

Murder and the Black Market: Prohibition's Impact on Homicide Rates in American Cities

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The success of recent marijuana legalization ballot initiatives reignited the national debate on the effectiveness of “the war on drugs” and prohibiting the sale of narcotics. Researchers investigating marijuana legalization can profit from measuring the impact of the early 20th century state level ban of alcohol on homicide rates. I measure the increase in homicides as a result of state level alcohol prohibition during the 1910s and national level alcohol prohibition during the 1920s. To account for variations in the timing of prohibition legislation, I have constructed a panel data set of 64 cities with yearly observations from 1911 to 1929. City level analysis provides a natural experiment as cities were involuntarily forced into prohibition by state and national legislators removing significant selection bias. Since data for alcohol consumption does not exist, I use the yearly number of intoxicating arrests at the city level as a proxy for the size of the alcohol market. The results show that homicides per intoxication arrest, as defined by the coroner, under legalized alcohol consumption were measurably fewer than the homicides per intoxication arrest under prohibition. The higher estimated murder rate per intoxication arrest is statistically and economically significant. According to my model prohibition legislation would only decrease murders in the city if there were a 33% or greater decrease in intoxication arrests. During the 1910s and 1920s some cities were able to achieve this significant reduction in alcohol consumption which reduced their murder rates after the enactment of prohibition. Proponents of marijuana legalization should recognize that the lower per unit murder rates could be offset by the higher rate of consumption. Opponents of marijuana legalization should recognize that the lower rate of consumption could be offset by higher per unit murder rates. To accurately predict the change in murder rates as a result of legalization further research should try to measure the effects of marijuana on murder rates and compare to those the rates I have determined for alcohol.

The simple truth is that legalizing narcotics will not make life better for our citizens, ease the level of crime and violence in our communities nor reduce the threat faced by law enforcement officers. To suggest otherwise ignores reality. [Speaking Out Against Drug Legalization, Drug Enforcement Administration, 2010]

Introduction

Most murders committed in the United States are personal. According to the Federal Bureau of Investigation (FBI), forty percent of victims in 2011 knew their murderer either as a family member, significant other, close friend, neighbor, or coworker.¹ The majority of these homicides were committed because of arguments over romance, money, and other disagreements. Murder, however, can also be considered an impersonal business practice. Gangs operating in the illegal drug trade can gain market share and make greater profits by murdering their competition. In 2011, the FBI reported that 8.4% of all recorded homicides dealt with the drug trade and gang violence. One major policy suggestion to reduce the number of violent crimes including murders is to legalize drugs. Public opinion has slowly started favoring this approach.

On November 6th, 2012 citizens in Colorado and Washington voted to legalize production, possession, distribution, and consumption of marijuana for recreational use in their state. The success of these ballot initiatives reignited the national debate on the effectiveness of “the war on drugs” and prohibiting the sale of narcotics. The argument between the opposing sides is centered on whether a world where marijuana is legal is better than a world where marijuana is illegal. Those in favor of legalization believe that legalizing marijuana will reduce crime, prisoners, and public spending on police while those opposed to legalization believe that legalization will increase drug use producing more problems. Unfortunately, economic theory cannot predict whether legalizing marijuana will reduce crime because of conflicting human responses to legalization legislation.

The ambiguity stems from consumers increasing their use of drugs and therefore consumer related crimes, while at the same time producers stop producing black market goods

¹ 2,895 out of 7,076 explained murders were classified as family, friend, boyfriend, girlfriend, neighbor, employee, or employer. There was an additional 5,588 unexplained murders. If they <http://www.fbi.gov/about-us/cjis/ucr/crime-in-the-u.s/2011/crime-in-the-u.s.-2011/tables/expanded-homicide-data-table-10>

reducing their use of violence. The magnitude of each side's response to the legislation is the most important when determining whether legalization legislation reduces or increases violence. If consumers raise their use of violence more than the decrease from suppliers than legalization will increase violence. However; if the drop in violence from suppliers is greater than the increase in consumer violence, a world of legalization would produce lower homicide rates. Since theory cannot provide a definitive answer to whether consumers or producers respond to legalization legislation, an empirical analysis is needed. Since there are insufficient changes in American marijuana laws throughout the last century, I analyze the impact of legalization legislation by examining another drug, alcohol. I measure homicide rates before and after the prohibition of alcohol during the 1910s to determine the net response of the marketplace to drug prohibition legislation.

The state level alcohol prohibition movement during the 1910s offers analysts an opportunity to compare the reaction of consumers and producers to a world where a drug is legal one year and illegal the next. The major weakness in the research design is the timing of prohibition legislation. Proponents of prohibition could be responding to an increase in violent crime or a rise in organized crime syndicates. To combat this shortcoming, murders are measured at the city level instead of county, state, or national level. Selection bias problems and confusion over whether prohibition legislation causes murders or murders cause prohibition legislation can be greatly diminished.

City level analysis removes selection bias problems because cities, unlike counties and states, did not select the timing of legislation. Of the 68 top cities in the United States during this era only two voluntarily selected the timing of prohibition.² Figures 1-9 show yearly maps of the counties under either local option county prohibition or state enforced prohibition from 1911 to 1918. The maps show that although a majority of the country had prohibition at the county level; cities voted to keep alcohol legal. Cities in states with large white, rural, protestant populations were forced into prohibition earlier than cities that made up a larger part of the state population. A quick examination of cities in the sample, listed in Tables 1 and 2, show that Omaha, Portland, Seattle, and Salt Lake City had prohibition pushed on them by state legislatures earlier than other

² The legality of the sale of alcohol information came from the Financial Statistics of Cities under the Business Taxes from Liquor Traffic category. The taxes collected on liquor traffic are positive only when the city is collecting taxes on alcohol and is 0 when the alcohol sales are prohibited. The indicators were then compared to whether the state was under prohibition at the time.

cities. Although cities resisted state prohibition, all cities were eventually forced into prohibiting alcohol with the 18th Amendment enacted in 1920. The result of national prohibition is the roaring 20s with the rise of popular organized crime figures such as Al Capone, underground markets supporting bootleggers, and wild parties in shadowy “speakeasies”. Since society associates this time period with violence, researchers have been eager to investigate whether prohibition was the cause in the increase in murders.

Researchers are divided on whether alcohol prohibition had a significant impact on homicides during national prohibition. Miron (1999) in a time series analysis of the United States between 1900 and 1995 argued that the enforcement of prohibition had increased violence. His argument agrees with commonly reported unadjusted national statistics that show the 1920s are one of the most violent times in America’s history. Owens (2011), however, finds that demographics —not prohibition— were causing a change in murder. Her analysis used a state level panel data analysis and found that urbanization explained most of the increase in murders during prohibition. I further the literature by using a panel data set of cities instead of states to test whether murder increased during prohibition.

To cover a significant part of the population, I constructed a data set with 64 of the top 68 most populated cities in the 1920 census.³ The variable of interest is homicides per 100,000 citizens recorded yearly in the cities. To further understand how consumers and producers react to changes in drug legalization, I also use the number of intoxication arrests by city as a proxy for the size of black market for alcohol. Unfortunately, the city level data on intoxication arrests is only available from 1914 to 1925. This along with a lack of consistent reporting in arrests drops the estimation analysis to 46 cities over the 12 years. To analyze the data I perform a fixed effect analysis using year effects and robust standard errors. I find that black markets create an increase in murders over white markets by 50 murders per 100,000 citizens for each per capita intoxication arrest. The results are statistically significant at the 5% level calculated using robust standard errors clustered at the city level. The results also show that if the size of the marketplace remains the same under prohibition as legalization, murder rates would be higher. For prohibition to be effective at lowering murders, cities needed to reduce its per capita intoxication arrests by 33%.

³ The cities missing from the sample are: Oakland, California (ranked 31st in population); Birmingham, Alabama (ranked 36th); Des Moines, Iowa (ranked 52nd); and Fort Worth, Texas (ranked 64th)

The paper proceeds as following. The next section details the economic theory behind prohibition. I assert that researchers need to separate the effects of prohibition legislation on murders from the effects of black markets on murders. Section 3 details prohibition legislation during the 1910s. Section 4 examines the claim that city level data is causal rather than correlation. Section 5 provides my strategy for estimating the effects of prohibition legislation along with a more detailed description of my data. Section 6 shows the results of the estimation. The last section details my conclusion on whether Prohibition in the 1910s and 1920s can be used to guide current policy.

Prohibition, Black Markets, and Homicides

Economic theory on prohibition and black markets has focused on the changes in the legal system. Miron (1999) argued that legal status in the marketplaces allows agents to resolve disputes using a nonviolent method. Parties agree to use lawyers instead of violence to end the disagreement. When law makers remove the legal system protecting the buying, selling, manufacturing, and transporting of a good or service, agents no longer have the ability to hire lawyers. This market is often referred in the literature as a “black market” as opposed to the “white market” where the goods are protected by the legal system. To fully understand the impact of the prohibition, researchers need to clearly identify how consumers and suppliers change their behavior with changes in both legislation and the introduction of a black market.

Equation 1 gives a simplified understanding for predicting the number of drug related murders in a given year.

$$\text{Eq 1: Drug Related Murders} = (\text{Market Size}) * \text{Pr}(\text{Consumers Commit Murder} | \text{Enforcement}) + (\text{Market Size}) * \text{Pr}(\text{Suppliers Commit Murder} | \text{Enforcement})$$

The equation simply states that the number of drug related murders depends both on the amount of drugs being consumed and also the behavior of both the consumers and suppliers conditional on enforcement. It is important to separate the effects of prohibition legislation on market size versus the probability of committing murder. Prohibition legislation that decreases

the size of the market should decrease the number of murders, while the resulting black market should increase the probability that suppliers commit murders for a given size of the market. Which effect dominates likely depends on the city's institutions, culture, and characteristics of the population.

Cities that greatly increase the costs to consumers of drinking should reduce the size of the market relative to cities where costs are marginally increased. Monetarily, this is achieved by cities having a significant price hikes in the black market compared to a white market. Since the production of the alcohol had to occur in a foreign country, as opposed to being made in the United States, the price of alcohol most likely was greatly affected by police presence and miles from the border. Receiving goods from outside of the country increased the cost whether through bribes or non-optimal trading routes in order to transport the good past the nation's border. In addition to the increase in price, nonmonetary incentives for consumption are changing with prohibition legislation.

Nonmonetarily, the decrease in consumption of alcohol was achieved through social stigmas of breaking the law and fear of going to jail. Enforcement of the laws most likely has a direct impact on these costs. The consumer's calculation of the probability of going to jail is directly related to police spending and level of enforcement. Unfortunately, the probability of getting arrested and convicted is not uniform across society.⁴ The rich were seldom arrested and never convicted, while the poor who could not pay the price of bribing officials were most likely prosecuted. The reduction in consumption from the higher price of alcohol and increased social cost should reduce the murders attributed to an "altered mindset" from alcohol.

The restriction of consumption helps reduce violence through allowing clear judgment about whether to commit a crime or not. The Drug Enforcement Administration's (DEA) clearly stated that they believe that the mind-altering effect of drugs is the most important cause of people committing homicides.⁵ In addition to reducing consumption, prohibition legislation creates incentives to reduce risky behavior by consuming alcohol at home instead of saloons and bars.

⁴ There are stories of Congress having a wet bar during national prohibition.

⁵ Six times as many homicides are committed by people under the influence of drugs than by those who are looking for money to buy drugs. Most drug crimes aren't committed by people trying to pay for drugs; they're committed by people on drugs. [Speaking Out Against Drug Legalization, DEA, 2010]

The marketplace for the consumption of alcohol most likely moved from a public setting of a saloon to a more isolated setting such as a private house. One of the main goals of the Anti-Saloon League, the main organization that pushed prohibition on a national scale was to close down men gathering in saloons rather than spending time at home. Prohibition of suppliers makes large gatherings in a marketplace less safe than drinking at home as they are more likely to be noticed by police. The movement from a social gathering activity to a more hidden smaller activity could reduce the number of “brawls due to the influence of alcohol” murders.⁶ While the higher prices of alcohol might decrease the size of the marketplace it also causes a greater incentive for suppliers to commit violence.

A lack of legal protection also has a significant impact on suppliers. Disagreements over contracts, territorial expansion, and basic property rights all can be contended using guns instead of lawyers. Suppliers within the vicinity of the black market are without legal recourse in all crimes not just alcohol related infractions. This is especially important for illegal goods that are able to be resold. Stealing other supplier’s drugs is no longer considered a “criminal act” as the owner of the illegal substance has no incentive to report the crime or expect legal protection for the stolen drugs. Protection from violence becomes important in black markets where private security needs to be hired as additional cost to conducting business increasing the price of alcohol further. To find the total effect of prohibition legislation on the market place, I measure the change in the size of the market and the probability of murders committed in society.

Measuring Markets Under Prohibition

The first part of the 20th century is the last occurrence of a significant change in American prohibition legislation. In 1910, nine states had state-wide prohibition on their books. During the years that followed, many cities, counties, and states also voted to enforce prohibition. On the eve of the national prohibition vote, twenty four states already had state-level prohibition laws. The laws were not uniform with details of consumption, transportation,

⁶ Brawls would cause unwanted attention to the police giving bar owners an extra incentive to make sure that their patrons caused no trouble.

production, enforcement and exemption varying among states. National prohibition changed that by forcing all states to enforce prohibition.

National prohibition was ushered in by the 18th Amendment to the United States Constitution. The Amendment only prohibited the “manufacture, sale, or transportation of intoxicating liquors” while leaving the *consumption* of alcohol legal. The proponents of the amendment knowing that enforcement agencies needed time to prepare for implementation made the law only apply one year after ratification. Therefore, even though the Amendment was ratified on January 16th 1919, alcohol was not made illegal until January 17th 1920. The vague wording in the amendment referring to “intoxicating liquors” was clearly defined by congress in the intervening year.

After January 16th 1919 Congress debated how to define what would be legal, illegal, and certain exemptions for the law. The result was the Volstead Act that defined “intoxicating liquors” as anything greater than 0.5% alcohol content. There were a number of loopholes including it was legal to have alcohol for scientific, religious, medical, and industrial use. Consumers took advantage of these loop holes during the following thirteen years.

National alcohol legalization started on December 5th, 1933 with the ratification of the 21st Amendment to the Constitution. The passage of the Amendment was a victory for Moderation Societies, Brewers, and others united in legalizing alcohol.⁷ After the amendment passed, America did not return to the same laws controlling alcohol that were present before national Prohibition. Instead counties and states decided to either keep with prohibition, enforce strict licensing procedures, or had government run monopolies sell alcohol exclusively. Since, cities selected into these enforcement mechanisms, a selection bias exists when exiting Prohibition. Therefore, I will not measure the change in homicides after legalization in 1933. A lack of economic data also restricts the analysis to the years 1911 to 1929 in order to avoid the ramifications of the Great Depression having an impact on my results.

I break down the market for alcohol into four classifications. The first is a licensed free white marketplace with consumers believing the supply of alcohol will last forever. The second is a white market where alcohol is assured to be illegal in one year. Cities in Table 1 and Table 2

⁷ Knowing that state politicians were politically threatened by temperance societies when voting for alcohol legalization, Congress took the unusual move of removing state elected politicians from deciding the fate of the 21st Amendment. Instead of having state legislatures vote for the ratification, Congress sent the legislation directly to the ordinary people by requiring ratification through ratifying conventions.

were frequently subject to a definite end legal alcohol procurement because of the delaying enactment of the 18th Amendment. The third market is a black market that allows transportation of alcohol into the state for private consumption but outlaws saloons. The fourth type of market is a black market where even transportation of alcohol through the state is illegal. This marketplace occurred infrequently throughout the states before 1920 but occurred in all of the states with the commencement of national prohibition.

In Pursuit of Causation

When given the choice, only two of the 64 cities in the sample voted to voluntarily enforce prohibition at the city level from 1910 to 1920. The data on whether the city voted for prohibition is derived from the Anti-Saloon League Year Books published yearly throughout the decade.⁸ Each state had an Anti-Saloon League chapter that reported results in the Year Book. Each report specifically listed all cities that were “dry” or prohibited alcohol. For the entire decade beginning in 1910 only two cities out of the entire sixty four voluntarily voted for prohibition. The two cities are Cambridge and Fall River Massachusetts. Cambridge voted to become dry in 1886 and continued to vote dry the entire sample period. Fall River voted to prohibit alcohol in 1917 but voted to legalize alcohol in 1918. The only other city that the Anti-Saloon League claimed was dry was Los Angeles from 1918 and 1919.⁹ Los Angeles prohibited hard liquor while allowing 14 per cent alcohol to be bought and sold. The city will be classified as a wet city for the years 1918 and 1919 in the dataset as prohibition only hard liquor is not creating a black market for all alcoholic goods. The rest of the sixty two cities were forced into prohibition either by state or national legislation.

Focusing on homicide rates in large cities instead of individual states allows for a clearer estimation of the change in homicide rates once prohibition was enacted. States voluntarily entered into prohibition usually well after a majority of the state’s counties had already voted to

⁸ I checked the Anti-Saloon League data with reports from the Year Book of Brewers and the General Statistics of Cities published by the Census Bureau.

⁹ Los Angeles...banished their saloons, prohibited sale of any distilled liquor and left only service of wines and beers not containing more than 14 per cent of alcohol. These can be sold during limited hours in sealed packages not to be consumed on the premises and may be served in the public dining room of hotels and restaurants with bona fide meals between the hours of 11 a.m. and 9 p.m. (Anti-Saloon League Year Book, 1918)

enact prohibition at the county level. Figures 1 through 9 show that before states enacted state level prohibition, most of the counties in the state were already prohibiting alcohol. Measuring the change in homicide rates at the state level before and after state level prohibition is not comparing a population under legalization to the same population under prohibition. Instead, if a large part of the state was already under prohibition the change in homicide rates is biased as black markets were already formed by prohibition. To measure the full impact of the legislation, cities offer a population that were fully legalized before state legislation and fully prohibited after the legislation. Unfortunately, this means that any conclusions will only apply to populations that are *opposed* to prohibition.

Analytical Framework

I use the following analytical framework to investigate the change in homicides from changes in prohibition legislation. To start I estimate the change in homicides in cities without a reference to the size of the corresponding black market.

$$\text{Eq 1: } Murder_{ct} = \alpha + \beta prohibition_{ct} + \theta X_{ct} + \phi H_{ct} + \lambda W_{ct} + \zeta F_{ct} + \xi B_{ct} + \gamma_c + \delta_t + \varepsilon_{ct}$$

Murder is measured as the number of homicides per 100,000 citizens recorded for city c in year t . *Prohibition* is a dummy variable indicating 1 when the city is under prohibition and 0 when the city is not under prohibition. A coefficient of $\beta > 0$ indicates that prohibition increased murders per capita in the city. The number of murders in a city for a given year is also dependent on the real per capita police spending (X), the real per capita total charity, hospital, and prison spending (H), the percent of white males ages 15-24 relative to the city population (W), the percent of foreign born males ages 15-24 relative to the city population (F), the percent of black males ages 15-24 relative to the population (B), the percent of citizens that were catholic, the percent of citizens that were jewish, and the number of state executions occurring in the year before ($t-1$). To correct for individual city characteristics that do not change through time, I use city level fixed effects. Also, because the early 20th century had several nation-wide events that affected all cities in a given year I have included year specific effects. The disturbance term for the estimation is for each city in each year.

Figure 10 shows the average homicides per 100,000 citizens in select cities between the years of 1911 and 1929. The graphs show why estimating the impact of prohibition on murders

using only a simple fixed effects model could be problematic. Murders fall in the first year of prohibition, either state or national prohibition whichever comes first. However, this effect is most likely temporary as black markets require time to be set up. Fixed effects models at the city level will estimate the change from before prohibition to after prohibition using the first year of prohibition. In order to correct for this problem, I use two strategies. The first is to separate the market structures into various time period i.e. white markets without an end date, one year before the start of prohibition, prohibition with transportation to private consumers, and prohibition without transportation.

$$\text{Eq 2: } Murder_{ct} = \alpha + \beta proh_{ct} + \pi one_{ct} + \xi trans + \theta X_{ct} + \phi H_{ct} + \lambda W_{ct} + \zeta F_{ct} + \xi B_{ct} + \gamma_c + \delta_t + \varepsilon_{ct}$$

The variable *proh* is an indicator whether the city had full prohibition or not. *One* is an indicator whether the city had a one year notice on prohibition. *Trans* is an indicator whether the city had prohibition, but that transportation and consumption were still legal. By splitting up the markets, the immediate decrease shown in Figure 10 should not be as dominant in determining the effect of prohibition. The problem associated with determining if market size is driving the change in murders or probability of committing murders by suppliers is the dominant influence still exists. To show changes in consumption through the years, I use yearly intoxication arrest reports and the number of deaths from cirrhosis of the liver from each city as a proxy for the change in the market for alcohol.

In any study of prohibition, measuring the size and scope of the black market that arises after legislation is challenging. Data on price, quantity, quality, and market structure of prohibited items does not exist as illegal transactions are seldom recorded and made public. Miron and Zwiebel (1991) indirectly measured the quantity of alcohol consumed during prohibition using national statistics on alcoholism deaths, drunkenness arrests, and cirrhosis of the liver. Dills and Miron (2004) and Dills, Jacobson, Miron (2005) also use arrests for intoxication and cirrhosis of the liver to approximate the impact of prohibition legislation. I use intoxication arrests for the quantity of alcohol consumed because of the immediate impact it receives from daily consumption. Unfortunately, data for intoxication arrests are only available from the years 1914 to 1925. Figure 10 shows the average intoxication arrest per 100,000 citizens in select cities. Most cities fall to the lowest levels of intoxication arrests at the first year of prohibition, although arrests start decreasing well before the enactment of prohibition. This is

most likely because of consumers hoarding alcohol and rationing when to drink because of an uncertain future supply. It also could be showing the closing of saloons before prohibition was enforced.

Yearly deaths from cirrhosis of the liver from 1911 to 1929 are also shown in Figure 10. Cirrhosis deaths fall during the time period and level off after national Prohibition. It is hard to determine if this trend is from a reduction in the size of the marketplace, changes in binge drinking habits, changes in the type of alcohol consumed, increases in health education on drinking, or other improvements in medical technology. Since cirrhosis of the liver data was obtainable from 1911 to 1929 the full sample can be used for analysis allowing cirrhosis deaths to be used as robustness check on intoxication arrests.

The change in intoxication arrests over the years had a greater variance than cirrhosis deaths. For example, Chicago starts at 2,226 intoxication arrests per every 100,000 citizens in 1914 but ends the period with 3,055 intoxication arrests per every 100,000 citizens in 1925. Boston, on the other hand, starts out with 8,432 intoxication arrests per every 100,000 citizens in 1914 and ends with 4,962 intoxication arrests per every 100,000 citizens in 1925. These arrest records might be showing why Boston's murder rate dropped from 3.8 in 1914 to 3.3 in 1925 while Chicago's increased from 10 to 15.1 during the same time frame. It could also be from spillover effects caused by surrounding dry cities such as Cambridge, Massachusetts.

Citizens living in dry counties could travel to wet cities artificially increasing their intoxication arrests before Prohibition. After national Prohibition, these citizens would have stopped traveling to the big cities as liquor was no longer legal in both cities. Figure 11 shows a map of the United States with highlighted counties that are within 60 miles of the sample cities.¹⁰ To figure out the potential spillover effect, I counted the population that lived in a "dry" county within 60 miles of the sample city.¹¹

To take into account spillover issues and measure the probability of committing a murder by consumers and producers, I use two new equations.

¹⁰ A radius of 60 miles was chosen as there are reports of motorists driving to Baltimore from Washington DC to obtain alcohol.

¹¹ If a county was "wet" it counted 0 population towards potential spillover effects. If a county was "dry" I calculated the number of citizens over the age of 10 by using a linear interpolation between census years.

$$\text{Eq 3: } \text{Murder}_{ct} = \alpha + \beta \text{pro}A_{ct} + \mathcal{G} \text{whitem}A + \psi K_{ct} + \gamma_c + \delta_t + \varepsilon_{ct}$$

$$\text{Eq 4: } \text{Murder}_{ct} = \alpha + \beta \text{pro}hA_{ct} + \pi \text{one}A_{ct} + \xi \text{trans}A + \mathcal{G} \text{whitem}A + \psi K_{ct} + \gamma_c + \delta_t + \varepsilon_{ct}$$

Equations 3 and 4 interact the indicator variables of the type of marketplace in Equations 1 and 2 with the number of intoxication arrests occurring in city c for year t . Since murder rates might change when there is greater consumption of alcohol in a white market, an indicator of a white market interacted with intoxication arrests are also added to both equations.¹² In Equation 3, $\text{pro}A$ is the indicator of a fully restrictive black market interacted with per capita intoxication arrests for the city c in year t . $\text{Whitem}A$ is the indicator of a white market interacted with intoxication arrests for the city c in year t . By having these interaction terms, I can estimate how murders change when there is a change in the size of alcohol consumption in a white market compared to a black market. In order to simplify the notation, K is the variables for demographics and spending (X, H, W, F, B) listed before in Equations 1 and 2. Equation 4 is the same as Equation 3 except the interaction term multiplied with the per capita alcohol arrests is broken up into four different markets, white ($\text{whitem}A$), one year till prohibition ($\text{one}A$), prohibition with transportation ($\text{trans}A$), and prohibition on everything but consumption ($\text{pro}hA$).

The number of cities in the dataset changes based on the whether the estimation equation takes into account intoxication arrests and whether the panel is balanced or not. The beginning dataset had 64 cities with murders being recorded yearly between 1911 and 1929. Unfortunately, some cities have missing observations, particularly in the early years, lowering the number of cities in the balanced panel dataset to 60 cities over 19 years.¹³ When adding in intoxication arrest data, several cities did not report arrests for all years between 1914 to 1925. The number of cities in the balanced data set with alcohol arrests recorded for all 12 years was 49.¹⁴

Results

Table 4 shows the results in estimating Equations 1 and 2 for both a balanced panel and an unbalanced panel. The coefficient estimates that are statistically significant at the 5% level are

¹² Since alcohol arrests vary yearly, adding in the white market indicator is no longer linearly dependent with the constant, year effects, and black market indicator.

¹³ List of Cities Dropped: Houston, Texas; Dallas, Texas; Memphis, Tennessee; Nashville, Tennessee

¹⁴ List of Cities Dropped: Scranton, Pennsylvania; Salt Lake City, Utah; Reading, Pennsylvania; Los Angeles, California; Denver, Colorado; Columbus, Ohio; Toledo, Ohio; Cleveland, Ohio; Kansas City, Kansas; Jersey City, New Jersey; Youngstown, Ohio.

white males ages 15-24 as a percent of total population and an indicator for prohibition. The percentage of white males ages 15-24 increases the murder rate, while enacting prohibition legislation decreases the murder rate. Moving from an unbalanced to a balanced panel, the only statistically significant coefficient was white males ages 15-24 as a percent of total population. The negative coefficient on the prohibition indicator is most likely picking up the immediate change in murder rates shown in Figure 5.

Table 5 shows the results in estimating Equations 3 and 4 for both a balanced panel and an unbalanced panel. The coefficients that are statistically significant at the 5% level are white markets interacted with per capita intoxication arrests, one year till prohibition interacted with per capita intoxication arrests, and complete prohibition interacted with per capita intoxication arrests. Since magnitudes and statistical significance are similar over all for estimations, I will focus only on column (4) for Table 5.

The change in consumption of alcohol in a normal white market has consequences on the murder rate. The coefficient on per capita intoxication under a black market is 169 homicides per 100,000 citizens while under a white market it was 113 homicides per 100,000 citizens. A one standard deviation increase of 0.0118 more per capita intoxication arrests is correlated with 1.33 more homicides per 100,000 citizens.¹⁵ For a city with a population of 2,000,000 this would mean an extra 26 deaths associated with the increase in consumption of alcohol even in a white market. For black markets, changes in the per capita intoxication arrests are even worse. A one standard deviation increase in per capita arrests causes 1.99 more homicides per 100,000 citizens. For a city with a population of 2,000,000 this would mean an extra 39 homicides from the change in alcohol consumption during a black market. To decrease the number of murders after prohibition legislation, per capita intoxication arrests would need to fall by greater than 33% to make up for the more dangerous black market.¹⁶

Conclusion

I find that prohibition legislation does increase the probability that consumers and suppliers will use violence when keeping the size of the market constant. However, in the real

¹⁵ Standard Deviation of per capita Intoxication Arrests multiplied by the White market coefficient = $0.0118 * 113 = 1.33$

¹⁶ $113 * \text{number of per capita intoxication arrests before prohibition} = 169 * \text{number of per capita intoxication arrests after prohibition}$. $(113/169) * \text{before arrests} = \text{after arrests}$. $(.668-1)/1$. -33%

world, the size of the market for illegal goods is most likely smaller than the market for legal goods. Lawmakers therefore are making a tradeoff when legalizing drugs. They are creating lower murder rates for the size of the market, but they are increasing the overall size of the marketplace. The higher murder rate per intoxication arrest after prohibition estimated in the paper is statistically significant and economically significant. Prohibition legislation would only decrease murders in the city if there was a 33% or greater decrease in intoxication arrests or size of the marketplace. During prohibition in the 1910s and 1920s some cities were able to achieve this significant enough of reduction in consumption to reduce their murder rates while others were not.

The debate on marijuana legalization should focus on measuring the potential expansion of the marketplace for marijuana. If there is a significant increase in the number of consumers and thus the size of the marketplace, legalization might be the incorrect choice for society. On the other hand, if the number of consumers is similar under prohibition as under legalization, legalization will most likely produce an improvement for society. Analysts on both side of debate have produced different results without a clear consensus of the effect of legalization. If marijuana follows alcohol, it remains doubtful that a non-popular law is suppressing the size of the marketplace.

The debate on legalization also needs to move forward through realizing that the law will not eliminate all murders or have the same response from all parts of the nation. Indeed in popular culture the discourse using Prohibition as argument for or against marijuana legalization needs to be elevated. In particular both organized against and for legalization should discontinue selecting only years that bias results for their argument. For those arguing against legalization, citations of prohibition statistics that stop before 1922 are sure to be against legalization but inaccurate.¹⁷ Black markets take time to form and if the horizon of comparison is stretched to 1925 and beyond the response of society looks different that those against legalization are claiming. Those for legalization are also abusing statistics by citing statistics that begin in 1920. Using statistics from the beginning of Prohibition in 1920 and showing the steady increase in alcohol arrests and murders does not show a before and after picture of prohibition legislation.

¹⁷ The 1989 NY Times opinion piece by Mark Moore is a good example of using Prohibition statistics improperly. The statement from the opinion piece used is “Arrests for public drunkenness and disorderly conduct declined 50 percent between 1916 and 1922” (NY Times 1989). This piece of information is correct; however, it stops short of the systematic increase of intoxication arrests after 1922.

To move the discussion forward, researchers should be focused on why cities decreased or increased their consumption of alcohol during prohibition. For example, why does Chicago react by increasing its consumption of alcohol while Boston cuts its consumption? Is political leadership important? Does religious affiliation determine adherence to civic laws? Does prohibition of other black markets in areas such as currency, prostitution, steroids, legal drugs sold without a prescription, gambling, forged identification cards, or exotic pets produce the same results as drug markets? These are all questions still need to be answered in order to better predict how crime varies between white and black markets.

Table 1. Alphabetical List of Cities in Sample (A - M) with Prohibition Timing

City	State	Normal Market For Alcohol	Market For Alcohol Ends in a Year	State is Dry but Transportation is Still Legal	State is Dry and Transportation is Not Legal
Akron	Ohio	1911-1918	1919		1920-1929
Albany	New York	1911-1918	1919		1920-1929
Atlanta	Georgia			1911-1916	1917-1929
Baltimore	Maryland	1911-1918	1919		1920-1929
Boston	Massachusetts	1911-1918	1919		1920-1929
Bridgeport	Connecticut	1911-1918	1919		1920-1929
Buffalo	New York	1911-1918	1919		1920-1929
Cambridge	Massachusetts				1920-1929
Camden	New Jersey	1911-1918	1919		1920-1929
Chicago	Illinois	1911-1918	1919		1920-1929
Cincinnati	Ohio	1911-1918	1919		1920-1929
Cleveland	Ohio	1911-1918	1919		1920-1929
Columbus	Ohio	1911-1918	1919		1920-1929
Dallas	Texas	1911-1917			1918-1929
Dayton	Ohio	1911-1918	1919		1920-1929
Denver	Colorado	1911-1914	1915		1916-1929
Detroit	Michigan	1911-1916	1917		1918-1929
Fall River	Massachusetts	1911-1917	1919		1920-1929
Grand Rapids	Michigan	1911-1916	1917		1918-1929
Hartford	Connecticut	1911-1918	1919		1920-1929
Houston	Texas	1911-1917			1918-1929
Indianapolis	Indiana	1911-1916	1917		1918-1929
Jersey City	New Jersey	1911-1918	1919		1920-1929
Kansas City	Kansas			1911-1912	1913-1929
Kansas City	Missouri	1911-1918	1919		1920-1929
Los Angeles	California	1911-1918	1919		1920-1929
Louisville	Kentucky	1911-1918	1919		1920-1929
Lowell	Massachusetts	1911-1918	1919		1920-1929
Memphis	Tennessee			1911-1916	1917-1929
Milwaukee	Wisconsin	1911-1918	1919		1920-1929
Minneapolis	Minnesota	1911-1918	1919		1920-1929

Source: *Anti-Saloon League Year Books, various years*

Table 2. Alphabetical List of Cities in Sample (N - Z) with Prohibition Timing

City	State	Normal Market For Alcohol	Market For Alcohol Ends in a Year	State is Dry but Transportation is Still Legal	State is Dry and Transportation is Not Legal
Nashville	Tennessee			1911-1916	1917-1929
New Bedford	Massachusetts	1911-1918	1919		1920-1929
New Haven	Connecticut	1911-1918	1919		1920-1929
New Orleans	Louisiana	1911-1918	1919		1920-1929
New York	New York	1911-1918	1919		1920-1929
Newark	New Jersey	1911-1918	1919		1920-1929
Norfolk	Virginia	1911-1914	1915		1916-1929
Omaha	Nebraska	1911-1916			1917-1929
Paterson	New Jersey	1911-1918	1919		1920-1929
Philadelphia	Pennsylvania	1911-1918	1919		1920-1929
Pittsburgh	Pennsylvania	1911-1918	1919		1920-1929
Portland	Oregon	1911-1915			1916-1929
Providence	Rhode Island	1911-1918	1919		1920-1929
Reading	Pennsylvania	1911-1918	1919		1920-1929
Richmond	Virginia	1911-1914	1915		1916-1929
Rochester	New York	1911-1918	1919		1920-1929
Salt Lake City	Utah	1911-1916			1917-1929
San Antonio	Texas	1911-1917			1918-1929
San Francisco	California	1911-1918	1919		1920-1929
Scranton	Pennsylvania	1911-1918	1919		1920-1929
Seattle	Washington	1911-1916			1917-1929
Spokane	Washington	1911-1916			1917-1929
Springfield	Massachusetts	1911-1918	1919		1920-1929
St. Louis	Missouri	1911-1918	1919		1920-1929
St. Paul	Minnesota	1911-1918	1919		1920-1929
Syracuse	New York	1911-1918	1919		1920-1929
Toledo	Ohio	1911-1918	1919		1920-1929
Trenton	New Jersey	1911-1918	1919		1920-1929
Washington	DC	1911-1916		1917-1918	1919-1929
Wilmington	Delaware	1911-1918	1919		1920-1929
Worcester	Massachusetts	1911-1918	1919		1920-1929
Yonkers	New York	1911-1918	1919		1920-1929
Youngstown	Ohio	1911-1918	1919		1920-1929

Source: *Anti-Saloon League Year Book*, various years

Table 3. Summary Statistics

Variable	Mean	Std. Dev.	Min	Max	Obs
Murders Per 100,000 Citizens	9	8	0	53	1,140
Real Per Capita Police Spending in 2012 Dollars	43	18	8	142	1,140
Real Per Capita Charity, Prison, and Hospital Spending in 2012 Dollars	24	20	0	119	1,140
Percent of White Males Ages 15 - 24 in City	0.071	0.012	0.050	0.143	1,140
Percent of Black Males Ages 15-24 in City	0.006	0.008	0.000	0.041	1,140
Percent of Foreign Males Age 15-24 in City	0.012	0.008	0.001	0.043	1,140
City Population	437,597	814,127	72,285	6,799,406	1,140
Arrests for Intoxication Per Citizen	0.0156	0.0118	0.001	0.101	675

Sources: Murder rate are collected from the Census Bureau's Mortality Statistics volumes published yearly from 1911-1929. Murders for Los Angeles come from the Los Angeles Homicides, 1830-2002 by Eric Monkkonen. For the years 1910-1912 and 1916-1929 I used the variable LAHMPC. For the years 1913-1915 the variable LAFYHPC was used. Police, Charity, Prison, and Hospital spending comes from Financial Statistics of Cities volumes published from 1911-1913, 1915-1919, and 1921-1929. The years 1914 and 1920 were never published. To estimate the value of spending in these missing years I took the average of the two surrounding years. To adjust the nominal amounts listed in the Financial Statistics books I used the CPI Index created by Lawrence H. Officer and Samuel H. Williamson found at <http://www.measuringworth.com/usdpi/>. Population and demographic variables are taken from the Census Bureau's Decennial Census volumes of 1910, 1920, and 1930. Data between census years is linearly interpolated.

Table 4. Fixed Effects Estimation Using Data from 1911-1929

	Homicides Per 100,000 Citizens			
	(1)	(2)	(3)	(4)
Police Spending	-0.004 (0.0326)	-0.007 (0.032)	-0.011 (0.031)	-0.012 (0.031)
Charity, Prison, and Hospital Spending	0.01 (0.02)	0.012 (0.019)	0.014 (0.019)	0.015 (0.019)
% of White Males Ages 15 - 24	47 (19)	45 (19)	42 (19)	45 (19)
% of Black Males Ages 15 - 24	538 (283)	496 (263)	382 (243)	391 (249)
% of Foreign Males Age 15 - 24 in City	74 (78)	94 (78)	111 (80)	101 (79)
Indicator of One Year Till Prohibition Legislation		-1.49 (1.06)		-0.97 (1.06)
Indicator of Prohibition on Alcohol but Transportation is Still Legal		3.3 (3.6)		-2.433 (1.45)
Indicator of Prohibition of Alcohol on Everything but Consumption	-3.538 (1.315)	-3.702 (1.451)	-1.984 (1.271)	-2.48 (1.45)
Constant	1.6 (2.5)	1.6 (2.5)	1.4 (2.5)	1.5 (2.5)
City Fixed Effects?	Yes	Yes	Yes	Yes
Year Fixed Effects?	Yes	Yes	Yes	Yes
Balanced?	No	No	Yes	Yes
R squared	0.53	0.54	0.35	0.35
Observations	1203	1203	1140	1140

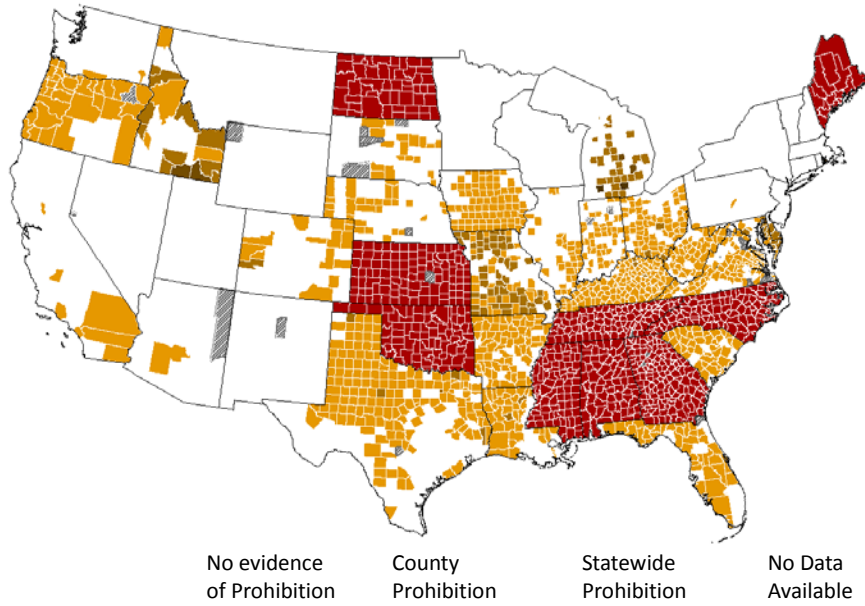
Notes: Robust standard errors clustered by city are in parentheses. Coefficients that are statistically significant at $p < 0.05$ are in bold.

Table 5. Fixed Effects Estimation Using Data from 1911-1929

	Homicides Per 100,000 Citizens			
	(1)	(2)	(3)	(4)
Police Spending	-0.07 (0.05)	-0.067 (0.052)	-0.045 (0.055)	-0.042 (0.055)
Charity, Prison, and Hospital Spending	-0.009 (0.029)	-0.008 (0.030)	-0.02 (0.03)	-0.02 (0.03)
% of White Males Ages 15 - 24	67 (48)	66 (48)	58 (50)	58 (50)
% of Black Males Ages 15 - 24	701 (425)	702 (433)	780 (507)	780 (510)
% of Foreign Males Age 15 - 24 in City	68 (94)	70 (96)	107 (94)	101 (93)
White Market Interacted with per capita Intoxication Arrests	118 (47)	117 (47)	115 (52)	113 (51)
One Year Till Prohibition Legislation Interacted with per capita Intoxication Arrests		156 (54)		149 (58)
Prohibition on Alcohol but Transportation is Still Legal Interacted with per capita Intoxication Arrests		104 (93)		38 (81)
Prohibition of Alcohol on Everything Interacted with per capita Intoxication Arrests	163 (71)	166 (70)	170 (84)	169 (82)
Constant	-0.14 (4.44)	-0.23 (4.39)	-2.2 (4.9)	-2.2 (4.9)
City Fixed Effects?	Yes	Yes	Yes	Yes
Year Fixed Effects?	Yes	Yes	Yes	Yes
Balanced?	No	No	Yes	Yes
R squared	0.53	0.57	0.55	0.55
Observations	675	675	552	552

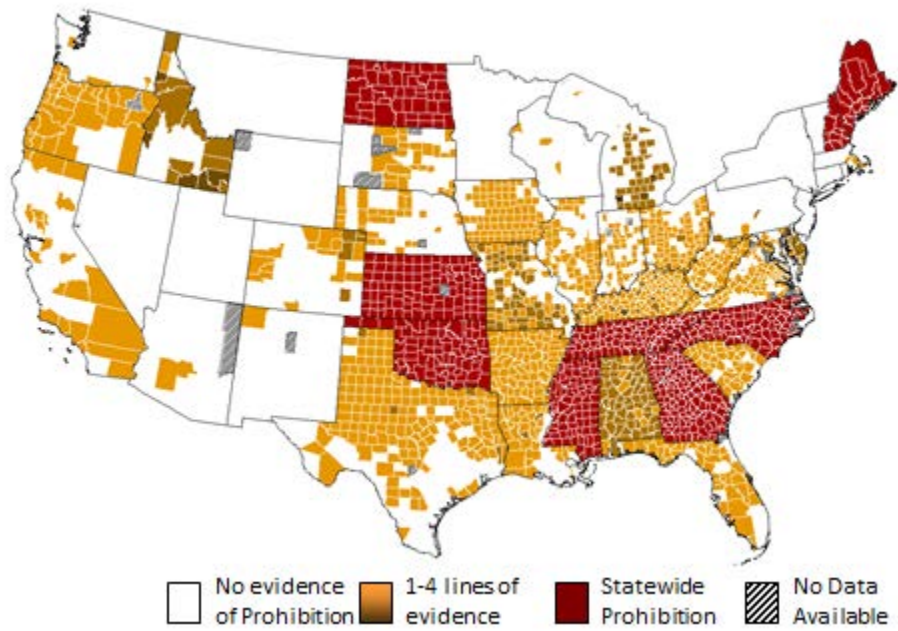
Notes: Robust standard errors clustered by city are in parentheses. Coefficients that are statistically significant at $p < 0.05$ are in bold

Figure 1. Prohibition in 1910 by county.



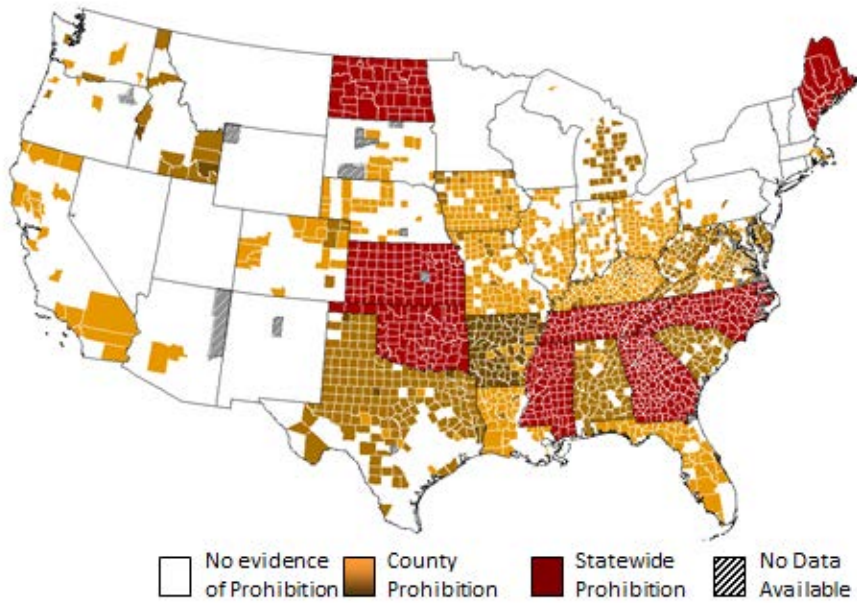
Source: Robert Sechrist's ICPSR (8343). Created by Zachary Christman (Rowan University)

Figure 2. Prohibition in 1911 by county.



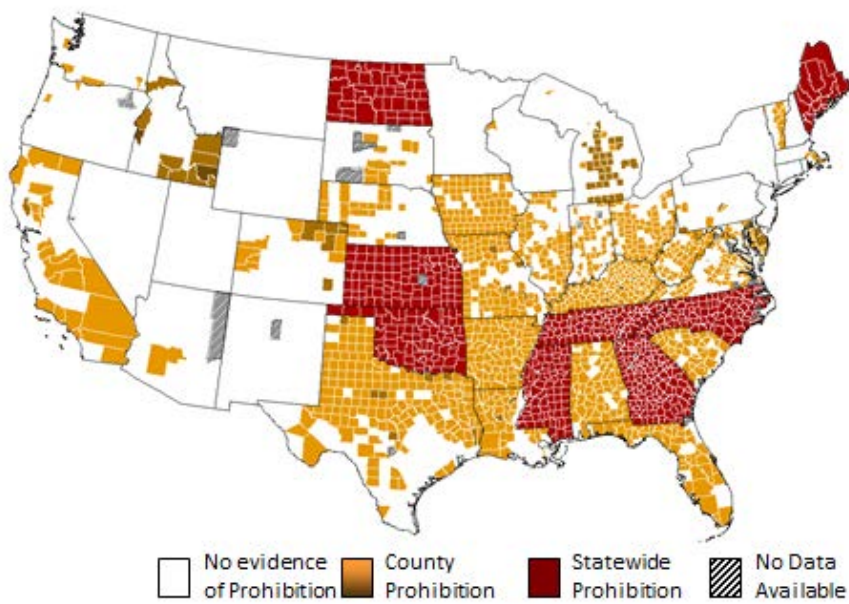
Source: Robert Sechrist's ICPSR (8343). Created by Zachary Christman (Rowan University)

Figure 3. Prohibition in 1912 by county.



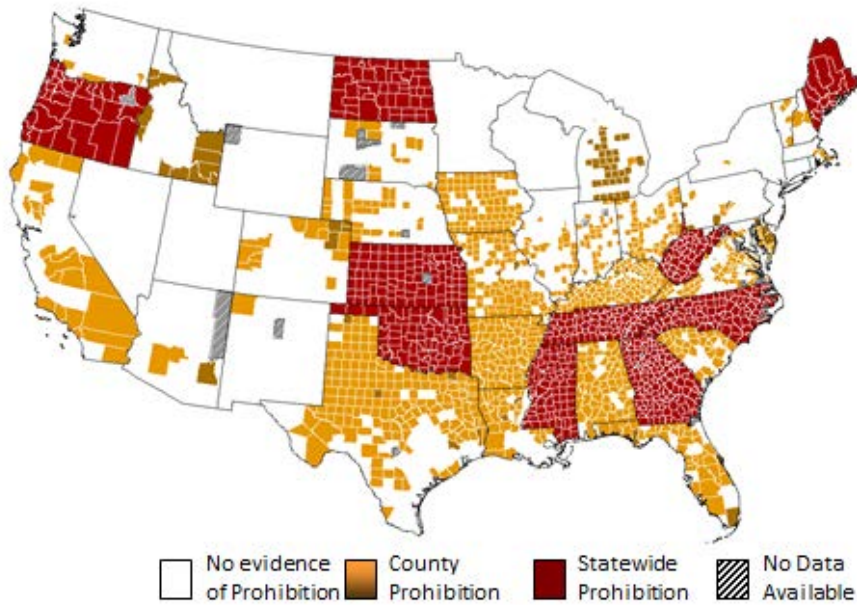
Source: Robert Sechrist's ICPSR (8343). Created by Zachary Christman (Rowan University)

Figure 4. Prohibition in 1913 by county.



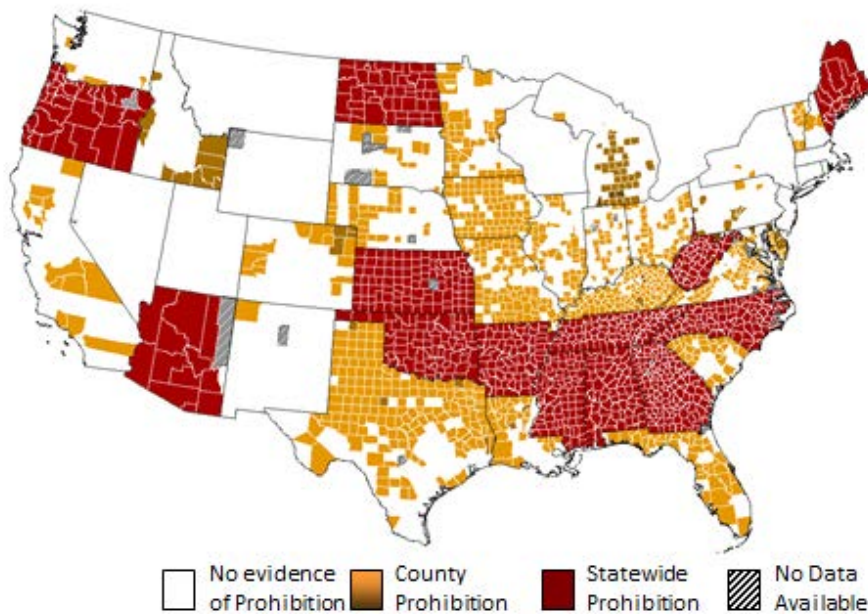
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Figure 5. Prohibition in 1914 by county.



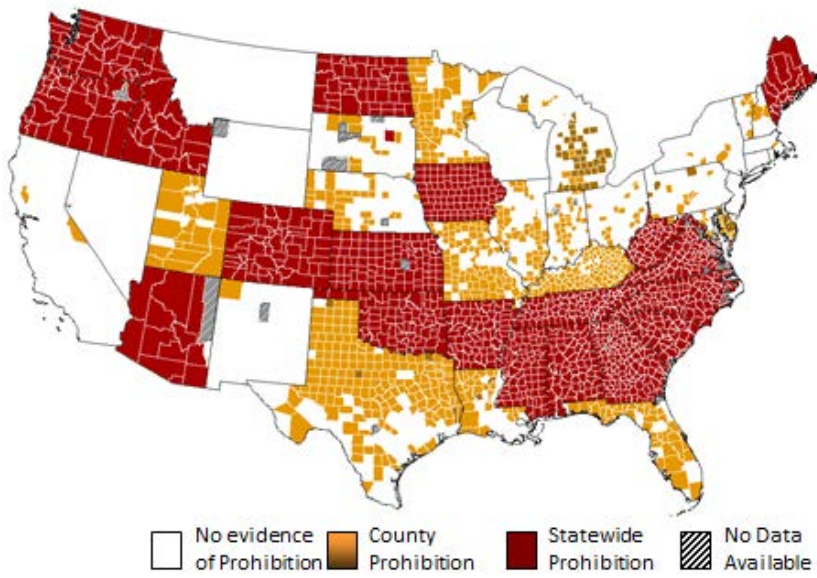
Source: Robert Sechrist's ICPSR (8343). Created by Zachary Christman (Rowan University)

Figure 6. Prohibition in 1915 by county.



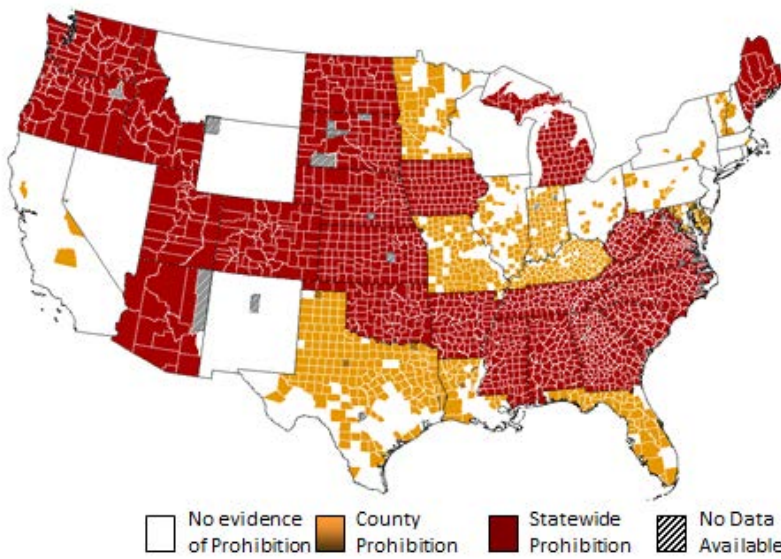
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Figure 7. Prohibition in 1916 by county.



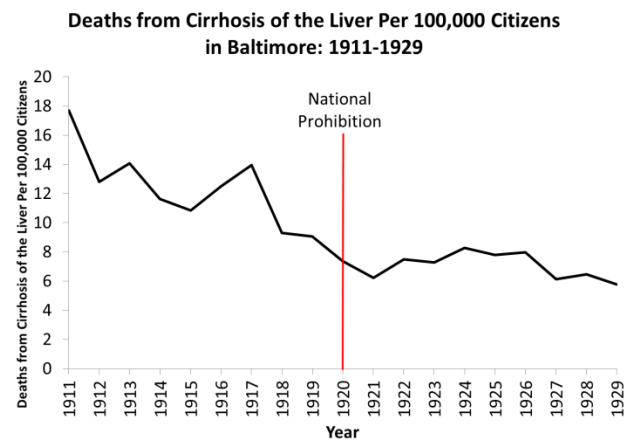
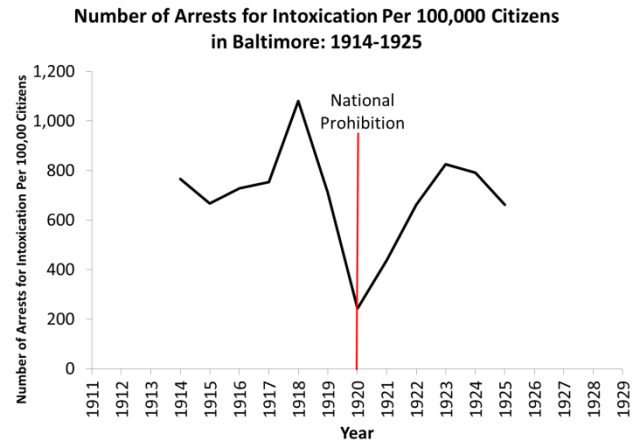
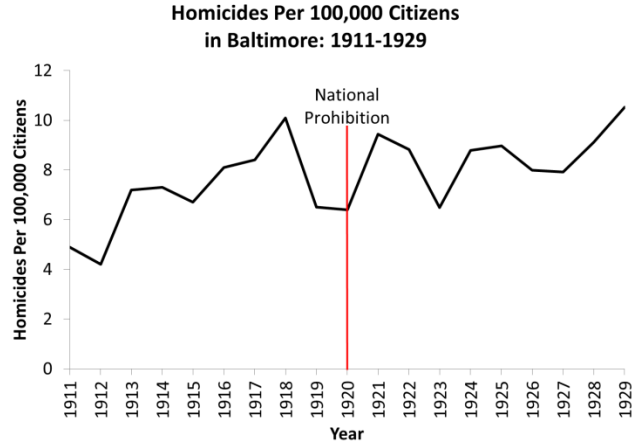
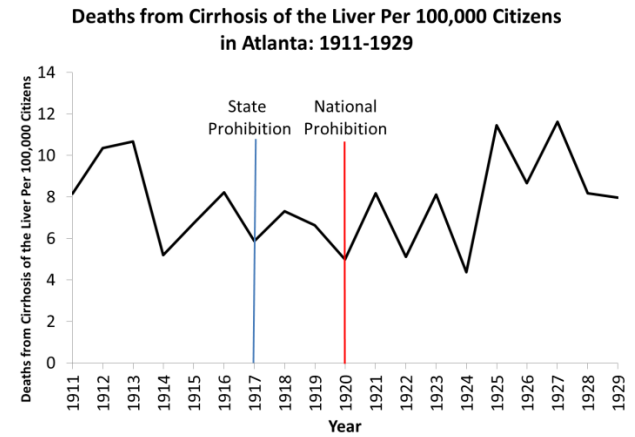
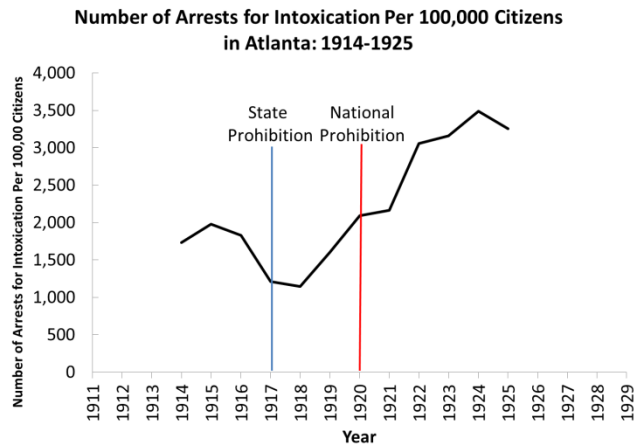
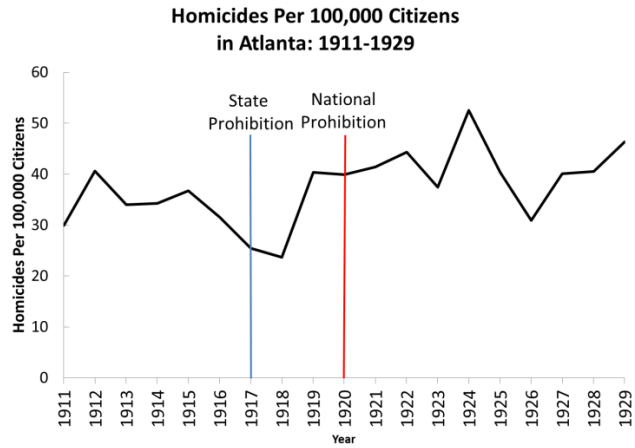
Source: Robert Sechrist's ICPSR (8343). Created by Zachary Christman (Rowan University)

Figure 8. Prohibition in 1917 by county.

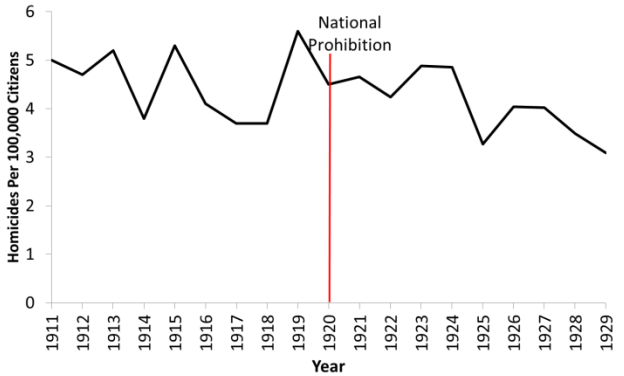


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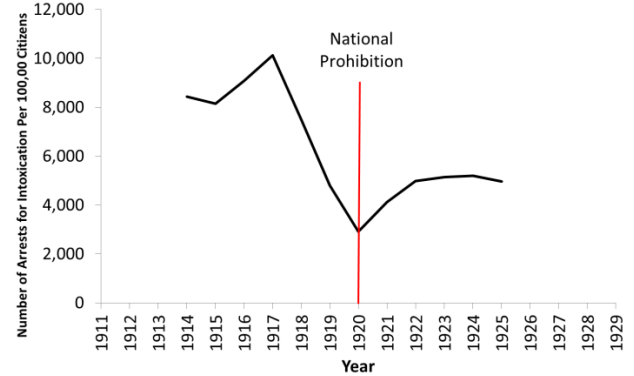
Figure 10. Homicides, Arrests for Intoxication, and Deaths from Cirrhosis of the Liver for Select Cities



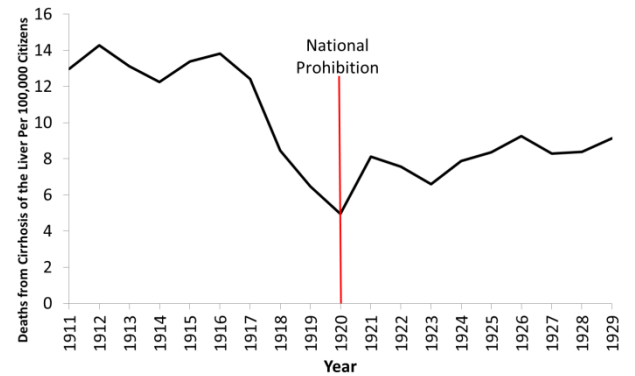
Homicides Per 100,000 Citizens in Boston: 1911-1929



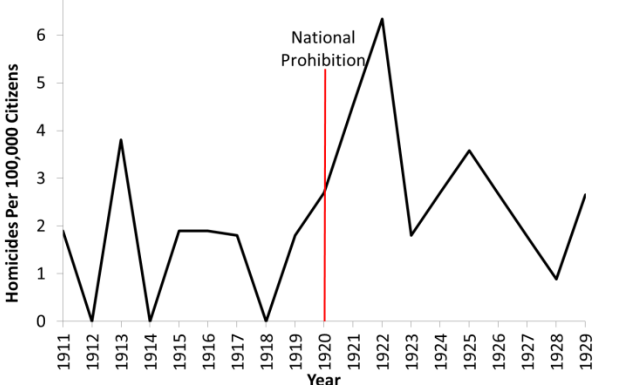
Number of Arrests for Intoxication Per 100,000 Citizens in Boston: 1914-1925



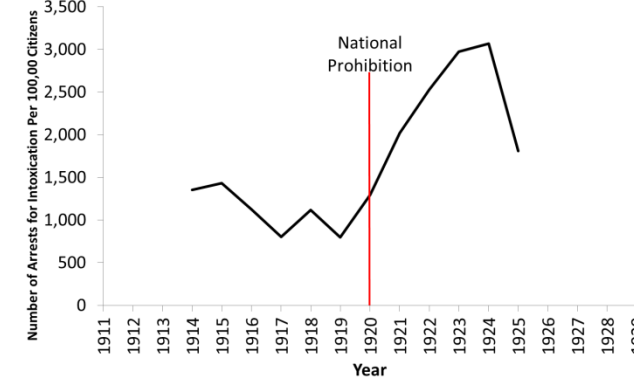
Deaths from Cirrhosis of the Liver Per 100,000 Citizens in Boston: 1911-1929



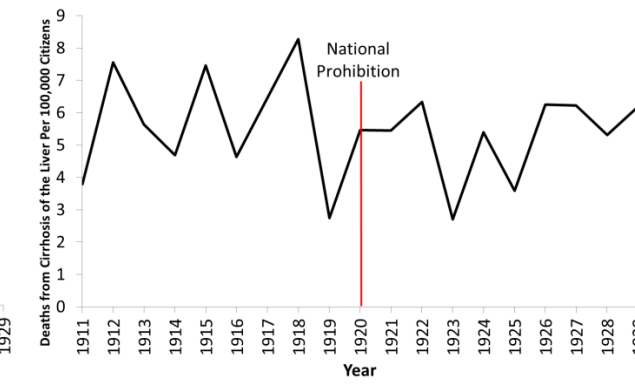
Homicides Per 100,000 Citizens in Cambridge: 1911-1929



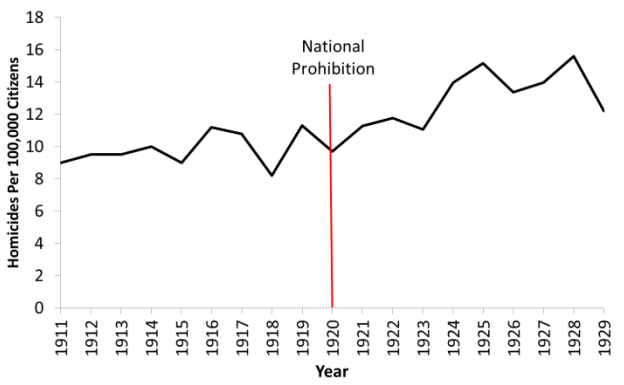
Number of Arrests for Intoxication Per 100,000 Citizens in Cambridge: 1914-1925



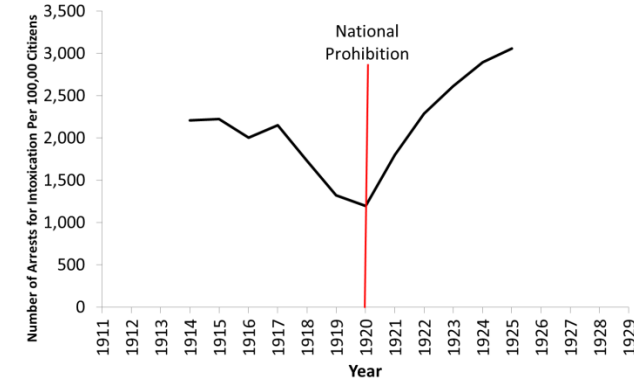
Deaths from Cirrhosis of the Liver Per 100,000 Citizens in Cambridge: 1911-1929



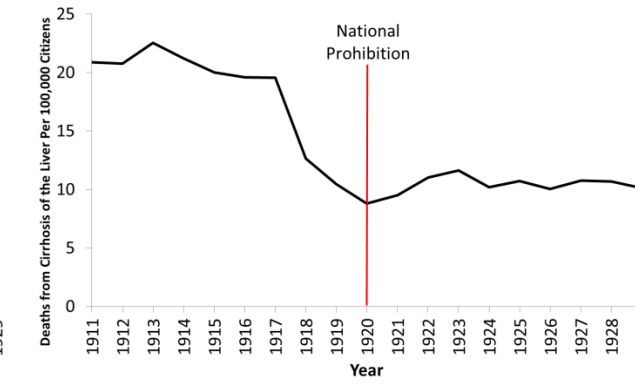
Homicides Per 100,000 Citizens in Chicago: 1911-1929



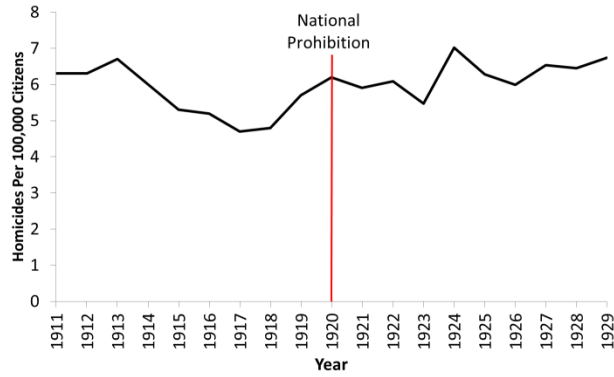
Number of Arrests for Intoxication Per 100,000 Citizens in Chicago: 1914-1925



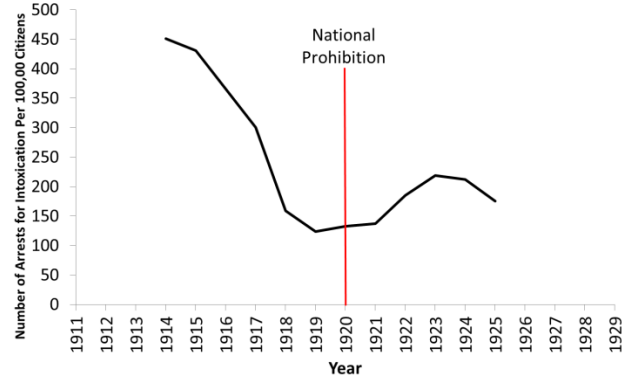
Deaths from Cirrhosis of the Liver Per 100,000 Citizens in Chicago: 1911-1929



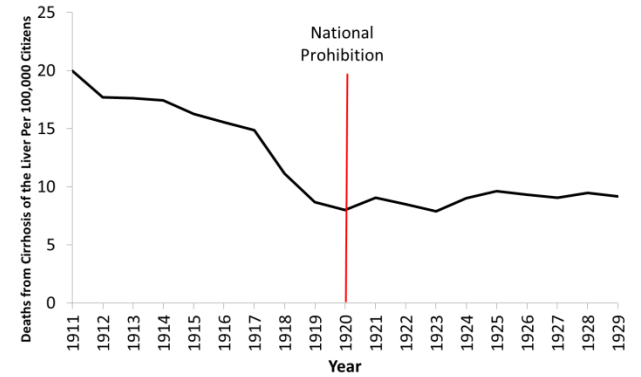
Homicides Per 100,000 Citizens in New York City: 1911-1929



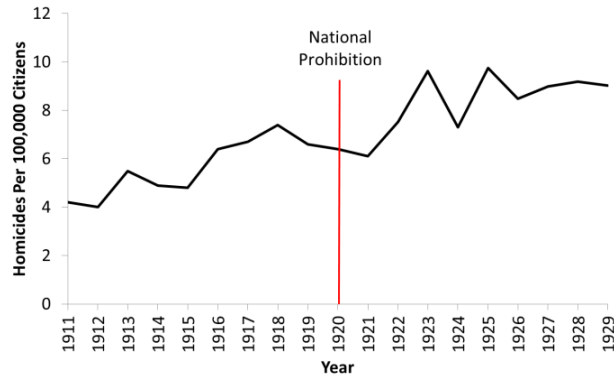
Number of Arrests for Intoxication Per 100,000 Citizens in New York City: 1914-1925



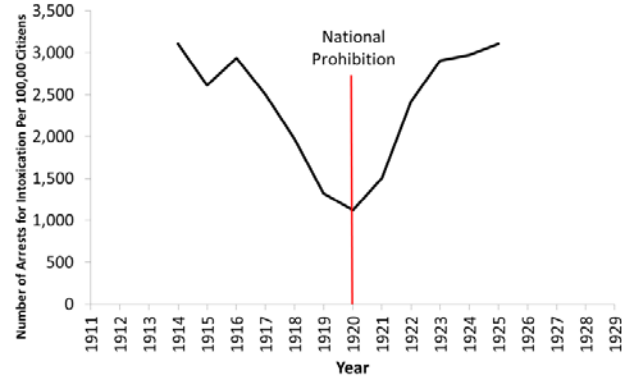
Deaths from Cirrhosis of the Liver Per 100,000 Citizens in New York City: 1911-1929



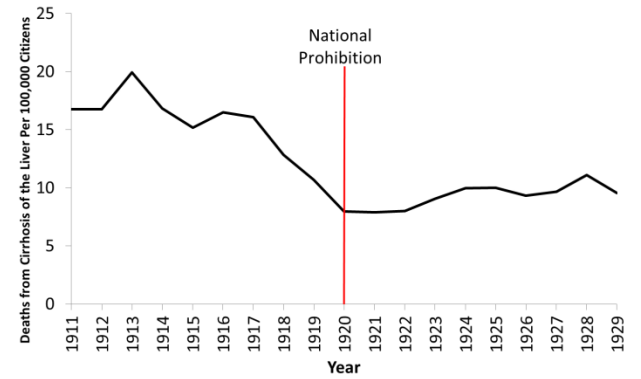
Homicides Per 100,000 Citizens in Philadelphia: 1911-1929



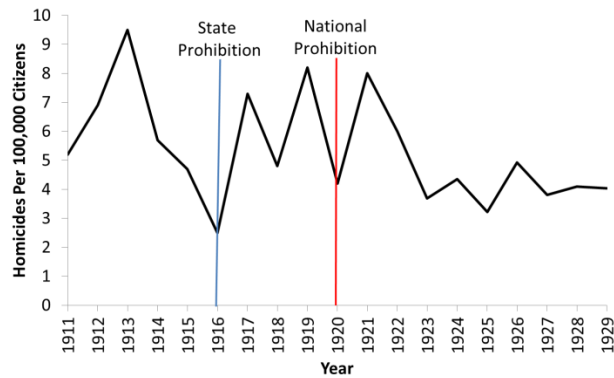
Number of Arrests for Intoxication Per 100,000 Citizens in Philadelphia: 1914-1925



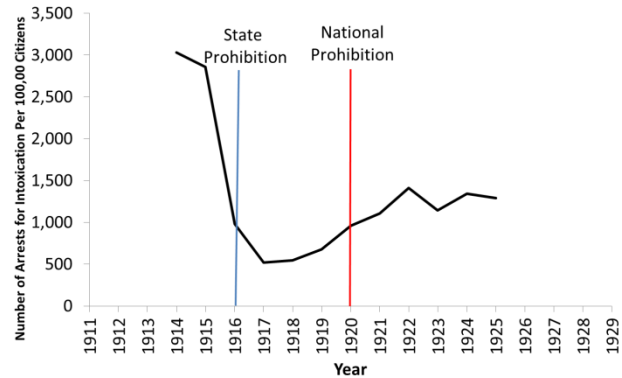
Deaths from Cirrhosis of the Liver Per 100,000 Citizens in Philadelphia: 1911-1929



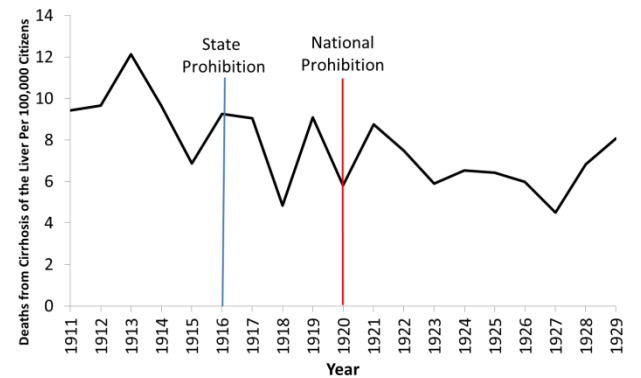
Homicides Per 100,000 Citizens in Portland: 1911-1929



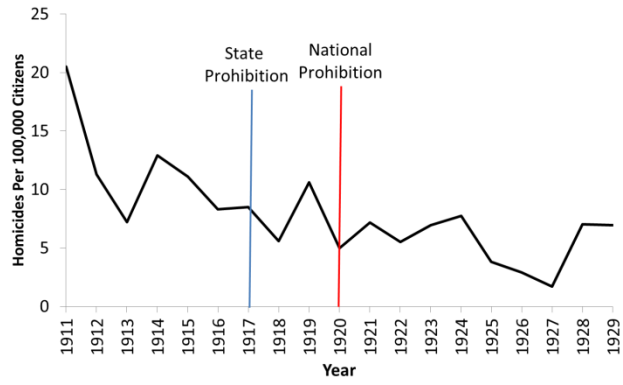
Number of Arrests for Intoxication Per 100,000 Citizens in Portland: 1914-1925



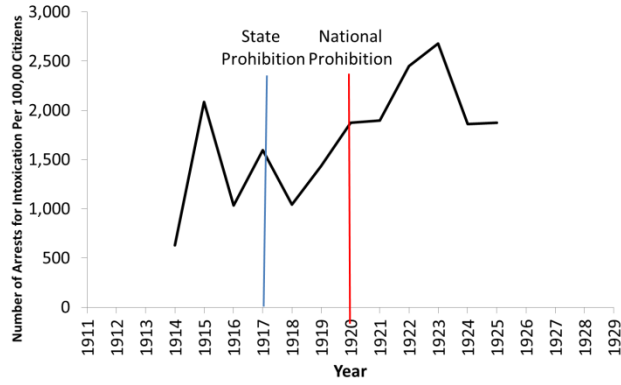
Deaths from Cirrhosis of the Liver Per 100,000 Citizens in Portland: 1911-1929



Homicides Per 100,000 Citizens in Seattle: 1911-1929



Number of Arrests for Intoxication Per 100,000 Citizens in Seattle: 1914-1925



Deaths from Cirrhosis of the Liver Per 100,000 Citizens in Seattle: 1911-1929

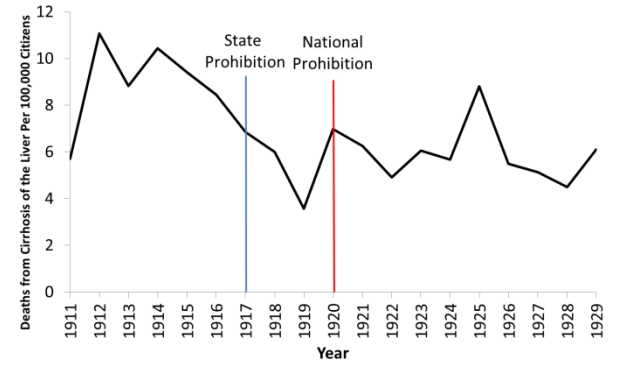
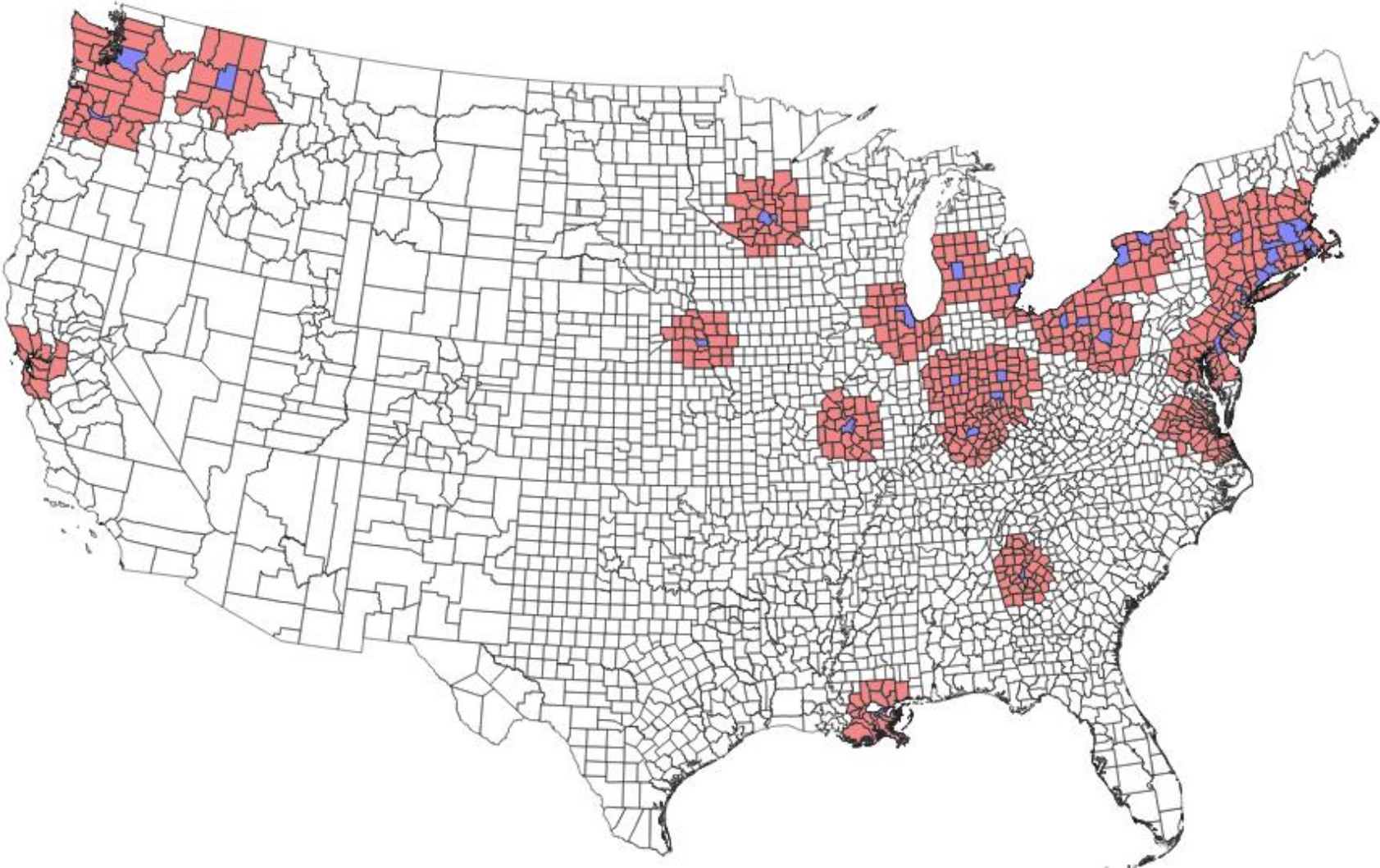


Figure 11. Counties Within 60 Miles of a City in the Sample



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- U.S. Federal Bureau of Investigation. Uniform Crime Reports. Washington, DC: Government Printing Office (2011) Expanded Homicide Data Table 12.