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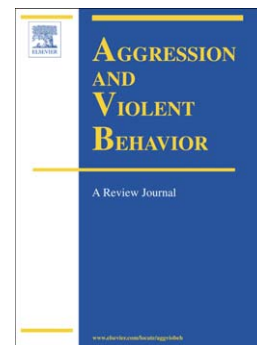
Political Correlates of Violent Death Rates in the U.S., 1900-2010: Longitudinal and Cross-Sectional Analyses

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**Political Correlates of Violent Death Rates in the U.S.,
1900-2010: Longitudinal and Cross-Sectional Analyses**

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Abstract

Objectives Our goal was to identify if there might be associations between a major public health problem, *i.e.*, violent deaths, and a potential macro-level determinant, *i.e.*, political party in office.

Methods Vital statistics, labor statistics, and GDP data were obtained for the years 1900-2010. Independent t tests were used to compare homicide, suicide, and total violent death rates during Republican and Democratic administrations and between states voting for Republican and Democratic presidential candidates. Correlation and hidden Markov modeling were used to assess the relationships among party of the president and changes in unemployment rate, GDP, and violent death.

Results The party of the president was significantly associated with annual changes in suicide and homicide rates, unemployment rates, and GDP ($p < 0.001$ to $p < 0.05$, depending on the measure and time lag), with higher violent death and unemployment increases being associated with Republican presidencies and higher GDP with Democratic ones. Adjusting for unemployment and GDP reduced but did not eliminate party effect. Suicide and homicide rates were higher in states that voted for the Republican candidate for president than in states that voted for the Democratic candidate ($p < 0.0001$ and $p < 0.07$).

Conclusions Violent deaths were associated with an increase under Republican presidents and a decrease under Democratic presidents, were higher in states that vote for Republican than for Democratic presidential candidates, and increased alongside increasing unemployment and falling national GDP. As with heart disease, obesity and cancer, identified associations with environmental factors can increase understanding of the public health problem and point to ways of reducing it. Future research beyond the

boundaries of the United States could help elucidate the relationship between government, socioeconomic policy orientation, and violent death rates.

Keywords. Suicide, homicide, violent deaths, political party, hidden Markov modeling

Declaration of Interests

The authors declare that they have no competing interests, be it financial, personal, or by affiliation, regarding the results of this study.

ORIGINAL ARTICLE

Over the past several decades, leading institutions such as the World Health Organization (WHO), the Institute of Medicine, the National Academy of Sciences, the Centers for Disease Control and Prevention (CDC), and more than one Surgeon General have advocated the view that violence is not random but a problem in public health and preventive medicine. This approach has allowed us to conceive of violence in the same manner as heart disease, obesity, and cancer—as problems that can be prevented by identifying and modifying social, economic, and other associated environmental factors. The WHO suggested, in particular, that we try to understand the different types of violence not just separately but also in totality, from an ecological point of view (Krug et al., 2002). This article attempts to discover the relationship political environment, as an important factor in a variety of social, economic, and other effects, has with a combination of different violent death rates.

Previous work has shown that economic factors are associated with violent deaths from suicide and possibly homicide. In pioneering work, Brenner showed that both rates of suicide and homicide rose within a year of increased unemployment, both in the U.S. and the U.K. (1936-1976) (Brenner, 1979), reconfirming general mortality observations in the U.S. over longer term (1901-2000) (Brenner, 2005). Additionally, Holinger observed that, over 1900-1979 in the U.S., both suicide and homicide rates strongly and positively correlated both with each other and with unemployment ($p < 0.001$) (Holinger, 1987). Swedish twin studies found that unemployment was associated with increased suicide and death from undetermined causes (Voss et al., 2004). A study in Germany found that four economic variables (growth of the economy, average real income, unemployment, and frequency of bankruptcy) correlated with suicide from 1881 to 1989, with the strongest holding for unemployment and frequency of bankruptcy (Weyerer & Wiedenmann, 1995). A cohort study in New Zealand, furthermore, showed that being unemployed was associated with a twofold to threefold increase in relative risk of death by suicide (Blakely et al., 2003). While short-term observations have sometimes shown a reverse relationship (Ruhm, 2000), or variations in certain cultures (Lester et al., 1992), longer time spans and multi-national

comparisons (Ceccherini-Nelli & Priebe, 2011) have shown the association to be strongly positive. Homicide has traditionally shown a less robust connection (South & Cohen, 1985; Cantor & Land, 1985; Yang & Lester, 1994; Hsieh & Pugh, 1993), but again, a recent study of 26 European Union countries from 1970 to 2007 showed homicide to have a comparable association with unemployment (Stuckler et al., 2009).

Other works have suggested that political factors might predict violent death rates, with higher suicide risk being associated with conservative government tenures compared with social democratic ones in both Great Britain and Australia. Page and colleagues have noted that in Australia, which has had a two-party parliamentary political system since 1901, significantly higher suicide risk ($p < 0.001$) was associated with conservative government occupancies compared with social democratic incumbents (Page et al., 2002). Others note that suicide rates in Britain have tended to follow unemployment, that the unemployment rate peaked during long periods of largely Conservative administration during the 1930s and 1980's, and that suicides have consistently risen with conservative party prime ministers from 1901 to 2000 (Shaw et al., 2002). Still others in the U.K. have found that the election of a Labour government is associated with reduced numbers of parasuicides, or nonfatal acts of self-harm (Masterton and Platt, 1989). In post-war U.S., from 1948-2001, partisan differences included unemployment rates (on average 4.8% under Democratic presidents vs. 6.3% under Republicans) and overall economic growth (GDP) (on average 4.1% under Democratic presidents vs. 2.8% under Republicans) (Bartels, 2004; Bartels, 2007)—both of which had the strongest effects on income growth at the bottom of the income distribution (Galbraith, 1998).

Given this background, the association between political party in office and violent death rates seemed worthy of investigation. This article endeavors to accomplish this through comparing the track records of the two major political parties in the U.S. over more than a century in terms of changes in national suicide and homicide rates. The hypothesis is that the social and economic policies of the two major parties lead to different violent death rates and that this difference will be large enough to be

statistically confirmed. This is based on the premise that the two political parties are differentiated from each other by core differences in political ethos that persist over time and are not reducible to a single, “one-item” policy difference. The rationale for this study is that such measured differences can give insight into the relationship between the environmental aspects of politics and associated risk factors for violence that could enable us to improve our ability to prevent two important and common causes of death.

Methods

Data

Data for the primary analyses were drawn from the following: (1) the CDC National Center for Health Statistics (NCHS) Mortality database (CDC website: <http://wonder.cdc.gov/mortSQL.html>); (2) suicide and homicide rates for 1900-1932 based on Eckberg’s (1995) calculations for homicides and our own for suicides in a similar fashion to correct for the fact that not all 48 states were reported on until 1933 (the effect of which diminished, not increased, the extent to which Republican rates exceeded Democratic ones from 1900 to 1932); (3) the Department of Labor Bureau of Labor Statistics Employment and Unemployment database (Bureau of Labor Statistics [BLS] website: <http://www.bls.gov/cps/home.htm>); (4) unemployment rates for 1900-1919 were pulled from the National Bureau of Economic Research (Lebergott, 1957); and (5) the Department of Commerce Bureau of Economic Analysis Gross Domestic Product (GDP) database (Bureau of Economic Analysis [BEA] website: <http://www.bea.gov/national/index.htm#gdp>).

The NCHS database was chosen over those of the Federal Bureau of Investigation (FBI) (Bureau of Justice Statistics [BJS], 2011) because of its far greater accuracy and completeness: it relies on death certificates rather than on police records, counts all homicides as well as suicides, and makes age adjustments that eliminate differences that would be caused by differences in age-distribution in the

population from one time to another. Because of the time it takes to calculate age adjustments, however, the data at the time of analysis were available only through 2010.

Statistical Analyses

Initial tests included descriptive data and a graph (Figure 1) to assess the appropriateness of the analyses. Independent t tests were then performed to assess the mean difference in annual homicide rate changes, suicide rate changes, and combined death rate changes under years of Republican or Democratic presidents. Time lags from zero to two years were applied to the t tests, based on the hypothesis that there would be a time delay between the implementation of certain economic or social policies and changes in human behavior that would lead to the deaths. Analyses were done with no, one-year, and two-year time lags. T tests were also performed to assess the mean difference in unemployment rate changes and the changes in natural logarithm of per capita real GDP (the logarithm was used because of the exponential nature of GDP) between the parties in leadership. Pearson correlations were then obtained for the unemployment rate and GDP changes and each of the death rate changes. To provide cross-sectional corroboration, an independent t test was performed for violent death rates between Republican and Democratic states as per the voting patterns in three recent presidential elections, namely the years 2000, 2004, and 2008. All statistical analyses were performed with SPSS/PC Version 22.0 except the hidden Markov modeling, for which the R package depmixS4 Version 13.2 was used.

Finally, we used hidden Markov modeling (HMM) to account for regime-switching over time. This model requires some explanation:

Explanation of Method

Description of the modeling paradigm

In contrast to linear models that assume stationary distributions such as ARIMA models, “regime-switching” hidden Markov models are in essence a mixture of parametric distributions that have mixture probabilities, which depend on unobserved (latent) state variable(s).

Time series with “regime-switching” look stationary over limited time intervals, but the data-generating mechanism suddenly changes between intervals. Simple Markov modeling is used for “regime-switching” where changes are controlled by an observed process; hidden Markov modeling (HMM) is used for “regime-switching” where changes are controlled by an unobserved process of transitions between a finite number of discrete states of an underlying latent construct.

We observe the changes in the annual rates of violent deaths, unemployment and GDP as indicators of unobservable states of a latent construct: “the socioeconomic health of the nation.” There is also a latent, unobservable process that drives transitions between latent states. Our hypothesis is that majority voting behavior that retains or changes the political party (Republican or Democrat) of the presidential administration at four-year intervals is associated with both states and transitions of the latent Markov process.

“Regime-switching” HMMs have been characterized as a game of “balls and urns” (Soltan, 2012). Consider a game whereby one urn is chosen randomly at each of a series of time points; a ball is then chosen randomly from that urn, and the color of the ball is observed. This process generates a sequence of ball colors as the “observation sequence.” Given these data, the game is to correctly guess the sequence of urns from which the balls were selected. In this example, the urns are analogous to the hidden states (regimes), and the switching of urns is analogous to transitions between hidden states.

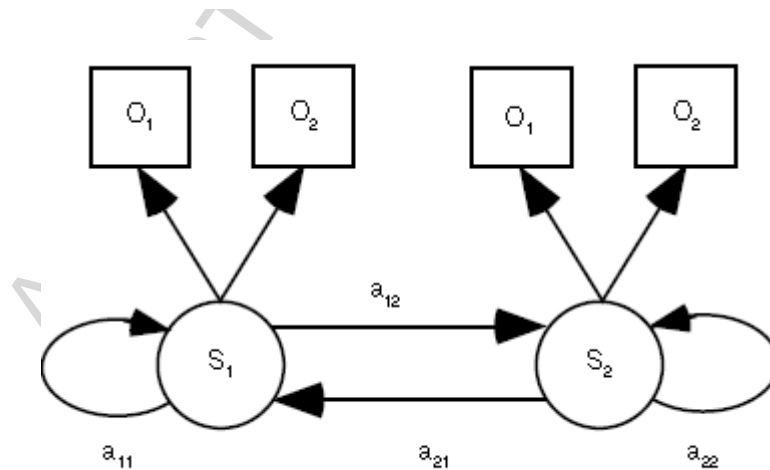
The theoretical model

An excellent description of HMMs is found in a paper by Visser and Speekenbrink (2010). The following is an excerpt:

Formally a hidden Markov model consists of the following elements (here we adopt notation by Rabiner, 1989):

1. A finite state space S with states $S_i, i = 1, \dots, n$.
2. A transition model A providing transition probabilities a_{ij} .
3. A measurement model for each state in S , denoted by $B_i, i = 1, \dots, n$, which relates the state to the observation O .
4. The initial state probabilities $\pi_i, i = 1, \dots, n$.

Here n is the number of states of the model, i.e., the number of possible values the state variable S_t can assume. π denotes the initial state distribution at $t = 1$, which is a probability vector with $\sum_i \pi_i = 1$. Next, $B_i(\cdot)$ is the distribution of the responses or observations O conditional on the current state $S_t = i$. For example, for a binary item O we have $b_i(O = 1) + b_i(O = 2) = 1$, for each i . Finally, a_{ij} is the transition probability of moving from state $S_t = i$ to state $S_{t+1} = j$, which is written as a probability matrix A . That is, for each state S_i the transition probabilities sum to one, $\sum_j a_{ij} = 1$.



The data considered here have the general form $O_{1:T} = (O_1^1, \dots, O_1^m, O_2^1, \dots, O_2^m, \dots, O_T^1, \dots, O_T^m)$ for an m -variate time series of length T .

Some excellent technical presentations of the mathematics underlying the model estimation algorithms can be found (Chamroukhi, 2013; Visser, 2011; Li, 2005).

The applied model

The observed dependent variable time series for the structural model will be represented by a multivariate 3-dimensional vector (y_{1t}, y_{2t}, y_{3t}) , measured at each year t from 1901 to 2010, with y_{1t} = change (difference between the value on 31 December 31 at year = t and the value on 31 December at year $t-1$) in the annual rate of violent death, y_{2t} = change in the annual rate of unemployment, and y_{3t} = change in natural log GDP. At any given time point, these variables are simultaneous manifestations of S_t , a state for the discrete latent variable: “the socioeconomic health of the nation.” This vector will be modeled as a function of the party of the presidential administration on 20 January (Inauguration Day) of year t . The a_{ij} ’s, the probabilities of transition from state $S_{t-1}=i$ to $S_t=j$, will be modeled as constant, independent of year, party, or other covariates. Initial state probabilities (π_1, π_2, π_3) sum to 1 and are generated randomly by an algorithm using uniform distributions $U[0, k]$. A representation of this model is provided by the R `depmixS4` code:

```
model<-depmix(list(DRpdif~RD,UERdif~RD,logGDPdif~RD),nstates=ns,
              data=mydata,family=list(gaussian(),gaussian(),gaussian()),
              transition = ~ 1 , instart = runif(ns))
```

The number of states ns in the final model is determined by fitting models for $ns = 1, 2, \dots$, assessing fit statistics (e.g. including log likelihood ratios, AIC, and/or BIC) and interpreting the implied states of the latent construct operationalized by the fitted model parameter estimates.

Results

Suicide, homicide, and combined suicide/homicide rates from 1900 to 2010 were found to be associated with an increase under Republican presidents and a decrease under Democratic ones with

statistical significance (Table 1). Changes in rates or differences were used because, given the near-even alternation between parties over time, the mean, median, and standard deviation of the values turned out to be remarkably similar for both parties; changes, on the other hand, were in opposite directions. In other words, the two parties were almost mirror images of each other, with the suicide and homicide rates showing an increase during Republican presidencies to the same degree as they showed a decrease during Democratic presidencies (Figure 2). The cumulative differences in unemployment were also near mirror images of each other, in the same direction as the violent death rates. Cross sectional analyses were consistent with the national longitudinal data linking political party and violent death rates. Suicide and homicide rates were significantly higher in Republican-dominated states than in Democrat-dominated ones as determined by presidential voting patterns in the years 2000, 2004, and 2008 (Table 2).

Changes in suicide and homicide rates were significantly correlated ($r = 0.27$, $p < 0.005$) and both were significantly correlated with unemployment ($r = 0.59$, $p < 0.0005$, and $r = 0.33$, $p < 0.0005$) and with GDP ($r = -0.42$, $p < 0.0005$ and $r = -0.32$, $p < 0.0005$). Based on the similar patterns of suicide and homicide in Figure 1 and the above correlation, a hidden Markov modeling was done with total violent death rates (See Figures 3-4 and Tables 3-5).

Discussion

In the present study, like other population-based epidemiological and public health research that depends upon naturalistic observation, we sought to identify associations between a major public health problem, *i.e.* violent deaths, and an important environmental factor, *i.e.* political party in office. Such associations can suggest directions for future research in determining the etiology of these major causes of death and possible prevention methods. Previously identified associations, also unlikely at the time, such as between nation of residence and cancer rates, dietary intake and cancer, heart disease and other illness, and obesity and a variety of medical conditions, provide models for this approach. In all such efforts non-experimental designs and the plethora of possible mediating factors and mechanisms make it

difficult to move from mere association to causal explanation, but evidence has become robust enough to inform preventive strategies for population health. Fluctuations in population violent death rates, in particular, have shown with improved data availability to be associated more with macro-level factors than the more immediate, micro-level influences (Eisner, 2013). Therefore, in none of these cases does the complexity of explication justify disregarding the demonstrated associations. Hence, the rationale for this study was that such associations can give insight into the etiology of violence and generate further hypotheses for effective prevention of an important and common cause of death.

No previous study had yet integrated these variables—economic measures, the political party in power (conservative or liberal), and rates of lethal violence (both suicide and homicide)—in an overarching empirical synthesis over time and across space. This article endeavored to accomplish that by comparing the track records of the two major U.S. political parties over more than one hundred years in terms of changes in national suicide and homicide rates and to link them to core policy orientations. The hypothesis was that the approaches of the two major parties of the U.S. government lead to different violent death rates and that this difference would be detectable statistically. The results answered in the affirmative.

We took steps to increase confidence in the identified associations. First, we looked at associations over time in the national population and sought to study the longest possible time period. With a long time period, the identified associations would have to persist over repeated variations of the independent variable (i.e., political party) and be less affected by coincident one-time events that have been claimed to influence rates of suicide and/or homicide (and sometimes did), such as Prohibition, the Great Depression, World War II, the Korean War, the violent conflicts over civil rights during the 1960's, the bulge in the youth population resulting from the Baby Boom, the subsequent Baby Bust, the unprecedented increase in the imprisonment rate that began for the first time in our history in the mid-1970's, and the waxing and waning of the "crack market," to mention just a few. Since both political parties were in power during at least part of the time during which each of the above historical

phenomena occurred, studying as long a time period as possible minimizes the chance that findings would be an artifact of any one of these unique events, rather than revealing enduring, repeated associations with political party over the course of the represented 111 years. Additionally, the assumption was that, in spite of the confluence of factors that might explain the fluctuation in death rates over shorter periods, party “hegemony” would override the influence of those other factors.

Two observations confirmed this assumption. First, the same analyses were run for various time periods (1900-2010, 1912-2010, 1920-2010, 1933-2010, 1946-2010, 1968-2010, and 1992-2010), and it was found consistently that the longer the period, the more significant the results (p values to 0.00008). Furthermore, statistical significance disappeared with periods shorter than 1946-2010, but the directions of the changes were the same: positive death rate changes for Republican years, and negative ones for Democratic years, confirming that eliminating certain major events did not significantly alter the results. This gave confidence to the fact that enlarging the time span, which would inevitably encompass more possibility for changes in party ideology and composition, highlighted more consistency than differences within each party over time. The trends started, for instance, far before World War II even began. The trends also continued after the change of allegiances of many white Southerners following the New Deal, the Civil Rights movement, and the so-called the “conservative coalition” that realigned the Democratic and Republican party ideologies in the mid-1960’s. These trends suggest that more has remained constant than changed in party distinctions over the period of study, as far as violent death rates and economic measures such as unemployment and GDP are concerned.

Our second approach to increase confidence in the identified associations was to compare suicide and homicide rates at single points in time in different states within the United States as a function of which presidential candidate received the greatest number of votes in that state. In such a cross-sectional correlation at a single point in time, data from all states are subject to effects of the same national and global issues prominent at the moment. Moreover, for an association to emerge, it must be powerful enough to overcome the effects of many local social and economic factors rather than reflect them.

However, when we speak of Republican or Democratic “hegemony,” we assume that what is occurring is not merely a change in the party label, but also a change in the set of values and policy priorities being pursued and implemented during the particular administration. Two important exceptions provide a clue as to the differences that may be at play. During the 111 years and nineteen different, completed presidential administrations under consideration here, the records of all but one of the twelve Republicans conform to the generalization formulated in this article, as do all but one of the seven Democrats: namely, measures of economic decline and violent death rates increase under Republicans and decrease under Democrats. The two exceptions, i.e. Dwight Eisenhower (1953-1961) and Jimmy Carter (1977-1981), do not eliminate the statistically significant differences in the study. What is interesting, rather, is what these exceptions reveal: that the party label of the president alone is not always a determinant, but perhaps the social and economic values, attitudes, and policies that he supports and that are also supported by the majority of the American public who voted for him. It seems important, therefore, to consider that economic prosperity and lower violent death rates may depend not only on the party in office but on the ability of the president to function along “Democratic” party lines and the general support for him to do so. If that were the case, and the differences outlined already present within the difference of Republican versus Democratic party alone, one can begin to imagine the influence on these factors of a truly social democratic government.

A limitation of this study was that presidencies were used to define party hegemonies, without inclusion of the composition of the Congress. The inclusion of Congress was attempted, either with or without presidency, but both methods complicated the data without giving rise to any definable patterns. When analysis was attempted with data on Congress alone, for instance, the results did not reveal any clear direction as they did with the presidency alone, and adding both only complicated the results; one possible explanation may be that Congresses do not have as much influence as do U.S. presidencies, and therefore may modify their votes on policies to attenuate or negotiate with the party in power, rather than providing independent opinions. U.S. presidencies are generally very strong, unlike a parliamentary

system, and increasingly more so in the twentieth and twenty-first centuries, as this study confirmed; however, the effects of mixed governmental systems have yielded attenuated patterns in other studies, and might be worthy of consideration in a more sophisticated research design in the future. The limitation in methodology concerned the fact that the data are a time series, where ARIMA modeling is often used, and this was tried. The stationarity assumption was problematic, however, and assumptions were many, and our theory begged for a latent variable approach. In using the hidden Markov modeling, these issues were resolved, but the components of the dependent variable vector were assumed to be multivariate Normal with all covariances equaling 0. This constraint on the covariance matrix can be relaxed, but `depmixS4` does not estimate the covariances; they would be provided in the model code manually.

While a more complete study of violent deaths might have included war operations and legal interventions, these were not included due to the often unreliable quality of the data as well as the negligible size of these numbers in comparison to the rates of suicide and homicide; as better measurement systems develop, a more complete study might also become possible. While suicide and homicide rates generally rose and fell together, it is notable that suicide rates alone did not exhibit a lag, and it would be interesting to note the reasons for this difference, which was thought to be beyond the scope of this paper. Using the NCHS database, while rigorous, implied a four-year wait to have age-adjusted rates, making the most up-to-date results unavailable; a glimpse into the FBI database showed that the downward trend in homicide rates continued after 2010 (when it was 5.4): 5.0, 4.8, and 4.7, despite the respective upswing in unemployment rates. Finally, we focused on death rates without discussing measures of the compromise in quality of life, not to mention the far more numerous assaults and attempted suicides that each loss of life represents. Looking at these measures, in addition to death rates alone, would bring the study into a broader context whereby evidence of human misery would be detectable without muffling through improvements in emergency room services or other tertiary interventions.

Postulating, as noted above, that the fluctuations in violence rates are not due to party labels per se but more likely due to differences in the social and economic policies that the parties tend to adopt, the GDP changes and the changes in unemployment rates were seen as possible confounders or mediators. Analyses excluding political party showed that violent deaths were predictable by both the unemployment rate change of that year and the change in natural logarithm of per capita real GDP of that year, as well as each separately, with an increase in coefficient with each elimination. We hypothesize that violent death rates relate to falling GDP and increasing unemployment, as well as other socioeconomic and environmental realities that have a psychological effect on the individuals who ultimately kill themselves, others, or both. There is evidence in the literature that points to the role of direct material, rather than primarily psychosocial factors, at play in the increase or decrease of violent deaths, and that suicide rates are influenced by economic realities more than by people's perception of the economy (Berk et al., 2006). We suggest that these effects can be moderated or exacerbated by local and national community values that place more or less blame on the individual for his or her economic problems, and relieve stressors or provide more community and economic support for those in distress: effects of the political party of the president on death rates that remain after considering the effects of changes in unemployment and GDP may be through factors such as these. Unemployment is also one of the best indicators for inequality that we could find for this period, and there is considerable evidence that points to greater levels of violence in societies that have greater inequality (Hsieh and Pugh, 1993; Wilkinson and Pickett, 2010). These hypotheses suggest the potential value of public education and support programs in decreasing deaths from suicide and homicide. They also point to the importance of policies that affect unemployment, inequality, or recessions as a way to get at primary prevention of lethal violence. Future research might include mediational studies that look at these policies and other population characteristics that might render a more nuanced explanation of the party effect that we have observed. While major fluctuations in the twentieth century (e.g., levels of gun ownership or social unrest) might account for some of the changes in the violent death rates, the analysis results suggest that party effect is large enough to overpower other contributors, making policy and general program an important level of consideration.

Finally, a limitation and a pointer for future research is the lack of a control group for our study. While we started with the United States for its robust data and our detailed knowledge of its political climate, an entire array of comparable studies are conceivable at the international level. Similar findings of greater violent death rates being associated with conservative, capital-oriented regimes in other English-speaking democracies is noteworthy, and whether these associations carry over to other cultures and other levels of industrial development can be an interesting subject of study. With the U.S. results alone, it is difficult to decipher if the political party is a cause, a consequence, or a confounding factor that co-occurs with “the socioeconomic health of the nation,” or levels of violent death; these distinctions can be given a more accurate analysis through multi-national longitudinal studies, as we begin to attempt in our companion paper here (Lee et al., 2014). Understanding the impact of macro-level factors, in general, has proven fruitful in the study of violence, as we discover that structural factors such as inequality far outweigh more proximate ones in the causation of individual violence, and social stratification, hitherto considered to be a small influence, is turning out to be deadly (Farmer, 2003). Therefore, public discussion of the patterns we identified at the national level over time, may increase the possibility of our understanding and control over the factors that contribute to a very significant public health problem and hence is worthy of further scientific study.

Conclusion

Suicide and homicide are major public health problems. Rates of both were associated with an increase under Republican presidents and a decrease under Democratic presidents, and increase alongside increasing unemployment and falling national GDP. As with heart disease, obesity and cancer, identified associations with environmental factors can increase understanding of the public health problem and point to ways of reducing it. Future research beyond the boundaries of the United States could help elucidate the relationship between government, socioeconomic policy orientation, and violent death rates.

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Figure 1. Homicide, Suicide, and Combined Death Rates, per 100,000 Population per Year, Democratic vs. Republican Administrations, U.S., 1900-2010

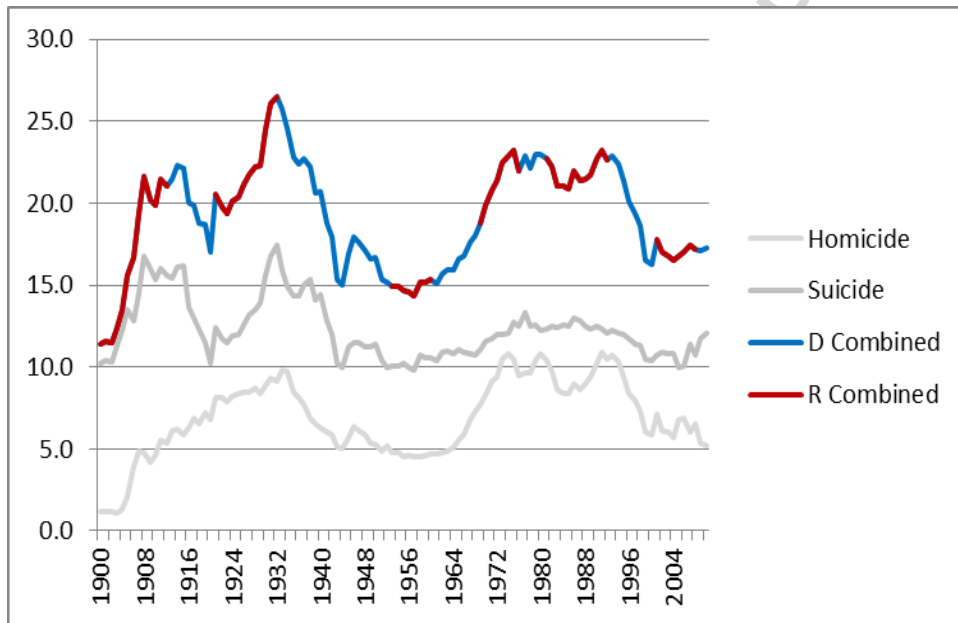


Figure 2. Cumulative Year-to-Year Increases and Decreases in Age-Adjusted Violent Death Rates, per 100,000 Population per Year, Democratic vs. Republican Administrations, U.S., 1900-2010

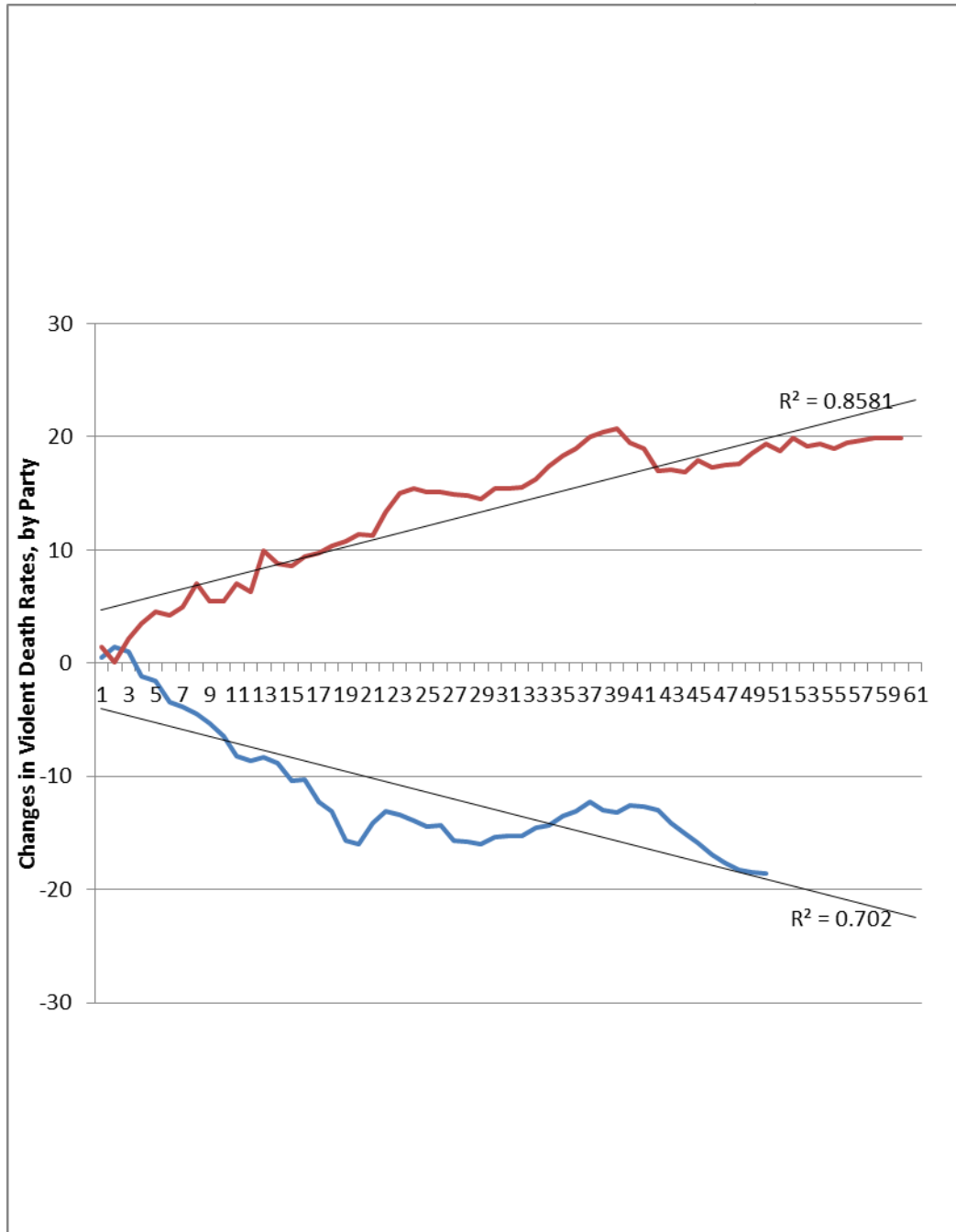
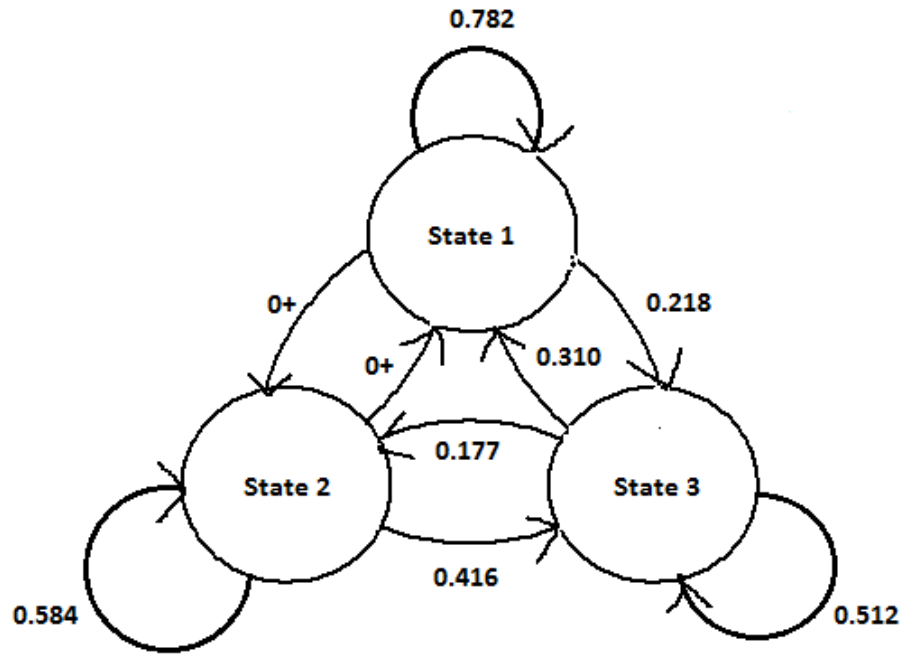
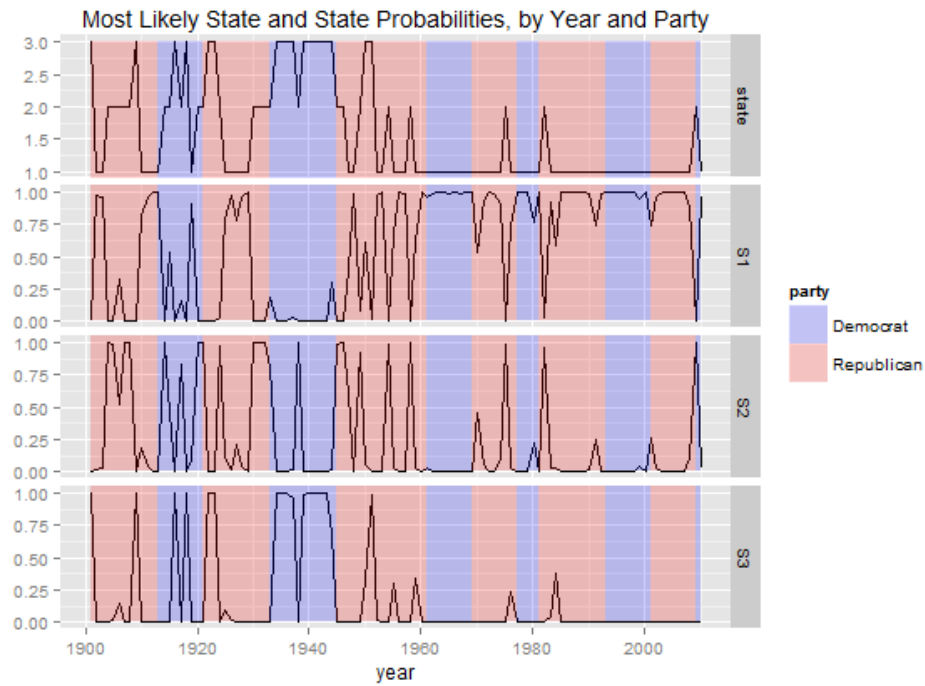


Figure 3. Estimated Transition Model

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Figure 4.

The top panel shows the state (1, 2, or 3) with the highest probability at each year. The lower panels show the probabilities for each state at each year. Blue background indicates a Democratic administration, red for Republicans.

Figure 5.



The top panel shows the state (1, 2, or 3) with the highest probability at each year. The lower panels show the % change from the previous year for each of the components of the dependent variable vector. Blue background indicates a Democratic administration, red for Republicans.

Table 1. Violent Death Rate and Economic Parameter Changes, Democratic vs. Republican Administrations, 1900-2010

	Republican Party (n = 60)		Democratic Party (n = 50)		Significance	
	Mean	SD	Mean	SD	T	p
Death Rate Changes (per 100,000)						
<u>No Lag</u>						
Suicide	0.25	0.67	-0.31	0.71	4.20	0.000*
Homicide	0.14	0.59	-0.07	0.54	1.90	0.061
Total	0.40	0.95	-0.37	0.95	4.19	0.000*
<u>One-Year Lag</u>						
Suicide	0.19	0.67	-0.22	0.77	2.93	0.004*
Homicide	0.14	0.55	-0.06	0.59	1.76	0.082
Total	0.32	0.85	-0.28	1.12	3.17	0.002*
<u>Two-Year Lag</u>						
Suicide	0.17	0.69	-0.20	0.75	2.67	0.009*
Homicide	0.15	0.52	-0.07	0.62	2.04	0.044*

Total	0.32	0.85	-0.28	1.11	3.15	0.002*
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	Republican Party (n = 60)		Democratic Party (n = 50)		Significance	
	Mean	SD	Mean	SD	T	p
Unemployment Rate Changes	0.46	2.45	-0.46	2.05	2.09	0.039*

	Republican Party (n = 60)		Democratic Party (n = 50)		Significance	
	Mean	SD	Mean	SD	T	p
Difference in GDP (natural log)	0.009	0.045	0.032	0.056	-2.35	0.021*

*significant

Table 2. Violent Death Rate Differences According to State Voting Patterns, Democratic vs. Republican, 2000, 2004, and 2008

2000	Republican (n = 30)		Democratic (n = 20)		Significance	
	Mean	SD	Mean	SD	T	p
Death Rate (per 100,000)						
Suicide	13.0	2.89	10.0	2.95	3.57	0.001*
Homicide	5.70	2.85	4.23	2.43	1.90	0.064
Total	18.7	3.80	14.3	4.02	4.01	0.000*
2004	Republican (n = 31)		Democratic (n = 19)		Significance	
	Mean	SD	Mean	SD	T	p
Death Rate (per 100,000)						
Suicide	13.9	3.19	10.2	2.70	4.28	0.000*
Homicide	5.70	2.67	4.01	2.15	2.38	0.021*
Total	19.7	4.04	14.2	2.90	5.16	0.000*
2008	Republican (n = 23)		Democratic (n = 27)		Significance	
	Mean	SD	Mean	SD	T	p
Death Rate (per 100,000)						
Suicide	14.7	3.66	12.1	3.39	2.66	0.011*
Homicide	5.93	2.92	4.56	2.06	1.93	0.059

Total 20.6 3.75 16.6 4.21 3.54 0.001*

*significant

Table 3. Years and Respective Political Party of the Presidential Administration Used for Analysis

Name	Start	End	Party
TRoosevelt	1901-01-20	1909-01-20	Republican
Taft	1909-01-20	1913-01-20	Republican
Wilson	1913-01-20	1921-01-20	Democrat
Harding	1921-01-20	1923-01-20	Republican
Coolidge	1923-01-20	1929-01-20	Republican
Hoover	1929-01-20	1933-01-20	Republican
FRoosevelt	1933-01-20	1945-01-20	Democrat
Truman	1945-01-20	1953-01-20	Republican
Eisenhower	1953-01-20	1961-01-20	Republican
Kennedy	1961-01-20	1963-01-20	Democrat
Johnson	1963-01-20	1969-01-20	Democrat
Nixon	1969-01-20	1974-01-20	Republican
Ford	1974-01-20	1977-01-20	Republican
Carter	1977-01-20	1981-01-20	Democrat
Reagan	1981-01-20	1989-01-20	Republican
Bush	1989-01-20	1993-01-20	Republican
Clinton	1993-01-20	2001-01-20	Democrat
Bush	2001-01-20	2009-01-20	Republican
Obama	2009-01-20	2010-01-20	Democrat

Table 4. Model Fit Statistics by Number of States

structural model	#states	transition model	LL	df	AIC	BIC
DRpdif ~ RD, UERdif ~ RD, logGDP ~ RD	1	transition ~ 1	-404.6	9	827.2	851.5
DRpdif ~ RD, UERdif ~ RD, logGDP ~ RD	2	transition ~ 1	-325.0	21	691.9	748.6
DRpdif ~ RD, UERdif ~ RD, logGDP ~ RD	3	transition ~ 1	-283.2	35	636.3	698.3
DRpdif ~ RD, UERdif ~ RD, logGDP ~ RD	4	transition ~ 1	-256.5	51	615.0	752.7
DRpdif ~ RD, UERdif ~ RD, logGDP ~ RD	3	transition ~ RD	-275.3	41	632.6	694.4

Likelihood ratio tests and AIC suggest improvement of fit up to $ns=4$, however the BIC, which penalizes more heavily than AIC for the number of model parameters estimated, suggests that $ns=3$ captures information in the data with parsimony. The model in the last row with transition probability as a function of party (RD) is shown because it has a better BIC, but for the purpose of our analysis, was quite complex to interpret and we had no theory or interest regarding the difference of transition probabilities within parties.

Table 5. Structural Model Estimates

% annual change in:	parameter	State 1	State 2	State 3
Violent Death Rate (change < 0 is good)	intercept=Rep mean	2.913	25.349 ^d	4.472
	slope=Dem effect	-1.809 ^a	-15.378 ^{a,d}	-2.248 ^a
	int + slope=Dem mean	1.104	9.971	2.224
	SD	3.828	5.008	5.183 ^c
Unemployment Rate (change < 0 is good)	intercept=Rep mean	0.660 ^e	16.517 ^d	0.575
	slope=Dem effect	-0.571 ^a	-9.797 ^{a,d}	1.163 ^b
	int + slope=Dem mean	0.089	6.720	1.738
	SD	0.575	2.107 ^c	1.956
Natural log GDP (change > 0 is good)	intercept=Rep mean	0+	-0.298 ^d	0.072
	slope=Dem effect	0.016 ^a	0.199 ^{a,d}	-0.051 ^b
	int + slope=Dem mean	0.016+	-0.099	0.021
	SD	0.015	0.036	0.038 ^c

^a Democratic administration in this state is better than Republican for the outcome variable

^b Republican administration in this state is better than Democratic for the outcome variable

^c Largest SD of the 3 states for the outcome variable

^d Worst mean change value of the 3 states for the outcome variable (intercept=Republican mean, intercept + slope=Democrat mean)

^e Not the closest to 0 across the 3 states

State 1 is the least volatile overall, as it has the smallest % change SDs for all 3 outcome variables. It could also be considered the most neutral state, as nearly all mean % changes (Dem or Rep) are closest to 0 (see footnote e). Means for both parties are in the ‘bad’ direction for Death and Unemployment change, but in the ‘good’ direction for GDP change. For all 3 outcome variables, Democrats in office create better % change than Republicans in office, albeit relatively modest. *“Steady, mild % changes, GDP changes tend to be slightly good, Democrats outperform Republicans for all outcomes” state.*

State 2 is the quite volatile overall, as it has relatively large % change SDs for all 3 outcome variables. It could also be considered the most extreme state, as nearly all mean % changes (Dem or Rep) are furthest from 0, and all in the ‘bad’ direction. For all 3 outcome variables, Democrats in office create good % change than Republicans in office, with mean % changes shifting from Republican ‘very, very bad’ to Democrat ‘very bad’. *“Volatile, extreme % changes, all changes tend to be bad, Democrats outperform Republicans for all outcomes” state.*

State 3 is also quite volatile overall. However, compared to states 1 and 2, levels of mean % changes are predominantly neither the closest nor the furthest from 0 % change. Similar to State 1, Death and UE tend to change in a ‘bad’ direction while GDP tends to change in a ‘good’ direction under both parties. Democratic administrations tend to have better mean % change for Death, but they have worse mean % change for UE and GDP compared with Republicans. *“Volatile, moderate % changes, GDP changing favorably, Democrats under-perform Republicans for mean % change GDP and UE, but not Death” state.*

Table 6. Estimated Transition Probabilities

Initial Values: $\pi_1=0$ $\pi_2=0$ $\pi_3=1$. The process begins in State 3 at the first time point.
Estimates from Transition Model:

		to	State 1	State 2	State 3
from	State 1		0.782	0+	0.218
	State 2		0+	0.584	0.416
	State 3		0.310	0.177	0.512

Highlights

- Under the public health model, violence is conceptualized as a problem that can be prevented by modifying social, economic, and other associated environmental factors.
- Past research has suggested that the political environment may be one such environmental factor that affects suicide (and possibly homicide).
- In this study over the period of 1900-2010, when a U.S. president of a conservative (Republican) party was in power, the unemployment rates were significantly higher and there was a reduction in growth of the gross domestic product (GDP) per capita.
- Additionally, under a conservative party president, the rates of suicide and homicide also increased, both separately and in combination.
- While causality has not been established, different forms of violence could relate to one another, fluctuate with political environment, and elucidate future directions of research.