Social Science & Medicine 120 (2014) 269–277

Contents lists available at ScienceDirect

Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed

State-level social capital and suicide mortality in the 50 U.S. states

Nathan Daniel Lucia Smith*, Ichiro Kawachi

Harvard University, USA

ARTICLE INFO

Article history:
Received 13 February 2014
Received in revised form
19 July 2014
Accepted 3 September 2014
Available online 16 September 2014

Keywords:
United States
Social capital
Suicide
Race
Ethnicity
Gender
Gun ownership
Population instability

ABSTRACT

This study investigated whether state levels of social capital are associated with rates of completed suicides in the fifty U.S. states. To do this we regressed state-level suicide rates on an index of social capital, along with other variables known to influence suicide rates such as gun ownership, income inequality, alcohol abuse and dependence, drug abuse and dependence, serious mental illness, unemployment, percent of population living in urban areas, poverty, population instability, and living in a "suicide belt" state. Suicide rates were aggregated from 1999 to 2002, and examined separately by sex and different race/ethnic groups. The results showed that White men and women in states with higher levels of social capital had significantly lower rates of suicide when controlling for the other influential variables. When we examined sub-dimensions of social capital, we found that community organizations (for White women) and group membership (for White men) were particularly strongly associated with lower suicide risk.

1. Introduction

Suicide is a major public health problem in the United States accounting for over 30,000 deaths, 650,000 emergency room visits, and the loss of almost twelve billion dollars in productivity each year. It is also the eleventh leading cause of death for all Americans and the third leading cause of death for American youth (Goldsmith et al., 2002). It is projected that suicide rates will rise into the foreseeable future (Mathers and Loncar, 2006) with some of this increase stemming from the dramatic rise in suicidality among United States veterans returning from foreign wars (Bryan et al., 2012). Reduction in suicide related injury and mortality is a stated goal of both the World Health Organization (World Health Organization, 1996) and the United States government (Satcher, 1999).

One of the earliest empirical researchers to investigate the origins of suicide was Emile Durkheim who demonstrated that suicide was tractable to systematic quantitative analysis, and that behind population suicide rates, it is possible to discern a patterned regularity conforming to distinct social determinants. Durkheim laid out a series of findings about suicide rates based upon a variety of social factors. He suggested that suicide rates are higher for Protestants than for Catholics or Jews, men as compared to women, soldiers as compared to civilians, and single people as compared to married people (Durkheim, 1897).

Following Durkheim, there have been many studies linking a variety of social factors to suicide rates (Wray et al., 2011). From these studies a number of strong correlates have emerged. Perhaps the strongest correlate to suicide is access to an effective means (e.g. coal gas or firearms) with studies showing that restrictions of the means can greatly reduce suicides, for example the restriction of coal gas in Britain (N. Kreitman, 1976) or gun control laws in the United States (Miller and Hemenway, 2008).

Roughly 90 percent of suicides occur in people with diagnosed mental disorders (Goldsmith et al., 2002), and a large study of trends in the United States found that having a DSM diagnosable mental disorder was also significantly related to suicidal ideation and attempts (Kessler and Borges, 1999). In addition to the general correlation between mental disorder and suicide, alcohol and other drug use seem to play a strong role in suicidal behaviors. In fact, alcohol restrictions have been found to decrease suicide rates (Wasserman and Värnik, 1998) while alcohol use and abuse and drug use and abuse correlate positively with suicide rates (Wilcox et al., 2004).

One problem of note that is common to many etiological studies on suicide (including this one) is a lack of data for non-White races. It has been suggested that suicides among racial minorities (particularly Blacks) and women have been systematically under-

* Corresponding author. Permanent address: 30 Orne St., Salem, MA 01970, USA.
E-mail address: nathan.rex.smith@gmail.com (N.D.L. Smith).

http://dx.doi.org/10.1016/j.socscimed.2014.09.007
0277-9536/

reported for many years (Rockett et al., 2010). These very low rates of suicide among Blacks are particularly questionable considering that Blacks suffer from higher rates of depression than Whites and are less likely to receive treatment for their mental health disorders than Whites (Rockett et al., 2010). The under-reporting of suicide among Blacks will result in misclassification of our outcome. However, we do not have reason to believe that this misclassification will be differential with respect to our exposure variable of interest (i.e. state-level social capital), and hence any bias introduced by the misclassification of the outcome is likely to be in the conservative direction, i.e. toward the null value.

In addition to psychological factors, several macro-economic factors have been linked to suicide. Higher unemployment rates have a long history of correlation with higher suicide rates; examples can be found in Australia (Morrell et al., 1993), the United Kingdom (Norman Kreitman and Platt, 1984), and New Zealand (Blakely et al., 2003). In addition, poverty is often included in studies of suicidality, and there has been a demonstrated relationship of increased suicide occurring along with higher poverty rates (Rehkopf and Buka, 2006). The gini coefficient, a measure of income inequality, has had a more inconsistent relationship with suicide. Higher inequality sometimes correlated with higher rates of suicide (Sapag et al., 2008), sometimes correlated with lower rates of suicide (Lester, 1996), and sometimes had no correlation at all (Andrés, 2005).

A final factor linked to suicide rates is geography, a subject discussed by several sociological researchers in the past decade (Baller and Richardson, 2002). One notable example of this relationship is the impact that population stability, that is the rate of people who are entering or leaving an area, has on suicide. One study found that (lack of) population stability was a very strong predictor of completed suicide and hypothesized that the reason may be that residential instability breaks down some aspects of social connection (Barkan et al., 2013). Another example of this geographic effect is that suicide rates in rural areas are consistently higher than those in urban areas, with one notable study finding that men in rural areas where twice as likely as men in urban areas to die from suicide (Singh and Siahpush, 2002). Another important finding is that the western mountain states in the United States have a much higher rate of suicide than other regions of the country – the so-called "suicide Belt" – where access to firearms, serious mental illness, and rurality do not totally account for the excess (Harper et al., 2008).

One factor in the social environment, which has not been analyzed extensively, is the stock of "social capital" of a locality. Social capital, defined generally as the collective value of social networks as well as norms of mutual aid and reciprocity (Putnam, 2001), can influence behavior in a number of ways including the provision of social support to isolated individuals and strengthening the sense of community solidarity or social cohesion. Social capital can be measured as one broad concept, as was done by Robert Putnam in his foundational book *Bowling Alone* (Putnam, 2001), or broken down into smaller, theoretically distinct parts. Distinctions drawn in research on social capital include Bonding versus Bridging social capital, connections made with those similar to oneself in social identity versus connections made with those different from oneself in social identity, respectively (Putnam, 2001). In addition to these there is also linking social capital, the relationships between individuals and the formal or institutionalized powers with whom they interact (Szreter and Woolcock, 2004). A further jump forward in theoretical understanding has come from the understanding that social capital can be measured as both an individual-level construct (e.g. perceptions of the trustworthiness of others in the community) and as a group-level construct by aggregating individual perceptions to the community level (Kawachi et al., 2004).

Over the past 15 years, a variety of studies have demonstrated the connection between lower social capital and adverse health outcomes at a variety of measurement levels (individual, communities, states) in populations throughout the world (Kawachi et al., 2004). Social capital has been shown to positively impact general health outcomes, such as mortality (Kawachi et al., 1997), as well as self-rated perceptions of health (Borges et al., 2010; Hurtado et al., 2011; Sapag et al., 2008). Social capital has also been shown to influence specific health outcomes such as oral health (Furuta et al., 2012) and obesity (Kim et al., 2006). In addition to neighborhood levels of social capital, higher levels of social capital in the workplace have been shown to improve a variety of health outcomes (Clays and De Clercq, 2012; Fujino et al., 2013; Oksanen et al., 2011, 2012). Importantly, social capital has also been shown to influence variables that could drive suicide rates such as firearm ownership rates (Hemenway et al., 2001), firearm violent crime (Kennedy et al., 1998), and mental health (Hamano et al., 2010).

While there are several studies that have shown the connection between social-connections and suicide prevention (for example, Borowsky et al., 2001; Marion and Range, 2003; Meadows et al., 2005), and others have looked at certain measures of social connection and suicide (Baller and Richardson, 2002; Barkan et al., 2013), there are only a few studies that have explicitly examined the construct of social capital and suicide over large geographic areas. Fewer studies still have controlled for the many known correlates of suicide. One study from Europe found that higher levels of social capital predicted lower rates of suicide among 11 European countries (Kelly et al., 2009) while another found that measures of social capital were inversely correlated with suicide (that is, as social capital went up suicide rates went down) when controlling for a number of confounders associated with suicide rates (Helliwell, 2007). One notable study from England found that higher rates of social capital were significantly related to lower rates of suicide and that adding social capital variables to geographic models significantly improved the models' ability to predict suicide (Congdon, 2012).

In the United States, a study that followed military veterans who had been discharged from inpatient care at VA hospitals found that suicide rates were lower in states that had higher levels of social capital, (in this case operationalized as Robert Putnam's all-inclusive index from *Bowling Alone*). The protection provided by the state's social capital was significant for both firearm and non-firearm suicides (Desai et al., 2008). Another study that used Robert Putnam's social capital variable found a significant relationship between *lower* rates of social capital and lower suicide rates (Flavin and Radcliff, 2009). However, this study focused on economic measures and controlled for some economic influencers of suicide rates (like unemployment) while ignoring other correlates like gun ownership, alcohol abuse/dependence, and serious mental illness.

The present study addresses gaps in suicide research by examining if higher levels of social capital in the fifty U.S. states are associated with lower suicide rates in those states when controlling for other economic and social variables that are known to influence suicide rates (e.g. gun ownership or living in a U.S. "suicide belt" state). In addition, we examined the specific sub-dimensions of Putnam's overall social capital index to check whether the associations with suicide are driven by any particular dimension. Finally, this study provides information on how social capital variables interact with the other ecological variables that influence suicide rates.

2. Data sets and methods

This study is based on secondary analysis of data collected previously by other sources including the Center for Disease Control and Robert Putnam, particularly his book *Bowling Alone* (Putnam, 2001). The subjects are residents of the 50 United States between 1975 and 2001. State-level suicide rates were calculated per 100,000 population and stratified by race (White, Black, American Indian/Alaska Native, Asian/Pacific Islander, and Other), sex, and/or Hispanic ethnicity. All rates were age-standardized using the year 2000 United States population as the standard.

2.1. Variables

2.1.1. Suicide rates by state, 1999–2002

The data on suicide rates was collected from the Center for Disease Control and Prevention (CDC)'s Web-based Injury Statistics Query and Reporting System (WISQARS) (Centers for Disease Control and Prevention and National Center for Injury Prevention and Control, 2013) and stratified by race, sex, and Hispanic ethnicity. Suicide rates can vary greatly from year to year; therefore data from 1999 to 2002 were aggregated for analysis. All state suicide data was age-standardized using the year 2000 United States population as the standard. Suicides were defined as all deaths that were given an International Classification of Disease (ICD) code where the listed "intent" was "suicide." This includes ICD codes X60-X84, Y87.0, and U03.

2.1.2. Gini coefficient

Our measure of state-level income inequality was the Gini coefficient. The gini coefficient is a summary measure of income distribution (Kawachi et al., 2002). Gini is calculated by finding half of the relative mean difference (that is the average absolute difference) between two items selected randomly from a population (Kawachi et al., 2002). It has a theoretical range from 0 (perfect equality of incomes, or all residents having the same income) to 1.0 (perfect inequality of incomes, such as one individual having a large income and no other individuals having any income at all). The gini coefficient for the 50 United States during the year 1999 was collected from the United States Census Bureau's website (US Census Bureau, n.d.).

2.1.3. Gun ownership

Gun ownership data was obtained from the Behavioral Risk Factor Surveillance System (BRFSS) 2001. The BRFSS is an annual telephone survey of persons aged 18 and older conducted by state health departments to estimate national and state prevalence of various health risk factors (Remington et al., 1988). The BRFSS posed the question, "Are any firearms now kept in or around your home? Include those kept in a garage, outdoor storage area, car, truck, or other motor vehicle." The percent of individuals answering "Yes" for their household in each state provided the percentage of statewide household gun ownership. There were 201,881 individuals who answered the question about gun ownership ranging from 1859 in the District of Columbia to 8474 in Massachusetts. This data was obtained from the North Carolina State Center for Health Statistics website (North Carolina State Center for Health Statistics, 2002).

2.1.4. Alcohol abuse/dependence

State specific rates of alcohol abuse and dependence for 2000–2001 were obtained from the *2001 State Estimates of Substance Use & Serious Mental Illness* available at the Substance Abuse and Mental Health Services Administration (SAMHSA)'s website (Wright, 2003) Full information available in Appendix Table A2.

2.1.5. Drug abuse/dependence

State specific rates of drug abuse and dependence for 2000–2001 were obtained from the *2001 State Estimates of Substance Use & Serious Mental Illness* available at SAMHSA's website (Wright, 2003). Full information available in Appendix Table A2.

2.1.6. Serious mental illness

State specific rates of serious mental illness for 2001 were obtained from the *2001 State Estimates of Substance Use & Serious Mental Illness* available at SAMHSA's website (Wright, 2003). Full information available in Appendix Table A2.

2.1.7. Poverty rate

The poverty rate for the fifty states in 1999–2000 was obtained from the United States Census Bureau's publication *Poverty in the United States: 2000*. Poverty rate is the portion of households living below the poverty threshold. For example, in the year 2000, a family of four with two small children making less than $17,463 would be living below the poverty level (Dalaker, 2001).

2.1.8. Unemployment rate

Unemployment data by state for the year 2001 was obtained from the Bureau of Labor Statistics (BLS) website. Unemployment rate is taken from the *Current Population Survey* of about 50,000 households conducted by the BLS. The data was collected for all 50 states and the District of Columbia (Bureau of Labor Statistics, 2009).

2.1.9. Urbanization

State urbanization data was calculated by dividing the percent of Americans living in an urban area (an area with 50,000 or more people) during the 2000 census by the total number of people

Table 1
Completed suicides in the United States between 1999 and 2002.

Demographic group	All suicides		Men		Women	
	Number of suicides (percent of total)	Age adj. rate	Number of suicides (percent of total)	Age adj. rate	Number of suicides (percent of total)	Age adj. rate
US suicides	120,826 (100%)	10.65	97,157 (80.4%)	18.06	23,669 (19.6%)	4.06
White	109,216 (90.4%)	11.6	87,777 (72.6%)	19.48	21,439 (17.7%)	4.48
Black	7808 (6.5%)	5.47	6547 (5.4%)	9.98	1261 (1%)	1.68
Am Indian/AK Native	1233 (1%)	10.08	987 (0.8%)	16.43	246 (0.2%)	3.92
Asian/Pac Islander	2569 (2.1%)	5.52	1846 (1.5%)	8.41	723 (0.6%)	3
Other (Combined)	3802 (3.1%)	6.43	2833 (2.3%)	10.02	969 (0.8%)	3.2
Non-Hispanic	112,995 (93.5%)	11.2	90,516 (74.9%)	18.99	22,479 (18.6%)	4.31
Hispanic	7286 (6%)	5.8	6182 (5.1%)	10.22	1104 (0.9%)	1.75
Non-Hispanic White	101,654 (84.1%)	12.35	81,364 (67.3%)	20.7	20,290 (16.8%)	4.82

Table 2
Pearson correlation coefficient matrix for state-level independent variables.

	1	2	3	4	5	6	7	8	9	10	11
1 Social capital	1	−.661[a]	.129	.615[a]	−.097	−.123	−.410[a]	−.471[a]	−.223	.098	.111
2 Gini	–	1	−.393[a]	−.066	.181	.048	.627[a]	.375[a]	.318[b]	−.040	−.305[b]
3 Gun Ownership		–	1	−.078	−.255	.487[a]	.175	.092	−.795[a]	−.034	.281[b]
4 Alcohol %			–	1	.206	−.154	.054	.036	.094	.311[b]	.205
5Drug %				–	1	.075	.198	.316[b]	.244	.244	.313[b]
6 Mental illness %					–	1	.352[b]	.148	−.372[a]	−.130	.072
7 Poverty rate						–	1	.603[a]	−.116	.032	.094
8 Unemployment %							–	1	.096	.195	.283[b]
9 Urbanized %								–	1	.134	.074
10 Population Instability									–	1	.575[a]
11 Suicide Belt										–	1

Social Capital is rated according to Putnam's combined index. Alcohol %, Drug %, and Mental illness represent percent of individuals in the state with Alcohol Abuse or Dependence, Drug Abuse or Dependence, and Serious Mental Illness respectively. Unemployment % and Urbanized % are state levels of Unemployment and Urbanized percent of population respectively. Population instability is sum of state inmigration and outmigration rates. Suicide Belt is the dummy variable for the 9 so-called "Suicide Belt" states.
[a] Correlation is significant at the .01 level (2-tailed).
[b] Correlation is significant at the .05 level (2-tailed).

living in that state. The data was obtained using the FactFinder2 tool on the United States Census Bureau (U.S. Census Bureau, n.d.).

2.1.10. Population instability

Previous suicide research has shown that population instability in an area is a risk factor for higher levels of suicide (Barkan et al., 2013). For the purposes of this study population instability was defined as the combined rates of state inmigration and outmigration collected from the 2000 national census (Perry, 2003).

2.1.11. Suicide belt states

Suicide rates in the American West are much higher than most the rest of the United States, leading to increased personal and public health burdens on residents of these states (Steljes et al., 2005). This area has come to be known as the American "Suicide Belt" (sometimes called the "Western Suicide Belt") and runs north to south roughly from New Mexico and Arizona to Montana and Idaho. Hypothesized reasons for these elevated rates range from social isolation to childhood trauma (Harper et al., 2008). The elevated suicide rates in these states must be accounted for in the regression and thus a dummy variable made up of the nine Suicide Belt states (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, and Wyoming) was created and added to all regression models.

2.1.12. Social capital

Social Capital data was collected by Robert Putnam and presented in his book, *Bowling Alone* (Putnam, 2001). The data were collected from various sources between 1975 and 1998, including: the Roper Social and Political trends Archive, the DBB Needham Life Style Archive and the General Social Survey. All Social Capital data was obtained from Robert Putnam's website under the "Research" tab. Putnam's work provides a general Social Capital score for each state made up of fourteen individual measures of social capital (Putnam, 2013). The individual measures of Social Capital, as well as their origins and dates collected, as reported in *Bowling Alone*, are listed below. Full information is available in Appendix Table A2.

2.1.13. Statistical methods

For all analyses, statistical significance was assessed at a level of .05 (2-tailed). States were excluded from any analysis they did not have complete data for. Further, any state measure that had fewer than 10 suicide deaths in any given year was excluded from analysis per the WISQARS written policy on variable inclusion. Statistical analyses were not performed on any population sub-groups that did not have more than 35 data points (full data on states included available in Appendix Table A1). For this reason there is no regression data presented for Black women (29 qualifying data points), neither is there data for American Indian/Alaska Natives of either sex, nor for Asian/Pacific Islanders of either sex, nor for those identifying as their race as "Other" of either sex.

To examine the correlations among the state-level variables and the outcome we created a correlation matrix using a bivariate two-tailed Pearson correlation.

To examine the relationship between the independent variables and state suicide rates we performed two multiple linear regressions for each demographic group. The first regression contained all of the independent variables and the second stepwise regression used entry and removal *F* probabilities of .05 and .10 respectively.

We also performed a factor analysis of Putnam's Social Capital variables using a varimax rotation. Additional factor analyses with fixed factors were conducted to produce solutions for each number of factors between two and six.

3. Results

Table 1 shows the breakdown of the 120,826 completed suicides in America between 1999 and 2002 by race, gender, and Hispanic ethnicity. Of these over 90% were by Whites and almost three out of four (72.6%) were by White men. In general, men have a higher rate than women (18.06–4.06) and Whites have a much higher rate than Blacks, Hispanics, and Asian/Pacific Islanders.

Table 2 is a correlation matrix that shows the relationship of each independent variable to each other independent variable. There are several significant correlations that were expected based on previous reports, such as higher social capital correlating with significantly lower gini coefficient (Kawachi et al., 1997), higher rates of population instability correlating with suicide belt states, and lower poverty rates correlating with lower unemployment rates, as well as other unexpected correlations such as higher social capital correlating with higher alcohol abuse rates. Higher income inequality is also correlated with significantly higher levels of poverty, unemployment and urbanization, as well as significantly lower gun ownership and membership in the "suicide belt" states. We found a notable strong positive correlation between serious mental illness and gun ownership ($r = .487$, $p < .000$).

Table 3 shows the multiple linear regression analyses and stepwise regression analyses of the independent variables on the statewide suicide rate of men. Living in a suicide belt state is significantly related to higher suicide rates for all groups and population stability is significantly related to higher suicide rates

Table 3
Regression and stepwise regression of statewide variables on completed suicides.

Variable	All men				White men				Non-Hispanic White men				Black men			
	Regression		Stepwise		Regression		Stepwise		Regression		Stepwise		Regression		Stepwise	
	β	P	β	P	β	P	β	P	β	P	β	P	β	P	β	P
Social capital	−.105	.439			−.286	.030[a]	−.274	.000[a]	−.291	.040[a]	−.242	.002[a]	−.257	.253		
Gini coefficient	−.158	.208			−.179	.135			−.207	.110			−.282	.175		
Gun ownership	.403	.008[a]	.443	.000[a]	.507	.001[a]	.598	.000[a]	.472	.003[a]	.363	.000[a]	.313	.394		
Alcohol abuse/Dep.	.022	.827			.009	.927			−.013	.904			.089	.616		
Drug abuse/Dep.	.063	.438			.123	.114	.152	.025[a]	.133	.115			−.166	.288		
Serious mental illness	.024	.755			.001	.989			−.033	.669			.309	.031[a]	.309	.008[a]
Poverty rate	.196	.155	.175	.000[a]	.227	.084			.319	.027[a]	.208	.013	−.119	.619		
Unemployment rate	.021	.835			−.009	.927			−.015	.883			.142	.411		
Urbanization	−.031	.818			.032	.799			.136	.322			.286	.434		
Population instability	.362	.001[a]	.404	.000[a]	.393	.000[a]	.373	.000[a]	.421	.000[a]	.442	.000[a]	−.123	.519		
Suicide belt states	.298	.021[a]	.321	.001[a]	.188	.115	.263	.003[a]	.167	.193	.297	.003[a]	.730	.001[a]	.695	.000[a]
Adjusted *R*-squared	.826		.841		.844		.849		.818		.821		.543		.538	

All reported Beta scores are standardized. Stepwise regression uses entry and exit cutoffs of .05 and .10 respectively.
[a] Correlations are significant at .05.

Table 4
Regression and stepwise regression of statewide variables on completed suicides.

Variable	All women				White women				Non-Hispanic White women			
	Regression		Stepwise		Regression		Stepwise		Regression		Stepwise	
	β	P	β	P	β	P	β	P	β	P	β	P
Social capital	−.167	.292	−.162	.029[a]	−.426	.009[a]			−.390	.031[a]	−.331	.001[a]
Gini coefficient	−.217	.142			−.225	.126			−.291	.079		
Gun ownership	.238	.162	.012[a]	.012	.309	.071			.144	.445		
Alcohol abuse/Dep.	−.049	.679			−.067	.568	−.295	.001[a]	−.078	.558		
Drug abuse/Dep.	.026	.787			.050	.600			.046	.661		
Serious mental illness	.104	.246	.139	.088	.079	.371			.001	.991		
Poverty rate	.280	.084			.365	.026[a]	.397	.000[a]	.554	.003[a]	.282	.004[a]
Unemployment rate	−.099	.395			−.182	.120			−.171	.189		
Urbanization	.152	.333			.204	.196			.236	.182		
Population instability	.410	.002[a]	.406	.000[a]	.434	.001[a]	.581	.000[a]	.395	.006[a]	.434	.000[a]
Suicide belt states	.352	.020[a]	.459	.000[a]	.213	.147	.236	.047[a]	.223	.175	.336	.007[a]
Adjusted *R*-squared	.762		.774		.764		.711		.704		.707	

All reported Beta scores are standardized. Stepwise regression uses entry and exit cutoffs of .05 and .10 respectively.
[a] Correlations are significant at .05.

for all groups other than Black men. Likewise, higher gun ownership is significantly related to higher rates of suicide for all men, White men, non-Hispanic White men, and all women.

Lower social capital is significantly related to higher rates of suicide for White men and non-Hispanic White men, White women, and non-Hispanic White women. In addition to living in a

Table 5
The regression of the 3 factors of social capital and the other independent variables on statewide suicide rate.

Variable	Adjusted suicide: White men			
	Regression		Stepwise	
	β	P	β	P
SC factor 1	−.190	.137		
SC factor 2	−.164	.214		
SC factor 3	−.116	.261	−.256	.001[a]
Gini coefficient	−.409	.007[a]		
Gun ownership	.592	.002[a]	.639	.000[a]
Alcohol abuse/Dep.	.022	.845		
Drug abuse/Dep.	.174	.055		
Serious mental illness	−.003	.972		
Poverty rate	.222	.151		
Unemployment rate	−.102	.348		
Urbanization	.080	.613		
Population instability	.169	.083		
Suicide belt states	.310	.018[a]	.535	.000[a]
Adjusted *R*-squared	.799		.766	

[a] Represents significance at .05.

Table 6
The regression of the 3 factors of social capital and the other independent variables on statewide suicide rate.

Variable	Adjusted suicide: White women			
	Regression		Stepwise	
	β	P	β	P
SC factor 1	.077	.609		
SC factor 2	−.377	.012[a]	−.495	.000[a]
SC factor 3	−.094	.392		
Gini coefficient	−.166	.281	−.345	.002[a]
Gun ownership	.231	.216		
Alcohol abuse/Dep.	−.054	.648		
Drug abuse/Dep.	.003	.978		
Serious mental illness	.031	.734		
Poverty rate	.383	.022[a]	.452	.000[a]
Unemployment rate	−.089	.458		
Urbanization	.150	.370		
Population instability	.518	.000[a]	.612	.000[a]
Suicide belt states	.141	.342		
Adjusted *R*-squared	.765		.781	

[a] Represents significance at .05.

Table A1
Number of states with enough suicide data for inclusion in regression models, 1999–2002.

	Number of states	
	Male	Female
US suicides	48	48
White	48	48
Black	39	28
Am Indian/AK Native	18	8
Asian/Pac Islander	25	15
Other (Combined)	35	25
Non-Hispanic	48	48
Hispanic	39	17
Non-Hispanic White	48	48

suicide belt state, suicide among Black men is significantly related to higher rates of serious mental illness.

Table 4 shows the multiple linear regression analyses and stepwise regression analyses of the independent variables on the statewide suicide rate of women. Higher rates of population instability is related to higher rates of suicide for all groups while living in a suicide belt state is significantly related to higher suicide rates for all women and non-Hispanic White women. In addition, poverty rate was associated with suicide for White women and non-Hispanic White women.

3.1. Components of social capital

Table 5 shows the regression and stepwise regression models for six *a priori* factors of social capital we identified, as well as the other independent variables, regressed against the statewide suicide rate for White men. Some of the *a priori* factors were selected based on theoretically validated concepts, such as the combining of beliefs about trust and beliefs about honesty into a single factor called "cognitive social capital," while others were simply grouped because they seemed to go together, such as visiting friends and entertaining at home being combined into a "friendship" factor. The other four *a priori* factors are club meetings attended and being a club officer being combined into the "clubs" factor; participating in community projects and times volunteered being combined into "service"; number of civic organization and number of 501c3 corporations (non-profits) being combined into "community organizations"; and voting turnout rates, attending a town meeting and group membership were combined into "civic engagement".

The regression on Table 5 shows that none of the six *a priori* factors were significantly associated with statewide suicide rates for White men, though living in a suicide belt state and gun ownership rates were. In the stepwise regression living in a suicide belt state, high rates of gun ownership and low rates for the "clubs" factor were all included in the model ($R^2 = .827$).

Table 6 shows the regression and stepwise regression for the *a priori* factors as well as the other independent variables this time regressed on statewide suicide rates for White women. The regression shows that none of the 6 *a priori* factors were significantly associated with statewide suicide rates for White women, though the association with population instability was significant. In the stepwise regression living in a suicide belt state, population instability, high rates of gun ownership and low rates for the "community organizations" factor were all included in the model ($R^2 = .767$).

4. Discussion

The results of this U. S. study suggest that higher levels of social capital at the state level are associated with lower suicide rates in white men and women. Adjusting for a number of potential confounding variables attenuated but did not completely explain away the associations. By contrast, there was no evidence that social capital was associated with suicide rates in Black men.

Income inequality has been previously suggested to adversely affect population health in several ways including all causes of mortality (Kawachi et al., 1997), maternal health (Kahn et al., 2000), and firearm violent crime against others (Kennedy et al., 1998). There is a strong inverse relationship between state-level income inequality and social capital (Kawachi et al., 1997; Putnam, 2001). Indeed, it has been suggested that the mechanism linking income inequality and worse population health status is partly mediated by erosion of social cohesion (Kawachi et al., 1997). Curiously, however, previous studies have not found an association between state-level income inequality and suicide rates, though income inequality is strongly correlated with homicide rates (Kennedy et al., 1998).

The study has several strengths, including the large sample and the variables tested. Most of the variables examined come from large data sets that include very large, diverse and representative samples. The study also benefits from the use of the fourteen social capital variables that allowed the examination of aspects of Social capital identified by both a statistical and *a priori* theoretical basis. The inclusion of the other independent variables also strengthens the study by accounting for several factors that have been shown to significantly affect suicide rates and other factors that may co-vary with Social capital.

The study is limited by several factors including issues common to all ecological studies, issues of state inclusion and how suicide data is collected. All ecological studies are subject to the "ecological fallacy", the idea that research findings about groups of individuals apply to the individuals that make up those groups in the same way. In this way group level studies cannot differentiate between contextual and compositional effect. In regards to this specific study, probably the most glaring omission is data for non-White races of both genders. In fact, only Black men had enough suicide data to be included in the regression analysis. This lack of data meant we were unable to include Black women, all Hispanics, all Asian/Pacific Islanders, all Native Americans/Alaskan Natives, and all people identifying as their race as "Other" in the analysis.

The use of death certificate records for classifying suicide, while common in ecological studies of suicide, also introduces some issues that limit the study. There is some evidence that suicides among racial minorities (particularly Blacks) have been systematically under-reported for many years (Rockett et al., 2010). The very low rates of suicide among Blacks are somewhat questionable considering that Blacks suffer from higher rates of depression than Whites and are less likely to receive treatment for their mental health disorders than Whites (Rockett et al., 2010). It is possible that the rates of suicide for women are under-reported because women are more likely to use less violent means than men, and thus their suicides might be easier to classify as accidental or of unknown intent (Rockett et al., 2010). The systematic under-reporting of suicides by racial and ethnic minorities may contribute to the lack of data available for these groups and thus to their exclusion from the majority of this study. Also, if suicide in women is being widely misclassified, it is possible that this misclassification is not occurring randomly (perhaps death certificates in states with high social capital are consistently less likely to be declared suicides for reasons of social desirability), and thus the results of our study may be affected.

The study opens the door for further research along several lines. First, the significant association between social capital and suicide rate over and above the significant effects of gun ownership, population instability, poverty rates, and living in a suicide belt state should be examined in both smaller (e.g. county level or city

Table A2
Information on alcohol, drugs, mental illness, and Putnam's social capital: data, questions, and samples.

Variable	Question wording	Survey	Sample	Response rate	Interview type
Alcohol	"During the past 12 months, was there a month or more when you spent a lot of your time getting or drinking alcohol?", "During the past 12 months, was there a month or more when you spent a lot of time getting over the effects of the alcohol you drank?", etc.	National Household Survey on Drug Abuse	68929	56.75 −79.55%	ACASI
Drugs	"During the past 12 months, was there a month or more when you spent a lot of your time getting or using marijuana or hashish?", "During the past 12 months, was there a month or more when you spent a lot of time getting over the effects of the cocaine you used?", etc.	National Household Survey on Drug Abuse	68929	56.75 −79.55%	ACASI
Mental illness	"During the past 12 months, did you have a sudden attack of fear when out of the blue you became very frightened, anxious, or uneasy?", "During the past 12 months, did you have a period of time lasting two weeks or longer when most of the time you felt sad, empty, or depressed?", etc.	National Household Survey on Drug Abuse	68929	56.75 −79.55%	ACASI
Club meetings	Attended club meetings: frequency last year	DBB Needham Life Style archive	87000	7–8%	Mail
Comm. projects	Worked on a community project: frequency last year	DBB Needham Life Style archive	87000	7–8%	Mail
Entertained	Entertained at home: frequency last year	DBB Needham Life Style archive	87000	7–8%	Mail
Volunteer	Did volunteer work: frequency last year	DBB Needham Life Style archive	87000	7–8%	Mail
Visiting friends	"I spend a lot of time visiting friends"	DBB Needham Life Style archive	87000	7–8%	Mail
Honest	Agree "Most people are honest"	DBB Needham Life Style archive	87000	7–8%	Mail
Committee service	"Which, if any, of these things have you done in the past year? -Served on a committee of some local organization."	Roper Social and Political Trends	410116	N.A.	Face to face.
Club officer	"Which, if any, of these things have you done in the past year? -Served as an officer of some local organization."	Roper Social and Political Trends	410116	N.A.	Face to face.
Meetings attended	"Which, if any, of these things have you done in the past year? -Attended a public meeting on town or school affairs."	Roper Social and Political Trends	410116	N.A.	Face to face.
501c3 Orgs.	501c3 Charitable Organizations per 1000 population	Non-Profit Almanac	–	–	–
Group	memberships Organizational Memberships per capita	General Social Survey	54000	70%	Face to face.
Trust	"Most people can be trusted" vs. "You can't be too careful"	General Social Survey	54000	70%	Face to face.
Civic orgs.	Civic and social organizations per 100,000 population	Department of Commerce	–	–	–
Voting %	Calculated by dividing the number of voters who voted by the number of registered voters.	US Census Bureau	–	–	–

Variables are: Alcohol use and abuse, drug use and abuse, serious mental illness, attended club meetings, worked on a community project, entertained at home, did volunteer work, visited friends, believe most people are honest, served on a committee for a local organization, served as an officer for a local organization, attended club meetings, 501c3 Charitable Organizations per 1000 population, organizational memberships per capita, believe most people can be trusted, civic and social organizations per 100,000 population, voting percentage.

block) and larger (e.g. multi-state regions or country level) geographic regions. Second, there is a tremendous opportunity for research on social capital, suicide, and racial and ethnic minorities. This study was only able to examine White men and women and Black men, and further study of all other racial and ethnic groups of both genders is needed to get a more complete picture of how social capital interacts with suicide. Third, this study provides some evidence that factors of social capital may have particular influence over suicide in men (club participation) and women (informal relationships). Further inquiry into these potential relationships should be undertaken. Finally, this study demonstrates that social capital can have an effect on statewide rates of violent outcomes and further research should be done to see if other variables (e.g. homicide or self-injury) are also associated with rates of statewide social capital.

5. Conclusion

This study found that White men and women in states with higher levels of social capital had significantly lower rates of suicide when controlling for other influential variables such as gini coefficient, gun ownership, population instability, and residing in the

"suicide belt" states. Further study should be done to corroborate these findings and extend the research to include racial and ethnic minorities and women, as well as smaller geographic groupings.

References

Andrés, A.R., 2005. Income inequality, unemployment, and suicide: a panel data analysis of 15 European countries. Appl. Econ. 37 (4), 439–451. http://dx.doi.org/10.1080/0003684042000295304.

Baller, R.D., Richardson, K.K., 2002. Social integration, imitation, and the geographic patterning of suicide. Am. Sociol. Rev. 873–888.

Barkan, S.E., Rocque, M., Houle, J., 2013. State and regional suicide rates: a new look at an old puzzle. Sociol. Perspect. 56 (2). Retrieved from: http://www.jnhoule.org/storage/BarkanRoqueHouleSuicide.pdf.

Blakely, T.A., Collings, S.C.D., Atkinson, J., 2003. Unemployment and suicide. Evidence for a causal association? J. Epidemiol. Community Health 57 (8), 594–600. http://dx.doi.org/10.1136/jech.57.8.594.

Borges, C.M., Campos, A.C.V., Vargas, A.D., Ferreira, E.F., Kawachi, I., 2010. Social capital and self-rated health among adolescents in Brazil: an exploratory study. BMC Res. Notes 3, 338. http://dx.doi.org/10.1186/1756-0500-3-338.

Borowsky, I.W., Ireland, M., Resnick, M.D., 2001. Adolescent suicide attempts: risks and protectors. Pediatrics 107 (3), 485–493.

Bryan, C.J., Jennings, K.W., Jobes, D.A., Bradley, J.C., 2012. Understanding and preventing military suicide. Arch. Suicide Res. 16 (2), 95–110. http://dx.doi.org/10.1080/13811118.2012.667321.

Bureau of Labor Statistics, 2009. Unemployment Rates for States. Local Area Unemployment Statistics. Retrieved March 29, 2013, from: http://www.bls.gov/lau/lastrk00.htm.

Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, 2013. Web-based Injury Statistics Query and Reporting System. Retrieved from: www.cdc.gov/ncipc/wisqars.

Clays, E., De Clercq, B., 2012. Individual and contextual influences of workplace social capital on cardiovascular health. G. Ital. Med. Lav. Ergon. 34 (3 Suppl. 1), 177–179.

Congdon, P., 2012. Latent variable model for suicide risk in relation to social capital and socio-economic status. Soc. Psychiatry Psychiatr. Epidemiol. 47 (8), 1205–1219 (in English).

Dalaker, J., 2001. Poverty in the United States: 2000 (US Census Bureau, Current Population Reports, Series P60–214). US Government Printing Office, Washington, DC.

Desai, R.A., Dausey, D., Rosenheck, R.A., 2008. Suicide among discharged psychiatric inpatients in the Department of Veterans Affairs. Mil. Med. 173 (8), 721–728.

Durkheim, E., 1897. Le suicide: étude de sociologie. Alcan, Paris.

Flavin, P., Radcliff, B., 2009. Public policies and suicide rates in the American States. Soc. Indic. Res. 90 (2), 195–209.

Fujino, Y., Kubo, T., Kunimoto, M., Tabata, H., Tsuchiya, T., Kadowaki, K., Nakamura, T., Oyama, I., 2013. A cross-sectional study of workplace social capital and blood pressure: a multilevel analysis at Japanese manufacturing companies. BMJ Open. 3 (2) http://dx.doi.org/10.1136/bmjopen-2012-002215.

Furuta, M., Ekuni, D., Takao, S., Suzuki, E., Morita, M., Kawachi, I., 2012. Social capital and self-rated oral health among young people. Community Dent. Oral Epidemiol. 40 (2), 97–104. http://dx.doi.org/10.1111/j.1600-0528.2011.00642.x.

Goldsmith, S.K., Pellmar, T.C., Kleinman, A.M., Bunney, W.E., 2002. Reducing Suicide: a National Imperative. National Academies Press. Retrieved from: http://books.google.com/books?hl=en&lr=&id=gRrPhTO8kAQC&oi=fnd&pg=PA1&dq=Reducing+suicide:+a+national+imperative.&ots=_4QZ2XQIpD&sig=x4Oq08TcUnCeOkID7KAR0L7bVvo.

Hamano, T., Fujisawa, Y., Ishida, Y., Subramanian, S.V., Kawachi, I., Shiwaku, K., 2010. Social capital and mental health in Japan: a multilevel analysis. PLoS One 5 (10), e13214. http://dx.doi.org/10.1371/journal.pone.0013214.

Harper, S., Yang, S., Lynch, J., 2008, June 25. Is There a Suicide Belt in the United States?. Presented at the Society for Epidemiologic Research. Retrieved from: http://webpages.mcgill.ca/staff/Group1/sharpe2/web/SER%202008%20suicide.pdf.

Helliwell, J.F., 2007. Well-being and social capital: does suicide pose a puzzle?, 81 (3), 455–496.

Hemenway, D., Kennedy, B.P., Kawachi, I., Putnam, R.D., 2001. Firearm prevalence and social capital. Ann. Epidemiol. 11 (7), 484–490.

Hurtado, D., Kawachi, I., Sudarsky, J., 2011. Social capital and self-rated health in Colombia: the good, the bad and the ugly. Soc. Sci. Med. (1982) 72 (4), 584–590. http://dx.doi.org/10.1016/j.socscimed.2010.11.023.

Kahn, R.S., Wise, P.H., Kennedy, B.P., Kawachi, I., 2000. State income inequality, household income, and maternal mental and physical health: cross sectional national survey. Br. Med. J. 321 (7272), 1311.

Kawachi, I., Kennedy, B.P., Lochner, K., Prothrow-Stith, D., 1997. Social capital, income inequality, and mortality. Am. J. Public Health 87 (9), 1491–1498.

Kawachi, I., Kim, D., Coutts, A., Subramanian, S.V., 2004. Commentary: reconciling the three accounts of social capital. Int. J. Epidemiol. 33 (4), 682–690.

Kawachi, I., Subramanian, S.V., Almeida-Filho, N., 2002. A glossary for health inequalities. J. Epidemiol. Community Health 56 (9), 647–652. http://dx.doi.org/10.1136/jech.56.9.647.

Kelly, B.D., Davoren, M., Ni Mhaolain, A., Breen, E.G., Casey, P., 2009. Social capital and suicide in 11 European countries: an ecological analysis. Soc. Psychiatry Psychiatr. Epidemiol. 44 (11), 971–977 (in English).

Kennedy, B.P., Kawachi, I., Prothrow-Stith, D., Lochner, K., Gupta, V., 1998. Social capital, income inequality, and firearm violent crime. Soc. Sci. Med. 47 (1), 7–17.

Kessler, R.C., Borges, G., 1999. Prevalence of and risk factors for lifetime suicide attempts in the national comorbidity survey. Arch. Gen. Psychiatry 56 (7), 617–626. http://dx.doi.org/10.1001/archpsyc.56.7.617.

Kim, D., Subramanian, S.V., Gortmaker, S.L., Kawachi, I., 2006. US state- and county-level social capital in relation to obesity and physical inactivity: a multilevel, multivariable analysis. Soc. Sci. Med. 63 (4), 1045–1059. http://dx.doi.org/10.1016/j.socscimed.2006.02.017.

Kreitman, N., 1976. The coal gas story. United Kingdom suicide rates, 1960–71. Br. J. Prev. Soc. Med. 30 (2), 86–93. http://dx.doi.org/10.1136/jech.30.2.86.

Kreitman, N., Platt, S., 1984. Suicide, unemployment, and domestic gas detoxification in Britain. J. Epidemiol. Community Health 38 (1), 1–6.

Lester, D., 1996. Inequality of income and rates of violence in Caucasian and Black groups. Psychol. Rep. 79 (3), 978. http://dx.doi.org/10.2466/pr0.1996.79.3.978.

Marion, M.S., Range, L.M., 2003. African American college women's suicide buffers. Suicide Life-Threat. Behav. 33 (1), 33–43.

Mathers, C.D., Loncar, D., 2006. Projections of global mortality and burden of disease from 2002 to 2030. PLoS Med. 3 (11), e442. http://dx.doi.org/10.1371/journal.pmed.0030442.

Meadows, L.A., Kaslow, N.J., Thompson, M.P., Jurkovic, G.J., 2005. Protective factors against suicide attempt risk among African American women experiencing intimate partner violence. Am. J. Community Psychol. 36 (1–2), 109–121.

Miller, M., Hemenway, D., 2008. Guns and suicide in the United States. N. Engl. J. Med. 359 (10), 989–991. http://dx.doi.org/10.1056/NEJMp0805923.

Morrell, S., Taylor, R., Quine, S., Kerr, C., 1993. Suicide and unemployment in Australia 1907–1990. Soc. Sci. Med. 36 (6), 749–756.

North Carolina State Center for Health Statistics, 2002. BRFSS 2001-Nationwide. Are Any Firearms Now Kept in or Around Your Home? Include Those Kept in a Garage, Outdoor Storage Area, Car, Truck, or Other Motor Vehicle. Retrieved March 29, 2013, from: http://www.schs.state.nc.us/schs/brfss/2001/us/firearm3.html.

Oksanen, T., Kawachi, I., Jokela, M., Kouvonen, A., Suzuki, E., Takao, S., Virtanen, M., Pentti, J., Vahtera, J., Kivimäki, M., 2012. Workplace social capital and risk of chronic and severe hypertension: a cohort study. J. Hypertens. 30 (6), 1129–1136. http://dx.doi.org/10.1097/HJH.0b013e32835377ed.

Oksanen, T., Kivimäki, M., Kawachi, I., Subramanian, S.V., Takao, S., Suzuki, E., Kouvonen, A., Pentti, J., Salo, P., Virtanen, M., Vahtera, J., 2011. Workplace social capital and all-cause mortality: a prospective cohort study of 28,043 public-sector employees in Finland. Am. J. Public Health 101 (9), 1742–1748. http://dx.doi.org/10.2105/AJPH.2011.300166.

Perry, M.J., 2003. State-to-state Migration Flows, 1995 to 2000. US Department of Commerce, Economics and Statistics Administration, US Census Bureau. Retrieved from: http://usa.ipums.org/usa/resources/voliii/pubdocs/2000/censr-8.pdf.

Putnam, R.D., 2001. Bowling Alone: the Collapse and Revival of American Community, first ed. Touchstone Books by Simon & Schuster.

Putnam, R.D., 2013. Research|Bowling Alone. Research: Selected Statistical Trend Data. Retrieved March 29, 2013, from: http://bowlingalone.com/?page_id=7.

Rehkopf, D.H., Buka, S.L., 2006. The association between suicide and the socio-economic characteristics of geographical areas: a systematic review. Psychol. Med. 36 (02), 145–157. http://dx.doi.org/10.1017/S003329170500588X.

Rockett, I.R.H., Wang, S., Stack, S., De Leo, D., Frost, J.L., Ducatman, A.M., Walker, R.L., Kapusta, N.D., 2010. Race/ethnicity and potential suicide misclassification: window on a minority suicide paradox? BMC Psychiatry 10, 35. http://dx.doi.org/10.1186/1471-244X-10-35.

Remington, P.L., Smith, M.Y., Williamson, D.F., Anda, R.F., Gentry, E.M., Hogelin, G.C., 1988. Design, characteristics, and usefulness of state-based behavioral risk factor surveillance: 1981-87. Public Health Rep. 103, 366.

Sapag, J.C., Aracena, M., Villarroel, L., Poblete, F., Berrocal, C., Hoyos, R., Martínez, M., Kawachi, I., 2008. Social capital and self-rated health in urban low income neighbourhoods in Chile. J. Epidemiol. Community Health 62 (9), 790–792. http://dx.doi.org/10.1136/jech.2006.052993.

Satcher, D., 1999. The Surgeon General's Call to Action to Prevent Suicide. US Public Health Service, Washington, DC.

Singh, G.K., Siahpush, M., 2002. Increasing rural–urban gradients in US suicide mortality, 1970–1997. Am. J. Public Health 92 (7), 1161–1167. http://dx.doi.org/10.2105/AJPH.92.7.1161.

Steljes, T.P.V., Fullerton-Gleason, L., Kuhls, D., Shires, G.T., Fildes, J., 2005. Epidemiology of suicide and the impact on Western trauma centers. J. Trauma 58 (4), 772–777.

Szreter, S., Woolcock, M., 2004. Health by association? Social capital, social theory, and the political economy of public health. Int. J. Epidemiol. 33 (4), 650–667.

U.S. Census Bureau. (n.d.). American FactFinder – Results. URBAN AND RURAL Universe: Housing Units. 110th Congressional District Summary File. Retrieved March 29, 2013, from: http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_00_110H_H002&prodType=table.

US Census Bureau, D.I.D. (n.d.). Income – Table S4. Gini Ratios by State: 1969, 1979, 1989, 1999-U.S Census Bureau. Retrieved March 29, 2013, from: http://www.census.gov/hhes/www/income/data/historical/state/state4.html.

Wasserman, D., Värnik, A., 1998. Suicide-preventive effects of perestroika in the former USSR: the role of alcohol restriction. Acta Psychiatr. Scand. 98, 1–4. http://dx.doi.org/10.1111/j.1600-0447.1998.tb10758.x.

Wilcox, H.C., Conner, K.R., Caine, E.D., 2004. Association of alcohol and drug use disorders and completed suicide: an empirical review of cohort studies. Drug Alcohol Depend. 76 (Suppl. l), S11–S19. http://dx.doi.org/10.1016/j.drugalcdep.2004.08.003.

World Health Organization, 1996. Prevention of Suicide: Guidelines for the Formulation and Implementation of National Strategies. World Health Organization, Geneva, p. 279.

Wray, M., Colen, C., Pescosolido, B., 2011. The sociology of suicide. Annu. Rev. Sociol. 37 (1), 505–528. http://dx.doi.org/10.1146/annurev-soc-081309-150058.

Wright, D.A., 2003. State Estimates of Substance Use from the 2001 National Household Survey on Drug Abuse: Volume I. Findings. DIANE Publishing. Retrieved from: http://books.google.com/books?hl=en&lr=&id=WKBAubsj9W0C&oi=fnd&pg=PR5&dq=State+Estimates+of+Substance+Use+from+the+2001+National+Household+Survey+on+Drug+Abuse:+Volume+I.+Findings&ots=zJ9opf994H&sig=Iyiw8ObJImOSbML8Q2SLwT-s7gw.