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Association between Alcohol Screening and Brief Intervention during Routine Check-Ups and Alcohol Consumption among Adults Living in California

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ASSOCIATION BETWEEN ALCOHOL SCREENING AND BRIEF INTERVENTION DURING ROUTINE CHECK-UPS AND ALCOHOL CONSUMPTION AMONG ADULTS LIVING IN CALIFORNIA

By

Gene Wells

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Abstract

Objective: Alcohol consumption accounts for 1 in 10 deaths among U.S. adults, and has cost upwards of $200 billion in a single year due to lost productivity. Alcohol Screening and Brief Intervention (ASBI) was developed as a treatment approach for use in primary care to identify and reduce hazardous and harmful substance use behaviors among the general population. Although ASBI has proven to be successful, implementation rates remain low. Few studies have been conducted in Nevada to encourage or improve ASBI implementation in primary care. In order to better support Nevada policy decisions, this study investigates the proportion of ASBI in primary care settings in California. With a population demographic similar to that of Nevada, and ASBI implementation initiatives supported by government policy and funded through Medicaid, California represents an ideal location for evaluating the usefulness of ASBI implementation. ***Methods:*** Using population level representative data from the 2014 Behavioral Risk Factor Surveillance System, this study utilizes logistic regression to analyze the association between self-reported drinking levels and screening and brief intervention practices during routine check-ups. ***Results:*** The results demonstrated that the more a person drank, the lower their odds of receiving ASBI during a routine check-up. Hispanics had reduced odds of receiving ASBI when compared to Whites. Women had increased odds of receiving intervention compared to men, but the odds of screening were the same for both genders. Among those who were at risk for alcohol abuse, there was roughly 80% screening coverage and only those who made more than $50,000 per year had reduced odds of receiving screening. However, the proportion of intervention was much lower and men had reduced odds of receiving screening compared to women. ***Conclusion:*** California's policy initiatives are effective in improving ASBI coverage among its general population but only in terms of screening. However, more

attention should be given to increasing the number of follow-up interventions. It is recommended that private insurers follow the lead of Medi-Cal and require ASBI from all general practitioners. To improve the overall coverage of screening and intervention, more attention should be directed toward providing ASBI to Hispanics and males. Nevada would benefit from implementing policies similar to California, requiring ASBI from general practitioners accepting Medicaid patients.

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Introduction

Worldwide, 3.3 million deaths are attributable to consumption of alcohol causing 25% of all deaths among those between the ages 20 and 39 (World Health Organization (WHO), 2015). In the US, excessive drinking accounts for 1 in 10 deaths among working age adults, 87,798 alcohol-attributable deaths annually, and 2.5 million years of potential life lost annually (Stahre, Roeber, Kanny, Brewer, & Zhang, 2014). Moreover, alcohol consumption has been shown to create more disability than mortality contributing extensively to the US burden of disease (National Institute on Alcohol Abuse & Alcoholism (NIAAA), 2005). In 2010, the economic impact of alcohol related costs to the US was $249 billion mostly due to lost productivity with government paying over 40% of these costs (Sacks, Gonzales, Bouchery, Tomedi, & Brewer, 2015). This is a 2.7% annual increase from the 2006 estimate of $236.5 billion and outpaces the rate of inflation indicating that the cost of alcohol abuse is increasing. (Bouchery, Harwood, Sacks, Simon, & Brewer, 2011; Sacks, Gonzales, Bouchery, Tomedi, & Brewer, 2015). Rehm and colleagues (2009) calculate that men lose 12 years of life to alcohol-attributable disability and women lose 4.5.

Background and Significance

Previous focus has been on treating individuals with severe alcohol-related problems or dependence, but research shows that the majority of alcohol-related harm is attributable to the larger group of hazardous or harmful drinkers, defined as a person currently experiencing physical, social, or psychological harm from alcohol, but who do not meet the criteria for dependence (Nilsen, Kaner, & Babor, 2008; US Preventive Services Task Force (USPSTF), 2004). In response to recommendations made by the Institute of Medicine, the Screening, Brief Intervention, and Referral to Treatment (SBIRT) approach for primary care settings was developed (National Academy of Sciences, Institute of Medicine, 1990; USPSTF, 2004). Screening typically involves use of a questionnaire assessing the patient for risky substance use behaviors. The Alcohol Use Disorders Identification Test (AUDIT) and the CAGE test are the most commonly used in primary care settings (USPSTF, 2004). Brief interventions involve a health care professional engaging those individuals identified as at-risk through screening in a short conversation, providing feedback, advice, and a referral to additional treatment services as required (Substance Abuse and Mental Health Services Administration, 2015). Such advice is based on drinking guidelines of no more than four drinks per day and no more than 14 drinks in a week for healthy men up to age 65, and no more than three drinks per day and no more than seven in a week for healthy women and healthy men over age 65 (NIAAA, 2005).

Since the 1990s, alcohol SBIRT has been reviewed and shown to be a successful preventive solution (Bien, Miller, & Tonigan, 1993; O'Donnell, et al., 2014). Fleming and colleagues (1997) showed the first direct evidence that brief physician advice in a primary care setting could reduce alcohol use by older adults. Not long after, Wilk, Jensen, and Havighurst (1997) showed that heavy drinkers were twice as likely to moderate their drinking habits when

assessed between six and twelve months after a brief intervention by a clinician. Moyer and colleagues (2002) conducted a review of studies delivering both extended interventions and brief interventions through health-care professionals to non-treatment-seeking populations that showed there was little benefit to be gained by using extended interventions compared to short interventions. Follow up reviews of alcohol SBIRT's efficacy continued to show positive results and support the recommendations of the US Preventive Services Task Force (Kaner, et al., 2007). This same study showed that when gender data were available, men continued to moderate their drinking habits when assessed at a one year follow-up after intervention, but this was not the case for women. Jonas and colleagues (2012) showed that the best results were gained from interventions that lasted between ten and fifteen minutes on multiple occasions, and that people offered intervention reduced their number of drinks by 3.6 drinks per week, drank on fewer occasions, and remained below the recommended limits when drinking.

However, there is controversy over the extent to which the positive results are attributable to screening and brief intervention or simply to screening alone (McCambridge & Day, 2008; McQueen, Howe, Ballinger, & Godwin., 2015). Additionally, it has been suggested that the studies conducted in primary care facilities suffer from a bias created by loss to follow-up (Edwards & Rollnick, 1997). Despite this, alcohol SBIRT remains the recommended approach in primary care settings (Moyer, 2013; Office of National Drug Control Policy, 2010; USPSTF, 2004; Whitlock, Polen, Green, Orleans, & Klein, 2004).

Furthermore, evidence suggests that alcohol SBIRT is cost beneficial to the patient, the health care system, and to society, saving $562 for every $100 spent (Barbosa, Cowell, Bray, & Aldridge, 2015; Coffield et al. 2001; Fleming et al., 2000; Latimer, Guillaume, Goyder, Chilcott, & Payne, 2010). And yet, alcohol SBIRT remains underutilized in primary care settings with

little change in already low intervention rates over a ten-year period. (Broderick, Kaplan, Martini, & Caruso, 2015; Solberg, Maciosek, & Edwards, 2008; McKnight et al., 2014; Williams et al., 2011). Even with the use of tailored improvement programs, barriers to alcohol SBIRT remain (van Beurden et al., 2012). Clinicians express concerns over competing priorities with SBIRT, appropriate context and the development of rapport when discussing drinking habits with patients, and a lack of training and support from management (Beich, Gannik, & Malterud, 2002; Johnson, Jackson, Guillaume, Meier, & Goyder, 2011; Rahm et al., 2015).

Very little research has been conducted on alcohol SBIRT in the state of Nevada and the studies that have been conducted suffered from strong limitations (Hartje, Edney, & Roget, 2015; Rivera, Edney, Hartje, & Roget., 2015). In California, alcohol SBIRT has stronger support in state policy and has received more attention in the literature (Davoudi & Rawson, 2010; Mertens, Sterling, Weisner, & Pating, 2013; Woodruff, Eisenberg, McCabe, Clapp, & Hohman, 2013). Following recommendations made by the US Preventive Services Task Force, California requires that general practitioners conduct alcohol prescreening for all patients over 11 years old who are covered by Medi-Cal, California's Medicaid program (State of California, Department of Health Care Services (CA DHCS), 2014). This prescreening consists of a single question administered in the Staying Healthy Assessment asking if the patient had more than the recommended single occasion drinking amount, 5 drinks or more for men, 4 drinks or more for women, on a single occasion in the last year (CS DHCS, 2013). If the patient answers "yes", the clinician is to administer an expanded alcohol screening tool such as the AUDIT to determine if intervention or referral is indicated (CA DHCS, 2014). Additionally, California requires that clinicians undergo regular SBIRT trainings (CA DHCS, 2014). A similar policy does not exist in Nevada. Currently, alcohol SBIRT is covered by Nevada Medicaid, but there are no policies

in place to encourage its use in primary care settings (Nevada Department of Health and Human Services, 2016).

Clinical trial results from California suggest that SBIRT initiatives have created positive trends in patient drinking habits and in provider involvement in substance use prevention (Woodruff, Eisenberg, McCabe, Clapp, & Hohman, 2013., 2013). Davoudi & Rawson (2013) reviewed SBIRT initiatives in California, and showed increased involvement in substance abuse prevention in primary care settings, increases in the number of providers trained in SBIRT practices, greater use of screening tools, and reductions in patient drinking habits after receiving screening and intervention.

However, most research conducted in California and Nevada has focused on implementation initiatives and, in one study, an acute care setting. Little attention has been paid to the issue of alcohol screening and brief intervention on a population level. Given similar demographics (see Figure 1 and Figure 2), California presents a suitable analogue for Nevada's population in assessing the effectiveness of state supported alcohol SBIRT initiatives (US Census Bureau, 2016a; US Census Bureau, 2016b).

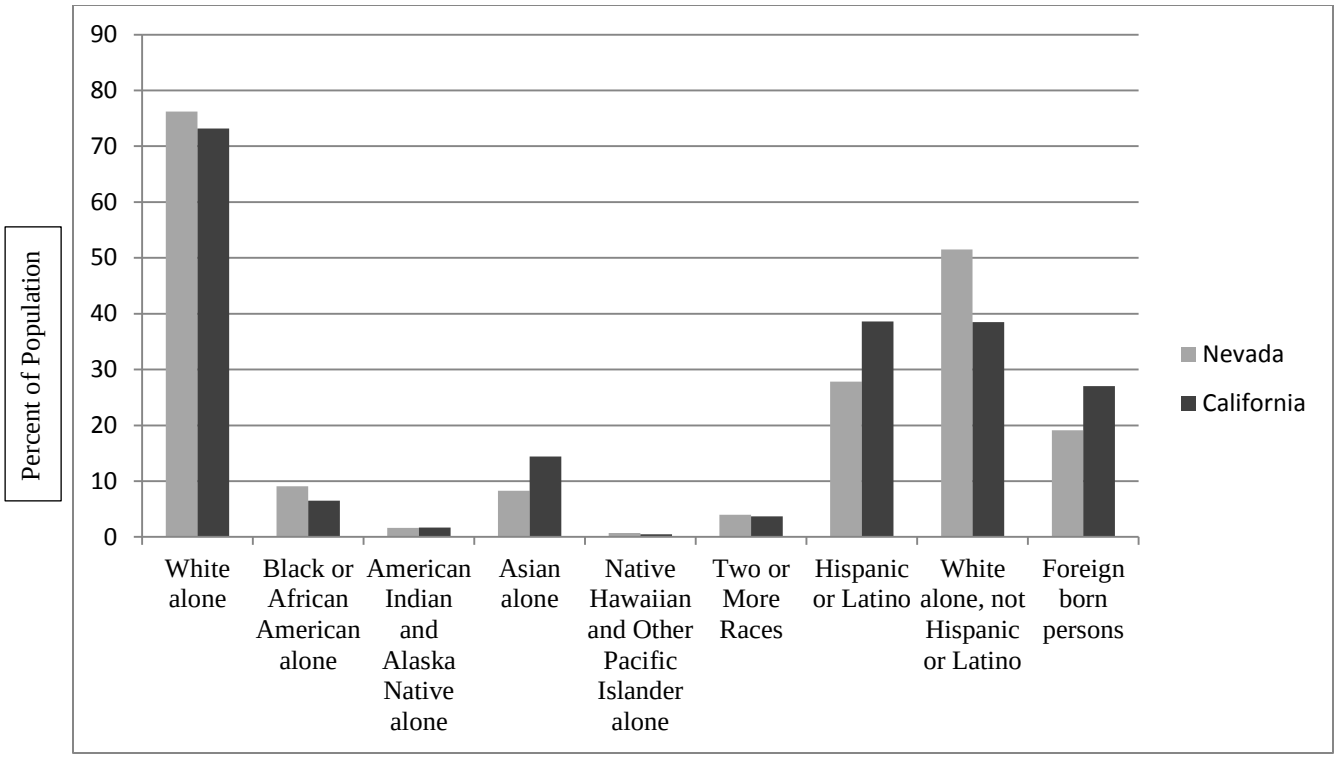

Figure 1. Race and Ethnicity Comparison for Nevada and California in 2016

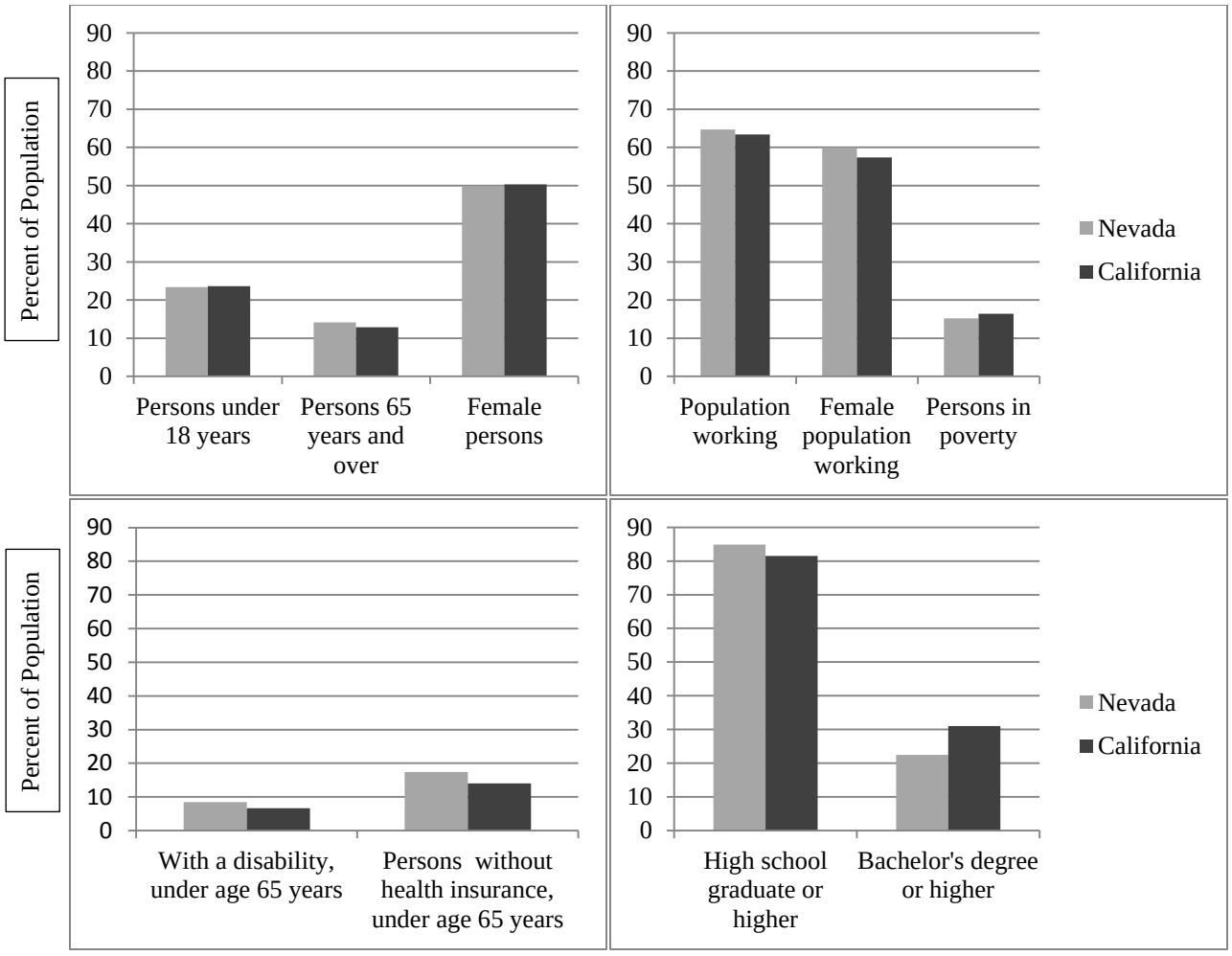

Figure 2. Age, Sex, Economic, Health, and Education Comparisons for California and Nevada in 2016

Research Questions

Given the lack of attention to population-level data in assessing the effectiveness of alcohol SBIRT, this study seeks to use representative population-level, self-reported data to discover if high drinking levels are associated with an increased proportion of alcohol screening and brief intervention in California

Goals and Objectives

The purpose of this study is to assess the coverage of alcohol screening and associated brief interventions among a population similar to that of Nevada. This will help to inform policy

decisions regarding funding initiatives to support alcohol SBIRT in primary care settings in Nevada.

Hypotheses

To answer the research question, the following hypotheses will be tested.

Hypothesis 1

H_a: There is a difference in the proportion of alcohol abuse screening during routine check-ups among drinking risk groups.

H_o: There is no difference in the proportion of alcohol abuse screening during routine check-ups among drinking risk groups.

Prediction: There will be no difference in screening among drinking risk groups.

Hypothesis 2

H_a: There is a difference in the proportion of physician advice regarding harmful drinking levels among drinking risk groups.

H_o: There is no difference in the proportion of physician advice regarding harmful drinking levels among drinking risk groups.

Prediction: There will be a higher proportion of advice regarding harmful drinking levels among higher risk groups.

Hypothesis 3

H_a: There is a difference in the proportion of physician advice to reduce drinking levels among drinking risk groups.

H_o: There is no difference in the proportion of physician advice to reduce drinking levels among drinking risk groups.

Prediction: There will be a higher proportion of advice to reduce or quit drinking among higher risk groups.

Hypothesis 4

H_a: There is a difference in demographics between patients with increased risk screened and offered a brief intervention and patients with increased risk not screened or offered a brief intervention.

H_o: There is no difference in demographics between patients with increased risk screened and offered a brief intervention and patients with increased risk not screened or offered a brief intervention.

Prediction: There will be no demographic differences among patients with increased risk given screening and intervention and patients with increased risk not given screening and intervention.

Methods

This is a cross-sectional study, using population-level data from the Behavioral Risk Factors Surveillance System (BRFSS) conducted for the state of California in 2014. The BRFSS is a collaborative project between each US state and the Centers for Disease Control and Prevention (CDC). It uses a disproportionate stratified sample design to select both landline and cellular phone numbers to call. The survey consists of a core component of questions used by all states that include questions regarding health-related perceptions, conditions, and behaviors, as well as demographic questions; optional BRFSS modules on specific topics such as healthcare access, or alcohol screening and brief intervention; and state added questions. Interviews are conducted continuously throughout the year during both daytime and evening hours. Details on the BRFSS and its methodology can be found at (http://www.cdc.gov/brfss/annual_data/annual_2014.html).

Study Sample

In 2014, California collected 8,832 interviews over landline and cellular phones from noninstitutionalized adults, 18 years of age or older, who reside in the United States with a response rate of 25.1%.

To account for an unequal probability of selection, response and nonresponse, the data is weighted so that generalizations can be made from the sample to the population it represents. The BRFSS uses design weighting to reduce bias due to unequal probability of selection, and uses iterative proportional fitting, a process called raking, to adjust for demographic differences between the individuals in the sample and the population they represent. Geographic stratum, the number of phones, and the number of adults with access to those phones are used to calculate

design weight. In 2014, the BRFSS took into account the possibility of overlapping sample frames with individuals who have a landline phone as well as a cellular phone.

Variables

The dependent variables include alcohol consumption screening performed during a routine check-up, advice given during a routine check-up about safe drinking levels, and advised during a routine check-up to reduce drinking levels. All three variables are dichotomous, coded as either yes or no with unknown or refuse to answer being removed from the sample.

The variable for screening performed during a routine check-up is comprised of three questions asked during the survey: "You told me earlier that your last routine checkup was [within the past year/within the past 2 years]. At that checkup, were you asked in person or on a form if you drink alcohol?", "Did the health care provider ask you in person or on a form how much you drink?", and "Did the healthcare provider specifically ask whether you drank [5 FOR MEN /4 FOR WOMEN] or more alcoholic drinks on an occasion?" All respondents having answered "yes" to any of these three questions are considered to have undergone screening for alcohol consumption during a routine check-up. All respondents having answered "no" to all of these questions are considered to not have been screened for alcohol consumption during a routine check-up.

The second dependent variable, advice given during a routine check-up about safe drinking level, consists of responses to the question, "Were you offered advice about what level of drinking is harmful or risky for your health?"

The third dependent variable, advised during a routine check-up to reduce drinking levels, consists of responses to the question, "Healthcare providers may also advise patients to

drink less for various reasons. At your last routine checkup, were you advised to reduce or quit your drinking?"

The last dependent variable combines the two advice variables into a single variable. All respondents coded as having been offered advice in either of the advice variables are considered to have received a brief intervention. All respondents coded as not receiving advice about either topic are considered to not have received a brief intervention. After running initial analyses, it was determined that the proportion of each response attributed to each level of drinking risk was not disparate enough to obscure any meaningful differences between groups. Follow-up analysis supported this.

The independent variable is a risk index comprised of responses to four questions asked during the survey: (1) "During the past 30 days, how many days per week or per month did you have at least one drink of any alcoholic beverage such as beer, wine, a malt beverage, or liquor?", (2) "One drink is equivalent to a 12-ounce beer, a 5-ounce glass of wine, or a drink with one shot of liquor. During the past 30 days, on the days when you drank, about how many drinks did you drink on the average?", (3) "Considering all types of alcoholic beverages, how many times during the past 30 days did you have X [CATI X = 5 for men, X = 4 for women] or more drinks on an occasion?", and (4) "During the past 30 days, what is the largest number of drinks you had on any occasion?" Using the guidelines set by NIAAA (2005), an at-risk drinking level is calculated for each respondent upon two axes: number of drinks each week and number of drinks on a single occasion (see Figure 3). Multiplying the number of days at least one drink was consumed in a week, by the average number of drinks consumed when drinking provides the number of drinks consumed per week. Those respondents who drank more than the recommended weekly amount only will be indexed as At-Risk Drinkers. Additionally, those

respondents who drank more than the recommended amount for a single occasion only will also be indexed as At-Risk Drinkers. Those respondents who drank more than the weekly recommended amount and who also drank more than the recommended amount for a single occasion both will be indexed as High-Risk Drinkers. Those respondents who do not exceed recommended drinking levels will be indexed as No-Risk Drinkers. This Risk Index is diagramed in Figure 4.

Appropriate co-variates were chosen to adjust the statistical models and to provide relevant demographic disparities. Clinical factors and co-morbidity variables were chosen based on the literature and what was available in the BRFSS 2014 survey. These include health insurance coverage status, myocardial infarction, stroke, depression, and diabetes. Demographic variables were chosen based on common identifiers for public health disparities. These include sex, race and ethnicity, age, education, income, employment status, and marital status.

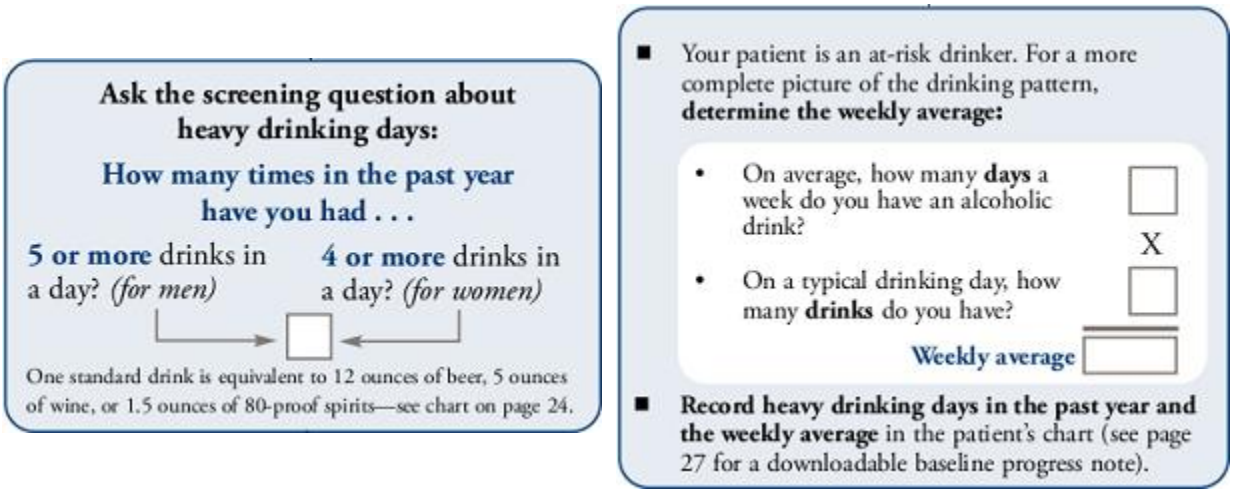

Figure 3. NIAAA (2005) Screening Tool to Determine Exceedance of Recommended Drinking Amounts

Drinks more than single occasion recommendation		Drinks more than weekly recommendation	
x	and	x	**High-Risk Drinker**
(x)	or	(x)	**At-Risk Drinker**
			No-Risk Drinker

Figure 4. Diagram of Alcohol Consumption Risk Index Classification

Statistical Analysis

All data were analyzed using IBM SPSS Statistics 20 software. Three multiple logistic regression models were created, one for screening, one for advice offered about harmful levels of drinking, and one for being advised to reduce or quit drinking. These include the level of risk and the chosen co-variates, with significance set at $p<0.05$.

The fourth model produced was a multiple logistic regression utilizing a block approach to determine the impact of demographic factors in screening and/or intervention for those with any level of increased risk using a combined screening and intervention variable. This model looked only at those respondents who were coded as At-Risk or High-Risk. The first stage of the block approach included the level of risk, co-morbidities, and health care coverage. The second stage of the block approach added physical demographic factors to the model: age, race, and sex. The third, and final, stage of the block approach added social demographic factors to the model: income, education, employment status, and marital status. Significance for this model was also set at $p<0.05$. However, this model produced no impactful results from one stage of the model to

the next (see Appendix A), so it was abandoned for a multiple logistic regression using all co-variates. Unfortunately this model did not provide enough information to fully explain what was being tested, so it was abandoned entirely.

To replace this model, two separate analyses were run. The first was a multiple logistic regression looking only at those respondents who were coded as At-Risk or High-Risk with screening as the outcome variable. The second was a multiple logistic regression looking at the same population but with the combined brief intervention variable as the outcome. Both of these included the level of risk and other relevant co-variates. Significance was set at $p<0.05$.

Ethical Considerations

All identifiers have been removed from the data and have been approved for public use through the Centers for Disease Control and Prevention. The research proposal was submitted for review to the University of Nevada, Las Vegas Office of Research Integrity for Human Subjects, Internal Review Board. The board ruled this research as exempt from review (see Appendix B).

Results

Alcohol Screening among the Total Population

Out of a total population of 8,832 interviews, 2,604 respondents offered information regarding screening during a routine check-up that occurred within the previous two years. After weighting, 78% were screened and 22% were not. Additionally, 69% were No-Risk drinkers, 24% were At-Risk drinkers, and 7% were High-Risk drinkers. These and other demographic variables are reported in Table 1.

Table 1. Weighted Demographic Distribution of Respondents Providing Alcohol Screening Information for the 2014 BRFSS

Variable	Weighted Frequency (millions)	Weighted Percent (%)	Variable	Weighted Frequency (millions)	Weighted Percent (%)	Variable	Weighted Frequency (millions)	Weighted Percent (%)
Screening			Sex			Education Groups		
Yes	1.70	22.1%	Female	3.52	45.7%	College	5.36	69.4%
No	6.01	77.9%	Male	4.19	54.3%	High School	1.48	19.2%
						Less than H.S.	0.88	11.4%
Risk Level			Race					
High Risk	0.55	7.1%	Other*	0.47	6.1%	Income Groups		
At Risk	1.87	24.3%	Hispanic	0.98	12.8%	> $50,000	4.53	58.7%
No Risk	5.29	68.5%	Black	2.27	29.4%	$25,000 - $50,000	1.39	18.1%
			White	3.99	51.7%	< $25,000	1.79	23.2%
Insurance Coverage								
Yes	7.10	92.0%	Age Groups			Employment Status		
No	0.61	8.0%	65+	1.43	18.6%	Unemployed	2.20	28.6%
			55-64	1.34	17.4%	Employed	5.51	71.4%
Myocardial Infarction			45-54	1.53	19.8%			
Yes	0.24	3.1%	35-44	1.17	15.2%	Marital Status		
No	7.47	96.9%	25-34	1.34	17.3%	Post-Relationship**	1.25	16.3%
			18-24	0.90	11.7%	Single	1.88	24.4%
Stroke						Married	4.58	59.3%
Yes	0.16	2.1%						
No	7.55	97.9%						
Depression								
Yes	1.12	14.6%						
No	6.59	85.4%						
Diabetes								
Yes	0.88	11.4%						
No	6.84	88.6%						

*Asians, Hawaiian and Pacific Islanders, Native American and Alaska Natives, Mixed Race, and Other
**Divorced, Widowed, and Separated

Logistic regression revealed that both At-Risk and High-Risk drinking groups were at reduced odds of receiving screening for alcohol abuse during their last routine check-up compared to the No-Risk drinking group. However, this result was significant only in the High-Risk drinking group when adjusted for co-variates. These results showed that High-Risk

drinkers had 54% reduced odds of receiving screening compared to No-Risk drinkers (OR=0.46 [95% CI 0.27-0.8]). Among the co-variates, Hispanics had 39% reduced odds of receiving screening when compared to Whites (OR=0.61 [95% CI 0.42-0.87]), and those races categorized as Other (Asians, Hawaiian and Pacific Islanders, Native Americans and Alaska Natives, Mixed Race, and Other) had 58% increased odds of receiving screening (OR=0.1.58 [95% CI 1.05-2.4]). Lastly, those 65 years of age or older had 2.1 times higher odds of being screened compared to those 18 to 24 years old (OR=2.12 [95% CI 1.13-3.99]). These results are reported in Table 2.

Table 2. Multiple Logistic Regression Results with the Outcome Variable "Screened for Alcohol Consumption during Routine Check-up"

Variable	OR	95% CI	Variable	OR	95% CI	Variable	OR	95% CI
Risk Level			Sex			Education		
High Risk	0.46	(0.27-0.80)	Female	0.82	(0.65-1.05)	College	1.44	(0.82-2.53)
At Risk	0.82	(0.60-1.14)	Male*	1.00		High School	1.56	(0.88-2.76)
No Risk*	1.00					Less than H.S.*	1.00	
			Race					
Insurance Coverage			Other**	1.58	(1.05-2.40)	Income per Year		
Yes	0.84	(0.51-1.39)	Hispanic	0.61	(0.42-0.87)	> $50,000	0.72	(0.50-1.03)
No*	1.00		Black	1.19	(0.72-1.95)	$25,000 - $50,000	0.81	(0.55-1.19)
			White*	1.00		< $25,000*	1.00	
Myocardial Infarction								
Yes	1.14	(0.64-2.05)	Age			Employment Status		
No*	1.00		65+	2.12	(1.13-3.99)	Unemployed	0.98	(0.72-1.32)
			55-64	1.10	(0.60-2.03)	Employed*	1.00	
Stroke			45-54	1.06	(0.58-1.91)			
Yes	0.60	(0.03-1.18)	35-44	0.99	(0.54-1.84)	Marital Status		
No*	1.00		25-34	0.61	(0.33-1.15)	Post-Relationship***	1.18	(0.84-1.61)
			18-24*	1.00		Single	1.10	(0.74-1.63)
Depression						Married*	1.00	
Yes	1.07	(0.75-1.52)						
No*	1.00							
Diabetes								
Yes	1.29	(0.92-1.82)						
No*	1.00							

*Reference Group
**Asians, Hawaiian and Pacific Islanders, Native American and Alaska Natives, Mixed Race, and Other
***Divorced, Widowed, and Separated

Brief Intervention among the Total Population

Out of a total population of 8,832 interviews, 1,890 respondents offered information regarding advice given during a routine check-up regarding harmful levels of drinking or to reduce or quit drinking. After weighting, 24% were advised about harmful levels of drinking and 76% were not, while 12.5% where advised to reduce or quit drinking and 87.5% were not.

Additionally, 66% were No-Risk drinkers, 26% were At-Risk drinkers, and 8% were High-Risk drinkers. These and other demographic variables are reported in Table 3.

Table 3. Weighted Demographic Distribution of Respondents Providing Brief Intervention Information for the 2014 BRFSS

Variable	Weighted Frequency (millions)	Weighted Percent (%)	Variable	Weighted Frequency (millions)	Weighted Percent (%)	Variable	Weighted Frequency (millions)	Weighted Percent (%)
Advised about Harmful Drinking			Sex			Education Groups		
Yes	1.41	24.2%	Female	2.66	45.8%	College	3.97	68.2%
No	4.41	75.8%	Male	3.15	54.2%	High School	1.12	19.3%
						Less than H.S.	0.73	12.5%
Advised to Reduce or Quit Drinking			Race					
Yes	0.72	12.5%	Other*	0.32	5.6%	Income Groups		
No	5.09	87.5%	Hispanic	0.67	11.6%	> $50,000	3.40	58.5%
			Black	1.91	32.9%	$25,000 - $50,000	1.06	18.2%
Risk Level			White	2.90	49.9%	< $25,000	1.36	23.3%
High Risk	0.46	7.9%						
At Risk	1.51	25.9%	Age Groups			Employment Status		
No Risk	3.85	66.2%	65+	0.87	15.0%	Unemployed	1.53	26.3%
			55-64	0.99	17.1%	Employed	4.28	73.7%
Insurance Coverage			45-54	1.17	20.1%			
Yes	5.32	91.4%	35-44	0.93	16.0%	Marital Status		
No	0.50	8.6%	25-34	1.13	19.4%	Post-Relationship**	0.86	14.8%
			18-24	0.72	12.4%	Single	1.49	25.6%
Myocardial Infarction						Married	3.47	59.6%
Yes	0.16	2.7%						
No	5.66	97.3%						
Stroke								
Yes	0.13	2.2%						
No	5.69	97.8%						
Depression								
Yes	0.81	14.0%						
No	5.00	86.0%						
Diabetes								
Yes	0.61	10.5%						
No	5.21	89.5%						

*Asians, Hawaiian and Pacific Islanders, Native American and Alaska Natives, Mixed Race, and Other
**Divorced, Widowed, and Separated

Similar to the screening results, both At-Risk and High-Risk drinkers had reduced odds of being advised about harmful levels of drinking compared to No-Risk drinkers, and these results were significant for both groups after adjustment. At-Risk drinkers had 29% reduced odds of receiving advice about harmful drinking levels compared to No-Risk Drinkers (OR=0.71 [95% CI 0.51-0.99]), and High-Risk drinkers had 47% reduced odds of receiving advice about harmful levels of drinking compared to No-Risk drinkers (OR=0.52 [95% CI 0.33-0.83]). Among the co-variates, only gender produced a significant difference with women having 96% increased odds of receiving advice about harmful levels of drinking when compared to men (OR=1.96 [95% CI 1.48-2.6]). These results are reported in Table 4.

Table 4. Multiple Logistic Regression Results with the Outcome Variable "Given Advice about Harmful Levels of Drinking"

Variable	OR	95% CI	Variable	OR	95% CI	Variable	OR	95% CI
Risk Level			Sex			Education		
High Risk	0.52	(0.33-0.83)	Female	1.96	(1.48-2.60)	College	1.14	(0.65-2.02)
At Risk	0.71	(0.51-0.99)	Male*	1.00		High School	0.72	(0.40-1.29)
No Risk*	1.00					Less than H.S.*	1.00	
			Race					
Insurance Coverage			Other**	1.00	(0.58-1.69)	Income per Year		
Yes	1.01	(0.59-1.74)	Hispanic	1.38	(0.95-2.01)	> $50,000	1.19	(0.78-1.81)
No*	1.00		Black	1.29	(0.65-2.54)	$25,000 - $50,000	1.24	(0.79-1.95)
			White*	1.00		< $25,000*	1.00	
Myocardial Infarction								
Yes	0.74	(0.38-1.47)	Age			Employment Status		
No*	1.00		65+	1.27	(0.65-2.49)	Unemployed	0.70	(0.48-1.03)
			55-64	1.39	(0.74-2.62)	Employed*	1.00	
Stroke			45-54	1.24	(0.68-2.28)			
Yes	1.72	(0.72-4.07)	35-44	1.22	(0.63-2.65)	Marital Status		
No*	1.00		25-34	1.43	(0.82-2.52)	Post-Relationship***	0.94	(0.64-1.38)
			18-24*	1.00		Single	0.81	(0.54-1.23)
Depression						Married*	1.00	
Yes	1.10	(0.75-1.61)						
No*	1.00							
Diabetes								
Yes	0.70	(0.45-1.10)						
No*	1.00							

*Reference Group
**Asians, Hawaiian and Pacific Islanders, Native American and Alaska Natives, Mixed Race, and Other
***Divorced, Widowed, and Separated

This trend remains the same for respondents being advised to reduce or even quit drinking with both At-Risk and High-Risk groups having significantly reduced odds of receiving this advice compared to the No-Risk drinking group. After adjustment, At-Risk drinkers had 54% reduced odds of beings advised to reduce or quit drinking compared to No-Risk Drinkers (OR=0.46 [95% CI 0.29-0.73]), and High-Risk drinkers had 83% reduced odds of being advised to reduce or quit drinking compared to No-Risk drinkers (OR=0.17 [95% CI 0.09-0.32]).

Multiple co-variates showed significant differences. Women were again at increased odds, three times more likely to be advised to reduce or quit drinking when compared to men (OR=3.03 [95% CI 1.96-4.69]). Having some college education put respondents at increased odds, almost twice as likely to receive this advice compared to those with less than a high school education (OR=1.99 [95% CI 1.08-3.68]). Those with a higher income had increased odds of receiving advice to reduce or quit drinking. Respondents who made between $25,000 and $50,000 per year were 2.4 times more likely to receive this advice compared to those who made less than $25,000 per year (OR=2.4 [95% CI 1.34-4.19]), and those who made greater than $50,000 per year had 2.2 times higher odds of receiving this advice compared to those who made less than $25,000 per year (OR=2.2 [95% CI 1.22-3.9]). Unexpectedly, those with diabetes had 57% reduced odds of receiving advice to reduce or quit drinking when compared to those who did not have diabetes (OR=0.43 [95% CI 0.24-.077]). Lastly, Hispanics had 41% reduced odds of receiving advice to reduce or quit drinking when compared to Whites (OR=0.59 [95% CI 0.36-0.96]). These results are reported in Table 3.

Table 5. Multiple Logistic Regression Results with the Outcome Variable "Advised to Reduce or Quit Drinking"

Variable	OR	95% CI	Variable	OR	95% CI	Variable	OR	95% CI
Risk Level			Sex			Education		
High Risk	0.17	(0.09-0.32)	Female	3.03	(1.96-4.69)	College	1.99	(1.08-3.68)
At Risk	0.46	(0.29-0.73)	Male*	1.00		High School	1.18	(0.62-2.24)
No Risk*	1.00					Less than H.S.*	1.00	
			Race					
Insurance Coverage			Other**	0.86	(0.40-1.86)	Income per Year		
Yes	1.36	(0.70-2.63)	Hispanic	0.59	(0.36-0.96)	> $50,000	2.18	(1.22-3.90)
No*	1.00		Black	1.15	(0.45-2.97)	$25,000 - $50,000	2.37	(1.34-4.19)
			White*	1.00		< $25,000*	1.00	
Myocardial Infarction								
Yes	1.87	(0.71-4.95)	Age			Employment Status		
No*	1.00		65+	0.90	(0.32-2.56)	Unemployed	0.68	(0.41-1.11)
			55-64	0.94	(0.36-2.46)	Employed*	1.00	
Stroke			45-54	0.83	(0.35-1.97)			
Yes	0.76	(0.23-2.45)	35-44	1.16	(0.45-3.00)	Marital Status		
No*	1.00		25-34	1.60	(0.71-3.59)	Post-Relationship***	1.10	(0.63-1.91)
			18-24*	1.00		Single	0.89	(0.44-1.77)
Depression						Married*	1.00	
Yes	0.65	(0.38-1.13)						
No*	1.00							
Diabetes								
Yes	0.43	(0.24-0.77)						
No*	1.00							

*Reference Group
**Asians, Hawaiian and Pacific Islanders, Native American and Alaska Natives, Mixed Race, and Other
***Divorced, Widowed, and Separated

Alcohol Screening among the At-Risk and High-Risk Populations

Out of a total population of 8,832 interviews, 1,220 respondents were classified as At-Risk or High-Risk drinkers. Only 723 of these offered alcohol screening information. After weighting, 83% were offered screening during a routine check-up and 17% were not. Additionally, 77% were At-Risk drinkers, and 23% were High-Risk drinkers. These and other demographic variables are reported in Table 6.

Table 6. Weighted Demographic Distribution of At-Risk and High-Risk Drinking Respondents Providing Screening Information for the 2014 BRFSS

Variable	Weighted Frequency (millions)	Weighted Percent (%)	Variable	Weighted Frequency (millions)	Weighted Percent (%)	Variable	Weighted Frequency (millions)	Weighted Percent (%)
Screening			Sex			Education		
Yes	2.02	83.1%	Female	0.92	38.0%	College	1.50	61.7%
No	0.41	16.9%	Male	1.50	62.0%	High School	0.53	22.0%
						Less than H.S.	0.39	16.3%
Risk Level			Race					
High Risk	0.55	22.7%	Other*	0.11	4.5%	Income per Year		
At Risk	1.87	77.3%	Hispanic	0.24	10.1%	> $50,000	1.27	52.3%
			Black	0.90	36.9%	$25,000 - $50,000	0.53	21.8%
Insurance Coverage			White	1.18	48.5%	< $25,000	0.63	25.9%
Yes	2.16	89.1%						
No	0.26	10.9%	Age			Employment Status		
			65+	0.27	11.0%	Unemployed	0.57	23.3%
Myocardial Infarction			55-64	0.33	13.7%	Employed	1.86	76.7%
Yes	0.08	3.1%	45-54	0.48	19.9%			
No	2.35	96.9%	35-44	0.31	12.8%	Marital Status		
			25-34	0.53	22.0%	Post-Relationship**	0.36	14.7%
Stroke			18-24	0.50	20.6%	Single	0.91	37.5%
Yes	0.03	1.2%				Married	1.16	47.8%
No	2.40	98.8%						
Depression								
Yes	0.43	17.6%						
No	2.00	82.4%						
Diabetes								
Yes	0.23	9.5%						
No	2.19	90.5%						

*Asians, Hawaiian and Pacific Islanders, Native American and Alaska Natives, Mixed Race, and Other
**Divorced, Widowed, and Separated

Only a single demographic group showed a significant result. Those respondents showing any drinking risk who made greater than $50,000 per year had 49% reduced odds of

receiving screening compared to those respondents showing any drinking risk who made less than $25,000 per year (OR=0.51 [95% CI 0.27-0.96]). These results are reported in Table 7.

Table 7. Multiple Logistic Regression Results with the Outcome Variable "Screened for Alcohol Consumption during Routine Check-up"

Variable	OR	95% CI	Variable	OR	95% CI	Variable	OR	95% CI
Risk Level			Sex			Education		
High Risk	0.60	(0.33-1.10)	Female	0.72	(0.43-1.21)	College	2.05	(0.79-5.32)
At Risk	1.00		Male*	1.00		High School	2.07	(0.81-5.32)
						Less than H.S.*	1.00	
Insurance Coverage			Race					
Yes	1.15	(0.47-2.78)	Other**	1.41	(0.50-4.03)	Income per Year		
No*	1.00		Hispanic	0.83	(0.34-2.03)	> $50,000	0.51	(0.27-0.96)
			Black	0.69	(0.33-1.41)	$25,000 - $50,000	0.60	(0.29-1.25)
Myocardial Infarction			White*	1.00		< $25,000*	1.00	
Yes	1.10	(0.36-3.35)						
No*	1.00		Age			Employment Status		
			65+	1.98	(0.59-6.66)	Unemployed	0.70	(0.35-1.43)
Stroke			55-64	0.96	(0.32-2.85)	Employed*	1.00	
Yes	0.96	(0.15-6.42)	45-54	0.99	(0.33-2.97)			
No*	1.00		35-44	1.18	(0.40-3.44)	Marital Status		
			25-34	0.54	(0.19-1.53)	Post-Relationship***	1.13	(0.60-2.13)
Depression			18-24*	1.00		Single	0.84	(0.04-1.75)
Yes	0.95	(0.49-1.85)				Married*	1.00	
No*	1.00							
Diabetes								
Yes	1.36	(0.62-2.96)						
No*	1.00							

*Reference Group
**Asians, Hawaiian and Pacific Islanders, Native American and Alaska Natives, Mixed Race, and Other
***Divorced, Widowed, and Separated

Brief Intervention among the At-Risk and High-Risk Populations

Out of a total population of 8,832 interviews, 1,220 respondents were classified as At-Risk or High-Risk drinkers. Only 576 of these offered brief intervention information. After

weighting, 38.5% were offered any form of brief intervention and 61.5% were not. Additionally, 77% were At-Risk drinkers, and 23% were High-Risk drinkers. These and other demographic variables are reported in Table 8.

Table 8. Weighted Demographic Distribution of At-Risk and High-Risk Drinking Respondents Providing Brief Intervention Information for the 2014 BRFSS

Variable	Weighted Frequency (millions)	Weighted Percent (%)	Variable	Weighted Frequency (millions)	Weighted Percent (%)	Variable	Weighted Frequency (millions)	Weighted Percent (%)
Brief Intervention			Sex			Education		
Yes	0.76	38.5%	Female	0.75	37.9%	College	1.20	61.1%
No	1.21	61.5%	Male	1.22	62.1%	High School	0.43	21.7%
						Less than H.S.	0.34	17.2%
Risk Level			Race					
High Risk	0.46	23.4%	Other*	0.08	4.0%	Income per Year		
At Risk	1.51	76.6%	Hispanic	0.21	10.5%	> $50,000	1.04	52.7%
			Black	0.76	38.8%	$25,000 - $50,000	0.44	22%
Insurance Coverage			White	0.92	46.7%	< $25,000	0.50	25.2%
Yes	1.75	88.6%						
No	0.23	11.4%	Age			Employment Status		
			65+	0.19	9.4%	Unemployed	0.45	22.7%
Myocardial Infarction			55-64	0.27	13.5%	Employed	1.52	77.3%
Yes	0.06	2.9%	45-54	0.39	19.7%			
No	1.91	97.1%	35-44	0.24	12.3%	Marital Status		
			25-34	0.47	23.9%	Post-Relationship**	0.27	13.9%
Stroke			18-24	0.42	21.1%	Single	0.77	39.0%
Yes	0.03	1.3%				Married	0.93	47.1%
No	1.95	98.7%						
Depression								
Yes	0.33	17.0%						
No	1.64	83.0%						
Diabetes								
Yes	0.18	9.0%						
No	1.79	91.0%						

*Asians, Hawaiian and Pacific Islanders, Native American and Alaska Natives, Mixed Race, and Other
**Divorced, Widowed, and Separated

The difference in income groups shown in the screening model is lost when looking at the odds of brief intervention. Instead, we see that those with diabetes have 71% reduced odds of receiving brief intervention compared to those without diabetes (OR=0.29 [95% CI 0.13-0.64]), and that those with a high school education have 65% reduced odds of receiving brief intervention compared to those with less than a high school education (OR=0.35 [95% CI 0.15-0.82]). However, those with a college education show no significant difference in the odds of receiving brief intervention. Conversely, we see that, again, women have 3.2 times higher odds of receiving brief intervention compared to men (OR=3.22 [95% CI 1.95-5.32]). These results are reported in Table 9.

Table 9. Multiple Logistic Regression Results with the Outcome Variable "Received Any Advice about Drinking Habits during Routine Check-up"

Variable	OR	95% CI	Variable	OR	95% CI	Variable	OR	95% CI
Risk Level			Sex			Education		
High Risk	0.71	(0.42-1.22)	Female	3.22	(1.95-5.32)	College	0.63	(0.28-1.43)
At Risk	1.00		Male*	1.00		High School	0.35	(0.15-0.82)
						Less than H.S.*	1.00	
Insurance Coverage			Race					
Yes	1.13	(0.52-2.46)	Other**	1.01	(0.32-3.20)	Income per Year		
No*	1.00		Hispanic	0.65	(0.29-1.45)	> $50,000	1.45	(0.78-2.68)
			Black	1.36	(0.77-2.42)	$25,000 - $50,000	1.28	(0.66-2.46)
Myocardial Infarction			White*	1.00		< $25,000*	1.00	
Yes	0.77	(0.21-2.88)						
No*	1.00		Age			Employment Status		
			65+	1.45	(0.50-4.24)	Unemployed	0.79	(0.44-1.42)
Stroke			55-64	1.74	(0.67-4.50)	Employed*	1.00	
Yes	0.23	(0.05-1.05)	45-54	1.26	(0.51-3.10)			
No*	1.00		35-44	1.79	(0.71-4.48)	Marital Status		
			25-34	2.10	(0.97-4.53)	Post-Relationship***	0.97	(0.53-1.78)
Depression			18-24*	1.00		Single	1.03	(0.55-1.94)
Yes	0.91	(0.53-1.57)				Married*	1.00	
No*	1.00							
Diabetes								
Yes	0.29	(0.13-0.64)						
No*	1.00							

*Reference Group

**Asians, Hawaiian and Pacific Islanders, Native American and Alaska Natives, Mixed Race, and Other

***Divorced, Widowed, and Separated

Discussion

When considering these results, it is important to note that the total population analyses show the general behavior of physicians with regard to alcohol SBIRT. The analyses looking only at the At-Risk and High-Risk population shows how these trends are impacting those who are at an increased risk of alcohol abuse.

In general, physicians were more likely to provide screening to those over the age of 65 and among some minority groups, such as Asians and Native Americans. Hispanics, however, were less likely to receive screening. In terms of risk, only those with a high risk of alcohol abuse had reduced odds of receiving screening compared to those who stayed within healthy drinking limits. These trends were not reflected in the At-Risk and High-Risk populations. Instead, those with higher-incomes were less likely to receive screening.

For intervention, almost all groups have an equal chance of receiving advice about harmful levels of drinking. The exceptions to this were those with higher risk of alcohol abuse and women. Women were more likely to receive this advice. Oddly, those with higher risk of alcohol abuse were less likely to receive this advice.

For advice to reduce or quit drinking, again, those with higher risk of alcohol abuse were less likely to receive this advice, as were Hispanics, and oddly, those with diabetes. Again we see that women have increased odds of receiving this advice, as do those with higher incomes and those with higher education.

For intervention, the general trends of physician's intervention behavior were lightly reflected in the At-Risk and High-Risk population. Women were still more likely to receive intervention. Diabetics were still less likely to receive intervention. Oddly, those with a high school education were less likely to receive intervention, but the confidence interval for this

result is very broad (0.15-0.82), and this trend is not significant among those with a college education. Both of these factors make this last result somewhat dubious.

These results suggest that screening is not directly related to intervention since more screening should coincide with more intervention as more of those with increased risk are identified and addressed. This is not the pattern this study reveals. Instead, patterns of screening followed by intervention vary depending mostly on income, age, and gender. How physician behaviors differ between the total population and the increased risk population reveals interesting implications for how alcohol SBIRT initiatives can be improved.

Income and Age

The most interesting aspect of this study is the regression results when all At-Risk and High-Risk drinkers were isolated from the No-Risk drinkers. A total of 83% of those drinkers with any level of increased risk received screening for alcohol abuse and only those who made more than $50,000 per year had reduced odds of receiving screening. Since those who make more than $50,000 per year were less likely to qualify for Medicaid, this tells us that California's policy of requiring primary care physicians to screen for alcohol abuse among Medicaid patients is helping to cover a large majority of the at risk population. However, it is important to note that the median annual income for California for 2010 to 2014 was $61,489, and the annual income per capita was $29,906 (US Census Bureau, 2016b). So while many of those with an increased risk of alcohol abuse are receiving screening, a majority of this population still has reduced odds of receiving this preventive service.

This presents an interesting focus for improving access to alcohol SBIRT since those of lower socioeconomic status are typically the focus for public health improvements, mainly because they tend to carry the greater burden of health disparity (Link & Phelan, 1995). By

implementing alcohol SBIRT requirements through Medicaid, California has taken a large step in addressing disparities regarding unidentified alcohol abuse. This has the unusual effect of leaving the greatest risk of unidentified alcohol abuse to fall among those who are of higher socioeconomic status.

To further improve the coverage of alcohol SBIRT among California's population, it is likely that private insurers would need to implement requirements for alcohol SBIRT as well. Given the financial savings that screening and intervention has been shown to produce (Barbosa, Cowell, Bray, & Aldridge, 2015; Coffield et al. 2001; Fleming et al., 2000; Latimer, Guillaume, Goyder, Chilcott, & Payne, 2010), such a recommendation is easily justifiable from both a public health perspective as well as a business perspective.

While the proportion of screening among the At-Risk and High-Risk population is high, the proportion of intervention is low by comparison with no income group having increased odds of receiving screening. This suggests two potential problems in California's implementation of alcohol SBIRT. (1) The single-question prescreening tool is not sensitive enough and a large number of At-Risk and High-Risk drinkers are not being identified, or (2) Clinicians are simply not following-up screening with intervention.

The single-question prescreening tool asks only if, in the past year, the patient had 5 or more drinks for men, or 4 or more drinks for women. This leaves an entire axis of risky drinking, weekly consumption, unaccounted for, and yet the US Preventive Services Task Force claims this single-question tool is sensitive enough to identify most hazardous drinkers (USPSTF, 2004). Losing this axis may, in fact, be a calculated risk deemed acceptable since binge drinking causes the majority of alcohol related harm. However, the results from the total population analysis for both forms of intervention show that High-Risk drinkers have the greatest

reduction in odds of receiving any form of intervention compared to the No-Risk drinkers. The single-question prescreening tool should have identified each of the High-Risk drinkers and intervention should have been indicated. Unless patients are not providing accurate information for the prescreening tool, it seems more likely that clinicians are not following-up screening with intervention.

As mentioned earlier, clinicians have reported difficulty in addressing drinking issues with their patients. While screening is easy to implement through intake forms, following up with patients requires time set aside for that specific purpose. Additionally, unless the patient has a specific condition related to alcohol consumption, clinicians may find it difficult to justify starting up a conversation with the patient about his or her drinking levels in a way that allows patients to remain receptive (Johnson, Jackson, Guillaume, Meier, & Goyder, 2011). Because of this, and a lack of support from management regarding workload, Rahm and colleagues (2015) suggest having a clinic-based psychologist available to conduct interventions. Alternatively, financial incentives could be used to help advance the implementation of intervention after screening (Beich, Gannik, & Malterud, 2002).

Unexpectedly, this pattern of high screening and low intervention undergoes a near complete reversal when looking at higher income groups in the total population. As a whole, higher-income groups were more likely to receive intervention than lower-income groups, yet the odds of screening were the same for all income groups. This shows that clinicians for lower-income groups are complying with the requirements to conduct screening but are failing to spend the time with patients to follow-up with intervention. Meanwhile, clinicians of higher income patients are just as likely to conduct screening but are more likely to spend time with patients discussing drinking habits. This may be due to the difference in the amount reimbursed by

Medicaid compared to private insurers. If private insurers are paying more for each patient visit, clinicians may be more inclined to spend additional time with those patients to discuss drinking habits than with Medicaid patients for whom they are receiving less.

It is not surprising that we see a trend similar to lower-income groups among those who are over the age of 65 since Medicare also offers reimbursement for alcohol SBIRT though it is not required (U.S. Department of Health and Human Services, 2015). As with the lower-income groups, the high proportion of screening disappears when looking at intervention for those over the age of 65, suggesting that again physicians are performing screening for alcohol abuse but are not following up with intervention services.

Given the controversy over the effectiveness of screening alone as an intervention method versus screening and brief intervention paired (McCambridge & Day, 2008; McQueen, Howe, Ballinger, & Godwin., 2015), it is possible that there is still some benefit being conferred to lower-income groups and to those over the age of 65. It is likely that this benefit is much less than what it could be if more interventions were provided following positive screening tests.

Alcohol Abuse Risk

While the overall coverage of screening remains low, the distribution of coverage appears only to disadvantage those who are at high risk of alcohol abuse. This is a curious result since all values shown are adjusted, meaning that this result is not an artifact of higher screening done among lower risk demographics. One explanation is that screening alone does confer some benefit. The routine check-up that respondents were surveyed about may have happened up to two years prior to the survey. Drinking habits were surveyed only for the previous 30 days. This makes it likely that screening and intervention were carried out prior to the drinking habits reported here. Individuals that have received screening may be moderating their drinking habits

as a result while the drinking habits of those who have not received screening remain unchanged. Additional research is needed to substantiate this result.

The intervention results among risk groups support what was previously discussed here. Higher risk individuals were less likely to receive intervention than lower risk individuals. If clinicians are finding it difficult to speak with patients about drinking habits, stating role-insecurity and patient's being unreceptive as reasons, then it is possible that clinicians are shying away from discussing drinking habits with patients that are defensive or closed-off regarding this behavior.

However, the agency of the patient cannot be disregarded in this. Respondents may feel more comfortable reporting higher alcohol use in an anonymous survey than to a physician they see immediately after. Without the ability to reconcile this data with what physicians may be seeing it is difficult to tell if this is biasing this study. These results may also be the product of respondent choice. Given the annoyance that risky drinkers feel toward criticism of their drinking habits, it is just as likely that At-Risk and High-Risk drinkers are drawn toward clinicians that do not broach the subject of drinking behaviors during routine check-ups.

Lastly, we may also be seeing the result of successful interventions reflected in these results. As with the screening difference, individuals that received brief intervention from their physician may be moderating their drinking habits as a result. This leaves those individuals who did not receive advice about harmful drinking levels or advice to reduce or quit drinking to continue their risky drinking habits. Each of these possibilities only serves to highlight the importance of improving the implementation of alcohol SBIRT in primary care settings.

Diabetes

Surprisingly, the odds for intervention were significantly reduced for the diabetes group for advice to reduce or quit drinking, both in the At-Risk and High-Risk population analysis and in the total population analysis. This is unexpected since heavy drinking is specifically contraindicated with diabetes (Ley, Hamdy, Mohan, & Hu, 2014). Considering the difficulty physicians claim in addressing drinking levels when not directly related to a patient's current health condition, it should be easier for clinicians to address alcohol consumption with patients who have diabetes. One possible explanation, however unlikely, is that the issue may be clouded by conflicting results in the literature regarding the effects of alcohol consumption on diabetes (Kao, Puddey, Boland, Watson, & Brancati, 2001; Li, Yu, Zhou, & He, 2016). However, it is far more likely that physicians of diabetes patients simply have more important disease management issues to face than drinking habits in the short time they have with patients, such as diet change, increasing physical exercise, tuning medication dosages. As a result, concern over appropriate drinking levels may take a back seat to more pressing subjects.

Gender

Among the At-Risk and High-Risk populations, there is a large gender difference, in that women have greater odds of receiving intervention compared to men. This same disparity is seen in the total population analysis as well. This is an interesting trend since men are more likely than women to engage in risky drinking behaviors (Wilsnack, Vogeltanz, Wilsnack, & Harris, 2000). The result that women were two to three times more likely to receive intervention from primary care physicians is counter-intuitive particularly since studies have shown that men are more likely than women to retain positive results after brief intervention (Kaner et al., 2007; O'Donnell et al., 2014). Future study should be directed toward understanding the cause of this

gender difference, as it could be instrumental in advancing the implementation of brief interventions after screening.

Race

As a whole, Hispanics were the only racial group to have reduced odds of receiving screening. They were also the only racial group to have reduced odds of receiving advice to reduce or quit drinking. It is good to see that these odds improve for Hispanics when looking only at those with increased risk of alcohol abuse. However, the effects of acculturation have been shown to increase risky drinking among Hispanics, especially binge drinking (Ceatano, Mills, & Vaeth, 2012). This effect is particularly apparent among Hispanic women, but Hispanic men have been shown to increase drinking behaviors as well (Vaeth, Caetano, & Rodriguez, 2012). Special attention should be given to this population to ensure that Hispanics are not being missed in alcohol SBIRT practices.

Limitations

This is a self-reported, cross-sectional study and therefore comes with a number of limitations. A temporal relationship between exposure and outcome cannot be determined. However, because the routine-check-up may have occurred up to two years prior to the survey, while the questionnaire surveyed drinking habits over the previous 30 days only, there is a high probability that screening preceded the recorded drinking habits. Unfortunately, the 30 day time period surveyed for drinking makes it unclear if the drinking habits recorded are the norm for the respondent or if the behavior is unusual, clouding the relationship between screening and drinking behaviors. It is possible that many No-risk drinkers have received interventions in the past two years and have moderated their drinking behaviors by the time of this survey.

In addition to the temporal limitations, self-reported measures are susceptible to recall bias, and respondents have a tendency to under-report behaviors they believe are socially undesirable. This may result in an underreporting of alcohol consumption. Moreover, this may result in an even greater amount of underreporting in physician's offices than what it shown here due to the anonymity of the BRFSS. This may deflate physician responses to higher risk drinking behaviors in this study.

Aside from the limitations caused by the study design, there were a number of limitations due to gaps in the data where relevant information was not collected or provided during data collection. Not all respondents from California in 2014 had a routine check-up within the past two years. Because of this, the sample size was reduced by 70-80% for the total population analyses, and by 40-50% for the At-Risk and High-Risk population analyses. This limits the generalizability of the sample to the larger population. Also, it is important to note that surveys only capture a portion of the population they are meant to represent. This survey was conducted over the phone, and so may suffer from a gap in responses from those who are less likely to own phones, those with less income or who are unemployed. Weighting is meant to correct some of this bias, but it is not a perfect solution. Lastly, the 2014 BRFSS did not collect data on liver disease or on specific healthcare coverage. As a result, this study is unable to determine if the sample contained a high concentration of subjects with liver disease that might confound the results of this study. Subjects with liver disease may have been screened and offered intervention based on their disease status rather than as a matter of standard practice. Additionally, without information regarding respondents' healthcare provider, this study is unable to determine the direct relationship between Medicaid and the frequency of screening and

intervention. However, while not a perfect solution, income can be used as a likely analogue for Medicaid status.

Public Health Implications

This study provides valuable information both for researchers and for public health policy-makers. It is important to follow-up policy decisions with an evaluation of their effectiveness. This research shows that implementation of screening is fairly straightforward, but the implementation of intervention may require more incentives. Future research should look to discover sustainable incentives that work to improve the rate of interventions given after screening. This research also sheds light on racial and gender differences in the delivery of intervention. Training programs should focus on the trend that men are not receiving intervention in the same proportion as women even though they are the higher risk group. Hispanics should also be focused on in training programs, especially those new to the U.S. who are in the process of acculturation.

Furthermore, this research shows that policy requiring alcohol SBIRT has the potential to reach a majority of the increased risk population. With improved implementation of intervention, the amount of harm caused by hazardous and harmful drinking could be greatly reduced thus providing cost savings in the form of more productive workers and reduced healthcare expenses. Such saving could be used to fund reimbursement for alcohol SBIRT services for those whose insurance does not cover screening and intervention further improving the coverage of alcohol SBIRT and its positive public health impact. Moreover, these results provide confirmation for other states that California's policy is a successful model for their own alcohol SBIRT implementation. If all states were to introduce screening and intervention requirements through their Medicaid programs, the U.S. might see a large reduction in the cost

due to hazardous and harmful drinking. In 2010, California had the highest cost due to alcohol related harm (Sacks, Gonzales, Bouchery, Tomedi, & Brewer, 2015). Public health officials and state policy-makers should look to how these more recent policy changes have affected California's alcohol related costs after they were implemented.

Conclusion

The purpose of this study was not only to evaluate the effectiveness of California's policies on the implementation alcohol SBIRT in primary care settings. It was also to evaluate the possible benefits that Nevada could expect to see by implementing its own alcohol SBIRT policy. Nevada currently offers reimbursement for alcohol SBIRT in primary care, yet studies have shown that implementation remains minimal. This study suggests that if Nevada were to require primary care physicians to provide screening for all Medicaid patients, the proportion of the population screened would greatly increase. These results also suggest that this would not be enough to encourage physicians to follow-up screening with brief interventions. If Nevada were to implement requirements for primary care physicians to provide screening and intervention, incentives would need to be added to encourage brief interventions. Small benefits from screening alone may still be seen in the population, so even if incentives cannot be added, Nevada could still benefit from implementing an SBIRT policy.

To improve the performance of alcohol SBIRT in California, policy makers should consider this same recommendation. Additionally, clinicians should be encouraged to discuss drinking behaviors more often with males and Hispanics.

Appendix A: Multiple Logistic Regression Results for At-Risk and High-Risk Populations Using a Block Approach

Table 10. Block Model Multiple Logistic Regression Results for Risk, Health Coverage, and Co-Morbidities with the Outcome Variable "Received Screening and/or Brief Intervention"

Block 1			Block 2			Block 3		
Variable	OR	95% CI	Variable	OR	95% CI	Variable	OR	95% CI
Risk Level			Risk Level			Risk Level		
High Risk	0.61	(0.34-1.08)	High Risk	0.56	(0.32-0.99)	High Risk	0.60	(0.33-1.10)
At Risk*	1.00		At Risk*	1.00		At Risk*	1.00	
Insurance Coverage			Insurance Coverage			Insurance Coverage		
Yes	1.49	(0.67-3.32)	Yes	1.15	(0.50-2.65)	Yes	1.15	(0.47-2.78)
No*	1.00		No*	1.00		No*	1.00	
Myocardial Infarction			Myocardial Infarction			Myocardial Infarction		
Yes	1.48	(0.49-4.47)	Yes	1.03	(0.33-3.17)	Yes	1.10	(0.36-3.35)
No*	1.00		No*	1.00		No*	1.00	
Stroke			Stroke			Stroke		
Yes	0.68	(0.08-6.11)	Yes	0.66	(0.08-5.32)	Yes	0.96	(0.15-6.42)
No*	1.00		No*	1.00		No*	1.00	
Depression			Depression			Depression		
Yes	1.05	(0.56-1.96)	Yes	1.08	(0.58-2)	Yes	0.95	(0.49-1.85)
No*	1.00		No*	1.00		No*	1.00	
Diabetes			Diabetes			Diabetes		
Yes	1.40	(0.67-2.91)	Yes	1.30	(0.62-2.73)	Yes	1.36	(0.62-2.96)
No*	1.00		No*	1.00		No*	1.00	

*Reference Group

Table 10 cont. Block Model Multiple Logistic Regression Results for Physical Demographic Varaibles with the Outcome Variable "Received Screening and/or Brief Intervention"

Block 1			Block 2			Block 3		
Variable	OR	95% CI	Variable	OR	95% CI	Variable	OR	95% CI
			Sex			Sex		
			Female	0.77	(0.47-1.26)	Female	0.72	(0.43-1.21)
			Male*	1.00		Male*	1.00	
			Race			Race		
			Other**	1.41	(0.51-3.88)	Other**	1.41	(0.50-4.03)
			Hispanic	0.72	(0.30-1.70)	Hispanic	0.83	(0.34-2.03)
			Black	0.65	(0.35-1.20)	Black	0.69	(0.33-1.41)
			White*	1.00		White*	1.00	
			Age			Age		
			65+	1.69	(0.76-3.70)	65+	1.98	(0.59-6.66)
			55-64	1.01	(0.46-2.24)	55-64	0.96	(0.32-2.85)
			45-54	0.94	(0.43-2.06)	45-54	0.99	(0.33-2.97)
			35-44	1.13	(0.49-2.61)	35-44	1.18	(0.40-3.44)
			25-34	0.61	(0.25-1.45)	25-34	0.54	(0.19-1.53)
			18-24*	1.00		18-24*	1.00	

*Reference Group

**Asians, Hawaiian and Pacific Islanders, Native American and Alaska Natives, Mixed Race, and Other

Table 10 cont. Block Model Multiple Logistic Regression Results for Social Demographic Variables with the Outcome Variable "Received Screening and/or Brief Intervention"

Block 1			Block 2			Block 3		
Variable	OR	95% CI	Variable	OR	95% CI	Variable	OR	95% CI
						Education		
						College	2.05	(0.79-5.32)
						High School	2.07	(0.81-5.32)
						Less than H.S.*	1.00	
						Income per Year		
						> $50,000	0.51	(0.27-0.96)
						$25,000 - $50,000	0.60	(0.29-1.25)
						< $25,000*	1.00	
						Employment Status		
						Unemployed	0.70	(0.35-1.43)
						Employed*	1.00	
						Marital Status		
						Post-Relationship**	1.13	(0.60-2.13)
						Single	0.84	(0.04-1.75)
						Married*	1.00	

*Reference Group

**Divorced, Widowed, and Separated

Appendix B: Internal Review Board Exclusion

UNLV

UNLV Biomedical IRB - Administrative Review
Notice of Excluded Activity

DATE:	March 4, 2016
TO:	Sheniz Moonie, PhD
FROM:	UNLV Biomedical IRB
PROTOCOL TITLE:	[875968-1] Association between Alcohol Consumption and Alcohol Screening and Brief Intervention during Routine Check-ups
SUBMISSION TYPE:	New Project
ACTION:	EXCLUDED - NOT HUMAN SUBJECTS RESEARCH
REVIEW DATE:	March 4, 2016
REVIEW TYPE:	Administrative Review

Thank you for your submission of New Project materials for this protocol. This memorandum is notification that the protocol referenced above has been reviewed as indicated in Federal regulatory statutes 45CFR46.

The UNLV Biomedical IRB has determined this protocol does not meet the definition of human subjects research under the purview of the IRB according to federal regulations. It is not in need of further review or approval by the IRB.

We will retain a copy of this correspondence with our records.

Any changes to the excluded activity may cause this protocol to require a different level of IRB review. Should any changes need to be made, please submit a Modification Form.

If you have questions, please contact the Office of Research Integrity - Human Subjects at IRB@unlv.edu or call 702-895-2794. Please include your protocol title and IRBNet ID in all correspondence.

Office of Research Integrity - Human Subjects
4505 Maryland Parkway . Box 451047 . Las Vegas, Nevada 89154-1047
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Curriculum Vitae

Gene Kilian Wells
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Education

2003-2014	B.A. in Anthropology, Graduated May 2014 (3.65 GPA) University of Nevada, Las Vegas

Research Interests

I have a wide variety of research interests, which include the efficacy of treatment options in addiction medicine, health outcomes directly related to industrialized food production, and the use and effects of folk medicine in industrialized society.

Research Appointments

2012 – 2014	Lead Lab Assistant, Metabolism, Anthropometry, and Nutrition Lab, Department of Anthropology, University of Nevada, Las Vegas. Worked under the direction of Dr. Alyssa Crittenden, Lincy Assistant Professor.
Summer 2013	Undergraduate Research Opportunity (UROP) at University of Nevada, Las Vegas. Worked under the direction of Dr. Alyssa Crittenden, Lincy Assistant Professor.
Fall 2014	Graduate Assistant at University of Nevada, Las Vegas. Worked under the direction of Darren Liu, Assistant Professor.

Scholarships and Awards

2013	National Institute of Health (NIH) General Medical Sciences, Undergraduate Research Opportunity at the University of Nevada, Las Vegas ($4500)

Research Skills/Experience

(1) Entered, cleaned, and coded behavioral and nutritional data collected by Dr. Alyssa Crittenden during fieldwork among the Hadza hunter-gatherers of Tanzania.
(2) Assisted in the preparation of two nutritional manuscripts, lead author Dr. Alyssa Crittenden.
(3) Developed and prepared a cognitive experiment testing the effects of mentorship on radical behavior among young boys. Included preparation of IRB human research subjects protocol

(4) Compiled cross-cultural ethnographic information regarding honey in religious practices and medical use.
(5) Presentation of research analyzing activity budgets and energy expenditure among juvenile Hadza foragers at an NIH funded undergraduate research symposium and at the annual meeting of the American Association of Physical Anthropologists.
(6) Compiled, cleaned, and coded qualitative data on the nursing home care inquiries collected by Dr. Darren Liu.
(7) Carried out a literature review and developed a manuscript presenting the prevalence of syphilis among pregnant, Nigerian women and their male partners. The data was collected by Dr. Echezona Ezeanolue.
(8) Carried out a literature review and developed a manuscript presenting the analysis of activity and energetics among Hadza hunter-gatherer children. The data was collected by Dr. Alyssa Crittenden.
(9) Developed and carried out a thesis project researching the effects of state policy on alcohol screening, brief intervention, and referral to treatment in California.

Service

2012 – 2014	Member of Lambda Alpha Anthropology Honor Society
2012 – 2014	Member of University of Nevada, Las Vegas Anthropology Society

Important Courses Taken

Undergraduate
Biological Anthropology and associated Lab, Medical Anthropology, Independent Study (Developmental Origins of Health and Disease), Ethnographic Field Methods, Principles of Statistics I
GPA: 3.65; GPA in Major (Anthropology): 3.98

Graduate
Biostatistical Methods for the Health Sciences, Nonparametric Statistics, Epidemiology and Public Health, Chronic Disease Epidemiology, Infectious Disease Epidemiology, General Linear Models
GPA: 3.92

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