers to engage in binge drinking.

Female Sample

Azerbaijani female respondents who were between 46 – 55 and 55 – 65 years of age, widowed, smokers, with a secondary education or less, retired, unemployed, and with a monthly household income of 200- 400 GEL and 400- 800 GEL showed a significant ($p < 0.05$) correlation with the likelihood of binge drinking.

Females who were 46 – 55 years old (odds = 0.56) and 55 – 65 years old (odds = 0.46), were about half as likely to binge drink as females in 18 – 25 age group. Widowed females were almost half as likely to binge drink (odds = 0.45) than married or cohabiting couples. Female smokers (odds = 3.00) were three times as likely to binge drink as non-smokers. Females with a secondary level of education or less (odds = 2.00) were twice as likely to binge drink as those with high school diplomas. Unemployed females (odds = 0.48) were about half as less likely to

binge than homemakers. Similarly, females from households with an income of 200- 400 GEL (odds = 0.49) and 400 - 800 GEL (odds = 0.52) per month were about half as likely to binge drink as females living in households with less than 200 GEL per month.

Discussion

The 2003 World Health Survey (WHS) implemented by WHO in partnership with 70 countries demonstrated that 33% of Georgian adults, including 11% of males and 51% of females, were lifetime abstainers from alcohol (Ustun et al., 2003). In 2010, only 22% of the Georgia adult population aged 18-65, including 10% of males and 34% of females, were lifetime abstainers from alcohol, which indicated a sharp decrease in less than a decade. Another study focusing on internally displaced ethnic Georgians, showed similar results (Ustun et al., 2003). A more recent study from 2010 found that 90% of 15-16 year old Georgian students had already tried drinking alcohol, which may indicate a shrinking number of the future lifetime abstainers among the adult Georgia population (Sturua et al., 2010). About 82% of Georgian adults in 2010, including 89% of males and 71% of females, consumed at least one standard drink of alcohol in the past 12 months. In 2003, the proportions of adult males and females who consumed alcohol in the past 12 months were 88% and 64%, respectively (EAR, 2001). Combination of a fairly stable proportion of males (89% in 2010 vs. 88% in 2003) and a higher proportion of females (71% in 2010 vs. 64% in 2003) is suggestive of a rising use of alcohol among females. In comparison with US statistics, the prevalence of past-12-months drinking among Georgian adults (82%) was more than 10% higher than that in US adults (70%) (Esser et al., 2014).

In 2010, the prevalence rate of binge drinking among Georgian adults was 30%, and the proportion of male and female respondents was 50% and 10%, respectively. These findings indicate that binge drinking in Georgia has increased many folds relative to 2003, when it was 11% among general population (22% among males and 1% among females), and only 3% higher than that in the US (27%) for the same period (Esser et al., 2014). However, a breakdown by gender indicated that the proportion of Georgian males engaging in binge drinking (50%) was 16 % higher as compared to their US counterparts (34%). Conversely, the prevalence of binge drinking among Georgian females (10%) was 11 percent lower than among their US counterparts (21%) (Esser et al., 2014).

Studies that focus on the Former Soviet Union (FSU), including Georgia, associated increased alcohol use to social upheavals and psychological stress in these societies (Mehta & Elo, 2012; Roberts, et al., 2014). Given periods of civil unrest, difficult economic reforms and 2008 war between Russia and Georgia which led to massive dislocation of people, one might expect alcohol use to be on the rise (de Jong, 2002; de Jong et al., 2003; IASC, 2007; Johnson, 1996; Porter & Haslam, 2005; Steel et al., 2009; UNHCR, 2013; UNHCR WHO, 2008; Robert et al., 2014). In a cross-sectional survey of 3,600 randomly selected IDPs due to war in Georgia, 71% of men and 16% of women were classified as drinkers. Of these, 28% of men and 1% of women drank often, while 12% of men and 2% of women were episodic heavy drinkers (Robert et al., 2014). An additional factor instigating higher alcohol use is due to the Georgian policies that promote large scale wine production for export. The efficiencies gained in alcohol production invariably lower domestic alcohol prices resulting in higher alcohol consumption (Leon et al., 1997; Shkolnikov et al., 1998). Psychological stress and economic motivations (lower prices)

coupled with Georgian wine culture (excessive drinking as a social norm) have provided background and causal factors for the observed increased alcohol use in Georgia (Anderson, 2013; Otiashvili et al., 2012; Rehm et al., 2010).

In terms of alcohol use among women, economics and culture are the underlying factors that distinguish Georgian women from their US counterparts. In practice, Georgian women do not enjoy the same access to economic resources as those of their US counterparts, and a young Georgian woman often lives in a house that belongs to her father-in-law. Strict cultural public status codes preclude women from making independent decisions (including those related to drinking) without incurring huge costs compared to men or women in the US. In Georgia, man almost by default is considered the head of the household and the decision-maker, and woman often does not make decisions about household related expenditure and services (OECD, 2014). Cultural norms discourage women from leading festive ritual drinking or binging in public (Goldstein, 1999). Except occasional dominance of woman as the toast master (*tamada*) in the Georgian ritual of hospitality and drinking (*supra*), the public performance is usually that of man. Men are also in charge of wine production, and have higher income. Proximity to alcohol, income, and culture appear to be the long-term drivers of alcohol use among men in Georgia.

In the study, a breakdown by ethnicity, household size, age and marital status demonstrated that binge drinkers (30%) were mainly Georgian males (43%), followed by Georgian females (10%), individuals living in households with two or more members (29%), younger than 55 years of age (28%), and either married or cohabiting (20%). Roughly 18% of smokers engaged in binge drinking. A further breakdown by gender revealed that 35% of male smokers and 1% of female

smokers engaged in binge drinking. The prevalence rate of binge drinking by gender exhibited some variations across breakdowns by education, occupation and income categories. The higher prevalence rate was among those with a high school diploma (16%) or college or higher degree (12%), among males with a high school (26%) or college degree (20%) than among females with a high school (5%) or college degree (4%). The rate of binge drinking among unemployed individuals (11%), particularly unemployed males (20%) were indicative of a strong association between unemployed status and binge drinking. Similarly, the prevalence rate of binge drinking was fairly high among those with a low monthly household income (200 GEL or less) (15%). A breakdown by gender indicated that the rate of binge drinking was four times higher for males (24%) than for females (6%). Multivariate correlates of binge drinking showed that ethnicity, smoking, secondary schooling or less, retired, unemployed, and respondents in certain income brackets, all had high likelihood (odds > 1) of engaging in binge drinking.

Despite the known alcohol use among Russians, ethnic Russian group in Georgia had lower odds of binge drinking in our study (odds = 0.24), as compared to their Georgians counterpart (control group). In other ethnic groups, Azerbaijani females (odds = 0.8) had a lower likelihood of binge drinking than Georgian females. Middle age (odds = 0.46) and older females (odds = 0.56) were half as likely to binge drink as the youngest females between 18 - 25 years of age. Widowed males (odds = 0.35) were less likely to binge drink than married or cohabiting couples. Also, widowed females (odds = 0.45) were less likely to binge drink than their married or cohabiting counterparts. Females with low education were twice as likely (odds = 2.00) to binge drink than their counterparts who had completed high school. Unemployed females and high income earning females are half as likely to binge than the homemakers or low income earning females,

respectively. In particular, unemployed females (odds = 0.48), and those females earning between 200- 400 GEL (odds = 0.49) and 400 - 800 GEL (odds = 0.52) were half as likely to binge relative to their counterparts who were homemakers or earn less than 200 GEL per month. Individuals in all other occupations, including the government employees (odds = 2.20), nongovernment employees (odds = 3.06), self-employed (odds = 3.59), students (odds = 2.12), and unemployed (odds = 2.57) had two to three times higher likelihood of binging on alcohol than homemakers. Individuals in lower monthly income group, earning less than 200 GEL, were more likely to binge drink than those with income in the range of 800 - 1600 GEL (odds = 0.58). However, smokers (odds = 5.30) were five times more likely than non-smokers to engage in binge drinking. The most significant correlate of binge drinking among males appears to be smoking Georgia, who were three times more likely (odds = 3.09) than non-smokers to engage in binge drinking. Individuals who smoked (odds = 5.30), male smokers (odds = 3.09) and female smokers (odds = 1.43) had a much higher likelihood of binge drinking than their non-smoking counterparts.

A culture of drinking alcohol that defines relationships and behavioral norms interacts with an economic expediency that promotes production and consumption of alcohol in Georgia. Official policy for endorsing wine industry is seen as an important component in growing income and raising employment in Georgia. Mass home-produced wine, informal markets, and availability of low-priced alcoholic drinks, made alcohol a popular element in lives of people strained with war and dislocation. However, studies based on detailed data from population surveys that are of significant interest to policy makers, are scarce in Georgia. Country-specific studies of alcohol use and alcohol abuse are the foundation for designing interventions that may curtail the harms

of alcohol abuse in the underlying societies (NIAAA, 2015; Bouchery et al., 2006; Rehm et al., 2010; Hingson & Zha , 2009; Otiashvili et al., 2013).

Conclusion

More than one quarter of Georgian adults (30%) aged 18-65 engage in binge drinking on regular basis, and there has been a sharp increase in the prevalence rate of binge drinking over the last decade. Promotion of the wine industry that is a priority in Georgia has been based on economic motivation, and historical wine culture with excessive drinking as an accepted social norm.

This study examined correlates and prevalence of binge drinking among men and women in Georgia. A probabilistic model demonstrated that smoking, education, occupation, and unemployment significantly associate with the likelihood of binge drinking.

Prior research indicated lack of specific public interventions. Our study has important implications for policy makers and future research. Informing and pointing the magnitude of the problem, may provide foundation for designing public education programs and preventive interventions centered on reducing binge drinking and smoking, as well as effective excise taxation policy on all forms of alcohol in Georgia.

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Conflict of Interest Statement

We declare that we have no proprietary, financial, professional or other personal interest of any nature or kind in any product, service and/or company that could be construed as influencing the position presented in, or the review of, the manuscript entitled *Binge Drinking in the Oldest Wine Country: Evidence from the Noncommunicable Disease Risk Factor Surveillance*.

Tables

Table 1. Prevalence of Drinking Pattern among Adults Aged 18 – 65 in Georgia, by Gender

	Full Sample (n = 6497)			Male (n = 1887)			Female (n = 4610)		
	Full Sample			**Male**			**Female**		
Consumed Alcohol	**%**	**STD**	**Chi-Square**	**%**	**STD**	**Chi-Square**	**%**	**STD**	**Chi-Square**
Ever	78.47	1.35	634.25*	90.44	1.17	552.50*	66.35	2.07	55.86*
In past 12 months	81.57	0.97	83.36*	89.3	1.03	114.07*	70.9	1.48	164.07*
In past 30 days	64.9	1.55	185.94*	73.59	1.95	0.02	49.79	1.92	0.01
Bing Drinking	30.06	1.34	184.97*	49.66	2.09	0.01	10.21	0.88	743.59*

Data: WHO's STEPwise Approach to Noncommunicable Disease Risk Factor Surveillance (STEPS)

SD: Standard Deviation; Chi-square: Rao-Scott Chi-Squared statistics.

Software: SAS (Surveyfreq Procedure)

Note: Binge Drinking is defined by drinking 5 or more standard drinks for men, or 4 or more for women in a single drinking occasion.

*: Statistically different from 0 by $p<0.05$.

Table 2. Prevalence of Drinking Pattern among Adults Aged 18 – 65 in Georgia, by Sociodemographic Characteristics

	Full Sample (n = 6497)						Male (n = 1887)						Female (n = 4610)					
	Full Sample			Binge Drinker			Male			Binge Drinker			Female			Binge Drinker		
	%	STD	Chi_ square	%	STD	Chi_ square	%	STD	Chi_ square	%	STD	Chi_ square	%	STD	Chi_ square	%	STD	Chi_ square
Ethnicity																		
Georgian	86.1	2.1	146.1	26.7	1.3	71.9	84.5	2.7	84.9	43.5	2.3	55.8	87.8	1.8	188.0	9.8	0.9	83.7
Ossetian	0.7	0.2	1213.6	0.2	0.1	400.7	0.7	0.3	794.9	0.4	0.3	306.5	0.7	0.2	1247.2	0.0	0.0	671.6
Azerbaijani	7.4	1.9	132.9	1.9	0.8	67.3	8.8	2.6	81.8	3.8	1.6	54.1	6.0	1.7	161.6	0.1	0.1	247.6
Armenian	5.0	1.1	313.8	1.2	0.5	117.0	5.7	1.5	196.0	2.2	1.0	96.6	4.4	0.9	399.6	0.3	0.2	60.7
Russian	0.5	0.1	7258.0	0.1	0.0	1185.0	0.2	0.1	2455.8	0.0	0.0	1551.7	0.8	0.2	3722.9	0.1	0.1	174.6
Household Size																		
One	6.3	0.5	2195.7	1.6	0.2	932.0	5.2	0.6	1296.3	2.2	0.3	777.4	7.4	0.5	1908.9	0.9	0.2	403.4
Two	24.8	1.0	473.6	6.7	0.5	248.2	24.0	1.4	258.1	11.0	0.9	198.5	25.7	1.0	432.2	2.2	0.3	81.6
Three	28.5	1.0	364.1	9.2	0.7	77.6	27.3	1.5	174.7	15.1	1.3	68.6	29.8	1.0	340.3	3.2	0.4	28.7
Four	23.8	1.1	440.3	7.9	0.7	114.7	27.2	1.8	126.7	13.5	1.3	79.7	20.3	1.0	629.7	2.2	0.4	57.7
Five or more	16.3	1.0	620.0	5.0	0.6	176.4	16.1	1.6	255.5	8.0	1.2	131.8	16.5	1.1	478.4	1.9	0.4	54.7
Age																		
18 - 25	22.8	1.0	492.1	7.2	0.7	158.7	24.3	1.5	204.2	11.2	1.2	123.7	21.2	1.2	397.0	3.2	0.5	30.2
26 - 35	24.7	1.0	530.2	8.5	0.7	110.1	27.0	1.5	177.1	14.5	1.4	72.3	22.5	0.9	641.9	2.4	0.4	54.5

36 - 45	19.2	0.7	1245.9	5.9	0.5	259.4	17.6	1.1	534.2	9.5	0.9	206.8	20.8	0.8	855.1	2.2	0.3	98.3
46 - 55	21.5	0.7	1046.6	6.0	0.4	345.4	19.9	1.1	449.3	10.1	0.8	250.2	23.1	0.8	812.1	1.9	0.3	147.1
56 - 65	11.8	0.5	2390.8	2.6	0.2	1020.2	11.3	0.7	1240.3	4.6	0.4	793.7	12.4	0.6	1924.0	0.6	0.1	427.1
Marital Status																		
Never married	25.5	0.9	524.2	9.4	0.8	77.0	32.0	1.5	123.1	16.0	1.4	51.1	18.9	1.0	609.2	2.8	0.4	40.1
Separated	1.4	0.2	4683.3	0.2	0.1	1798.7	1.2	0.2	2098.4	0.3	0.1	1348.6	1.5	0.2	4794.2	1.4	0.2	391.9
Divorced	2.2	0.2	3894.5	0.4	0.1	692.6	1.2	0.3	1209.1	0.6	0.3	460.4	3.2	0.3	2820.3	0.2	0.1	356.0
Widowed	4.5	0.3	5417.4	0.4	0.1	1691.2	1.3	0.2	3103.3	0.5	0.1	1122.3	7.8	0.4	2687.2	0.3	0.1	509.7
Married	66.1	1.0	253.4	19.7	1.0	48.7	64.1	1.5	76.8	32.4	1.7	35.1	68.2	1.0	262.7	6.9	0.7	24.4
Maternal Status																		
Pregnant	1.4	0.2	3497.8	0.1	0.1	1006.6							2.8	0.4	1643.7	0.3	0.1	162.0
Smoker																		
Smoker	30.2	1.0	350.5	18.0	1.0	35.5	55.4	1.4	14.1	34.7	1.7	118.9	4.8	0.5	1298.6	1.1	0.2	149.1
Education																		
Secondary school	8.8	1.0	1859.5	2.6	0.4		8.4	1.1	986.5	4.1	0.6	411.0	9.1	1.2	1363.6	1.1	0.3	
High school	55.0	1.3	574.3	15.5	1.1	502.5	52.3	1.8	476.6	25.8	1.8	16.2	57.8	1.4	413.2	5.2	0.6	89.5
College	35.9	1.3	108.1	12.1	0.8	19.1	39.0	1.8	33.7	20.0	1.3	256.0	32.8	1.2	185.7	4.0	0.5	9.7
Occupation																		
Government	14.8	0.8	967.0	4.2	0.4	320.0	13.9	1.2	419.1	6.8	0.8	236.5	15.7	0.9	823.6	1.6	0.3	106.3
Non-government	8.2	0.7	1175.6	3.4	0.5	331.9	10.8	1.1	457.6	6.3	0.9	74.7	5.5	0.6	1332.2	0.6	0.2	167.2
Self-employed	15.0	1.0	662.2	6.9	0.7	115.8	23.2	1.7	175.3	12.8	1.4	689.2	6.7	0.5	1619.7	0.9	0.2	119.5
Non-paid	0.4	0.2	1836.8	0.1	0.1	899.7	0.5	0.3	702.1	0.2	0.1	336.6	0.3	0.1	2168.2	0.0	0.0	364.9
Student	6.3	0.6	1433.8	1.8	0.3	459.1	5.7	0.8	630.1	2.3	0.5	800.3	6.8	0.7	1116.4	1.4	0.3	96.2
Homemaker	21.2	0.8	856.2	2.2	0.3	694.5	0.2	0.1	1608.2	0.2	0.1	1335.6	42.5	1.3	35.2	4.3	0.5	5.7
Retired	4.1	0.3	4132.9	0.4	0.1	1917.9	2.8	0.4	1643.7	0.5	0.1	16.7	5.3	0.4	2805.9	0.2	0.1	614.2

Unemployed	28.1	1.1	327.1	10.9	0.7	49.6	40.2	1.8	28.9	20.4	1.4	1317.2	15.8	0.9	738.1	1.3	0.2	148.9
Unable to work	1.8	0.3	1659.7	0.3	0.1	1150.5	2.4	0.5	865.2	0.4	0.1	0.3	0.1	0.2	1815.1	0.1	0.1	147.5
Monthly Income (GEL)																		
=< 200	52.2	1.6	2.04[a]	15.2	1.1	0.03[a]	51.0	2.0	0.2713[a]	24.2	1.7	0.00[a]	53.4	1.8	3.9	6.2	0.8	5.2
> 200 to <=400	23.6	0.9	579.2	7.3	0.7	143.7	23.7	1.4	249.3	12.9	1.2	105.7	23.5	1.1	460.0	1.7	0.3	123.7
> 400 to <=800	17.3	1.0	564.9	5.5	0.5	221.6	18.1	1.4	306.0	9.4	1.0	172.7	16.5	1.1	510.7	1.5	0.3	84.9
> 800 to <=1600	5.9	0.6	1211.8	1.7	0.3	546.8	6.1	0.8	633.8	2.5	0.5	429.4	5.7	0.6	1110.5	0.8	0.2	115.5
More than 1600	0.9	0.2	1770.7	0.5	0.2	380.7	1.0	0.4	645.1	0.9	0.4	274.9	0.8	0.2	2099.4	0.2	0.1	215.1

Data: WHO's STEPwise Approach to Noncommunicable Disease Risk Factor Surveillance (STEPS)

SD: Standard Deviation; Chi-square: Rao-Scott Chi-Squared statistics.

Software: SAS (Surveyfreq Procedure)

Blank: Not enough observations

a: Indicate that demographic differences did not achieve statistical significance; p>.05.

Table 3. Results of Multiple Logistic Regression Analysis for correlates of Binge Drinking, Full Sample and by Gender, Adults Aged 18 – 65 in Georgia

	Full Sample (n = 6497)					**Male (n = 1887)**				**Female (n = 4610)**				
% Concordant	*0.77*					*0.68*				*0.66*				
Effect	**Odds**	**95% CL**		***p-values***		**Odds**	**95% CL**		***p-values***	**Odds**	**95% CL**		***p-values***	
Ethnicity														
Ossetian	1.03	0.35	3.03	0.95		1.49	0.30	7.33	0.62	0.49	0.10	2.50	0.39	
Azerbaijani	0.64	0.30	1.37	0.25		0.70	0.32	1.55	0.38	0.08	0.02	0.29	0.00	*
Armenian	0.61	0.32	1.18	0.14		0.60	0.28	1.30	0.19	0.52	0.14	1.91	0.32	
Russian	0.24	0.06	0.95	0.04	*	0.16	0.01	2.51	0.19	0.92	0.23	3.70	0.90	
Household Size														
Two	0.81	0.57	1.15	*0.23*		0.93	0.58	1.49	0.77	0.67	0.43	1.03	0.07	
Three	1.02	0.72	1.46	*0.90*		1.39	0.87	2.21	0.17	0.79	0.51	1.24	0.31	
Four	1.15	0.78	1.70	*0.47*		1.27	0.77	2.10	0.35	0.93	0.54	1.60	0.80	
Five or more	1.06	0.71	1.60	*0.77*		1.19	0.70	2.04	0.52	1.00	0.58	1.72	0.99	
Age														
26 - 35	1.01	0.71	1.44	*0.95*		1.13	0.72	1.78	0.59	0.84	0.48	1.48	0.55	
36 - 45	0.98	0.69	1.40	*0.92*		1.22	0.78	1.92	0.38	0.79	0.47	1.35	0.40	

46 - 55	0.93	0.66	1.33	*0.70*		1.16	0.73	1.87	0.53		0.56	0.33	0.96	0.04	*
56 - 65	1.05	0.70	1.57	*0.81*		1.19	0.72	1.99	0.50		0.46	0.25	0.86	0.01	*
Marital Status															
Never married	1.12	0.83	1.52	*0.45*		1.21	0.82	1.78	0.34		1.09	0.67	1.79	0.73	
Separated	0.52	0.24	1.12	*0.10*		0.43	0.17	1.14	0.09		0.75	0.25	2.24	0.60	
Divorced	0.55	0.25	1.21	*0.14*		1.08	0.29	4.00	0.91		0.47	0.21	1.04	0.06	
Widowed	0.35	0.23	0.54	*0.00*	*	0.88	0.43	1.80	0.73		0.45	0.26	0.78	0.00	*
Maternal Status															
Pregnant	0.53	0.20	1.39	*0.19*							0.62	0.23	1.68	0.35	
Smoking															
Smoker	5.30	4.35	6.46	*0.00*	*	3.09	2.41	3.97	0.00	*	3.00	1.84	4.89	0.00	*
Education															
Secondary School	1.37	0.96	1.97	*0.09*		1.20	0.76	1.90	0.44		2.00	1.09	3.67	0.02	*
College or higher	1.08	0.86	1.37	*0.50*		1.04	0.77	1.39	0.81		1.43	0.99	2.05	0.06	
Occupation															
Government	2.20	1.50	3.22	*0.00*	*	1.00	0.22	4.47	0.99		1.05	0.64	1.72	0.84	
Non-government	3.06	2.09	4.50	*0.00*	*	1.34	0.31	5.71	0.69		0.83	0.40	1.70	0.61	
Self-employed	3.59	2.52	5.12	*0.00*	*	1.19	0.27	5.17	0.82		1.30	0.73	2.30	0.38	
Non-paid	1.29	0.47	3.58	*0.62*		0.44	0.08	2.39	0.34		1.29	0.12	13.59	0.83	
Student	2.12	1.24	3.61	*0.01*	*	0.72	0.16	3.36	0.68		1.31	0.66	2.63	0.44	
Retired	0.64	0.37	1.13	*0.12*		0.26	0.05	1.22	0.09		0.48	0.25	0.92	0.03	*
Unemployed	2.57	1.85	3.59	*0.00*	*	1.03	0.25	4.29	0.97		0.61	0.39	0.98	0.04	*

Unable to work	0.82	0.31	2.14	*0.68*		0.22	0.04	1.22	0.08	0.72	0.13	3.86	0.70	
Monthly Income (GEL)														
> 200 to <=400	0.93	0.73	1.20	*0.59*		1.19	0.86	1.65	0.29	0.49	0.33	0.72	0.00	*
> 400 to <=800	0.85	0.63	1.13	*0.26*		1.01	0.68	1.49	0.97	0.52	0.33	0.82	0.01	*
> 800 to <=1600	0.58	0.34	0.99	*0.05*	*	0.53	0.27	1.02	0.06	0.75	0.39	1.45	0.39	
More than 1600	2.07	0.76	5.59	*0.15*		3.96	0.69	22.86	0.12	1.06	0.29	3.91	0.93	

Data: WHO's STEPwise Approach to Noncommunicable Disease Risk Factor Surveillance (STEPS)

Odds: Odds ratio point estimates

CL: Confidence Limits (Wald Confidence Limits)

p-values: probability values from the multiple logistic regression estimates (probability that estimated Wald Chi-square is greater than its critical value)

GEL: Georgian Lari (currency of the Republic of Georgia; 1 Lari = 0.55 US dollar in October 2010).

* Statistically different from 0 by $p<0.05$

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Getting Serious about Substance Abuse Treatment Requires Adopting the Five-Year Recovery Standard

Robert L. DuPont, M.D.

It is estimated that 21.6 million individuals in the US aged 12 and older suffered from a substance use disorder in the past year, but less than 11% or 2.5 million people actually received specialty treatment.[1] It could be assumed that far more are in need of treatment, but the back story to what is called the "treatment gap" is that 95% of people with substance use disorders do not think they have a problem and do not want treatment.[1] Drug users spend about $100 billion of their own money each year on drugs[2] and virtually nothing on treatment. While many are screened for substance use problems and referred to treatment, it is difficult to ensure that they not only enter but complete treatment. For those who complete treatment, the danger of relapse remains for the rest of their lives. Substance use disorders are life-long diseases. While some individuals suffering from a substance use disorder have stopped using drugs; most have stopped numerous times. Stopping drug use is relatively easy; staying off drugs is very hard.

This conundrum is particularly worrisome in the context of a significant increase in drug overdose deaths in this country; the number of deaths has nearly quadrupled since 2002 to an all- time high. In 2014, the most recent year for which data are available, over 47,000 Americans died of drug overdoses. About half of these overdoses, 28,000, were opioid-related, due to prescription painkillers and heroin.[3] Fifty nine percent of heroin deaths include the concurrent use of other

drugs.[4] Opioid abusers are especially likely to simultaneously use many drugs, often including alcohol and benzodiazepines, such as Xanax.

The primary response to the current epidemic of opioid dependence has been a massive increase in medication-assisted treatment (MAT) using buprenorphine, methadone or naltrexone. It is regrettable but not surprising that the typical time a patient spends in MAT for heroin and other opioid addiction is commonly very brief (e.g., three to six months for buprenorphine and naltrexone and only slightly longer for methadone). Most patients who leave MAT return to opioid use, many shortly after leaving. Treatment programs that do not use medications for opioid and other substance use disorders typically retain patients for even shorter periods of time. No matter the type of treatment – or the primary drug of abuse – relapse frequently is the outcome of treatment for substance use disorders.

What can be done to reduce relapse? Though a life-long threat, addiction does not need to be a life sentence. A path to long-term recovery, not relapse, can be seen in the care management of addicted physicians. Because physicians with substance use disorders risk revocation of their medical licenses by their state licensing board, they voluntarily sign contracts for the management of their care with state physician health programs (PHPs) to avoid this penalty.

PHPs do not impose any sanctions but they do provide a safe haven for such physicians. Under PHP management, physicians are required to enter and complete treatment for substance use and any co-occurring disorders. Following discharge, PHP management continues with monitoring, typically for five years, with frequent random tests to detect any alcohol or other illegal drug use. During this prolonged period of monitoring, program graduates are required to engage with the 12-Step fellowships of Alcoholics Anonymous (AA) or Narcotics Anonymous (NA) or similar community-based recovery support.

A national study of PHPs showed that over the five-year period of monitoring, 78% of physicians never tested positive for drugs or alcohol, and of the 22% who had at least one positive test for alcohol or other drugs, two thirds (or 14% of the total) never had a second positive test.[5] Forthcoming data from a follow-up pilot study of physicians who successfully completed PHP monitoring contracts show that five or more years after mandatory monitoring stopped, 96% considered themselves to be in recovery, with the vast majority reported not using any alcohol or other drugs.[6] For decades the PHP model has set the standard for excellent long- term outcomes for the biological disease of addiction including addiction to opioids.[7]

How can other substance use disorder treatment programs achieve similar outstanding results? There are three elements that ensure success during PHP care management and in the years following discharge. Currently most other types of treatment do not include them:

1) There is an externally imposed mandate that funnels addicted patients into high quality treatment and helps them stay there from intake through completion.

2) After formal treatment concludes, patients are intensively monitored for up to five years. Any alcohol or other drug use leads to prompt, effective interventions to ensure a rapid return to abstinence.

3) Throughout the time of treatment and aftercare management all patients are actively and continuously engaged in peer-based recovery support such as the 12-Step fellowships.

The PHP system of care management is part of the New Paradigm for the management of

substance use disorders.[8 9] Is this prescription practical for most people with substance use disorders, including heroin addiction? Regrettably the answer is no, because it is not possible to put those three elements together for most patients. The source of an externally imposed mandate could be families, insurers, employers or agents of the criminal justice system but few of these entities understand that their roles could be crucial in ensuring that an individual enters treatment and remains in treatment through discharge, then providing meaningful consequences for any return to the use of alcohol or other drugs and support in order to ensure long-term recovery.

The US health care system is in the early stages of a transformation in the care provision for serious chronic disorders along a similar continuum, including prevention, early identification, effective treatment and long-term monitoring to prevent and intervene in relapses. There are few, if any, serious chronic disorders that are more prevalent or more costly to health care than substance use disorders. It is in health care that the most hopeful location for the New Paradigm of treatment can be found as it is here that the hard-won lessons from the PHPs are just beginning to be appreciated. The state PHPs provide a template for making recovery instead of relapse the most common outcome of treatment. Helping the public and the health care field understand what is possible and how to achieve long-term recovery is an essential public health priority.

Today substance use disorder treatment is a vital part of the solution to the national drug problem, with heroin and opioid addiction its greatest challenge. Some patients now complete treatment, achieve sobriety and enter long-term recovery with the assistance of medications. Others do so without the assistance of medications. This is a worthy public health achievement to be celebrated. But most patients do not succeed with current care. The lessons and methods

of the PHPs show the way to improve long-term treatment outcomes.

Using the measure of five years of recovery gives all treatment programs, those that use medication and those that do not, a standard against which to assess their rates of success based on a single easy-to-understand outcome.[10] It is important to recognize that continued use of medications (such as buprenorphine, methadone or naltrexone) is entirely compatible with being in recovery – provided the patient is not also using alcohol and other drugs of abuse.

Publication of five-year outcome results for all treatment programs will provide patients, families and payers, both private and public, with information that will allow them to assess the potential effectiveness of various treatment programs and to make smarter choices. Universal calculation of five-year recovery rates, however disappointing initially, will stimulate effective new strategies to achieve lasting recovery for more people suffering from substance use disorders, and result in the improvement in performance of all addiction treatment programs.

Established in 1978, the Institute for Behavior and Health, Inc. (IBH) is a 501(c)3 non-profit organization working to reduce illegal drug use through the power of good ideas. IBH websites include: www.IBHinc.org, www.StopDruggedDriving.org, www.PreventTeenDrugUse.org, and www.PreventionNotPunishment.org.

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About the Author

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For more than 30 years, Robert L. DuPont, M.D. has been a leader in drug abuse prevention and treatment. Among his many contributions to the field is his leadership as the first Director of the National Institute on Drug Abuse (1973-1978) and as the second White House Drug Chief (1973-1978). From 1968 to 1970 he was Director of Community services for the District of Columbia Department of Corrections, heading parole and half-way house services. From 1970 to 1973, he served as administrator of the District of Columbia Narcotics Treatment Administration (NTA), the city-wide drug abuse treatment program that was the model for the federal government's massive commitment to drug abuse treatment in the early 1970s. Following this distinguished public career, in 1978 Dr. DuPont became the founding president of the Institute for Behavior and Health, Inc.

Dr. DuPont has written for publication more than three hundred professional articles and fifteen books and monographs on a variety of health-related subjects. His books include *Getting Tough on Gateway Drugs* A *Guide for the Family*, A *Bridge to Recovery: An Introduction to Twelve-Step Programs* and *The Selfish Brain: Learning from Addiction.* In 2005, Hazelden, the nation's leading publisher of books on addiction and recovery, published three books on drug testing by

Dr. DuPont: *Drug Testing in Drug Abuse Treatment*, *Drug Testing in Schools*, and *Drug Testing in the Criminal Justice System.*

Throughout his decades of work in addiction prevention, Dr. DuPont has served in many capacities. His activities in the American Society of Addiction Medicine (ASAM) include chairing the forensic science committee and he is a Life Fellow. He is also a Life Fellow of the American Psychiatric Association (APA) and was chairman of the Drug Dependence Section of the World Psychiatric Association (WPA) from 1974 to 1979. In 1989 he became a founding member of the Medical Review Officer Committee of ASAM.

A graduate of Emory University, Dr. DuPont received an M.D. degree in 1963 from the Harvard Medical School. He completed his psychiatric training at Harvard and the National Institutes of Health in Bethesda, Maryland. Dr. DuPont maintains an active practice of psychiatry specializing in addiction and the anxiety disorders and has been Clinical Professor of Psychiatry at the Georgetown University School of Medicine since 1980. He is vice president of Bensinger, DuPont and Associates (BOA), a leading national consulting firm dealing with substance abuse, founded in 1982 by Dr. DuPont and Peter Bensinger, former Director of the Drug Enforcement Administration.

Dr. DuPont's signature role throughout his career has been to focus on the public health goal of reducing the use of illegal drugs.

Conflict of Interest

I declare that I have no proprietary, financial, professional or other personal interest of any nature or kind in any product, service and/or company that could be construed as influencing the position presented in, or the review of, the manuscript entitled *Getting Serious about Substance Abuse Treatment Requires Adopting the Five-Year Recovery Standard*.