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Modeling The Effects Of Substance Dependence On General Self-Reported Health Using Nominal Regression

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MODELING THE EFFECTS OF SUBSTANCE DEPENDENCE ON GENERAL SELF-REPORTED HEALTH USING NOMINAL REGRESSION

By

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Abstract

The goal of this research project was to produce a model of the effects of drug dependence on general self-rated health. Due to power issues, two additional models, one for cocaine and one for heroin, were required. The models used data from the 2005-2009 National Survey on Drug Use and Health. The result of this effort was a ranking of the effects of drug dependence on general health for individuals and for the study population. The model controlled for infectious, chronic and mental illness as well as sociodemographic variables. Significantly increased odds ratios were found for alcohol, marijuana, analgesics, and cocaine at $p < .001$, and for heroin at $p < .01$. A ranking of odds ratios was constructed, but wide confidence intervals make the scale difficult to interpret and thus less useful for guiding policy.

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Introduction

The abuse and misuse of alcohol and other drugs is a major physical, mental and social health problem. As such, drugs are heavily regulated in most countries, but the regulatory schemas often are more products of the political process and moral panics (Reinarman, 1994) than of rational inquiry and science. Groups in the United Kingdom and the Netherlands (Nutt, King, Saulsbury & Blakemore, 2007, Nutt, King & Phillips, 2010, van Amsterdam, Opperhuizen, Koeter, & van den Brink 2010) have attempted to quantify the overall harm of drugs and have compared the results to regulatory schema. These efforts were very broad and relied on expert opinion. The scales constructed by Nutt et al. (2007, 2010) were constructed by groups of experts using a method called Multi-Criteria Decision Analysis. This method involved moderated discussion of the score for each substance for each dimension, and in the later study, what weight was applied to each dimension. These studies included dependence as an element of 'Harms to users' but only as a small piece of something much broader. This proposal will explore the extent to which drug dependency of various types affects health in more detail.

The existing scales include data on acute toxicity (Gable, 2004) and on some causes of mortality, but both have limitations. Acute toxicity is useful in predicting one kind of mortality, but a measure that is more general is needed. Drug abuse can cause death in a variety of ways, from long-term toxicity and disease to preventable injury. Mortality figures are useful but do not provide any idea of the per capita risk and are far from universally available or reliable, especially due to misclassification (Paulozzi & Annest 2007). What is needed is a measure that can predict future mortality among the living in a representative sample of the population.

Fortunately, one such measure exists. This measure is called “general self-rated health”, and it is a one measure that has found its way into a number of studies on drug use and abuse. A typical implementation of the question would read “In general, how would you rate your health?”

with “Excellent, Very good, Good, Fair, and Poor” as responses. A meta-study by De Salvo, Blower, Reynolds, He & Manner, (2006) found that the risk ratio for mortality among respondents that selected “Poor’ was (1.92 or 92% higher) relative to those who selected “Excellent”. The effect risk increased as health went from “Good” to “Fair” to “Poor” as well.

There are a wide variety of studies that include self rated general health, and drug use questions, including classroom surveys, like the Youth Risk behavior Surveillance System and Monitoring the Future surveys, telephone surveys like the BRFSS, and The National Household Survey on Drug Use and Health (Substance Abuse and Mental Health Services Administration, 2008). This last survey is uniquely suited to the proposed analysis in a number of ways. First, it has the broadest target population, including non- institutionalized Americans of all ages, as opposed to other surveys that target either youth our adults exclusively. Second, it uses a proven methodology, namely Audio Computer Assisted Self Interviewing, or ACASI (SAMHSA, 2008). This method allows more privacy than telephone or face-to-face interviewing, and allows for more assistance than pen-and-paper self-interviews. Third, the survey is conducted annually, which allows for near constant collection of data. It is also a very long and detailed survey that includes a large number of potential control variables. Finally the sample size is very large; the public use files contain approximately 55,000 cases per year.

Definitions

National Survey on Drug Use and Health (NSDUH) – A national, yearly household survey of persons over the age of 12 living in the United States.

Substance dependence – The NSDUH survey includes variables representing dependence on various drugs and categories of drugs. Dependence is determined by answers to a battery of 12 questions for each drug. The questions are based on the *DSM-IV* (SAMHSA 2008, p. 71) definition of substance dependence for each substance.

General Self-Reported Health (GSRH) - A one question measure that has found its way into a number of studies on drug use and abuse. A typical implementation of the question would read "In general, how would you rate your health?" with "Excellent, Very good, Good, Fair, and Poor" as responses.

See Appendix 1 for all variables used in the analyses supporting this thesis.

Method

The goal of this thesis was to provide an analysis of cross-sectional data from the 2005-2009 National Survey on Drug use and health in an effort to address the research question "What are the relative effects of substance dependence on general self-reported health". The relative effects of dependence of each substance are the focus of the project. A secondary question is "What are the relative effects of chronic illness, infectious disease, and mental illness on self-reported health.". Finally an number of demographic control variables are included as well.

Hypotheses and predictions

H0: None of the variables in the model will significantly predict GSRH

H1: At least one variable will predict GRSH

H2: At least one of the substance dependence variables will predict GSRH

I predict that most or all of the substance dependence variables will have some effect on GSRH.

Participants

The study participants are those who participated in the 2005-2009 NSDUH survey. The target population is residents of the United States who are 12 or older. The study does not include persons who are institutionalized, incarcerated or are homeless and living outside a shelter. Participants who English or Spanish are also excluded, because the instrument is only available in cannot speak either those languages. This was an in person, household survey. All residents 12 and over in each household were interviewed, and all respondents were given $30 for their time. The total sample size for the years included in this study is 278,130.

Data collection and management

This study uses secondary data from the National Survey on Drug Use and Health (United States Department of Health and Human Services. SAMHSA. Office of Applied Studies. 2005-2009). These surveys were household surveys of roughly 70,000 respondents per year, of which roughly 55,000 were available in the public use file. Respondents were interviewed both by a live interviewer for screening questions, and then alone in a computer assisted interview with apre-recorded audio. This improves the quality of sensitive questions, of which there were many. Such topics include substance use, abuse, and dependence, mental health, risk behaviors and criminal behaviors. The NSDUH uses a multi-stage design, and as such requires the use of design weights to adjust for differing probabilities of selection. Strata include age and geography. Adjustments to design weights were made with a logit model SAMHSA (2005-2009). Data were obtained from the *Substance Abuse and Mental Health Data Archive (SAMHDA)* managed by the Inter-university Consortium for Political and Social Research (ICPSR) at the University of Michigan. Five years of data were combined to ensure adequate statistical power.

Analytical Methods

Initially, one model containing all the variables of interest was built using the multinomial regression procedure in SPSS Complex samples 19.0. This extra package was required to analyze data using the weights produced to account for the multi-stage design. Some of the substance abuse variables were not statistically significant, including sedative and tranquilizer dependence or abuse, inhalant dependence and abuse, hallucinogen dependence or abuse, cocaine dependence and abuse and heroin dependence and abuse. Many of these are rare, below the yearly threshold of 100 cases set by the authors of NSDUH for publishing a prevalence estimate, and so were excluded from the model. This model will be referred to as the main or overall weighted model. Cocaine and Heroin dependence and abuse are so central to

understanding the effects of substance abuse and dependence on general self-reported health that additional steps were required to generate odds ratios for these variables.

Cocaine and heroin abuse or dependence was each drawn into their own case control study. Cases were specified by the substance dependence variables, and controls were matched by all the demographic variables using the 'gmatch' SAS macro published by the mayo clinic (Bergstralh & Kosanke, 2003). The control-to-case ratio was 5-to-1. Each of the variables in the main model was entered into a single variable multinomial logistic regression model using only the cases, and any non-significant variables were excluded from the final models. This was done to avoid over-specification error. The sample size for the heroin users' model was 2,254, and for the cocaine users model the sample size was 12,360.

Results

The demographic control variables in the model include health insurance, age, education, income, marital status, sex, population density, and race, all presented in Tables 1 and 2. Of these, the strongest effects on fair or poor health were education, age, and income. Effects on other levels of GSRH were weaker and generally followed those of fair or poor health. Surprisingly, having insurance was a mild risk factor. This may be due to reverse causation or the inclusion of risk groups.

Table 1

Percentages for variables in the weighted model

Variable	Value	Weighted Percent
4 Level health a.	Fair/Poor b.	12.20%
	Good	26.80%
	Very Good	36.50%
	Excellent	24.40%
ALCOHOL DEPENDENCE IN THE PAST YEAR	Yes	3.40%
	No	96.60%
PAIN RELIEVER ABUSE OR DEPENDENCE - PAST YEAR	Yes	0.70%
	No	99.30%
COCAINE ABUSE OR DEPENDENCE - PAST YEAR	Yes	0.60%
	No	99.40%
HEROIN ABUSE OR DEPENDENCE - PAST YEAR	Yes	0.10%
	No	99.90%
MARIJUANA ABUSE OR DEPENDENCE - PAST YEAR	Yes	1.70%
	No	98.30%
NEEDLE USE (ANY DRUG) - EVER USED	Yes	1.50%
	No	98.50%
COVERED BY ANY HEALTH INSURANCE - RECODE	No	14.50%
	Yes	85.50%
AGE CATEGORY RECODE (5 LEVELS)	12-17 Years Old	10.00%
	26-34 Years Old	14.30%
	35-49 Years Old	26.20%
	50 or Older	36.20%
	18-25 Years Old	13.20%
EDUCATION RECODE	Less than high school	14.30%
	High school graduate	28.10%
	Some college	22.80%
	College graduate	24.80%
	12 to 17 year olds	10.00%
TOTAL FAMILY INCOME RECODE	Less than $20,000	18.10%
	$20,000 - $49,999	33.40%
	$50,000 - $74,999	18.00%
	$75,000 or More	30.60%
IMPUTATION REVISED MARITAL STATUS	Widowed	5.50%
	Divorced or Separated	11.70%
	Never Been Married	28.00%

	Respondent is <= 14 years old	4.90%
	Married	49.90%
IMPUTATION REVISED GENDER	Male	48.50%
	Female	51.50%
POPULATION DENSITY	Segm. in a CBSA with fewer than 1 million persons	41.30%
	Segment not in a CBSA	6.60%
	Segment in a CBSA with 1 million or more persons	52.10%
ASIAN	Yes	4.20%
	No	95.80%
BLACK	Yes	11.80%
	No	88.20%
HISPANIC	Yes	13.80%
	No	86.20%
CMENTAL	1-2 MI reported	8.90%
	No MI reported	91.10%
CCHRONIC	1 CD Reported	22.50%
	2+ CD Reported	7.50%
	No CD Reported	70.00%
CINFECTIOUS	1+ ID reported	8.40%
	No ID reported	91.60%
NICOTINE (CIG) DEPENDENCE IN PAST MONTH	Yes	14.00%
	No	86.00%

a. Dependent Variable

b. Reference Category

Table 2

Demographic and geographic variables

Health	Fair/Poor Exp(b)	95% C.I.	Good Exp(b)	95% C.I.	Very Good Exp(b)	95% C.I.
Not insured	1.103**	1.019 - 1.193	1.214***	1.147 - 1.284	1.024	0.973 - 1.078
12-17 years	3.330***	2.947 - 3.763	2.141***	2.002 - 2.291	1.327***	1.257 - 1.400
26-34 years	1.775***	1.618 - 1.948	1.323***	1.244 - 1.407	1.093**	1.036 - 1.153
35-49 years	3.285***	2.995 - 3.604	1.719***	1.613 - 1.832	1.202***	1.136 - 1.271
50+ years	6.698***	6.025 - 7.446	2.327***	2.153 - 2.514	1.260***	1.174 - 1.353
18-25 years						
< High School	8.335***	7.394 - 9.397	3.450***	3.175 - 3.749	1.386***	1.283 - 1.497
High School	3.322***	2.989 - 3.693	2.352***	2.202 - 2.512	1.413***	1.338 - 1.493
Some college	2.302***	2.064 - 2.568	1.827***	1.711 - 1.951	1.368***	1.296 - 1.443
In School						
College Graduate						
< $20,000	4.648***	4.174 - 5.175	1.850***	1.730 - 1.978	1.143***	1.080 - 1.210
$20,000-$49,999	2.779***	2.525 - 3.058	1.677***	1.584 - 1.774	1.223***	1.166 - 1.282
$50,000-	1.616***	1.446 -	1.299**	1.219 -	1.199***	1.138 -

$74,999		1.806	*	1.383		1.263
>= $75,000						
Widowed	1.352***	1.146 - 1.595	1.259**	1.085 - 1.460	1.206**	1.044 - 1.392
Divorced or separated	1.224***	1.109 - 1.352	1.046	0.966 - 1.133	1.020	0.947 - 1.098
Never married	1.148**	1.046 - 1.260	0.989	0.929 - 1.054	1.008	0.954 - 1.065
Underage	1.006	0.877 - 1.155	1.062	0.980 - 1.152	1.036	0.967 - 1.110
Married						
Male	1.187***	1.115 - 1.262	1.092***	1.047 - 1.138	1.046**	1.009 - 1.084
Small urban	1.080**	1.012 - 1.152	1.068**	1.022 - 1.116	1.070***	1.030 - 1.111
Rural	1.271***	1.140 - 1.416	1.106**	1.019 - 1.200	1.132**	1.054 - 1.217
Large urban						
Asian	1.891***	1.541 - 2.320	1.615***	1.433 - 1.821	1.095	0.990 - 1.211
Black	1.223***	1.112 - 1.346	1.198***	1.121 - 1.280	0.947	0.893 - 1.004
Hispanic	2.046***	1.872 - 2.237	1.491***	1.400 - 1.588	0.930**	0.878 - 0.985

* p < .05; **p < .01 *** p < .001

Table 3

Disease and Mental Health

Health	Fair/Poor Exp(b)	95% C.I.	Good Exp(b)	95% C.I.	Very Good Exp(b)	95% C.I.
Mental Illness	3.758***	3.407 - 4.145	2.001***	1.840 - 2.177	1.473***	1.362 - 1.594
One Chronic Disease	4.337***	4.011 - 4.690	2.940***	2.768 - 3.124	1.882***	1.778 - 1.992
Two or more Chronic Diseases	26.645***	22.549 - 31.484	9.518***	8.121 - 11.155	3.257***	2.768 - 3.834
Infectious Disease	1.987***	1.788 - 2.209	1.497***	1.373 - 1.633	1.361***	1.259 - 1.471

* $p < .05$; **$p < .01$ *** $p < .001$

Table 3 contains the odds ratios and confidence intervals from the disease variables in the overall weighted model. Of these three variables, chronic disease had the strongest effect on GRSH. This relationship is the strongest in the entire dataset, and is nearly exponential in nature. Mental health was also stronger than infectious disease.

Table 4

Substance Abuse and Dependence

Health	Fair/Poor Exp(b)	95% C.I.	Good Exp(b)	95% C.I.	Very Good Exp(b)	95% C.I.
Alcohol[1]	1.396***	1.205 - 1.618	1.399***	1.250 - 1.565	1.242***	1.122 - 1.375
Analgesics	2.098***	1.635 - 2.692	1.839***	1.506 - 2.245	1.340**	1.110 - 1.619
Cocaine	1.302	0.960 - 1.767	1.225	0.952 - 1.576	1.225	0.965 - 1.554
Heroin	0.534	0.226 - 1.260	0.886	0.449 - 1.748	0.928	0.492 - 1.751
Marijuana	1.584***	1.343 - 1.868	1.498***	1.337 - 1.678	1.256***	1.132 - 1.394
Needle use[2]	1.392**	1.076 - 1.802	1.220	0.978 - 1.522	1.037	0.837 - 1.286
Cigarettes	2.998***	2.757 - 3.259	2.403***	2.246 - 2.572	1.720***	1.614 - 1.834

* $p < .05$; **$p < .01$ *** $p < .001$ [1] Dependence only. [2] Lifetime All other variables are dependence or abuse, past year.

Of the substance dependence variables in Table 3, nicotine addiction was the strongest predictor of fair or poor health, with an OR of 2.998. Next strongest was addiction to or abuse of analgesics (2.098), then marijuana abuse or dependence (1.584). Alcohol dependence had an OR of 1.396. Heroin and cocaine abuse or dependence were not statistically significant in this model, nor was injection drug use. These results are problematic, as both heroin and cocaine are regarded as among the most serious drugs of abuse, with injection drug use being an important factor.

Possible reasons for the model's failure to measure these anticipated effects could be the low prevalence of these drugs in the sample, fewer than 2 percent, or confounding with one another. For this reason, the following case control studies were conducted.

Table 5

Percentages for variables in the heroin model

Variable	Value	N	Marginal Percentage
4 Level Health	Fair/Poor	272	10.70%
	Good	756	29.70%
	Very Good	963	37.90%
	Excellent	553	21.70%
AGE CATEGORY RECODE (5 LEVELS)	12-17 Years Old	306	12.00%
	26-34 Years Old	282	11.10%
	35-49 Years Old	315	12.40%
	50 or Older	99	3.90%
	18-25 Years Old	1542	60.60%
TOTAL FAMILY INCOME RECODE	Less than $20,000	875	34.40%
	$20,000 - $49,999	937	36.80%
	$50,000 - $74,999	234	9.20%
	$75,000 or More	498	19.60%
CMENTAL	1-2 MI reported	354	13.90%
	No MI reported	2190	86.10%
CINFECTIOUS	1+ ID reported	172	6.80%
	No ID reported	2372	93.20%
HEROIN ABUSE OR DEPENDENCE - PAST YEAR	Yes	424	16.70%
	No	2120	83.30%
TOTAL		2544	100.00%

Table 5 shows the percentages of each variable included in the model for heroin The demographics match the heroin using population, and as such the majority of the cases in this model come from the 18-25 year age range. The lower income group was also more prevalent here.

Table 6

Health	Fair/Poor Exp(b)	95% C.I.	Good Exp(b)	95% C.I.	Very Good Exp(b)	95% C.I.
12-17 years	0.517**	0.276 - 0.967	0.661**	0.467 - 0.935	0.807	0.598 - 1.089
26-34 years	1.844**	1.135 - 2.996	1.438**	1.001 - 2.065	0.911	0.635 - 1.307
35-49 years	4.677***	3.022 - 7.237	1.635**	1.112 - 2.403	0.988	0.670 - 1.459
50+ years	11.413***	5.047 - 25.808	2.873**	1.290 - 6.399	1.892	0.846 - 4.234
18-25 years						
< $20,000	4.261***	2.549 - 7.122	2.328***	1.684 - 3.217	1.339	0.996 - 1.799
$20,000-$49,999	2.290**	1.367 - 3.837	1.409**	1.034 - 1.922	1.048	0.797 - 1.378
$50,000-$74,999	1.155	0.502 - 2.657	1.885**	1.195 - 2.973	1.604**	1.064 - 2.419
>= $75,000						
Mental Illness	2.657***	1.686 - 4.187	1.764**	1.206 - 2.578	1.544**	1.066 - 2.237
Infectious Disease	2.082**	1.119 - 3.873	1.996**	1.179 - 3.379	1.427	0.840 - 2.422
Heroin	2.122**	1.357 - 3.317	2.716***	1.912 - 3.859	1.720**	1.212 - 2.440

* p < .05; **p < .01 *** p < .001

The heroin case control model contains a relatively small number of subjects, n = 2554, so the model included relatively few variables. These variables included age, income, mental health, infectious disease and heroin abuse or dependence, as shown in Table 6. Of these, heroin use was only the fourth highest with an OR of 2.122. Age was the strongest, with respondents over 50 being 11.413 times more likely to be in poor health than 18-25 year olds.

Table 7

Percentages for variables in the cocaine model

Variable		N	Marginal Percentage
4 Level health	Fair/Poor	1322	10.70%
	Good	3510	28.40%
	Very Good	4742	38.40%
	Excellent	2781	22.50%
COVERED BY ANY HEALTH INSURANCE	No	4287	34.70%
	Yes	8068	65.30%
AGE CATEGORY RECODE (5 LEVELS)	12-17 Years Old	1678	13.60%
	26-34 Years Old	1503	12.20%
	35-49 Years Old	1961	15.90%
	50 or Older	329	2.70%
	18-25 Years Old	6884	55.70%
TOTAL FAMILY INCOME RECODE	Less than $20,000	4402	35.60%
	$20,000 - $49,999	4270	34.60%
	$50,000 - $74,999	1571	12.70%
	$75,000 or More	2112	17.10%
EDUCATION RECODE	Less than high school	3119	25.20%
	High school graduate	3928	31.80%
	Some college	2940	23.80%
	College graduate	690	5.60%
	12 to 17 year olds	1678	13.60%
IMPUTATION REVISED GENDER	Male	6746	54.60%
	Female	5609	45.40%
BLACK	Yes	1182	9.60%
	No	11173	90.40%
HISPANIC	Yes	2145	17.40%
	No	10210	82.60%
CMENTAL	1-2 MI reported	1546	12.50%
	No MI reported	10809	87.50%
CCHRONIC	1 CD Reported	1874	15.20%
	2+ CD Reported	349	2.80%
	No CD Reported	10132	82.00%
CINFECTIOUS	1+ ID reported	892	7.20%
	No ID reported	11463	92.80%
NICOTINE (CIG) DEPENDENCE IN PAST MONTH	Yes	3484	28.20%
	No	8871	71.80%
COCAINE ABUSE	Yes	2058	16.70%

OR DEPENDENCE - PAST YEAR	No	10297	83.30%
Total		12355	100.00%

Table 7 depicts the frequencies of the variables included in the cocaine case control model. Here also the proportions of 18-25 and low income households are higher than the weighted model. Over 25% of the respondents in this study have a high school education or less compared to 14.3% in the weighted model. These younger, poorer, less educated demographics highlight the utility of matched case-control methods for this population.

Table 8

Cocaine Users and Matched Non Users

Health	Fair/Poor Exp(b)	95% C.I.	Good Exp(b)	95% C.I.	Very Good Exp(b)	95% C.I.
Not insured	1.419***	1.214 - 1.658	1.287***	1.145 - 1.446	1.052	0.943 - 1.173
12-17 years	3.516***	2.133 - 5.795	2.289***	1.747 - 2.998	1.535***	1.235 - 1.906
26-34 years	1.713***	1.366 - 2.148	1.519***	1.285 - 1.795	1.141	0.975 - 1.336
35-49 years	3.743***	3.052 - 4.591	2.059***	1.740 - 2.437	1.323**	1.126 - 1.556
50+ years	12.176***	7.647 - 19.388	4.023***	2.585 - 6.259	1.773**	1.132 - 2.778
18-25 years						
< $20,000	2.132***	1.667 - 2.726	1.375***	1.174 - 1.611	1.024	0.891 - 1.177
$20,000-$49,999	1.554**	1.211 - 1.994	1.406***	1.204 - 1.643	1.191**	1.041 - 1.363
$50,000-$74,999	1.164	0.849 - 1.595	1.205	0.994 - 1.461	1.219**	1.035 - 1.437
>= $75,000						
< High School	8.195***	5.217 - 12.874	3.288***	2.547 - 4.245	1.483***	1.200 - 1.833
High School	4.425***	2.832 - 6.915	2.657***	2.081 - 3.394	1.63***	1.339 - 1.985

Some college	3.497***	2.226 - 5.494	2.009***	1.566 - 2.577	1.56***	1.279 - 1.903
In School						
College Graduate						
Male	0.804**	0.693 - 0.934	0.718***	0.644 - 0.800	0.864**	0.783 - 0.953
Black	1.018	0.801 - 1.293	0.842	0.689 - 1.029	0.813**	0.672 - 0.984
Hispanic	1.795***	1.484 - 2.172	1.435***	1.248 - 1.650	0.851**	0.744 - 0.973
Mental Illness	3.738***	2.983 - 4.686	2.368***	1.949 - 2.876	1.676***	1.385 - 2.027
One Chronic Disease	3.176***	2.612 - 3.861	2.099***	1.785 - 2.469	1.551***	1.327 - 1.813
Two or more Chronic Diseases	8.259***	5.228 - 13.048	3.273***	2.104 - 5.092	1.283	0.804 - 2.046
Infectious Disease	1.604**	1.220 - 2.108	1.466**	1.170 - 1.836	1.269**	1.022 - 1.575
Cigarettes	2.643***	2.229 - 3.134	2.234***	1.952 - 2.557	1.588***	1.394 - 1.809
Cocaine	2.21***	1.812 - 2.696	1.87***	1.591 - 2.197	1.456***	1.247 - 1.701

* $p < .05$; **$p < .01$ *** $p < .001$

The model for cocaine has a much larger sample size, n = 12,360, and correspondingly a much larger model, shown in Table 8. Like the main model, here chronic disease was the strongest factor. Respondents having two or more chronic diseases were 8.259 times more likely to have fair or poor health than those without. The odds ratio for cocaine users was similar to that for heroin, OR = 2.21.

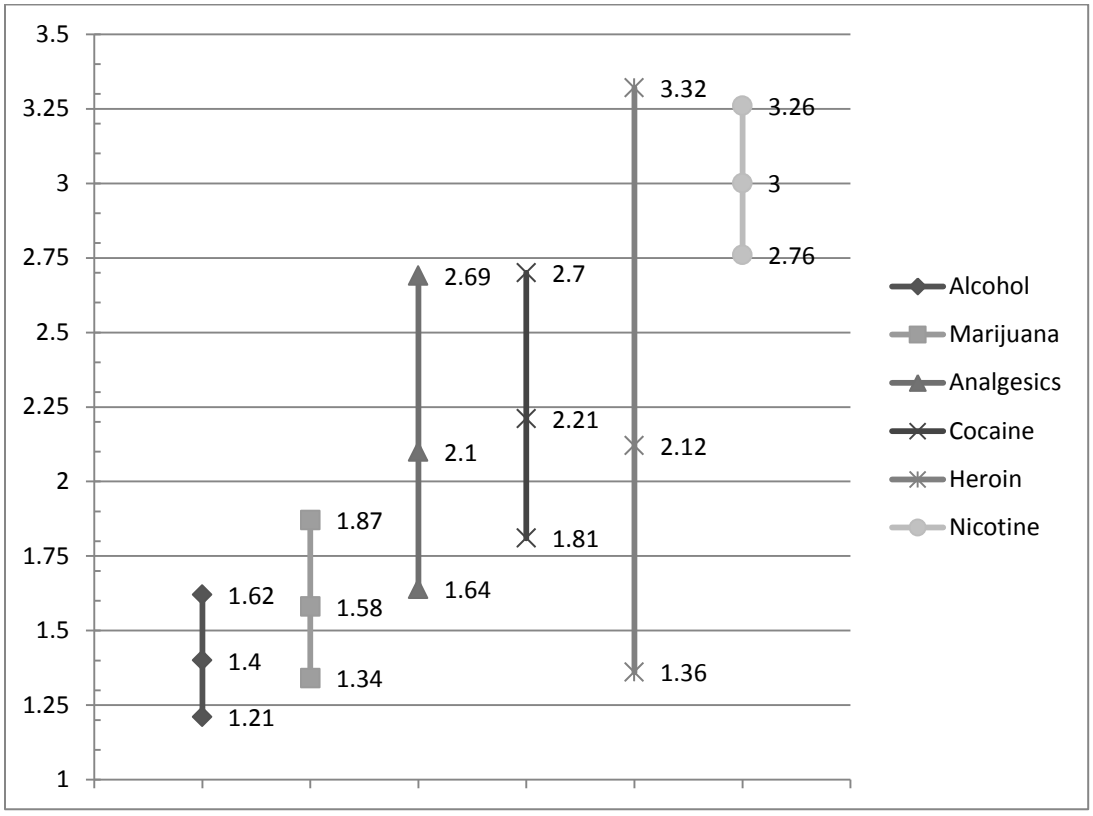

Figure 1. 95% confidence intervals of the predicted odds of fair or poor health by substance abuse variable.

Constructing the models for cocaine and heroin allows a ranking of each dependence variable by odds of fair or poor health. These OR's and their confidence intervals are shown, lowest to highest, in Figure 1. The odds ratios allow for a clear order, lowest to highest of alcohol, marijuana, analgesics, cocaine, heroin, and finally nicotine. However, most of the confidence intervals overlap. The analgesic abuse or dependence confidence intervals overlap with all variables except alcohol and cigarettes. Cocaine intervals overlap with all variables but alcohol. Heroin overlaps with all other variables. While each value is significant with regards to fair or poor health, wide confidence intervals render them statistically indistinguishable from each other.

Discussion

The development of rational, empirical measures for assessing drug harm ties directly into the practice and principles of public health. Current drug laws are largely based on moral panic and politics, and directly target 'dangerous classes' (Reinarman, 1994) not for health risk, but out of fear. These 'dangerous classes' in the US have historically been immigrants and minorities, for whom disparities in health already exist.

The World Health Organization (1978) has declared gross inequality like this to be politically and socially unacceptable, within and between countries. It follows that policies that target particular drugs based on which type of person is perceived to use those drugs, do not address these disparities, but they could exacerbate them.

A more scientific approach to assessing the impact of drug use on health that ties policy to social harm and health in particular would better meet the goals of public health. This assessment could make better use of existing data, provoke new research and inform policy makers on the effects of policy. Such a policy could reserve the strictest regulation for the most harmful drugs, thus saving resources which could then be allocated to treating or preventing the abuse of the most harmful substances.

Researchers in the UK and the Netherlands have created scales to measure harm from drug use so that a ranking could be created. The British research measured the opinions of experts (Nutt et al, 2007, Nutt et al, 2010) and drug users (Morgan, Muetzelfeldt, Muetzelfeldt, Nutt, & Curran, 2010) to construct two sub scales, "Harm to users" and "Harm to others. For the first study of experts (Nutt et al, 2007) and the study of users (Morgan et al, 2010) this research could inform or be compared to the "chronic harm" element of the "harms to user" scale, if the research were to be replicated for the US. The more recent study (Nutt et al, 2010) uses different categories, and it is more difficult to determine whether the results of this research are more

relevant to drug specific harm or drug related harm. The study by Van Amsterdam et al (2010) has fewer elements overall, 6 rather than .This research is most comparable to "mean physical harm" on this scale, as it is a combination of acute and chronic toxicity. For all of the above, it must be noted that this research covers the harm of dependence and abuse, not use overall. This means it could only be a part of any judgments made on overall harm to users by an expert panel. Finally, the large amount of variance renders any comparison of measurements from this research no more valid than any of the non-probability methods in the articles discussed above.

The concept of guiding policy by creating scales to measure drug related harm has been hotly debated in the scientific literature. One critique by Caulkins, Reuter and Coulson (2011) dismisses the whole exercise as "creating simplistic pseudo-scientific scores that tilt towards particular policies". The authors point out that the scale conflates individual and aggregate harms, ignores prevalence, and includes harms that may be caused by existing policy not the drugs themselves. For example, a drug may lead to lots of arrests for possession, but those only occur because it is illegal! Similarly, illegal manufacture often has adverse environmental effects that would be avoided by legal manufacture. Instead, the authors suggest a matrix based approach, with many univariate measures presented for each substance, with and without some policy change. Another set of authors (Rolles & Measham, 2011) offer a similar set of critiques, and also advocate disaggregating the scale. Rather than reject the idea entirely, they suggest it may be useful for educating the public, but that its policy relevance may be fading as enforcement is trending away from user level punishments. Nutt (2011) rebuts that the scales he helped develop are simple, clear and quite useful and that the development of something better would be a good outcome. Critics of the scale concept have some good points, but ultimately they have not produced anything better. The work of Nutt, et al. (2010) could be improved by something as simple as displaying a matrix of un-weighted scores or even the source data as Caulkins et al suggests. Removing value judgments from the process via mathematical modeling, or predicting

the effects of policy change would be very difficult. This research highlights the difficulty of modeling even one small aspect of drug related harm.

This analysis succeeds in creating a ranking of drug dependencies by the odds of having fair or poor health. However, the usefulness of this ranking is limited by the wide confidence intervals of some of the estimates, particularly heroin. The combination of estimates from weighted survey data and un-weighted case control studies also increases the difficulty of interpreting the results.

Given these limitations, three categories or breakpoints can be observed in the final data. First, nicotine is clearly separated from the other drugs in terms of risk and is by far the highest risk. It was expected that nicotine would be very high risk, and possibly the highest risk because how much chronic illness it causes. This finding is consistent with the literature tends to rate it very highly when it comes to individual harm or chronic toxicity.

Second, cocaine, heroin and analgesics group into a second category. Analgesics were not expected to be as close in risk to heroin and cocaine as they turned out to be. This expectation was because cocaine and heroin are street drugs, and the analgesics are diverted pharmaceuticals. The results are fairly consistent with the literature because cocaine, especially crack, heroin and the stronger synthetic opioids (methadone, buprenorphine) tend to have very high harm scores in all the studies cited.

Third, alcohol and marijuana form a lower risk group. That they are fairly close together with an OR of 1.4 for alcohol and 1.58 for marijuana is somewhat unexpected. Alcohol is rated as much more damaging in Nutt's work, but a key difference here is that dependence is being studied, not just use. Being dependent on or abusing any drug may influence how a respondent might feel about their health. Finally, the confidence intervals for both variables overlap extensively, so sampling error cannot be ruled out.

Also notable is the importance of chronic disease as a control variable, given that its magnitude was much greater than the other variables of interest. Some categories of other control variables had more impact than the drug abuse and dependence variables as well. Household income of less than $20,000, the top two age categories, and the lowest education category all had greater odds of fair or poor health than nicotine dependence and all the other substance abuse variables.

Limitations

This thesis uses cross-sectional data. Causal inference is not possible with this study design. The study population also excludes some significant groups of people. Mortality, incarceration, homelessness, and institutionalization are all frequently studied outcomes in the field of substance abuse, and all those groups are excluded. This may lead to an underestimation of the effects of some drugs. Due to the complexity of possible interactions and low prevalence of some drugs, interactions were not studied. The low prevalence of some drug dependencies may have also reduced the power of the models.

Odds ratios produced by this model were statistically significant, but large confidence intervals make comparisons between the variables of interests less useful for guiding policy. Finally, General Self-Reported Health is a good predictor of mortality, but has its own limitations as an outcome. It can be difficult to predict, and respondents may not always be aware of their true health status.

Conclusion

The results of this study are more useful as a guide for future research using multiple years of the NSDUH data set, than as part of a scale as in Nutt et al (2010) or Van Amsterdam et al(2010). Analyzing all the drug dependencies with a case-control method would make for more useful and easier to compare results. In addition, it could make it possible to analyze drugs that were removed from this analysis (tranquilizers, sedatives, inhalants) and possibly even allow for the analysis of subsets of drug dependence that may be interesting, like Adderall or OxyContin.

Ethical Considerations

This study uses secondary data that has been collected over 5 years. The data have also been computationally rendered anonymous to a very high degree. There are no potentially identifying variables in the data. There is no way to identify state, metropolitan area or household. There are also a number of measures to prevent data mining, most notably a deletion of a large number of cases from each year. In short, the risk of a subject being identified or otherwise harmed is very small.

Appendix 1

Variables Used in Main Model

Variable grouping	Variable name	Operational variable
Outcome	General Self-Reported Health	4 LEVEL HEALTH
Predictors		
Demographics	Insurance status	COVERED BY ANY HEALTH INSURANCE
	Age	AGE CATEGORY RECODE (5 LEVELS)
	Education	EDUCATION RECODE
	Marital Status	IMPUTATION REVISED MARITAL STATUS
	Gender	IMPUTATION REVISED GENDER
	Population Density	POPULATION DENSITY
	Race	ASIAN
		BLACK
		HISPANIC
Mental Illness	Anxiety Disorder	
	Depression	MENTAL ILLNESS
Chronic Diseases	Asthma	
	Cirrhosis of the Liver	
	Diabetes	
	Heart Disease	
	High Blood	CHRONIC DISEASES

	Pressure	
	Lung Cancer	
	Pancreatitis	
	Sleep Apnea	
	Stroke	
	Tinnitus	
Infectious Diseases	Bronchitis	
	Hepatitis	
	HIV	
	Pneumonia	
	Sexually Transmitted Diseases	
	Sinusitis	
	Tuberculosis	
	Ulcers	INFECTIOUS DISEASES
Substance Dependence	Nicotine Dependence	NICOTINE (CIG) DEPENDENCE IN PAST MONTH
	Alcohol Dependence	ALCOHOL DEPENDENCE IN THE PAST YEAR
	Opioid Dependence	PAIN RELIEVER DEPENDENCE IN THE PAST YEAR
	Cocaine Abuse or Dependence	COCAINE ABUSE OR DEPENDENCE – PAST YEAR
	Heroin Abuse or Dependence	HEROIN ABUSE OR DEPENDENCE – PAST YEAR
	Marijuana	MARIJUANA DEPENDENCE IN

	Dependence	THE PAST YEAR
Injection Drug Use	Lifetime Needle Use	NEEDLE USE (ANY DRUG) - EVER USED

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Curriculum Vitae

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EDUCATION

UNIVERSITY OF NEVADA, LAS VEGAS

Las Vegas, Nevada

2004

Bachelor of Arts in Sociology

UNIVERSITY OF NEVADA, LAS VEGAS

Las Vegas, Nevada

Candidate, May 2012

Master of Public Health concentrating in Epidemiology and Biostatistics.

PROFESSIONAL EXPERIENCE

2005 - Present

UNIVERSITY OF NEVADA, LAS VEGAS

Las Vegas, Nevada

SURVEY MANGAGER of the Cannon Survey Center. Responsible for all phases of survey research projects both internally and with external clients including State of Nevada and national clients. Duties include supervision of staff that numbers 30, survey and study design, development and implementation of interviewer training techniques, client development, advanced statistical analysis including multivariate and regression analysis and report writing, CATI and TELEform programming.

2002 - 2004

UNIVERSITY OF NEVADA, LAS VEGAS

Las Vegas, Nevada

INTERN, Cannon Center for Survey Research. Duties included Coding, analyzing and presenting data, streamlining report generation and various other tasks.

RESEARCH EXPERIENCE (PARTIAL LIST)

(Analysis and CATI administration)

Awareness of Safe Injection Practices

The Nevada Institute for Children's Research and Policy (NICRP) contracted with the UNLV Cannon Survey Center (CSC) to conduct an assessment with residents of Nevada to assess their knowledge of safe injection practices. In addition, data was gathered on how residents of Nevada prefer to receive information on health and wellness. I designed a combined cell and landline sampling methodology, oversaw the collection of survey data and designed the survey weight.

H1N1 Survey

On behalf of the Southern Nevada Health District (SNHD), the Cannon Survey Center conducted a study to assess the knowledge, attitudes, and perceptions of Clark County residents, regarding the Influenza A (H1N1) virus. Due to the fact that the SNHD had a large supply of the H1N1

vaccine and was experiencing a low demand for the vaccination, ascertaining the factors influencing the decision to obtain the vaccine were needed. I designed a combined cell and landline sampling methodology, oversaw the collection of survey data and designed the survey weight.

Portrait of Nevada Seniors, 2006 - 2010

The Cannon Survey Center at UNLV was commissioned in 2005 to conduct multiple surveys over several years on a variety of issues affecting Nevada seniors. Findings from the reports will provide empirical data on the growing senior (and about to be senior) citizen population. Throughout the multiple studies, I have designed Disproportionate and proportionate stratified samples, coded the survey, managed data collection and designed the final survey weight.

Community Health Survey

The goal of the needs assessment was to collect information from community members about their health and well-being, as well as to assess whether health care options in the Clark County area are meeting the needs of its residents. I designed the sampling methodology to collect data for each of three sets of zip codes. I also oversaw the collection of data and provided a final weight for analysis of the data.

Nevada Elected Officials Tobacco Control Survey

An initiative has been put forth to implement a comprehensive tobacco-free policy within Clark County and Nevada higher educational institutions. The Nevada Elected Officials Tobacco Control Survey was conducted to help gain an understanding of the factors that may influence future tobacco policy in Nevada. In order to understand the political factors that may influence tobacco policy, elected Nevada officials were asked to participate. The objective of the survey was to gather the viewpoints of Nevada officials' regarding tobacco control, such as: cigarette excise taxes, tobacco cessation coverage, and the Nevada Clean Indoor Air Act. I programmed the web based survey for the most recent iteration of this study.

Cool Share/ General Population

Nevada Energy, previous known as Nevada Power, contracted the Cannon Survey Center to conduct survey to assess the knowledge, attitudes, and perceptions of Nevada residents regarding the Cool Share Program, an electrical load management program and their opinions about in

home technology (i.e. General Population). I designed a sampling methodology using NV Energy Database information as a sampling frame. I also coded the surveys, and oversaw data collection.

Las Vegas Metropolitan Area Social Survey

Sociologists from the Department of Sociology at UNLV contracted the Cannon Survey Center to collect data for Las Vegas Metropolitan Area Social Survey (LVMASS) to identify the socio-spatial distribution of attitudes and attributes relevant to urban sustainability in the Las Vegas Valley. The project goal is to understand how Las Vegas residents think about urban sustainability issues across three dimensions: 1) natural environment; 2) community and quality of life; 3) economy. I oversaw the collection of data across mail, phone and household methodologies, and integrated the data into one file for analysis. I also coded the phone survey.

COMMITTEES AND ORGANIZATIONS

National and UNLV Chapter of Phi Kappa Phi

AWARDS RECEIVED

2010

PHI KAPPA PHI membership granted into the University of Nevada, Las Vegas chapter of the National Honor Society of Phi Kappa Phi.

PUBLICATIONS & PRESENTATIONS (Partial List)

2008

The Uninsured Near Elderly Nevadan: Co-written with Dr. Charles Moseley and Mr. Taylor Moseley and was printed in the *Journal of the Nevada Public Health Association,* Vol 4, Issue 1, 2007. The article focuses on the 55 -64 year Nevadan's access to health insurance and the ensuing problems that develop when access is limited or does not exist. The research completed as a part of the larger Portrait of Nevada's Seniors appears to be the first survey to investigate this topic.

SPECIAL SKILLS

Proficient in the use of Microsoft Word, Microsoft Excel, Microsoft Access, Microsoft Publisher., Microsoft Power point, TELEform, Sawtooth Win Cati and Sensus, Qualtrix, SPSS, R and SAS. Proficient in programming and management of a C.A.T.I environment and high rate optic scanner programming and management, hardware acquisition and call center infrastructure planning. Statistical Consulting proficiencies include study planning, survey sampling, survey data weighting and adjustment, parametric, non-parametric and multivariate analysis.

References furnished upon request.

TRAINING

Non-credit courses : AAPOR short courses cover Weighting Survey Data (Advanced), Addressed based Samples, And Cell Phone Surveying in the U.S.