DISSERTATION

THREE ESSAYS ABOUT SUBSTANCE USE AND ADDICTION IN ECONOMICS

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ABSTRACT

THREE ESSAYS ABOUT SUBSTANCE USE AND ADDICTION IN ECONOMICS

This dissertation includes three papers on substance use and addiction in economics. Chapter 1 explains the different theories of addiction within economics with a particular emphasis on the rational addiction model. Once these theories are defined I present a historical overview of the different theories of addiction. Classical economists such as Adam Smith, Jeremy Bentham, John Stuart Mill, and others are incorporated into the paper as a critique to the rational addiction model. After the historical analysis Chapter 2 and Chapter 3 present a quantitative analysis about how community level events impact substance use. Chapter 2 models the impact of community level violence using the National Health and Nutrition Survey (ENSANUT) to examine how an exogenous measure, kingpin captures, impacts cigarette use. The results indicate that, in the short run, the number of current smokers increases for adults in areas of high levels of increased violence and that the consumption of cigarettes among current smokers increases for adolescents when violence increases in their municipalities or federal entities. Chapter 3 models the impact of the 2016 election on individuals based on their race, ethnicity, and gender by using the Behavioral Risk Factor Surveillance system data set and a difference-in-differences estimation strategy. There results indicate that there has been an increase in cigarette use for Hispanic individuals after the 2016 election. Each chapter uses an interdisciplinary approach and incorporates literature and theories outside of economics to better understand the research question. Each chapter also expands on ways in which substance use can be studied within economics.

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TABLE OF CONTENTS

Chapter 1- Should Addiction be Studied in Economics? A Historical Perspective on the Study of Addiction and Substance Use in Economics

1 Introduction

> "I have absolutely no pleasure in the stimulants in which I sometimes so madly indulge. It has not been in the pursuit of pleasure that I have periled life and reputation and reason. It has been the desperate attempt to escape from torturing memories, from a sense of insupportable loneliness and a dread of some strange impending doom." - Edgar Allan Poe

In this quote Edgar Allan Poe describes both the reasons for and consequences of his addiction to stimulants. To a casual observer, addiction seems irrational. After all, who would give up everything for the consumption of one good? On the other hand, the study of economics depends on the assumption of rationality to model its theories. This highlights the paradox of the study of addiction in economics. Economic models of addiction argue that consumers are rational, forward looking, utility maximizing agents. These models imply that individuals who are addicted to goods actively and consciously choose to be addicted. This view has been criticized by most other disciplines that study the process of addiction.

The study of addiction and addictive substances has developed substantially since the 1960's. However, substance use and addiction have been around for much longer than the term "addiction" has been defined. For instance, the Ancient Greeks and Egyptians both warn against alcohol abuse in their literature (Mandelbaum, 1965). In 1806, morphine was discovered by a German pharmacist and became widely distributed for pain (Musto, 1996).

Around the same time, when alcohol was very cheap and abundant in the US, Benjamin Rush published a pamphlet about the negative impact of the "ardent spirit" (Katcher, 1993). The first attempts at understanding addiction and treating it started in the early 19th CE. William James, one of the first researchers in the psychology field, also analyzed how substance use impacted human consciousness, energy, and the thought process (Mendelowitz, 2017). However, the terminology "addiction", in the way that we know it, was not used until the 20th CE (Rosenthal & Faris, 2019). Historically addiction was often described as inebrity, loss of self-control, and passions. Although the terminology was different before the 19th CE, the phenomena of addiction was very similar to what it is now.

Definitions of addiction also vary across fields. Clinically, substance dependency, substance abuse, and addiction are different diagnoses. The DSM-IV separated substance dependency and substance abuse as disorders, but the DSM-V put these together to create diagnostic criteria for substance use disorders (Hasin et al., 2013). The table below shows these differences and is replicated from Hasin et al. (2013).

Table 1.1: DSM-V Criteria for Substance Use Disorders

	DSM-IV Abuse	DSM-IV Dependence	DSM-V Substance Use Disorders
Hazardous Use	X		X
Social/interpersonal problems related to use	X		X
Neglected major roles to use	X		X
Legal Problems	X		
Withdrawal		X	X
Tolerance		X	X
Used larger amounts/longer		X	X
Repeated attempts to quit/control use		X	X
Much time spent using		X	X
Physical/psychological problems related to use		X	X
Activities given up to use		X	X
Craving		X	X

An individual is diagnosed with a substance use disorder if they meet 2 or more of the above criteria under the DSM-V substance use disorder category.

While psychologists rely on individual behavior to diagnose addiction, neuroscientists

analyze addiction by looking at the brain. Volkow et al. (2019) explains that, "Neuroscience research has revealed that addiction is a chronic, relapsing disease of the brain triggered by repeated exposure to drugs in those who are vulnerable because of genetics and developmental or adverse social exposures" (p.2115). Neuroscientists analyze the impact of addictive substances on the reward and emotional circuits in the brain and determine addiction based on the brain's response (Volkow et al., 2019).

While neuroscientists focus on a definition of addiction based on the brain, biologists focus on the entire body's response to addictive substances. Like neuroscientists, biologists argue that reward-based signals and activity within the brain can determine addiction (Potenza, 2013). Motivation-focused models argue that people are addicted to goods if they give higher priority to drug use and less priority to other activities (Potenza, 2013). Biologists, like neuoroscientists and psychologists, also emphasize the importance of the interaction of genetics, the brain's reward system, and environmental factors in determining addiction.

Economists focus on the amount of consumption of the good rather than social, environmental, or individual factors. For instance, in the rational addiction model, Becker and Murphy (1988) explain that an individual may be "potentially" addicted if their past consumption increases their current consumption. They also argue that addiction occurs through reinforcement and tolerance. Like economists, psychologists have also used steady states to explain addiction. For instance, "Witkiewitz and Alan Marlatt (2004) explain that relapse is like a feedback loop, whereby changes in interpersonal factors (e.g., negative affect) interact with changes in interpersonal factors (e.g. marital happiness) until a steady state of drinking (a lapse) or not drinking is achieved" (Witkiewitz & Marlatt, 2005, p. 342). A "steady state of addiction" refers to a person's consistent or inconsistent consumption of an

addictive good. This perspective helps explain the nature of addiction in both economics and psychology. Throughout the dissertation, the economic definition of addiction is utilized. In chapter 2 and chapter 3 I utilize data about the consumption of addictive substances, and thus rely on the economic definition of addiction. Most of my analysis also focuses on the use of addictive goods and not addiction specifically.

As addiction has become more clearly defined over time, economic models have evolved to explain it. The myopic addiction model was first introduced by Houthakker and Taylor (1966). The myopic addiction model shows that the consumption stock for an addictive good in period t-1 causes users to consume more of the addictive good in period t (Houthakker & Taylor, 1966). Imperfectly rational addiction models were also introduced to model substance use. These models argue that individuals who experience addiction have stable but inconsistent preferences (Elster, 1979; McKenzie, 1979; Winston, 1980). These two groups of economic models were replaced by rational addiction models in economics. Rational addiction models assume that the consumption behavior of an addictive good is affected by future, past, and current consumption (Becker & Murphy, 1988). Therefore, it argues that people who experience addiction actively choose to consume more of the addictive good. The rational addiction model is now the most famous, widely used, and highly critiqued model of addiction in economics.

The rational addiction model relies on neoclassical economic theory, namely rational choice theory, to illustrate how addiction evolves over the course of someone's lifetime. Becker and Murphy (1988) argue that individuals have two consumption paths where one is for the addictive good and the other is for all other goods. They define a good as "addictive" if past consumption raises current consumption. They also acknowledge that some goods are more

"addictive" than other goods and that addiction is dependent on "the interaction between goods and people" (Becker & Murphy, 1988, p. 694). Individuals have a lifetime budget constraint based on their initial assets and future earnings to capital stock. The consumption of the addictive good builds stock over time such that consumption of the addictive good in period t-1 will have consumption stock in period t (Becker & Murphy, 1988). The path of the addictive stock is dependent on the depreciation rate of the capital stock, consumption of the addictive good, and expenditure to forget the consumption of the addictive good (Becker & Murphy, 1988).

An individual chooses their optimal consumption bundle of the two goods over time, subject to their budget constraint. Individuals preferences are represented by monotonic and concave utility functions and individuals are assumed to have stable preferences (i.e. preferences do not change over time). Stigler and Becker (1977) argue that tastes and preferences are stable over time using examples about fashion and fads, stability of taste and advertising, stability of tastes and custom and tradition, and stability of tastes and "addiction". Their example on addiction mirrors the rational addiction model in many ways. They use heroin as part of their example and argue that addiction to heroin is a result of an inelastic demand curve and not a cause of the inelastic demand curve (Stigler & Becker, 1977). Becker and Murphy (1988) use this same argument in the rational addiction model (i.e. substance use doesn't change the demand curve, rather the demand curve is what causes substance abuse).

Becker and Murphy (1988) analyze the first order conditions of individuals' optimization to find the steady state outcome of the model and determine whether this outcome is stable or unstable. They conclude that the steady state for addictive goods is unstable when the

degree of addiction is strong. Becker and Murphy (1988) explain, "The basic definition of addiction at the foundation of our analysis is that a person is potentially addicted to c if an increase in his current consumption of c increases his future consumption of c" (p.681). This definition is inconsistent with the diagnostic criteria for substance use disorder in Table 1. They also argue that reinforcement, when greater current consumption of a good raises its future consumption, and tolerance, when greater past consumption requires greater future consumption, impact addiction. They conclude that individuals who discount the future heavily are more likely to become addicted, and that the level of income, temporary stressful events, and prices can also impact consumption amount of addictive goods.

More recent research has modified the rational addiction model. Orphanides and Zervos (1995) adapt the rational addiction model to incorporate regret. Another model adds time inconsistent preferences to the rational addiction model (Gruber & Köszegi, 2001). Yuengert (2001) incorporates passions into a model of addiction. Despite these modifications, economic models of addiction are still plagued by many issues. These issues primarily deal with the rationality component of the rational addiction model and include theories surrounding habitual behavior, endogenous preferences, utility maximization, and the heterogeneity of addiction. In this paper, I use a history of economic thought framework to outline some of the main critiques about the rational addiction model. I present theory from economists in the 18th and 19th CE and tie their work into the contemporary critiques of the rational addiction model. Starting with Adam Smith, this paper explores the different theories and examples about addiction and addictive goods presented in the economic literature. I also use theories by Jeremy Bentham, John Stuart Mill, Thomas Malthus, Karl Marx, and other economists throughout the paper.

The dominant theories of addiction in economics and their critiques highlight an important debate about the scope of the economic discipline. Can addiction be accurately modelled using economic theory? By presenting the critiques of the rational addiction model we can better understand whether economists can truly study addiction. The evidence shows that the classical economists discussed addiction and substance use frequently in their research. After covering the critiques of the rational addiction model, I present policy recommendations from the economists covered in this paper. The paper concludes with recommendations about how economists can move forward with studying addiction in economics.

This paper is motivated by a large literature on the history of economic thought about behavioral economics (Ashraf et al., 2005; Frantz & Leeson, 2013; Thaler, 2016). However, this paper expands on this literature by using a historical analysis to analyze the study of addiction specifically and to examine the bounds of economic topics. It is the first paper of my knowledge to examine the study of addictive goods in economics from a historical perspective. The remainder of this paper is broken up as follows: Section II (Critiques), Section III(Policy Recommendations), Section IV(Avenues for Future Research) and Section V(Conclusion).

2 Critiques of the Rational Addiction Model

Other fields that study addiction, such as psychology, biology, and neurology, have critiqued the study of addiction in economics. These critiques focus on the presence of habitual behavior, the existence of endogenous preferences, the utility maximization process in economic models of addiction, the heterogeneity of addiction, and imperfect and asymmetric

information.

2.1 Habitual Behavior

A primary critique of the rational addiction model is the limitation of human behavior. The view that individuals actually think about all of their possible action sets and maximize their utility based on these action sets seems unlikely. This is especially true when someone is under the influence of a substance and has limited critical reasoning skills. Simon (1955) developed the theory of bounded rationality to explain the limit of human decision making. He argues that relaxing the assumptions of subjective utility theory (which is used in the rational addiction model) gives a more accurate representation of decision making. He asserts that bounded rationality may occur in the following ways: by individuals creating a process of generating alternative outcomes instead of knowing their own fixed set of alternative outcomes, ways in which individuals deal with uncertainty when they don't know the exact probability set of different actions, and individuals looking for satisfying their happiness as opposed to maximizing their utility (Simon, 1955). Satisfying, as opposed to maximizing, utility means that individuals will choose an action set that is "good enough" even if they could do better. People end up at sub-optimal outcomes if they only satisfy their wants instead of maximizing their utility. Additionally, social and peer factors may play an important role in mis-predicting alternative outcomes when maximizing their overall utility or well-being. For instance, most people don't think that they'll become addicted to an addictive good when they first start consuming it. They are making the decision to consume the good based on their miscalculation of a future outcome.

Kahneman (2003a) creates a map of bounded rationality based on three cognitive systems. He argues that these systems are perception, intuition, and reasoning. Perception and intuition are fast, parallel, automatic, effortless, associative, slow-learning, and emotional. Reasoning on the other hand is slow, serial, controlled, effortful, rule-governed, flexible and neutral. He explains that intuition is often emotionally charged and governed by habit, and therefore difficult to control or modify. The consumption of addictive goods often occurs because of habits, whether individual, social, or cultural. Habit shows up in the rational addiction model as part of the consumption stock equation of the addictive good. Utility maximization is a component of the reasoning system, whereas consumption of addictive goods is part of the intuition system that Kahneman (2003a) introduces. This framework highlights that it is impossible for utility maximization to explain the consumption of addictive goods. Kahneman (2003a) highlights how habitual behavior, as a function of brain processing, operates outside of a utility maximization framework.

The rational addiction model fails to discuss habit within its framework. Jeremy Bentham, one of the classical economists, discussed alcohol use and the process of addiction in his work. For example, he explains the difference between repeating an act and a habit in his book "An Introduction to the Principles of Morals and Legislation". He explains,

> "There is a difference, again, between a repetition of acts, and a habit or practice. The term repetition of acts may be employed, let the acts in question be separated by ever such short intervals, and let the sum total of them occupy ever so short a space of time. The term habit is not employed but when the acts in question are supposed to be separated by long-continued intervals, and the sum total of them to occupy a considerable space of time. It is not (for instance) the drinking ever so many times, nor ever so much at a time, in the course of the same sitting, that will constitute a habit of drunkenness: it is necessary that such sittings themselves be frequently repeated. Every habit is a repetition of acts; or, to speak more strictly, when a man has frequently repeated such and such

> acts after considerable intervals, he is said to have persevered in or contracted a habit: but every repetition of acts is not a habit" (Bentham, 1781; 2000, p.64).

Bentham argues that one occasion of drunkenness will not result in alcohol addiction, but that alcohol consumption needs to be repeated over time for someone to become dependent on alcohol. He argues that habits require repetition, but that repetition doesn't always result in habit formation. As defined by the American Psychiatric Association, one of the main characteristics in the development of alcoholism is frequent episodes of intoxication (Gilpin & Koob, 2008). Bentham accurately explains that individuals can develop a habit of alcohol use from the repeated consumption of alcohol. Becker and Murphy (1988) do not distinguish between the repetition of acts and habit formation in their work. They argue that a good is addictive if past consumption increases current consumption, but fail to clearly distinguish a specific "point" where someone is addicted versus not-addicted to a good. The rational addiction model discusses the repetition of acts when analyzing the consumption of addictive goods, but not habit. Bentham argues that the spacing of intervals between alcohol consumption is important in determining whether an alcohol habit is formed. Becker and Murphy (1988) make no such distinction about the timing of the consumption of addictive goods. The rational addiction model fails to clearly distinguish between the repetition of acts and habit as Bentham does.

Bentham also uses alcohol consumption in an example to explain one of his theories about mischief and how it appears. In Bentham's "An Introduction to the Principles of Morals and Legislation" he states,

> A man drinks a certain quantity of liquor, and intoxicates himself. The intoxication in this particular instance does him no sort of harm: or, what comes to the same thing, none that is perceptible. But it is probable, and indeed next

> to certain, that a given number of acts of the same kind would do him a very considerable degree of harm: more or less according to his constitution and other circumstances: for this is no more than what experience manifests every day. It is also certain, that one act of this sort, by one means or other, tends considerably to increase the disposition a man may be in to practise other acts of the same sort: for this also is verified by experience. This, therefore, is one instance where the mischief producible by the act is contingent? in other words, in which the tendency of the act is no otherwise mischievous than in virtue of its producing a chance of mischief. This chance depends upon the concurrence of other acts of the same kind; and those such as must be practiced by the same person. The object of the mischief is that very person himself who is the author of it, and he only, unless by accident. The mischief is therefore private and self-regarding. (Bentham, 1781; 2000, p 127)."

In this excerpt, Bentham discusses the consequences of alcohol consumption. He argues that drinking occasionally has minimal consequences, but as the number of drinking occasions increases the consequences also increase. He also maintains that mischief while consuming alcohol increases the chance of future mischief. Bentham also highlights how the consumption of addictive goods a few times isn't a problem, but that there's some point where an individual crosses over and becomes addicted to a good. This point is unknown to the consumer of the addictive good. Bentham's analysis is consistent with the rational addiction model because he argues that one act of mischief increases the probability of future acts of mischief. This is also how Becker and Murphy (1988) define addictive goods. However, Bentham distinguishes between habit and repetition of acts and the rational addiction model does not.

Institutions impact habit formation and are ignored in the rational addiction model. Engels discusses this relationship and its impact on the consumption of addictive goods. He explains,

> "On Saturday evenings, especially when wages are paid and work stops somewhat earlier than usual, when the whole working-class pours from its own poor

> quarters into the main thoroughfares, intemperance may be seen in all its brutality. I have rarely come out of Manchester on such an evening without meeting numbers of people staggering and seeing others lying in the gutter. On Sunday evening the same scene is usually repeated, only less noisily. And when their money is spent, the drunkards go to the nearest pawnshop, of which there are plenty in every city – over sixty in Manchester, and ten or twelve in a single street of Salford, Chapel Street – and pawn whatever they possess. Furniture, Sunday clothes where such exist, kitchen utensils in masses are fetched from the pawnbrokers on Saturday night only to wander back, almost without fail, before the next Wednesday, until at last some accident makes the final redemption impossible, and one article after another falls into the clutches of the usurer, or until he refuses to give a single farthing more upon the battered, used up pledge" (Engels, 1892, p.127).

Engels explains how habit as a function of institutions impacts alcohol use amongst the working class. He argues that workers stay sober during the work day and then consume extreme amounts of alcohol during their time off to help cope with the working environment. He believes that it is the social norm of getting drunk after work that causes such extreme displays of drunkenness amongst the working class. In other words, the habit of intoxication was formed so that workers can deal with the capitalist system. Engels also describes the extent of alcohol consumption amongst the working class in this excerpt. He claims that workers binge drink to such an excessive point that they cannot make it home. He also explains that many of the workers who consume alcohol have no control over their drinking when he says that they trade in anything that they have of value to get money to buy more alcohol.

Engels' description of alcohol consumption is more consistent with the explanation in Kahneman (2003a) about habitual behavior and intuition as opposed to the argument in Becker and Murphy (1988) about forward looking rational agents. He argues that behavior surrounding addictive goods is more habitual than rational. This habit was founded by insti-

tutional norms created within the capitalist system. The experiences that Engels' witnessed of the working class still happens today. For instance, people living in poverty are more likely to use cigarettes, injection drugs, cocaine, and heroin (Silverman et al., 2019). There is still a clear link between being a member of the working class and substance use.

Bentham and Engels, along with other contemporary economists, highlight the importance of habitual behavior in the consumption of addictive goods and in human decision making. Habits can be incorporated as a component of bounded rationality to explain why people end up at sub-optimal outcomes because habits cause people to satisfy rather than maximize their utility. Habit formation is also an important component of addictive behavior and is often determined by institutions within a society. This analysis is omitted from the rational addiction model because of the assumption that preferences are exogenous and that addiction is only determined by individual behavior.

2.2 Endogenous and Social Preferences

Addiction models in economics are also critiqued because of the assumptions required by rational choice theory. Kahneman (2003b) a pioneer of behavioral economics and a psychologist explains, "Perhaps more than any other, the rational-addiction model highlights the large gap that persists between the criteria of reasonableness that are applied to views of human motivation in the disciplines of economics and psychology" (p.165). This critique explains that economic assumptions about human behavior are unrealistic. The assumption of exogenous preferences is one reason for the misalignment between reality and economic theory regarding addiction. Exogenous preferences omit any social or institutional factors

that might contribute to the consumption of addictive goods.

John Meynard Keynes also critiqued the neoclassical assumption of exogenous preferences. In Keynes' book "General Theory" he discusses individual decision making and explains that many human decisions are made based on our "animal spirits" (Keynes, 1936). Keynes means that individuals don't maximize their utility subject to a budget constraint but instead make decisions in the moment and deal with the consequences after the fact. Keynes also notes that these animal spirits are determined by habit. He explains, "We are merely reminding ourselves that human decisions affecting the future, whether personal or political or economic, cannot depend on strict mathematical expectation, since the basis for making such calculations does not exist; and that it is our innate urge to activity which makes the wheels go round, our rational selves choosing between the alternatives as best we are able, calculating where we can, but often falling back for our motive on whim or sentiment or chance" (Keynes, 1936, p.82). He argues that human nature is often unpredictable and that individuals do not always maximize their utility based on their preferences. For Keynes, the consumption of addictive goods can occur because people are making decisions based on the social setting that they are in and not based on utility maximization.

All individuals are members of different social networks and relationships that influence their consumption of addictive goods. England (1989) argues that the assumptions of neoclassical models harmonizes with a view of separate rather than connected selves, and that this claim distorts theories, especially for women. The impact of substance use and abuse on family outcomes and dynamics has largely been ignored in economic theory and treatment as a whole and is also ignored in the rational addiction model. However, the presence of addiction within a household plays a large role in both the addictive behavior of the person who

uses substances and the behavior of the other family members. In fact, there is a national program in the US, Al-Anon, which is dedicated to helping individuals who are connected to people who use substances. The rational addiction model also omits the impact of social relationships on substance use and addiction.

Arrow (1994) explains that social categories are used frequently in economic analysis and that they are necessary to include in economic analysis. He argues that price, a cornerstone of economic theory, is determined in markets and that markets are social institutions. He says, "tastes can be socially caused, expectations are influenced by others, and firms are organizations, not individuals" (Arrow, 1994, p.4). Polanyi expands on the argument made by Arrow (1994) and argues that economies are embedded in social institutions (Gemici, 2007). Prices, markets, and assets are socially determined. Polanyi and Arrow highlight how many components of economics are endogenous. This includes preferences for addictive goods because social factors play an important role in the consumption of addictive goods. For instance, peer effects play a large role in the consumption behavior of addictive goods and addictive behavior (Ali & Dwyer, 2009; Kawaguchi, 2004; Lundborg, 2006). In "Under the influence: Putting peer pressure to work" Frank (2020) explains, "By far the strongest predictor of whether someone will smoke is the percentage of her closest friends who smoke" (p.12).

Veblen's theory of conspicuous consumption provides another explanation for how peer effects influence the consumption of addictive goods. Veblen (1899) asserts that individuals show their value to the world through the conspicuous consumption of goods. He argues that consuming "high value" goods will signal to other individuals and households that you are of a "higher class." Thus, people of all socioeconomic groups consume above their economic

means to ensure that they are socially accepted. An individual may try to gain status in their social group by using and offering addictive substances to their group. Veblen's theory of conspicuous consumption has been used as an explanation for cigarette use through peer effects (Wearing & Wearing, 2000). What is deemed as "cool" is largely dependent on the social and cultural norms of a specific social group. The desire for social status can cause people to become addicted to goods through repeated use. Therefore, Veblen's theory of conspicuous consumption provides a counterpoint to the rational addiction model. In this case, the consumption of addictive substances is determined by the maximization of an individual's social status, not their individual utility function.

Adam Smith, whom many attribute as the founder of economics, also discusses the importance of social factors in consuming addictive substances. He explains why he thinks people drink alcohol in the excerpt below.

> "It deserves to be remarked too, that, if we consult experience, the cheapness of wine seems to be a cause, not of drunkenness, but of sobriety. The inhabitants of the wine countries are in general the soberest people in Europe; witness the Spaniards, the Italians, and the inhabitants of the southern provinces of France. People are seldom guilty of excess in what is their daily fare. Nobody affects the character of liberality and good fellowship, by being profuse of a liquor which is as cheap as small beer. On the contrary, in the countries which, either from excessive heat or cold, produce no grapes, and where wine consequently is dear and a rarity, drunkenness is a common vice, as among the northern nations, and all those who live between the tropics, the negroes, for example, on the coast of Guinea. When a French regiment comes from some of the northern provinces of France, where wine is somewhat dear, to be quartered in the southern, where it is very cheap, the soldiers, I have frequently heard it observed, are at first debauched by the cheapness and novelty of good wine; but after a few months residence, the greater part of them become as sober as the rest of the inhabitants" (Smith, 1776/1981a, p.492).

Smith explains that people consume alcohol because of peer effects and price effects. He argues that when people move to places where alcohol is cheaper they will consume

more alcohol for a short period of time and then align their alcohol consumption with the drinking norms in the area. There is a large literature that illustrates that regional norms and community norms influence drinking behavior (Ahern et al., 2008; Room & Mäkelä, 2000; Skog, 1985). These norms reflect the larger influence of peer effects. Peer effects also play a substantial role in alcohol consumption (Kawaguchi, 2004; Lundborg, 2006). In Smith's discussion about alcohol use, he accurately describes the importance that social norms have on drinking behavior. Becker and Murphy (1988) do include a variable for a short term shock in life experience which can increase someone's consumption of addictive goods over the course of their lifetime. However, the rational addiction model omits the importance of peer effects and culture on the preferences for addictive goods.

Engels and Marx link substance use to the capitalist system directly. They believe that capitalists control workers with addictive substances and that this can lead to addiction. Engels explains,

> "Hence the manufacturers introduced the shameful system of night-work. Some of them employed two sets of operatives, each numerous enough to fill the whole mill, and let one set work the twelve hours of the day, and the other the twelve hours of the night. It is needless to picture the effect upon the frames of young children, and even upon the health of young persons and adults, produced by permanent loss of sleep at night, which cannot be made good by any amount of sleep during the day. Irritation of the whole nervous system, with general lassitude and enfeeblement of the entire frame, were the inevitable results, with the fostering of temptation to drunkenness and unbridled sexual indulgence" (Engels, 1892, p.152).

Engels argues that changing the work schedule to include night shifts severely impacted the health of workers because it caused a disruption to their sleep schedule and nervous system. To help cope with these changes, workers turned to sex and alcohol. This is consistent with a large literature on the relationship between stress and substance use. For

instance Serxner et al. (1991) argues that job stress, in conjunction with cultural factors, is an important determinant of cigarette use. Another study found that there was no direct relationship between job stress and alcohol consumption, but that there were associations between low skill work, high job boredom, and low autonomy and depression (Wiesner et al., 2005). There were minimal protections for workers when Engels was writing about capitalism, and it is likely that there was a stronger link between job stress and substance use at that time.

Marx also discussed the use of substances amongst the working class to deal with the capitalist system. Marx explains in an excerpt from Marx (1867/2013) about the employment of women and children and the appropriation of their labor power, "Every phenomenon of the factory districts is here reproduced, including, but to a greater extent, ill-disguised infanticide, and dosing children with opiates" (p.274). Child workers were being given opiates so that they could be more productive. Marx ties opium use to the capitalist system because it made workers easier to control and more productive.

Engels further supports Marx's discussion of forced substance use by explaining, "Moreover, the custom of giving children spirits, and even opium, is very general; and these two influences, with the rest of the conditions of life prejudicial to bodily development, give rise to the most diverse affections of the digestive organs, leaving life-long traces behind them" (Engels, 1892, p.101). Marx and Engels emphasize how drugs were given to workers by capitalists to control their labor power. They also introduce an important critique of the rational addiction model. Workers didn't have power and they were forced to consume addictive substances. Their substance use was a function of the social system that they lived in, not their individual preferences, because they had no autonomy over what substances

they were taking. The rational addiction model does not incorporate consumption decisions that are made unwillingly and it assumes that all individuals have freedom of choice in what they consume.

The rational addiction model in Becker and Murphy (1988) does not incorporate economic systems, institutional systems, or social systems into the model. In the rational addiction model, preferences are exogenous and pre-determined and individuals have control over the substances that they use and when they stop. Marx and Engels argue that capitalism plays a large role in substance use. The larger role of capitalism in impacting preferences, utility, and decision making is omitted from the rational addiction model.

Finally, Marx summarizes the impact of social factors on substance use in one of his most famous quotes. He explains,

> "Religious suffering is, at one and the same time, the expression of real suffering and a protest against real suffering. Religion is the sigh of the oppressed creature, the heart of a heartless world, and the soul of soulless conditions. It is the opium of the people" (Marx, 1992, p ccxlvii).

When Marx equates religion as the opium of the people he is explaining how religion, as a social institution, is used by capitalists to control workers but also how religion is used by workers as an outlet and expression of their suffering. Opium is also an outlet for the suffering of the working-class, but is used less frequently than religion. Marx argues that that capitalist system is a root cause of substance use for the working class. Institutions are important in determining preferences for addictive goods. For instance, people who live in Muslim countries or who identify as Muslim are much less likely to consume alcohol because it is discouraged by their religion. The rational addiction model does not incorporate the importance of social institutions and endogenous preferences and is another shortcoming of

the model.

2.3 Utility Maximization

Maximization of the individual utility function based on preference orderings is an underlying component of rationality in economics. Becker and Murphy (1988) argue that people who use substances are forward looking in their decision making and maximize their utility function subject to their budget constraint. However, critics of the rational addiction model argue that preferences regarding addictive goods aren't stable and therefore utility maximization is not a valid way to examine how substance dependent indviduals make decisions.

There is an argument amongst contemporary economists about whether a single utility function and preference ordering adequately represents individual decision making. To address these concerns, theories of multiple selves have been introduced in economics. Steedman and Krause (1986) proposed that a divided self might have two utility functions where one was for self-interested utility and the other was for group-interested utility (Davis, 2010). To remedy the issue of multiple selves, many solutions were proposed to incorporate different preferences into one utility function. For instance, Sen (1977) proposes that meta ranking, as opposed to preference ranking would better explain how outcomes differ within an individual. Meta ranking, as defined by Sen (1977), states that individuals have sets of preferences and rank the various actions within the different sets of preference rankings, and then ranks the different sets. Sen (1977) explains that this would better explain the phenemona of addiction. For instance, it might explain why a person using substances might rank the addictive substance first one week and might try to stop consuming the addictive substance completely

the next week. In one preference ranking the addictive substance is ranked first and in the second preference ranking the addictive substance is not at the top of the preference ordering. Additionally, in the first circumstance the first preference ordering is ranked first and in the second circumstance the second preference ordering is ranked first. Meta ranking can explain the seemingly inconsistent behavior of individuals who consume addictive goods.

This view was extended to incorporate multiple interests in utility functions (Davis, 2010). Elster (1979) explains that a present individual and a future individual constitute two separate selves. He argues that this explains why an individual might make decisions that seem short sighted. To deal with these inconsistencies, Elster (1979) argues that individuals adopt pre-commitment strategies, or binding agreements, to remain consistent over time (Davis, 2010). For example, an individual who is trying to drink less alcohol might give a friend their debit card when they go out. This will help them from consuming an "irrational" amount and keep their present self accountable and maximize utility for their future self. The famous marshmallow test, a test where children were given the opportunity to have one marshmallow immediately or two marshmallows if they waited for a longer period of time, highlights the issue of delayed discounting. Mischel et al. (1972) found that 3-5 year olds would delay gratification if they were distracted by "thinking fun things". The marshmallow test highlights the validity of the multiple selves hypothesis. People will take a lower quantity of a good now over a higher amount of a good later because it maximizes their current utility function over their future utility function.

The rational addiction model argues that individuals maximize their utility based on a single utility function and preference ordering (Becker & Murphy, 1988). It assumes that the rate of preference for the present is equal to the rate of interest and that an increase in the rate

of preference and the discount rate raises demand for the addictive good. The multiple selves theory contradicts this conclusion from the rational addiction model. With multiple selves, an individual would consume more of an addictive good to maximize their current utility function even though it is detrimental to their future self. In the rational addiction model an increase in the rate of preference for the present doesn't change the utility maximization function. The separation of the utility functions in multiple selves theory allows for actions that create high payoffs in the current period and lower payoffs in future periods. These opposing actions can only exist if there are multiple selves and substance use prevails because individuals are myopic in their consumption of addictive goods. Becker and Murphy (1988) argue that preferences are static, but the theory of multiple selves argues that preferences are dynamic. Dynamic preferences better explain the inconsistent behavior of many individuals who are struggling with addiction.

Bentham also argues that individuals who consume addictive goods have multiple selves. He explains, "In intoxication; where he has been a deprived of it by the transient influence of a visible cause: such as the use of wine, or opium, or other drugs, that act in this manner on the nervous system: which condition is indeed neither more nor less than a temporary insanity produced by an assignable cause" (Bentham, 1781; 2000, p.136). Bentham argues that individuals who are intoxicated act in unpredictable and irrational ways because addictive substances influence the body and mind. This argument about intoxication is also inconsistent with the rational addiction model because it argues that individuals who are dependent on substances do not have consistent preference orderings. However, Bentham's argument is consistent with a multiple selves hypothesis because individuals who are intoxicated are maximizing a separate utility function as compared to when they are sober.

Bentham also contended that people consume addictive substances because it gives them pleasure in their body and brain. Bentham believed that utility determined human decision making and is defined by pleasure and pain. Bentham stated that the second pleasure of sense was intoxication (An Introduction to the Principles of Morals and Legislation, p.36). People consume addictive substances because it gives them pleasure or happiness. Engels makes a similar argument as to why he thought people consumed alcohol. He explains, "Besides these, there are other influences which enfeeble the health of a great number of workers, intemperance most of all. All possible temptations, all allurements combine to bring the workers to drunkenness. Liquor is almost their only source of pleasure, and all things conspire to make it accessible to them" (Engels, 1892, p.102). Like Bentham, Engels argues that people drink liquor because it's a source of pleasure, or happiness. In fact many addictive substances and behaviors are driven by an increase in dopamine, "the pleasure center of the brain" (Linnet, 2020). Individuals who are addicted to goods overpredict the reward (or pleasure) that they will get from an addictive good (Parvaz et al., 2015). Engels and Bentham accurately capture one of the neurological components of consuming alcohol, the pleasure that it brings in the brain. They correctly argue that pleasure is one reason people continue to consume addictive goods. Engels also identifies that negative health effects occur because of alcohol use. These include disorders such as dementia, breast cancer, colorectal cancer, cirrhosis, upper digestive tract cancer and alcohol dependency (Grønbæk, 2009).

Malthus also discussed the relationship between biological and neurological human characteristics and addictive behavior, but argues that humans do not have the ability to control urges when they are addicted to something. He explains, "Impelled to the increase of his

species by an equally powerful instinct, reason interrupts his career, and asks him whether he may not bring beings into the world for whom he cannot provide the means of support. If he attends to his natural suggestion, the restriction too frequently produces vice" (Malthus, 1798, p.8). Malthus talked about the uncontrollable urge that people experience regarding sex. He argues that it is human nature to reproduce, regardless of an individuals' circumstance. He also thinks that the destructiveness of this urge does not change it, or allow people to rationalize the benefits and consequences. Malthus argued that people do not have control over their bodies desires.

Bentham, Engels, and Malthus all argue that addictive substances or activities would rank highly if not highest in the preference rankings of most people. Pleasure from addictive substances explains why addiction prevails in society. Bentham and Engels argument is consistent with the rational addiction model because they argue that preferences for addictive goods are exogenous and determined by the human body. Malthus also argues that addictive tendencies are an inherent component of human nature. However, he also believes that people aren't in control of their actions when it comes to sex and other vices. Individuals cannot accurately maximize their utility functions based on their preference sets and budget constraints because they are clouded by their desires. This conclusion is inconsistent with the utility maximization process that occurs in the rational addiction model. Malthus' interpretation of human behavior provides the critique that people who consume addictive goods are unable to properly reason about the consequences of their actions and their future utility paths. This is consistent with a multiple selves argument because people have a separate utility function in the current period where people maximize their desires and a future utility function where they have to deal with the consequences. This critique highlights

that one utility function won't sufficiently encapsulate the consumption of addictive goods.

2.4 Heterogeneity of Addiction

The reason for why some individuals become addicted to certain goods and others do not is still a prominent question amongst researchers in many different fields. Becker and Murphy (1988) argue that this difference may lie in different discount factors, budget constraints, or utility functions. They also acknowledge that these differences might occur because of differences in lived experiences. They include a variable in the equation of the capital stock that incorporates the rate of change of different experiences that exist across individuals. This variable only incorporates temporary shocks. Peer pressure or a traumatic event can cause a person to jump to a higher or lower consumption path for the addictive good. While this is a good starting point, the model fails to explain how permanent or fundamental differences in lived experiences impacts differences in substance use or addiction.

Social identity matters in determining human behavior and preferences. One example of this is the difference in preferences between women and men. John Stuart Mill debates the difference between men and women in his book "The Subjection of Women". Mill gives a number of reasons in support of women's rights in the book. Many of the gender norms that we associate with femininity permeate Mill's analysis. He also discusses the notion that women are less rational and intelligent than men (Mill, 1869; 2017). Mill disagrees with this by arguing that, "Natural differences will be what is left behind after setting aside every characteristic of either sex that can be explained through external circumstances." (Mill, 1869; 2017, p.13). Today, many people still hold the opinion that women are less "rational"

then men. While there is little evidence that women are less rational than men based on the economic definition of rationality (which has been defined by men), social institutions and culture do impact gender differences in behavior. Gender identity may play an important role in determining what we define as rational, and thus may highlight that some groups are more "rational" than others. Gender identity impacts the consumption of addictive goods because the level of acceptance regarding the consumption of addictive goods is partially defined by someone's gender.

The heterogeneity in feminine versus masculine behavior also highlights the importance of social identities in decision making. In "The Subjection of Women" Mill explains that women are nurturing, selfless, kind, moral, and caretakers (Mill, 1869; 2017). These are characteristics that are still associated with womanhood. It is not that women naturally have a preference for nurturing or kindness, it is that society signals that those qualities are a component of what it means to be a women. In other words, a women's identity influences her preferences, behavior, and decision making. Mill agrees with this sentiment and argues that women and men are fundamentally different, but that social factors plays a large role in determining these differences.

Mill provides important insight into how gender impacts human behavior. Becker and Murphy (1988) ignore the role of identity in preference formation and ordering because they assume preferences are exogenous and that individuals make utility maximizing decisions based on their individual utility function. As Nelson so clearly put it, "Humans do not simply spring out of the earth. Humans are born of women, nurtured and cared for as dependent children and when aged or ill, socialized into family and community groups, and are perpetually dependent on nourishment and a home to sustain life" (Nelson, 1995, p.136).

People are defined by their different identities precisely because of the culture that they grow up in. Mills analysis provides evidence of how gender varies by social group.

Like gender, socioeconomic status is also an important component of identity. Many economists in the 18th and 19th centuries viewed alcohol and drug use as a problem of the lower classes. They believed that many people spent too much of their income on alcohol. For instance, Adam Smith discussed some social and economic factors that influence alcohol consumption in "The Wealth of Nations". He explains, "Though individuals, besides, may sometimes ruin their fortunes by an excessive consumption of fermented liquors, there seems to be no risk that a nation should do so. Though in every country there are many people who spend upon such liquors more than they can afford, there are always many more who spend less" (Smith, 1776/1981a, p.). Smith highlights the heterogeneity in alcohol consumption across individuals. He notes that some people can consume alcohol without it taking up their income, while others cannot.

Malthus agrees that only some people are impacted by the issue of alcohol consumption, but Malthus believes that the working class disproportionately consume alcohol over wealthier classes. He says,

> "The labouring poor, to use a vulgar expression, seem always to live from hand to mouth. Their present wants employ their whole attention, and they seldom think of the future. Even when they have an opportunity of saving they seldom exercise it, but all that is beyond their present necessities goes, generally speaking, to the ale-house. The poor laws of England may therefore be said to diminish both the power and the will to save among the common people, and thus to weaken one of the strongest incentives to sobriety and industry, and consequently to happiness. It is a general complaint among master manufacturers that high wages ruin all their workmen, but it is difficult to conceive that these men would not save a part of their high wages for the future support of their families, instead of spending it in drunkenness and dissipation, if they did not rely on parish assistance for support in case of accidents" (Malthus, 1798, p.27).

Malthus argues that workers waste their income on alcohol instead of saving it. He views the workers as having no self control when it comes to the consumption of alcohol. With this point, Malthus identifies another critique of the rational addiction model. Why would someone continue to consume an addictive substance if it seemingly brings them so little pleasure? Becker and Murphy (1988) acknowledge this criticism in their paper and explain that individuals consume the addictive good because the alternative would lead them to have less overall utility. While this argument makes sense from a utilitarian perspective, it is inconsistent with evidence from the real world. Most people who use substances say that they would be happier if they could stop consuming the good. The issue is one of control and not utility.

Malthus also argues that an individual's identity as a working class individual increases their consumption of alcohol. The rational addiction model only incorporates the effect of temporary changes in the consumption of addictive substances as a result of stress. Even if being a member of the working class could be incorporated in a variable that represents the rate of change in the difference of experiences, it does not explain how identity is fundamental to substance use. Being a member of the working class isn't a temporary change in stress and can't be modelled as such. Studies show that growing up in poverty substantially influences your health and well-being over the course of your lifetime (Murray, 2006; Raphael, 2011). Identity impacts the amount of an addictive substance that an individual consumes, but also when, how, and why an individual consumes it. These preferences are formed at a young age when someone learns social cues about substance use from their social group. Identity is fundamental in determining heterogeneous behavior across groups. Research shows that substance use varies across race, ethnicity, gender, socioeconomic status, sexual orientation,

religious affiliation, and more (Alvanzo et al., 2011). Identity is not only a contributing factor in the rate of consumption stock of the addictive good, but it's also fundamental to the preference formation of individuals. Various identities inform one another to create heterogeneity in substance use. The rational addiction model misses the relationship between identity and preferences.

Arguments about the importance of identity in human behavior are an important critique of the rational addiction model, but biological arguments about behavior also present contradictory information to the rational addiction model. A ground breaking article by Weeks (1962) found that rats would quickly become addicted morphine when they were given the opportunity to self administer it. Importantly, these rats self-administered the morphine at different rates and became dependent on the morphine at different times. People also differ in their levels of rationality regarding addictive goods, and these levels are determined by social factors in addition to behavioral and biological factors. Another landmark study about animal behavior found that irrational behavior might occur when inequity is detected (Brosnan & Waal, 2003). In Brosnan and Waal (2003) brown capuchin monkeys refused to participate in certain activities if they saw their peers receiving a greater award than them for doing so. Similar to Malthus' argument, marginalized groups whom are subjected to unfair or unjust treatment might act irrationally in some situations because of their unfair treatment. Additionally, some monkeys in the study traded their token but refused the less valuable reward if their peers received the more valuable reward (Brosnan & Waal, 2003). The monkey's were upset about the unfairness of their award based on their peers reward. This implies that utility functions are interdependent. The monkey's are happy with the lesser reward when their peers receive the same reward, but are upset when their peers re-

ceive a better reward and they receive the lesser reward. Brosnan and Waal (2003) connect this response to emotions and passions, rather than utility maximization.

Adam Smith also believed that passions were innate to human behavior and that humans wanted to please and not offend one another (Smith, 1759/1981b). Like monkeys, people also notice when they are in an unjust and unfair situation. For instance, empirical evidence illustrates that unfair treatment based on identity leads to increased stress, anger, frustration, and other mental health outcomes which increases substance use and other poor health outcomes (Williams et al., 2019). Identity within a social group can lead to an emotional response that contradicts someones utility maximizing response. This response is also heterogeneous across individuals. This strand of literature is an example of how biology and identity interact to create irrational behavior. The rational addiction model cannot predict the consumption of addictive substances because it does not incorporate the emotional responses tied to individual identity. However, these responses to help explain some of the heterogeneity of substance use across different social groups.

2.5 Uncertainty, and Asymmetric Information

Another critique of the rational addiction model involves asymmetric information. Individuals who consume addictive substances are uncertain about how the addictive substance will impact their future actions. Utility maximization is not possible if someone does not have access to complete information.

Keynes explains that it is foolish to attach great weight to things that are uncertain (Keynes, 1936). Keynes argues that people will only make changes based on future assump-

tions if they expect changes. He asserts that the state of confidence in the future will impact an individual's decision making today. In other words, Keynes asserts that it is impossible for individuals to accurately make utility maximizing decisions because they have incomplete information about the future. Keynes' point about uncertainty, and decision making under uncertainty, has been extended upon by other economists. Asymmetric information, or when one individual/firm/country knows more information than another individual/firm/country, impacts market and macroeconomic outcomes. Akerlof (1970) argues that consumers make decisions based on the average outcomes within a market, but that the sellers in that market have more information than buyers. This extra information causes producers to produce below the average market outcome. Over time this reduces the quality of the market good (Akerlof, 1970). Akerlof (1970) highlights that people often make decisions based on incorrect assumptions because they don't have enough information.

Asymmetric information presents issues in decision making for prescribers, producers, and consumers of addictive substances. For example, in 2019, 85.6 percent of people in the United States had consumed alcohol at least once in their life, but only 14.5 million (or about 4.42 percent) of people had Alcohol Use Disorder (National Institute of Alcohol Abuse and Alcoholism, 2022). Most people do not know the exact probability for which they will become addicted to addictive goods and make their decision based on the average outcome. The average outcome is that a consumer will not become addicted to the good. Therefore people maximize their utility function based on incomplete information. The rational addiction model cannot accurately predict substance use because people do not have access to full information.

The recent Opioid epidemic in the United States is another example of how asymmetric

information impacts substance use. This epidemic has been attributed, in part, to the introduction of the drug OxyContin, which was produced by Purdue Pharma. When OxyContin was first introduced, it was marketed as being less addictive than other pain medications (Evans et al., 2019). Doctors and patients felt more comfortable prescribing and consuming OxyContin because of its' supposedly less addictive qualities. Recent studies show that OxyContin is extremely addictive, and a gateway drug to heroin use (Evans et al., 2019). The pharmaceutical company knew about the drugs addictive qualities, but the doctors and patients did not know about these qualities.

Asymmetric information in the market led to sub optimal decision making decisions by consumers. These individuals may have been maximizing their utility function based on the budget constraint as in the rational addiction model. However, many of them believed that the drug was not addictive and were maximizing their utility based on that assumption. These individuals could not have been forward looking because they did not and could not know what the future time periods would look like based on this assumption.

Bentham and Mill also discuss uncertainty in their work. Bentham discussed a component of uncertainty in his book "The rationale of reward". He explains, "Prejudice apart, the game of push-pin is of equal value with the arts and sciences of music and poetry. If the game of push-pin furnish more pleasure, it is more valuable than either" (Bentham, 1825, p. 206). Bentham believed that anything can give someone utility, and that utility is determined by preferences. On the other hand Mill presents an opposing view to Bentham's theory. He states, "It is quite compatible with the principle of utility to recognize the fact that some kinds of pleasure are more desirable and more valuable than others" (Mill, 1863; 2017, p.6). Mill believes that music and poetry will always be preferred to a game of push-pin because

poetry and music are "higher pleasures". Someone would only prefer push-pin if they had never experienced poetry or music. Bentham and Mill both argue that people only know their preference orderings once they have tried both activities. In the context of the rational addiction model, both Bentham and Mill would critique the model because they would argue that people are unable to predict their future utility of a good when they have never consumed that good. It is the uncertainty about the future and incomplete information that causes people to make decisions based on social preferences and habitual behavior.

3 Policy Recommendations

In this section I will analyze whether the policy recommendations from the rational addiction model are consistent with the policy recommendations about substance use from other economists. A primary purpose of economic research is to introduce policy options to address economic issues and concerns. Becker and Murphy (1988) argue that permanent changes in the price of addictive goods will result in decreases in the consumption of addictive goods and that the long run demand for addictive goods is more elastic than non-addictive goods. Becker et al. (1994) also test the rational addiction model empirically to examine if there is empirical support for the model. Becker et al. (1994) find that an increase in the price of cigarettes results in a decrease in the consumption of cigarettes, and that future consumption and past consumption impact current consumption. They conclude their analysis by recommending price controls as an effective tool for limiting the consumption of addictive goods.

Adam Smith also discussed the taxation, elasticity, and price of addictive goods. For

example, he explains, "Were the duties upon foreign wines, and the excises upon malt, beer, and ale, to be taken away all at once, it might, in the same manner, occasion in Great Britain a pretty general and temporary drunkenness among the middling and inferior ranks of people, which would probably be soon followed by a permanent and almost universal sobriety" (Smith, 1776/1981a, p.492). Adam Smith asserts that lowering the price of alcohol will cause a decrease in alcohol consumption. He explains that decreasing the price makes alcohol less scarce and in turn will cause people to consume alcohol less. Adam Smith recognized the important relationship between price and alcohol consumption, however current research illustrates that price increases of alcohol cause decreases in consumption of alcohol (Baltagi & Griffin, 2002).

Adam Smith also identifies how taxation impacts the consumers versus the producers of addictive goods. He explains, "Such stamp-duties as those upon licences to retail ale, wine, and spirituous liquors, though intended, perhaps, to fall upon the profits of the retailers, are likewise finally paid by the consumers of those liquors" (Smith, 1776/1981a, p.671). In this quote Smith notes the inelasticity of demand for alcohol and that consumers will pay more of the burden of a tax then producers because of this. Smith also explains, "It has for some time past been the policy of Great Britain to discourage the consumption of spirituous liquors, on account of their supposed tendency to ruin the health and to corrupt the morals of the common people. According to this policy, the abatement of the taxes upon the distillery ought not to be so great as to reduce, in any respect, the price of those liquors. Spirituous liquors might remain as dear as ever, while at the same time the wholesome and invigorating liquors of beer and ale might be considerably reduced in their price. The people might thus be in part relieved from one of the burdens of which they at present complain the most,

while at the same time the revenue might be considerably augmented. (Smith, 1776/1981a, p.693)" Smith describes the current taxation strategy of the government in limiting alcohol use. The government was especially concerned about liquors with higher alcohol content as opposed to beer. Smith asserts that demand for these liquors was higher and more inelastic then demand for beer. Smith's discussion of policy about the consumption of addictive goods centered on price and taxation measures, just as Becker and Murphy (1988) and Becker et al. (1994). They all argue that price changes impact the incentive of consuming the addictive good.

John Stuart Mill had a different opinion about the role of the government in the consumption of addictive substances. In John Stuart Mill's book "On Liberty" he discusses the role of policy in substance use. For instance he explains "No person ought to be punished simply for being drunk; but a soldier or a policeman should be punished for being drunk on duty. Whenever, in short, there is a definite damage, or a definite risk of damage, either to an individual or to the public, the case is taken out of the province of liberty, and placed in that of morality or law" (Mill, 1857; 2001, p.75). Mill proposes that drunkenness itself should not be punished or monitored unless there is a chance that something negative would happen as a result of drunkenness to other people. Beyond the possibility of harm as a reason for implementing laws to limit drunkenness, Mill also believes that there should be policies that stop individuals from consuming alcohol if they are known to cause damage to other people when they consume it. Mill asserts that alcohol consumption is not a crime, but that an individual's harmful actions to others is a crime.

Like Mill, Bentham also discussed the role of the government in regulating substance use. He says,

> "With what chance of success, for example, would a legislator go about to extirpate drunkenness and fornication by dint of legal punishment? Not all the tortures which ingenuity could invent would compass it: and, before he had made any progress worth regarding, such a mass of evil would be produced by the punishment, as would exceed, a thousand-fold, the utmost possible mischief of the offence. The great difficulty would be in the procuring evidence; an object which could not be attempted, with any probability of success, without spreading dismay through every family, tearing the bonds of sympathy asunder, and rooting out the influence of all the social motives. All that he can do then, against offences of this nature, with any prospect of advantage, in the way of direct legislation, is to subject them, in cases of notoriety, to a slight censure, so as thereby to cover them with a slight shade of artificial disrepute" (Bentham, 1781; 2000, p.232).

Bentham's argument is about the moral bounds of policy regarding substance use. Bentham also argues that it would be very difficult to prove the crimes of drunkenness and fornication. He believes that this would be a waste of resources and it would also take a toll on the families of members who are involved in the investigation. Bentham concludes that the solution to excessive alcohol use is to implement minor punishments to those individuals and believes the costs of implementing policies regarding substance use outweigh the benefits.

Bentham and Mill both debate the governments role in limiting the consumption of addictive substances and the challenges that existed when they did so. Bentham primarily discussed the externalities associated with a policy surrounding substance use. A price or tax may decrease consumption, but it also might have negative effects for other members of the household or social group. For instance, if the price of an addictive substance goes up and someone wants to continue to consume the same amount of the addictive good, the household will have to consume less of other goods. The rational addiction model rules out policies that give support to households or other social groups dealing with addiction because it only focuses on individual behavior.

Engels discusses a specific policy, the Beer Act of 1830, that was created to encourage beer drinking and discourage the consumption of hard liquor. He explains,

> "The Beer Act of 1830, which facilitated the opening of beerhouses (jerry-shops), whose keepers are licensed to sell beer to be drunk on the premises, facilitated the spread of intemperance by bringing a beerhouse, so to say, to everybody's door. In nearly every street there are several such beerhouses, and among two or three neighbouring houses in the country one is sure to be a jerry-shop. Besides these, there are hush-shops in multitudes, i.e., secret drinking-places which are not licensed, and quite as many secret distilleries which product great quantities of spirits in retired spots, rarely visited by the police, in the great cities. Gaskell estimates these secret distilleries in Manchester alone at more than a hundred, and their product at 156,000 gallons at the least. In Manchester there are, besides, more than a thousand public houses selling all sorts of alcoholic drinks, or quite as many in proportion to the number of inhabitants as in Glasgow. In all other great towns, the state of things is the same. And when one considers, apart from the usual consequences of intemperance, that men and women, even children, often mothers with babies in their arms, come into contact in these places with the most degraded victims of the bourgeois regime, with thieves, swindlers, and prostitutes; when one reflects that many a mother gives the baby on her arm gin to drink, the demoralising effects of frequenting such places cannot be denied."

The Beer Act was not successful in limiting the consumption of hard liquor because there was not enough policing of the illegal shops that sell these liquors. Engels argues that enforcement capability is another important consideration when implementing policy about addictive substances. He also explains that the illegal liquor establishments were demoralizing and degrading and that no one should have to come in contact with them. Engels also discusses that for many consumers of alcohol, substitution away from liquor to beer was not feasible or desired, regardless of the laws in place. Finally, Engels argues that there is a negative effect of alcohol consumption on families. Like Bentham, Engels acknowledges that any policy addressing substance use will have spillover effects on households. Becker and Murphy (1988) don't discuss the role of the government in criminalizing substances and its

effect on substance use in the context of the rational addiction model. As discussed above, they also miss the impact of substance use on households. Finally, they miss the importance of the substitution mechanism for addictive substances. For instance, during the opioid epidemic many opioid users switched to heroin when increased regulations were put into effect (Evans et al., 2019). Policies that target the use of illegal substances are also ruled out by the rational addiction model because regulating the price of these substances is technically not possible because they operate outside of a market where the government can implement price controls.

Malthus was the only classical economist whose policy recommendations focused on the relationship of institutional and structural components and addiction. He believed that substance use occurred because of a lack of self-control amongst working class individuals but he also thought that the lack of self-control was driven by subsistence living and horrible working conditions. He explains,

> "The lower classes of people in Europe may at some future period be much better instructed than they are at present; they may be taught to employ the little spare time they have in many better ways than at the ale-house; they may live under better and more equal laws than they have ever hitherto done, perhaps, in any country; and I even conceive it possible, though not probable that they may have more leisure; but it is not in the nature of things that they can be awarded such a quantity of money or subsistence as will allow them all to marry early, in the full confidence that they shall be able to provide with ease for a numerous family. (p.96)"

Malthus believed that working class individuals needed to learn self-control when consuming alcohol and other addictive substances. He also stresses that the implementation of more equal laws would help improve the amount of drunkenness in society. Malthus also emphasized the importance of education in limiting substance use and addiction. Brosnan

and Waal (2003) also highlight how inequality can create emotional and passionate responses in monkeys. Empirical evidence supports this conclusion. For instance, chronic stress as a result of low socioeconomic status can increase substance use for some substances, in addition to other mental and physical health effects (Adler & Newman, 2002). Policies that help those in poverty and improve the welfare of individuals in low socioeconomic status improves health outcomes and has spillover effects for limiting substance use and substance use disorders. The rational addiction model doesn't consider this policy as an effective measure to limit the consumption of addictive goods because it doesn't incorporate social factors into the model.

Taxation and price controls are still employed frequently to limit the consumption of addictive goods. DiIulio (1996) explains that, "the challenge is to identify policies that can make a positive contribution at the margin by preventing or reducing crime at a reasonable human and financial cost. It is a challenge for which policy-oriented economists are especially well suited, all the more if they begin by rethinking deterrence" (p.15). As discussed by the classical economists, policies other than price controls and taxation should also be incorporated into economic analysis.

4 Recommendations for Future Research

Rational choice theory is a valuable tool to study economic phenomena, including addiction. However, this framework also fails to incorporate many important factors that contribute to substance use and addiction. My biggest critique of the study of addiction in economics is that there are not more models of addiction and substance use. Models that incorporate so-

cial factors, endogenous preferences, habits, institutionalism, heterogeneity, and alternatives to utility maximization are important future avenues of research for the study of addiction in economics.

The social element of substance use was highlighted by Smith, Malthus, and others. Rational, myopic, and imperfectly rational addiction models all use neoclassical economic theory to illustrate the cycle of addictive behavior in individuals. Smith argues that the norms about drinking in a society or culture will play a significant role in individual alcohol consumption. Modern research in other disciplines illustrates that peer effects are very important in determining the consumption of addictive goods. These social components are largely ignored in the neoclassical economic approach to addiction because it can't be modelled mathematically. Creating endogenous models of substance use would help remedy some of these issues and would incorporate a more well rounded representation of substance use and addiction. For instance, models that incorporate the power dynamic within a family unit and how it impacts substance use within a family are an important avenue of research. An intra-household bargaining model (i.e a dictatorial model, symmetric bargains, bargaining models with interdependent utility, etc.) as opposed to a rational framework might better explain addictive behavior (Manser & Brown, 1980).

The economists in this paper also discuss how individual identity, especially identity as a worker, impacts substance use. They argue that addictive goods, specifically alcohol and opium, are the only sources of pleasure or enjoyment for workers. There has been a wide range of empirical work examining how substance use varies based on identity. However, this work misses the impact of institutions in shaping identity and thus substance use. This research also omits the impact that habits have in shaping preferences for addictive goods.

Economic theories of substance use which incorporate identity and habits will be a valuable addition to the study of addiction in economics.

Theories that are able to incorporate heterogeneity in substance use are also important for improving the economic literature on addiction. Addiction varies substantially by individual because it occurs for multiple reasons. Focusing on just the consumption of addictive goods and not other factors has left economics lagging behind other social sciences in its' analysis of addiction. One way to fix this is to incorporate the diagnostic criteria for substance use disorder into economic theories. The consumption amount of addictive substances only makes up one of the diagnostic criteria for substance use disorder (refer to Table 1). Yet, most addiction models in economics only focus on the amount of consumption. The diagnostic criteria highlights the importance of other factors besides consumption that results in substance use disorders. Additionally, there are varying levels of severity of substance use disorders. Someone might meet 3 of the criteria while someone else might meet 6. Understanding how addiction is different for different individuals is also important for economists to understand.

Psychology will be a critical field for economists to study addiction moving forward. Psychologists acknowledge the complexity and heterogeneity of substance use. The emergence of neuroeconomics and behavioral economics are a promising start for incorporating psychology into economic theory, but there is still much to be done. Behavioral economics incorporates theory from psychology to more accurately model human behavior and can be utilized to explain addiction within the scope of economics. Hyperbolic discounting is one example which highlights the main issues with the exponential discounting assumptions in rational addiction models. The rational addiction model assumes that individuals have a

stable discount rate over time (Becker & Murphy, 1988). Hyperbolic discounting occurs when people place less importance on the future then on the present (Dasgupta & Maskin, 2005). Hyperbolic discounting captures individual preferences for the current period over future periods. Petry (2001) found that alcohol abusers had more rapid discounting than the non-abusers. However, Bretteville-Jensen (1999) find that the discount rate between active and former users of illegal intoxicants varies significantly, discrediting the exponential discounting method used in the rational addiction model. Additionally, empirical evidence indicates that hyperbolic discounting better explains addiction than exponential discounting does (Dauner, 2018). Hyperbolic discounting is a superior theory to exponential discounting for explaining addiction because it explains why people might consume addictive substances which give a low payoff in the current period at the expense of a high punishment in future periods (Vuchinich & Heather, 2003). Hyperbolic discounting occurred because of research in psychology and economics. There are other areas at the intersection of psychology and economics which can be studied to understand addiction. For instance, Acker et al. (2012) examines the impact of behavior on substance use within a behavioral economic context. They find that maximum expenditure and intellectual functioning are associated with weekly alcohol use, while intensity and craving for alcohol are associated with alcohol misuse (Acker et al., 2012). This paper highlights how psychology, in conjunction with economics, helps explain alcohol use.

Neuroeconomics has also led to models of addiction using neurology and biology in conjunction with economics to build economic theories. Neuroeconomists argue that individuals with substance dependency have an impaired response of reward prediction error signaling (Parvaz et al., 2015). They over-predict the pleasure that they receive from the addictive

good and they under-predict the pain that they will receive. The rational optimization framework presented in Becker and Murphy (1988) cannot be true if individuals miscalculate their utility function and payoffs. Neuroeconomics also highlights that the brain is made up of multiple systems that interact (Camerer et al., 2004). Homeostasis is one example of new theory that has been incorporated in neuroeconomics. Homeostasis impacts preferences because that are "state" dependent within the body and that act as information signals (Camerer et al., 2004). The homeostasic mechanism is where feelings of pain and pleasure orginate (Camerer et al., 2004). Substance use changes the homeostatic mechanism and processes in your body, which means that the human body responds to decision making differently over time and state (Koob & Moal, 1997). The rational addiction model, which represents preferences as static, fails to account for these changes. Neuroeconomic theory better explains the components and processes of addiction than the rational addiction model does.

These new theories of addiction in economics have created alternative ways to study addiction and substance use in economics. These methods provide a promising way forward for economists studying addiction because they rely on theories about the human brain and human behavior to support their argument.

The importance of group identity in determining the heterogeneity of substance use is also an important avenue for future research. Engels and Marx explore the relationship between capitalism and substance use in their excerpts. They argue that capitalists yield control over their workers by encouraging substance use. While addictive substances can be used to control the working class, the inelastic demand of addictive goods also provides capitalists with an ideal market to maximize their profits. Addiction is an appealing phenomenon for

capitalists because it creates an individual desire for the addictive commodity over all other commodities. Therefore, Marx's theory predicts that capitalists who enter the markets of addictive goods will squeeze the surplus value out of those markets. Capitalists contribute to the problem of addiction and substance use because they want to make a profit and they want to control workers. The relationship between economic and social institutions and addiction is another promising avenue of research.

5 Conclusion

The founders of economics discussed addictive goods, explained why people gravitated towards addictive goods, and talked about policies that would limit the consumption of those goods. While some of what they discussed was incorrect, they also made some very accurate and important insights about the consumption of addictive goods. The founders of economics discussed many important components of substance use and dependency and tried to figure out how to limit the negative effects on society. The literature in this paper gives economists a good structure for incorporating substance use in economics.

Unfortunately, history of economic thought is no longer a primary approach to economic research. History provides a rich context for what economics is, and what it can be. The economists in this paper discuss substance use and its implications on society in great depth. They provide many critiques of the rational addiction model and provide ideas for other possible ways forward to study addiction in economics. Theories from the classical economists; Bentham, Malthus, Mill, and Smith all support the study of complex human behavior like addiction within economics. Bentham discusses the complex process of addiction and its im-

plications. Malthus and Smith explain why people become addicted to goods. Mill discusses the ethics of policies which limit the individual consumption of addictive substances. Their theories and examples robustly explain the complex phenomena of addiction. More recent economists, like Engels and Marx, also provide alternatives to the rational addiction model. These theories also explain addictive behavior and the prevalence of addiction in the world.

This brings us back to the question in this paper: Should economists model addiction? From a historical perspective, it is clear that the consumption of addictive goods should be studied in economics. However, economics has changed substantially since the 18th CE. Economists in the 18th and 19th CE used words and philosophical arguments to build their theories. Today, economists rely on complex mathematical theory to construct their arguments. Economists study individual behavior, and can make fairly accurate policy recommendations based on the consumer behavior of addictive goods through mechanisms like elasticity and discount factors. However, economists often fail to understand and accurately model the process of addiction. Incorporating habitual behavior, endogenous and social preferences, alternatives to utility maximization, and heterogeneity into economic theories of addiction are important avenues for future research. It is important that economists embrace both quantitative and qualitative methods to understand the complex phenomena of addiction.

References

Acker, J., Amlung, M., Stojek, M., Murphy, J. G., & MacKillop, J. (2012). Individual variation in behavioral economic indices of the relative value of alcohol: Incremental validity in relation to impulsivity, craving, and intellectual functioning. *Journal of Experimental Psychopathology*, *3*(3), 423–436. https://doi.org/10.5127/jep.021411

Adler, N. E., & Newman, K. (2002). Socioeconomic disparities in health: Pathways and policies [Copyright - Copyright The People to People Health Foundation, Inc., Project HOPE Mar/Apr 2002; Last updated - 2021-09-09; SubjectsTermNotLitGenreText - Canada; United States–US]. *Health affairs*, *21*(2), 60–76. https://ezproxy2.library.colostate.edu/login?url=https://www.proquest.com/scholarly-journals/socioeconomic-disparities-health-pathways/docview/204621250/se-2?accountid=10223

Ahern, J., Galea, S., Hubbard, A., Midanik, L., & Syme, S. L. (2008). Culture of drinking" and individual problems with alcohol use. *American Journal of Epidemiology*, *167*, 1041–1049. https://doi.org/https://doi.org/10.1093/aje/kwn022

Akerlof, G. A. (1970). The market for "lemons": Quality uncertainty and the market mechanism. *The Quarterly Journal of Economics*, *84*(3), 488–500. Retrieved April 17, 2022, from http://www.jstor.org/stable/1879431

Ali, M. M., & Dwyer, D. S. (2009). Estimating peer effects in adolescent smoking behavior: A longitudinal analysis. *Journal of Adolescent Health*, *45*(4), 402–408. https://www.sciencedirect.com/science/article/pii/S1054139X09001001

Alvanzo, A. A., Storr, C. L., La Flair, L., Green, K. M., Wagner, F. A., & Crum, R. M. (2011). Race/ethnicity and sex differences in progression from drinking initiation to the development of alcohol dependence. *Drug and Alcohol Dependence*, *118*(2), 375–382. https://doi.org/https://doi.org/10.1016/j.drugalcdep.2011.04.024

Arrow, K. J. (1994). Methodological individualism and social knowledge. *The American Economic Review*, *84*(2), 1–9. Retrieved April 7, 2022, from http://www.jstor.org/stable/2117792

Ashraf, N., Camerer, C. F., & Loewenstein, G. (2005). Adam smith, behavioral economist. *Journal of Economic Perspectives*, *19*(3), 131–145. https://www.aeaweb.org/articles?id=10.1257/089533005774357897

Baltagi, B. H., & Griffin, J. M. (2002). Rational addiction to alcohol: panel data analysis of liquor consumption. *Health Economics*, *11*(6), 485–491. https://doi.org/10.1002/hec.748

Becker, G. S., Grossman, M., & Murphy, K. M. (1994). An empirical analysis of cigarette addiction. *The American Economic Review*, *84*(3), 396–418. http://www.jstor.org/stable/2118059

Becker, G. S., & Murphy, K. M. (1988). A theory of rational addiction. *Journal of Political Economy*, *96*(4), 675–700. http://www.jstor.org/stable/1830469

Bentham, J. (1825). *The rationale of reward*. Published by John; H. L. Hunt. https://archive.org/details/rationaleofrewar00bent/page/n11/mode/2up

Bentham, J. (1781; 2000). *An introduction to the principles of morals and legislation* (O. Kitchener, Ed.). Batoche Books. https://socialsciences.mcmaster.ca/econ/ugcm/3ll3/bentham/morals.pdf

Bretteville-Jensen, A. (1999). Addiction and discounting1a preliminary version of this paper was presented at the 18th nordic health economists' study group meeting, finland, august 22–23 1997.1. *Journal of Health Economics*, *18*(4), 393–407. https://doi.org/https://doi.org/10.1016/S0167-6296(98)00057-5

Brosnan, S. F., & Waal, F. B. M. (2003). Monkeys reject unequal pay. *Nature*, *425*, 297–299.

Camerer, C. F., Loewenstein, G., & Prelec, D. (2004). Neuroeconomics: Why economics needs brains. *The Scandinavian Journal of Economics*, *106*(3), 555–579. Retrieved April 17, 2022, from http://www.jstor.org/stable/3441124

Dasgupta, P., & Maskin, E. (2005). Uncertainty and hyperbolic discounting. *American Economic Review*, *95*(4), 1290–1299. https://doi.org/10.1257/0002828054825637

Dauner, L. (2018). Does rational addiction exist? *Consumer Behavior*. https://www.grin.com/document/416898

Davis, J. B. (2010). Handbook of philosophy of science: Philosophy of economics. Available%20at%20SSRN:%20https://ssrn.com/abstract=1574975

DiIulio, J. J. (1996). Help wanted: Economists, crime and public policy. *Journal of Economic Perspectives*, *10*(1), 3–24. https://doi.org/10.1257/jep.10.1.3

Elster, J. (1979). *Ulysses and the sirens: Studies in rationality and irrationality*. Cambridge University Press.

Engels, F. (1892). *The condition of the working-class in england in 1844*. S. Sonnenschein & Company. https://books.google.com/books?id=B4YpAAAAYAAJ

England, P. (1989). A feminist critique of rational-choice theories: Implications for sociology. *The American Sociologist*, *20*(1), 14–28.

Evans, W. N., Lieber, E. M. J., & Power, P. (2019). How the reformulation of oxycontin ignited the heroin epidemic. *The Review of Economics and Statistics*, *101*(1), 1–15. https://doi.org/10.1162/rest_a_00755

Frank, R. H. (2020). *Under the influence: Putting peer pressure to work*. Princeton University Press.

Frantz, R., & Leeson, R. (2013). *Hayek and behavioral economics*. Palgrave Macmillan.

Gemici, K. (2007). Karl Polanyi and the antinomies of embeddedness. *Socio-Economic Review*, *6*(1), 5–33. https://doi.org/10.1093/ser/mwl034

Gilpin, N. W., & Koob, G. F. (2008). Neurobiology of alcohol dependence: Focus on motivational mechanisms. *Alcohol research health : the journal of the National Institute on Alcohol Abuse and Alcoholism*, *31*(3), 185–195.

Grønbæk, M. (2009). The positive and negative health effects of alcohol- and the public health implications. *Journal of Internal Medicine*, *265*(4), 407–420. https://doi.org/https://doi.org/10.1111/j.1365-2796.2009.02082.x

Gruber, J., & Köszegi, B. (2001). Is addiction "rational"? theory and evidence*. *The Quarterly Journal of Economics*, *116*(4), 1261–1303.

Hasin, D. S., O'Brien, C. P., Auriacombe, M., Borges, G., Bucholz, K., Budney, A., Compton, W. M., Crowley, T., Ling, W., Petry, N. M., Schuckit, M., & Grant, B. F. (2013). Dsm-5 criteria for substance use disorders: Recommendations and rationale [PMID: 23903334]. *American Journal of Psychiatry*, *170*(8), 834–851. https://doi.org/10.1176/appi.ajp.2013.12060782

Houthakker, H. S., & Taylor, L. D. (1966). *Consumer demand in the united states, 1929–1970, analyses and projections* (2nd edition, 1970). Cambridge, Harvard University Press.

Kahneman, D. (2003a). Maps of bounded rationality: Psychology for behavioral economics. *The American Economic Review*, *93*(5), 1449–1475. Retrieved April 10, 2022, from http://www.jstor.org/stable/3132137

Kahneman, D. (2003b). A psychological perspective on economics. *American Economic Review*, *93*(2), 162–168. https://doi.org/10.1257/000282803321946985

Katcher, B. S. (1993). Benjamin rush's educational campaign against hard drinking. *American journal of public health*, 273–281.

Kawaguchi, D. (2004). Peer effects on substance use among american teenagers. *Journal of Population Economics*, *17*(2), 351–367. http://www.jstor.org/stable/20007912

Keynes, J. M. (1936). *The general theory of employment, interest, and money* (I. Relations & S. Network, Eds.). https://www.files.ethz.ch/isn/125515/1366_KeynesTheoryofEmployment.pdf

Koob, G. F., & Moal, M. L. (1997). Drug abuse: Hedonic homeostatic dysregulation. *Science*, *278*(5335), 52–58. https://doi.org/10.1126/science.278.5335.52

Linnet, J. (2020). The anticipatory dopamine response in addiction: A common neurobiological underpinning of gambling disorder and substance use disorder? *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, *98*, 109802. https://doi.org/https://doi.org/10.1016/j.pnpbp.2019.109802

Lundborg, P. (2006). Having the wrong friends? peer effects in adolescent substance use. *Journal of Health Economics*, *25*(2), 214–233. https://doi.org/https://doi.org/10.1016/j.jhealeco.2005.02.001

Malthus, T. R. (1798). *An essay on the principle of population* (E. S. P. Project, Ed.). London: J. Johnson in St Paul's Church-yard. http://www.esp.org/books/malthus/population/malthus.pdf

Mandelbaum, D. G. (1965). Alcohol and culture. *Current Anthropology*, *6*(3), 281–293. http://www.jstor.org/stable/2739922

Manser, M., & Brown, M. (1980). Marriage and household decision-making: A bargaining analysis. *International Economic Review*, *21*(1), 31–44. https://EconPapers.repec.org/RePEc:ier:iecrev:v:21:y:1980:i:1:p:31-44

Marx, K. (1992). *Early writings* (3rd). Penguin Books Limited.

Marx, K. (2013). *Capital* (T. Griffith, Ed.; Vol. 1). Wordsworth Edition Limited. (Original work published 1867)

McKenzie, R. B. (1979). The non-rational domain and the limits of economic analysis. *Southern Economic Journal*, *46*(1), 145–157. http://www.jstor.org/stable/1057009

Mendelowitz, E. (2017). William james and addiction.

Mill, J. S. (1869; 2017). *The subjection of women* (J. Bennett, Ed.). Longmans, Green, Reader; Dyer. https://www.earlymoderntexts.com/assets/pdfs/mill1869.pdf

Mill, J. S. (1857; 2001). *On liberty* (Kitchener, Ed.). Batoche Books. https://socialsciences.mcmaster.ca/econ/ugcm/3ll3/mill/liberty.pdf

Mill, J. S. (1863; 2017). *Utilitarianism* (J. Bennett, Ed.). Cambridge University Press. https://www.earlymoderntexts.com/assets/pdfs/mill1863.pdf

Mischel, W., Ebbesen, E. B., & Zeiss, A. R. (1972). Cognitive and attentional mechanisms in delay of gratification. *Journal of personality and social psychology*, *21 2*, 204–18.

Murray, S. (2006). Poverty and health. *CMAJ*, *174*(7), 923–923. https://doi.org/10.1503/cmaj.060235

Musto, D. (1996). *Pathways of addiction: Opportunities in drug abuse research* (I. of Medicine (US) Committee on Opportunities in Drug Abuse Research, Ed.). National Academies Press (US). https://www.ncbi.nlm.nih.gov/books/NBK232965/

National Institute of Alcohol Abuse and Alcoholism. (2022). Alcohol use in the united states. https://www.niaaa.nih.gov/publications/brochures-and-fact-sheets/alcohol-facts-and-statistics

Nelson, J. A. (1995). Feminism and economics. *Journal of Economic Perspectives*, *9*(2), 131–148. https://doi.org/10.1257/jep.9.2.131

Orphanides, A., & Zervos, D. (1995). Rational addiction with learning and regret. *Journal of Political Economy*, *103*(4), 739–758. https://doi.org/10.1086/262001

Parvaz, M. A., Konova, A. B., Proudfit, G. H., Dunning, J. P., Malaker, P., Moeller, S. J., Maloney, T., Alia-Klein, N., & Goldstein, R. Z. (2015). Impaired neural response to negative prediction errors in cocaine addiction. *The Journal of neuroscience : the official journal of the Society for Neuroscience*, 1872–1879.

Petry, N. (2001). Delay discounting of money and alcohol in actively using alcoholics, currently abstinent alcoholics, and controls. *Psychopharmacology*, *154*, 243–50. https://doi.org/10.1007/s002130000638

Potenza, M. (2013). Biological contributions to addictions in adolescents and adults: Prevention, treatment, and policy implications. *The Journal of adolescent health : official*

publication of the Society for Adolescent Medicine, *52*, S22–S32. https://doi.org/10.1016/j.jadohealth.2012.05.007

Raphael, D. (2011). Poverty in childhood and adverse health outcomes in adulthood. *Maturitas*, *69*(1), 22–26. https://doi.org/https://doi.org/10.1016/j.maturitas.2011.02.011

Room, R., & Mäkelä, K. (2000). Typologies of the cultural position of drinking. *Journal of studies on alcohol*, 475–483. https://doi.org/https://doi.org/10.15288/jsa.2000.61.475

Rosenthal, R. J., & Faris, S. B. (2019). The etymology and early history of 'addiction'. *Addiction Research & Theory*, *27*(5), 437–449. https://doi.org/10.1080/16066359.2018.1543412

Sen, A. K. (1977). Rational fools: A critique of the behavioral foundations of economic theory. *Philosophy Public Affairs*, *6*(4), 317–344. http://www.jstor.org/stable/2264946

Serxner, S., Catalano, R., Dooley, D., & Mishra, S. (1991). Tobacco use: Selection, stress, or culture? *Journal of occupational medicine. : official publication of the Industrial Medical Association*, *33*(10), 1035–1039. http://europepmc.org/abstract/MED/1753299

Silverman, K., Holtyn, A., & Toegel, F. (2019). The utility of operant conditioning to address poverty and drug addiction. *Perspectives on Behavior Science*, *42*, 1–22. https://doi.org/10.1007/s40614-019-00203-4

Simon, H. A. (1955). A behavioral model of rational choice. *The Quarterly Journal of Economics*, *69*(1), 99–118. Retrieved April 10, 2022, from http://www.jstor.org/stable/1884852

Skog, O.-J. (1985). The collectivity of drinking cultures: A theory of the distribution of alcohol consumption.*. *British Journal of Addiction*, *80*(1), 83–99. https://doi.org/https://doi.org/10.1111/j.1360-0443.1985.tb05294.x

Smith, A. (1981a). *An inquiry into the nature and causes of the wealth of nations* (R. H. Campbell & A. S. Skinner, Eds.). Liberty Fund. (Original work published 1776)

Smith, A. (1981b). *The theory of moral sentiments* (D.D., Raphael and A.L, Mafice). Liberty Fund. (Original work published 1759)

Steedman, I., & Krause, U. (1986). *Goethe's faust, arrow's possibility theorem and the individual decision-takerin the multiple self* (J. E. (ed.), Ed.). Cambridge: Cambridge University Press.

Stigler, G. J., & Becker, G. S. (1977). De gustibus non est disputandum. *The American Economic Review*, *67*(2), 76–90. Retrieved April 17, 2022, from http://www.jstor.org/stable/1807222

Thaler, R. H. (2016). Behavioral economics: Past, present, and future. *American Economic Review*, *106*(7), 1577–1600. https://doi.org/10.1257/aer.106.7.1577

Veblen, T. (1899). *The theory of the leisure class*. McMaster University Archive for the History of Economic Thought. http://moglen.law.columbia.edu/LCS/theoryleisureclass.pdf

Volkow, N. D., Michaelides, M., & Baler, R. (2019). The neuroscience of drug reward and addiction [PMID: 31507244]. *Physiological Reviews*, *99*(4), 2115–2140. https://doi.org/10.1152/physrev.00014.2018

Vuchinich, R. E., & Heather, N. (2003). Chapter 1 - introduction: Overview of behavioural economic perspectives on substance use and addition. In R. E. Vuchinich & N. Heather

(Eds.), *Choice, behavioural economics and addiction* (pp. 1–31). Pergamon. https://doi.org/https://doi.org/10.1016/B978-008044056-9/50042-7

Wearing, S., & Wearing, B. (2000). Smoking as a fashion accessory in the 90s: Conspicuous consumption, identity and adolescent women's leisure choices. *Leisure Studies*, *19*(1), 45–58. https://doi.org/10.1080/026143600374833

Weeks, J. R. (1962). Experimental morphine addiction: Method for automatic intravenous injections in unrestrained rats. *Science*, *138*(3537), 143–144. https://doi.org/10.1126/science.138.3537.143

Wiesner, M., Windle, M., & Freeman, A. (2005). Work stress, substance use, and depression among young adult workers: An examination of main and moderator effect model. *Journal of occupational health psychology*, *10*, 83–96. https://doi.org/10.1037/1076-8998.10.2.83

Williams, D. R., Lawrence, J. A., Davis, B. A., & Vu, C. (2019). Understanding how discrimination can affect health. *Health Services Research*, *54*(S2), 1374–1388. https://doi.org/https://doi.org/10.1111/1475-6773.13222

Winston, G. (1980). Addiction and backsliding: A theory of compulsive consumption. *Journal of Economic Behavior Organization*, *1*(4), 295–324. https://EconPapers.repec.org/RePEc:eee:jeborg:v:1:y:1980:i:4:p:295-324

Witkiewitz, K., & Alan Marlatt, G. (2004). Relapse prevention for alcohol and drug problems: That was zen, this is tao. *The American psychologist*, *59*(4), 224–235.

Witkiewitz, K., & Marlatt, G. (2005). Emphasis on interpersonal factors in a dynamic model of relapse. *The American psychologist*, *60*, 341–2. https://doi.org/10.1037/0003-066X.60.4.341

Yuengert, A. M. (2001). Rational choice with passion: Virtue in a model of rational addiction. *Review of Social Economy*, *59*(1), 1–21. http://www.jstor.org/stable/29770092

Chapter 2- The Impact of Community Violence on Cigarette Use in Mexico

1 Introduction

While smoking is a major cause of death globally, smoking rates have been declining in most countries. Mexico experienced a significant decline in smoking between 2002 to 2009, which was followed by an increase between 2009 and 2016 (Zavala-Arciniega et al., 2020). Additionally, Zavala-Arciniega et al. (2020) found that there was a 35 percent increase in non-daily smoking between 2009 and 2016 in Mexico. Increases in smoking rates are concerning because smoking is associated with numerous negative health outcomes, such as sudden cardiac death, coronary heart disease, stroke, and lung cancer (U.S. Department of Health and Human Services, 2004). This paper will examine the impact of macro-level community violence on cigarette smoking rates in Mexico.

This paper will focus on the impact of changes in community-level violence on cigarette smoking. The existing literature indicates that violence has a negative impact on both physical and mental health. There is a large literature suggesting that an increase in local violence increases mental health disorders, stress, and post tramautic stress disorder (PTSD) for adolescents and adults in those areas (Cuartas & Roy, 2019; Fowler et al., 2009; McDonald & Richmond, 2008; Monahan & Steadman, 1996; Pearlin, 1989). One study found that the Mexican drug war was associated with a substantial decline in infant birth weight (Brown, 2018). Another qualitative study argues that members living in areas with increased violence use coping mechanisms, like alcohol abuse, to deal with stress related to violence (Altman

et al., 2018). Biological stress and other mental health disorders also lead to increased substance use and substance use disorders (Goeders, 2003).

Theory predicts two possible outcomes from an increase in community-level violence. Violence can increase cigarette use through the mechanism of increased stress, PTSD, depression, and anxiety. This effect may be magnified by peer effects and endogenous preferences. Violence may impact cigarette use through the mechanism of mental health, but it also might impact cigarette use through the mechanism of substitution. Increased drug trafficking organization (DTO) competition may drive down the prices of illicit drugs. The resulting substitution of illicit drugs (e.g., marijuana, cocaine, etc.) for cigarettes would result in decreased consumption of cigarettes.

To measure empirically how cigarette use changes as a result of violence from drug trafficking organizations, I use a difference in differences (DD) strategy to estimate the treatment effects of increased violence. This strategy was used by Lindo and Padilla-Romo (2018) to determine whether violence increases in areas where kingpins are captured and whether it increases in municipalities of association of the captured kingpin's DTO. Individuals who live in those municipalities are in the treated group, and individuals living in other municipalities are in the control group. I examine the impact of increased violence in the short run (0-5 months after capture) and in the medium run (6-11 months after capture). I use a pooled cross sectional dataset, The Mexico Health and Nutrition Survey (ENSANUT), to analyze changes in cigarette use over time. As a robustness measure I also use the 2005-2006 and 2009-2012 waves of the Mexican Family Life Survey, a longitudinal data set, to examine the impact of violence on cigarette use. Finally, the data is examined for adolescents and adults separately because most smoking habits are formed during adolescence.

The health of individuals who are exposed to drug-related violence is a critical line of study. The UN estimates that drug trafficking accounts for 0.6 to 0.9 percent of global GDP, which suggests that the impacts of drug-related violence are important to examine (UNODC, 2011). While homicides and violence are often included in the estimates of the costs of drug trafficking other costs, like changes in mental health, go uncounted. Indeed, the costs associated with the impact of drug-related violence on substance use and mental health have been relatively unstudied. This research will contribute to the literature on violence, substance use, and mental health in several ways. First, the United States is often the primary country of study for research about violence, substance use, and mental health. To my knowledge there are no empirical studies in economics using an econometric analysis about drug trafficking organization violence and it's impact on substance use in the country of Mexico. Second, in light of the substantial and prolonged nature of drug-related violence in Mexico any effects of such violence on substance use and health outcomes would be revealed in this study. Finally, while there is a large literature on violence and health, there is minimal research about how community violence impacts substance use. This distinction is important because of its policy implications.

2 Literature Review

There is a large literature examining the impact of violence on stress. Exposure to community-level violence can lead to PTSD in children and adolescents (Overstreet & Braun, 2000; Scarpa et al., 2006). Fowler et al. (2009) find in a meta-analysis that community violence victimization, witnessing, or hearing about community violence led to PTSD symptoms for

children and adolescents. A different study showed that physical community violence led to increased anger in both female and male adolescents (Dubé et al., 2018). Imas et al. (2018) find that exposure to violence increases impulsivity in time preferences.

There is also a clear link between mental health and mental health disorders, and cigarette use and nicotine use. One study found that women who had a history of PTSD or depression were 1.34 and 2.22 times more likely to use cigarettes than those who had no history of that disorder (Acierno et al., 1996). Individuals who have panic disorder and specific phobia were more likely to use smoking and chewing tobacco than those without the same disorders (Fu et al., 2014). Bandiera et al. (2017) found that e-cigarette use did not predict elevated depressive symptoms, but that depressive symptoms predict e-cigarette use. Another paper argued that individuals under high stress drank more coffee and smoked more cigarettes, but drank less alcohol than lower stressed individuals (Conway et al., 1981). Moreover, research also suggests that smokers with psychopathology may have higher levels of smoking demand after smoking cessation or deprivation (Farris et al., 2017). These studies highlight that PTSD, anxiety, depression, and other mental disorders all impact tobacco use.

In addition to clinically diagnosed mental disorders, stress also affects cigarette use. Byrne et al. (1995) found that a primary reason for cigarette uptake amongst adolescents was to help mediate stress during adolescence. Friedman (2020) shows that smoking is used as a stress coping mechanism for those who experience violent crime victimization and death of a non-family member who was close to them. Another study found that cigarette smoking was used as a maladaptive coping technique for individuals who are struggling with their identities (Jannat-Khah et al., 2018). Serxner et al. (1991) argue that job stress in conjunction with cultural factors are important determinants of cigarette use.

Studies show that females and males respond to stress differently. Research shows that these differences exist at the biological and developmental levels (Verma et al., 2011). One study found that women are more susceptible to tobacco use as a result of stress than men because women experience greater rewarding effects from nicotine and have higher withdrawal effects from nicotine (Torres & O'Dell, 2015). The differences by sex of smoking prevalence, stress response, and smoking behavior indicates that an analysis by sex needs to be an important component of this paper.

There has been a large literature that examines the impact of national violence on health outcomes. Dagnelie et al. (2018) examine the impact of violence from the civil war in Congo on infant mortality and find that it causes culling effects. Tsujimoto and Kijima (2020) examine the impact of the 1990-1994 conflict in northern Mali on child health and argue that exposure to conflict in utero, rather than after birth, creates negative health outcomes. A different study about conflict exposure in the Gaza Strip asserts that individuals who live in higher conflict areas are more likely to have physical impairments and chronic diseases (Di Maio & Leone Sciabolazza, 2021). Janke et al. (2016) find that communal violence leads to a decrease in physical activity. These studies illustrate that communal violence and conflict can have a significant negative impact on objective health outcomes. Building on the papers above, this paper uses the regional variation in violence in Mexico to examine the impact of community-level violence on cigarette use.

3 Conceptual Framework

Economic models of addiction attempt to use economic theory to explain addiction. Becker and Murphy (1988) developed the most famous economic model of addiction. The "rational addiction model" argues that the past and future consumption of addictive goods impact the current consumption of addictive goods (Becker & Murphy, 1988). The rational addiction model does have an added component to account for life cycle events that might increase or decrease the consumption of cigarettes. However, as Friedman (2020) explains, this component accounts for a broad range of life events and does little to clarify the mechanisms for these results.

Grossman (1972) also provides a framework for understanding the effect of increased violence on health. His theoretical framework highlights that health capital in a given period depends on health capital in the prior period, the depreciation of that health capital, and the investment in health capital in the present period. Almond and Currie (2011) use the Grossman model to show that health shocks also depreciate over time. Health shocks depreciate over time because they are a function of health capital which depreciates at some rate delta. If community violence does create a change in stress, this will result in a health shock in period t. The health shock will start to depreciate in period t+1, t+2, etc. Therefore, a shock in violence should lead to short-run change in health, but this effect should depreciate over time. The Grossman model predicts that there should only be short-run changes in substance use and health if community violence does increase stress.

These economic theories of addiction provide an economic framework to understand addiction, but often fail to explain important components of addiction. Theories about sub-

stance use and addiction from psychology, neurology, and biology provide a more comprehensive and thorough overview of the impact of community violence on cigarette use and can help bridge the gap in understanding between the economic models of addiction and other theories of addiction.

Theory in psychology illustrates that increases in communal violence lead to increases in stress and PTSD. For example, the life events checklist in the DSM-5 is a self-report measure to screen for traumatic events in a respondent's life that can lead to PTSD (American Psychiatric Association [APA], 2013). There are many events that would be classified under violence in the traumatic events list, including physical assault, assault with a weapon, sexual assault, combat or exposure to a war-zone, captivity, sudden violent death, and serious injury, harm, or death you caused to someone else. Changes in DTO ownership could result in many of these for people who live in municipalities and federal entities where violence increases.

Many theories also support the link between mental health and cigarette use. Nicotine activates the nicotinic receptor which increases neurotransmitters like acetylholine, norepinephrine, dopamine, serotonin, glutamate, and endorphins (Teesson et al., 2002). These "feel good" responses in the brain encourage individuals' continued consumption of cigarettes and reinforce cigarette use. Biological factors, like genetics, also play a role in cigarette use and addiction to cigarettes. Cue exposure theory could also explain the link between community level violence and cigarette use. As stress increases as a result of violence, the brain may cue an individual to use a cigarette (Teesson et al., 2002). This effect is strongest for current or previous consumers of cigarettes. Cigarettes and nicotine are often used as a stress coping mechanism (Overstreet & Braun, 2000; Scarpa et al., 2006).

Social and environmental factors also contribute to substance use. Peer effects play a

strong role in determining substance use, especially among adolescents (Lundborg, 2006). Parents, and their attitudes about substance use, also impact an individual's views and perspective about substance use (Teesson et al., 2002). Additionally, adolescents who grow up in areas where there are high rates of crime are more likely to have issues with substance use (Teesson et al., 2002). These social factors play a critical role in explaining differences in cigarette use across municipalities.

Preferences and decision making are impacted by a multitude of factors and are an important component in forming habits. Hodgson (2007) explains, "Habits are individual neural connections and mechanisms, but they bear a social imprint. Reconstitutive downward causation, from specific social structure to individual, operates by creating and molding habits. (pg.332)" Social structure and groups impact individual habit formation. Their changes in smoking behavior can impact other individuals through social pressure and peer effects because individuals have endogenous preferences.

The substitution mechanism explains why cigarette use might decrease after a kingpin capture. When a kingpin is captured, different DTO's are trying to take over that territory and assert their dominance. This equates to an increase in competition. Economic theory predicts that an increase in the number of sellers in a particular municipality or federal entity will lead to a decrease in price and increase in quantity of illicit drugs. Individuals in those areas may substitute cigarettes for illicit drugs, causing a decrease in overall cigarette use in areas where kingpins are captured.

The conceptual framework in this paper outlines two possible mechanisms through which kingpin captures may influence cigarette use. First, an increase in violence can lead to an increase in cigarette use through the mediator of stress and mental health. Secondly, areas

with increased violence from kingpin captures can lead to a decrease in cigarette use because of substitution. Peer effects and social preferences can further compound any changes in cigarette use after changes in community level violence.

4 The Setting

Mexico has had steadily increasing homicide rates for the past two decades. For instance, the National Institute of Statistics and Geography (2019) found that there was a record high rate of 29 homicides per 100,000 inhabitants in 2018. Most of the violence in Mexico is due to drug trafficking and organized crime (Calderon et al., 2018). While this has always been true, many experts attribute the kingpin strategy as a primary reason for increasing violence from 2006 onwards. The kingpin strategy was first implemented in 2006 when President Calderon was elected. He declared war on the drug cartels at the end of 2006. As Lindo and Padilla-Romo (2018) explain, "Calderon's strategy mainly consisted in a frontal attack led by members of the army, the navy, and the federal police seeking the eradication of crops, the confiscation of drugs and guns, and the incarceration or killing of high ranked drug traffickers (the kingpin strategy)" (p.6). The kingpin strategy is a method of fighting crime where law enforcement targets the leaders of a criminal organization (Lindo & Padilla-Romo, 2018). By targeting the leaders of the organization, the goal is to limit that organization's power and influence and hopefully dismantle it from the top down.

There is limited evidence that the kingpin strategy actually decreases crime. The results in Lindo and Padilla-Romo (2018) indicate that violence increases substantially in the municipality of capture when a kingpin is caught and that there are smaller, but statisti-

cally significant increases in violence in municipalities associated with the captured kingpin's DTO. One reason for this is that the capture of cartel leaders leads to increased competition in their municipalities of capture (Lindo & Padilla-Romo, 2018). "Territorial wars" in cartel areas create increased violence and deaths as rival groups fight for control of the drug market in those regions. Instead of eliminating drug trafficking organizations in the areas of kingpin influence, competition increases in those areas and a new kingpin or new cartel comes into power. The variation over time and across municipality in kingpin captures, and thus community violence, is used in the empirical portion of this paper to measure the impact of violence on health outcomes.

5 Data and Motivation

Homicide data for the paper is from the National Institute of Statistics and Geography (INEGI). While the homicide data is not used in the main regression analysis because of endogeneity, it is used to highlight the motivation of this paper. Data on homicides by municipality is available from 1990-2020. INEGI collects data from death certificates where homicide is the listed cause of death by municipality and federal entity. Because many crimes go unreported in Mexico, including homicides, the data is interpreted with caution. Figure 2.1 illustrates homicide trends over time in each municipality.

The orange line illustrates the start of the Kingpin Strategy in Mexico. It is clear that homicides have substantially increased since the start of the war on drugs. Figure 2.2 shows the average homicide rates by year and federal entity.

There is a large variation in homicides by federal entity. Baja California has the highest

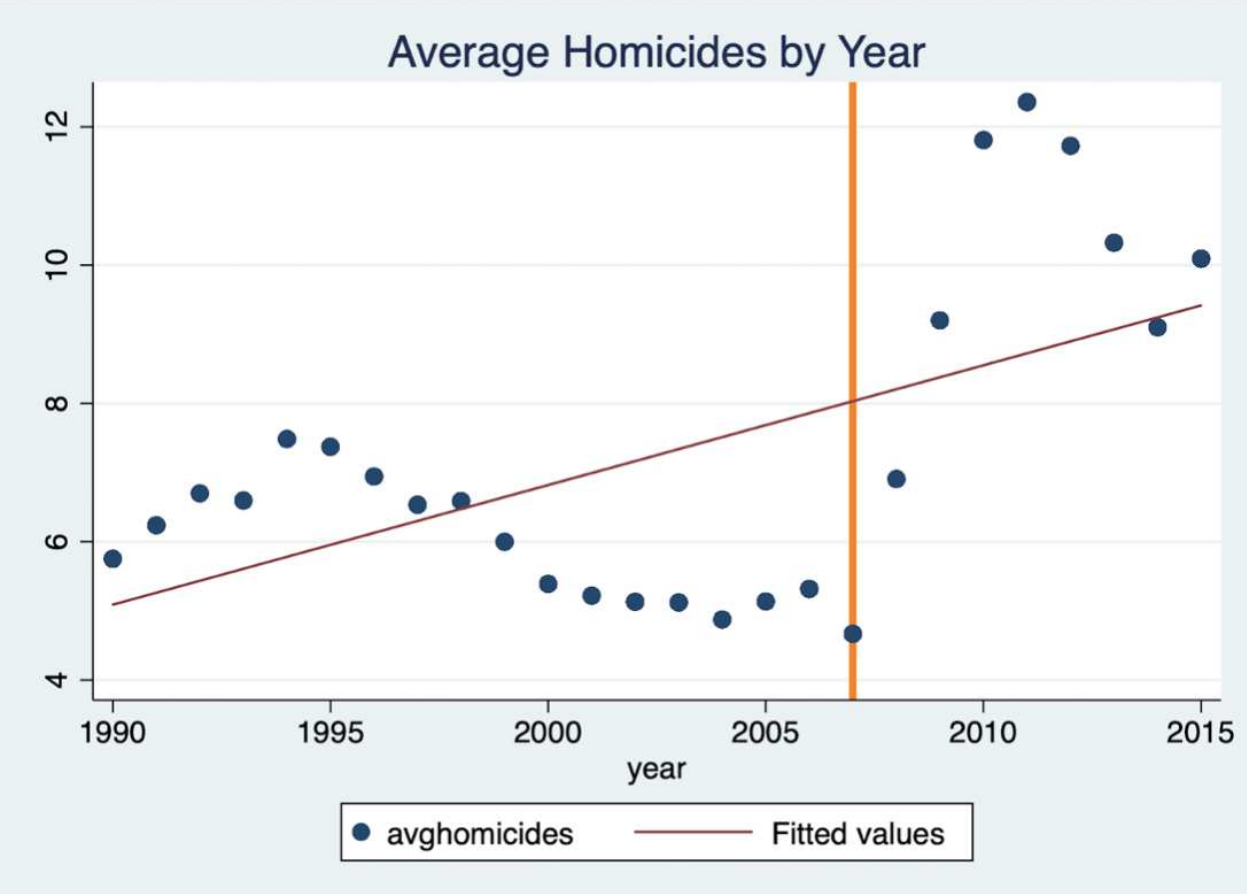

Figure 2.1: Average Homicides Per Year By Municipality

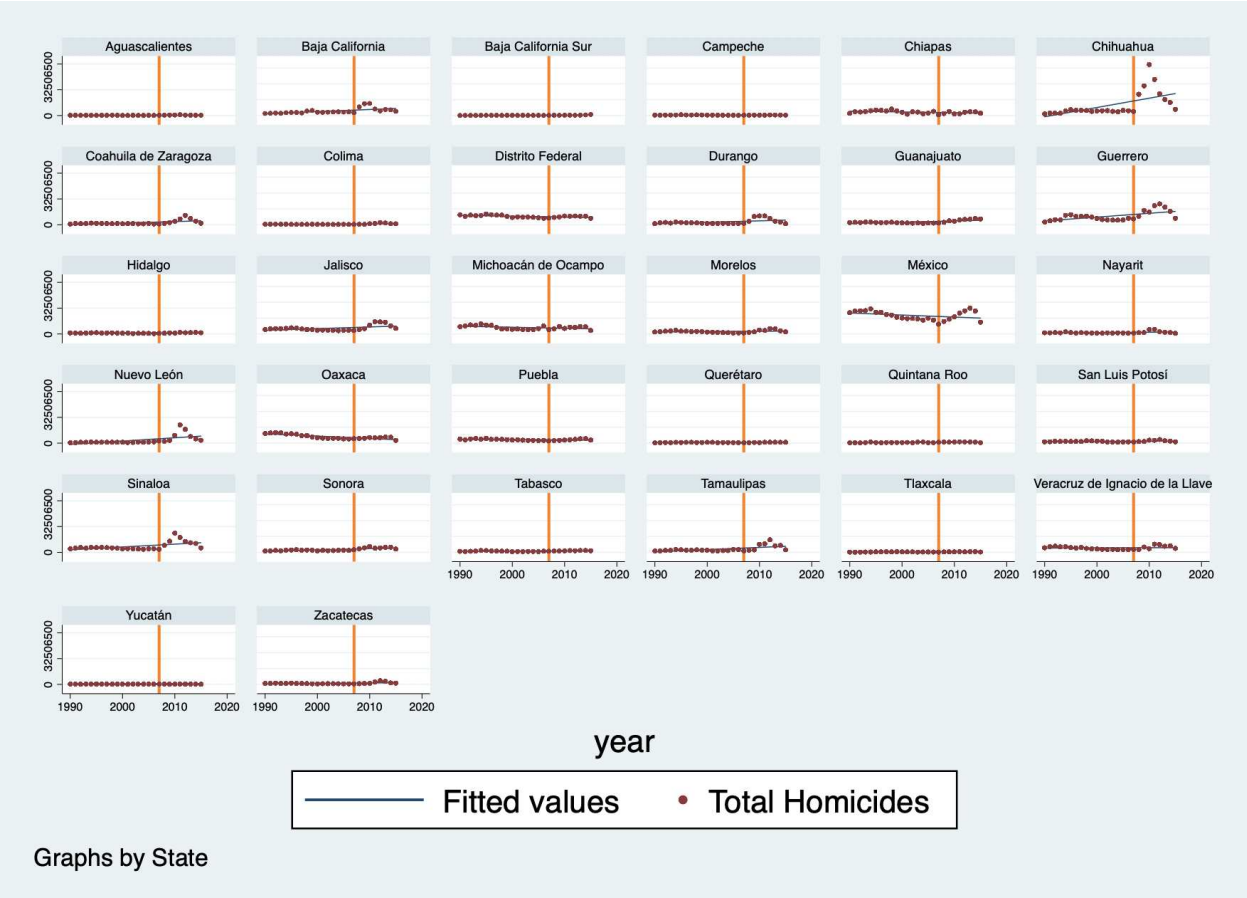

Figure 2.2: Homicides by State

number of homicides. This is followed by Sinaloa, Chihuahua, Distrito Federal, and Nuevo Leon. Figure 2.1 and Figure 2.2 highlight how violence varies by location. These figures also illustrate the motivation for this paper. Violence has increased substantially as a result of the war on drugs in Mexico. It is important to understand how violence impacts the behavior of individuals in those areas.

To better understand how violence impacts cigarette use, I use two datasets with health questions. The first dataset is The Mexico Health and Nutrition Survey (ENSANUT). This is a pooled cross sectional dataset that is administered every six years starting in 2000 (2000, 2006, 2012, 2018). A survey supplement was also completed in 2016. I use the 2012 wave where survey participants were surveyed from 10/2011-03/2012. Mexican citizens are surveyed randomly in survey years. In most years 50,000 or more households are surveyed throughout the year. The surveys are conducted for adults and for adolescents. Municipality and federal entity location information is provided for each individual who is surveyed. In addition to their location information, survey participants are asked about their sex, indigenous status, alcohol use, general health, age, and mental health, amongst other questions.

There are several questions that ask about cigarette use in the ENSANUT survey. I utilize a survey question which asks about the frequency of smoking (***Frequency Smoked (Smokes Daily, Weekly, Monthly, Occasionally, Yearly, or Never)***). Survey participants select whether they smoke daily, weekly, monthly, occasionally, at least once a year, or have never smoked. I create a categorical variable with daily equal to a value of one, weekly equal to a value of 2, monthly equal to a value of 3, occasionally equal to a value of 4, yearly equal to a value of 5, and never equal to a value of 6. This variable

is shortened to Frequency Smoked in the main result tables. Individuals who do smoke (i.e if Frequency smoked equals a value of 1-6) are asked how much they smoke based on the frequency that they smoke. I call this variable (***Amount Smoked Based on Frequency***) and it is a continuous variable that is the amount of cigarettes smoked based on their frequency. For instance, someone might answer that they smoke weekly, which would be a 2 for the Frequency Smoked variable, and 20 for the Amount Smoked Based on Frequency, which means that they smoke 20 cigarettes a week. I utilize these two variables to create a cigarettes smoked per day variable (***Cigarettes Smoked Per Day***). In the example above, the value would be (20/7) or 2.857 cigarettes smoked per day. These three variables measure how smoking amounts have changed for as a result of community level violence and measure how the quantity of smoking has changed for individuals who already smoke. I also create a variable about current smoking to analyze changes in smoking uptake (***Current Smoker***). A binary variable is created where individuals who have smoked in their life but don't currently smoke are marked as a 0 and individuals who currently smoke are marked as a 1. This variable measures how smoking prevalence has changed as a result of community level violence. All results are weighted with the survey sampling techniques to be representative of the population. The survey sampling includes strata sampling which is based on urbanicity and locality of the survey participant. I omit clustering of the standard errors by municipality because of the survey weighting techniques that are employed.

Table 2.1 includes summary statistics for the data across the survey years for adults and adolescents. In the adult and adolescent sample, there are more females than males and the weighted sample average for age is 32.69 years for adults and 14.45 years for adolescents. The amount of indigenous language speakers is relatively the same for adolescents and adults:

Table 2.1: Summary Statistics for ENSANUT Dataset

	Weighted Average	Standard Error	Observations
Adults			
Male	48.60 percent	(.0012)	176,912
Age	32.69 years	(.201)	176,912
Household Yearly Income	4,567,931 pesos	(744,378)	61,707
Indigenous	20.24 percent	(.005)	176,912
Currently Smokes	42.51 percent	(.004)	21,789
Cigarettes Smoked per Day	3.576 cigarettes	(.0918)	8,684
Adolescents			
Male	50.31 percent	(.005)	21,127
Age	14.45 years	(.028)	21,127
Household Yearly Income	2,471,146 pesos	(1380750)	2,013
Indigenous	20.6 percent	(.006)	21,127
Currently Smokes	42.54 percent	(.013)	3,638
Cigarettes Smoked per Day	1.388 cigarettes	(.095)	1,571

All variables are measured at the individual level. The reported averages are for individuals from all municipalities in Mexico. Data is from the ENSANUT survey in the 2012 wave which spans October of 2011 to March of 2012.

20.24 percent of adults and 20.6 percent of adolescents speak an indigenous language. The household weighted average income is lower for adolescents (2,471,146 pesos) than adults (4,567,931 pesos). The percent of adults who currently smoke is 42.51 percent and 42.54 percent of adolescents currently smoke. Recall that currently smokes is a 1 if someone smokes and a 0 if they have smoked previously, but are not currently smoking. However, only 9.1 percent of adolescents have ever smoked in their life, whereas 35.10 percent of adults have smoked at some point in their life. This indicates that adolescents have a higher share of current smokers than adults, but a lower share of individuals who have ever consumed cigarettes. The average cigarette use among participants who do smoke is 3.576 cigarettes per day for adults and 1.388 cigarettes for adolescents.

As a robustness measure, a second dataset is employed. The second data set is a longitudinal study called the Mexican Family Life Survey (MXLS). The waves of the study are 2002, 2005-2006, and 2009-2012, and I use the second two waves in my analysis. The study has information at the individual, household, and community level. Given that the research question focuses on individuals, the analysis in this paper uses the individual level data.

This survey also has several questions about smoking, including the age that an individual started smoking, if an individual has ever smoked, and the amount of cigarettes that a current smoker consumes in a week. This data is not split up into adolescent and adult groups because there are an insufficient number of observations for adolescents. This data is used for the panel model in the paper.

This paper utilizes municipality and federal entity variation in DTO presence or kingpin capture to measure the impact of violence on cigarette use. Kingpin capture information can be found in Table A1. Press releases for kingpin captures on the Mexican attorney general, military, or police websites only date back to 2013. Therefore, I utilize national news outlets to get the information about the location of kingpin capture and their DTO affiliation. I utilized the kingpin captures in Lindo and Padilla-Romo (2018) and via google search to first check for kingpin capture, and then verified the capture location and date via national news outlets.

Table A1 highlights the municipality of capture for each kingpin, their associated DTO, and the source of this information. Given that the survey is only administered every 6 years, the paper focuses on captures in 2011 and 2012 to understand the short run (0-5 months) and medium run (6-11 months) effects of increases on violence on cigarette use. In the ENSANUT dataset, data for the 2012 survey was collected from October 3rd, 2011 to March 13, 2012. To analyze the area of influence of each kingpin's DTO, I use the public dataset provided by Rıos and Coscia (2012). Rıos and Coscia (2012) use a webscraping method utilizing a MOGO (or a Making Order Using Google) to find the municipalities of association for each DTO. Their dataset, which is publicly available, only exists for the years 1990-2010. As most of the kingpin captures (as shown in Table A1) occurred in 2010

and 2011, I merge the associated DTO location for the year 2010 with the DTO of capture. Figure A1 illustrates DTO presence in Mexico in mid-2011 and highlights that DTO presence did not change significantly from 2010-2011 and that the municipality level data from Rıos and Coscia (2012) is reliable to use for the time period for the data in the paper.

6 Empirical Strategy

There are two methodologies employed in this paper to examine the impact of community level violence on cigarette use. First, I utilize homicide data from INEGI at the municipality level to examine the impact of an increase in homicides on smoking behavior. I estimate the following equation,

$$Y_{imt} = \beta_0 + \beta_1 Homicides_{mt} + \beta_2 Homicides_{mt-1} + \beta_3 Homicides_{mt-2} + \beta_4 X_{im} + \lambda_m + \lambda_y + \lambda_{DOW} + \alpha_{fm} + \epsilon_{imt} \quad (1)$$

Where Y_{imt} is one of the following variables: (i) current smoker (ii) cigarettes smoked per day (ii) frequency smoked (smokes daily, weekly, monthly, occasionally, yearly, or never) (iv) amount smoked based on frequency. *Current smoker* is a one if an individual is a current smoker. Recall that *Amount Smoked based on Frequency*, and *Amount of Cigarettes Smoked Per Day* are continuous variables that measure how much and often current smokers smoke and that *Frequency Smoked (Smokes Daily, Weekly, Monthly, Occasionally, Yearly, or Never* is a categorical variable. β_1 measures the effect of the number of homicides in municipality m in a month and year in the data time frame. β_2 and β_3 measure the lagged effects of homicides for the previous one and two months. For instance, if an individual was

interviewed in March the amount of homicides in their municipality would be represented by $Homicides_{mt}$, the amount of homicides in February in their municipality would be represented by $Homicides_{mt-1}$, and the amount of homicides in January in their municipality would be represented by $Homicides_{mt-2}$. X_{im} is a vector of individual covariates, λ_{DOW} is an interview day of week time fixed effect, λ_m is a month fixed effect, λ_y is a year fixed effect, and α_{fm} are municipality level fixed effects controlling for the federal entity. While this methodology gives a reasonable way to examine the correlation between community level violence and cigarette use, issues of endogeneity exist. The total number of reported homicides depend on a number of factors for which we have no measures. To remedy this issue I measure the average treatment effect of changes in violence as a result of the kingpin strategy using a difference in differences (DD) estimation strategy.

This methodology was used by Lindo and Padilla-Romo (2018). The municipality or federal entity of capture and the municipality or federal entity of association are utilized to identify changes in violence. I use a treatment effect approach and a DD estimator where municipalities or federal entities of capture and municipalities or federal entities of association with the captured drug kingpin are in the treated group and other municipalities are in the control group. There is municipality variation for both measures of violence in the short run and medium run in both of the datasets. The data is normally distributed and ordinary least squares is used when the dependent variable is continuous and a Probit model is used when the dependent variable is binary. For *Frequency Smoked (Smokes Daily, Weekly, Monthly, Occasionally, Yearly, or Never)* an OLS estimator is used to estimate the model and there is no economic interpretation of the average treatment effect. The sign of the variable is used to examine the direction of the treatment effect.

This strategy is highlighted below:

$$Y_{imt} = \beta_0 + \beta_1 Capture_{05m} + \beta_2 Capture_{611m} + \beta_3 Association_{05m} + \beta_4 Association_{611m} + \beta_5 X_{im} + \lambda_m + \lambda_y + \lambda_{DOW} + \alpha_{mf} + \epsilon_{imt} \quad (2)$$

Y_{imt} is the same set of dependent variables used in equation (1). β_1 captures the short-term treatment effect of increased violence from kingpin capture in the municipality or federal entity of capture and β_2 captures the medium-run treatment effect of increased violence from kingpin capture in the municipality or federal entity of capture. These variables take a value of 1 if the individual lives in the kingpins captured municipality in the time frame of interest and a 0 otherwise. β_3 and β_4 capture the same effect for DTO presence. The same control variables in equation(1) are used here.

The panel data nature of the MXFLS provides an opportunity to use a panel data estimator. A random effects model is utilized for the panel model to examine changes to smoking behavior within and across individuals in the treated and control group. Because a Hausman test indicated that the random effects model was appropriate for the data, I assume that the error term is uncorrelated with any of the independent regressors [1].

$$Y_{imt} = \beta_0 +_1 Capture_{05m} + \beta_2 Capture_{611m} + \beta_3 Association_{05m} + \beta_4 Association_{611m} + \beta_5 X_{im} + \lambda_m + \lambda_y + \lambda_{DOW} + \alpha_{mf} + \epsilon_{imt} \quad (3)$$

The dependent variables are, (i) age started smoking (ii) have ever "smoked" (iii) cigarettes smoked per week. Age started smoking is a continuous variable that asks when someone

[1] The chi-squared statistic was 65.47 and the p-value was .0027

started smoking. Have ever smoked is a binary variable that equals one if an individual has ever smoked and equals a 0 otherwise. The cigarettes smoked per week variable is a continuous variable that measures how many cigarettes a current smoker consumes in a week. Note that the data for the second wave spans 2009-2012 and incorporates more kingpin captures than the data in the ENSANUT survey. However, the number of participants in the Mexican Family Life Survey is much smaller.

7 Results

The first set of results in Tables 2.2, 2.3, and 2.4 are from the ENSANUT 2012 survey data. Results are separated by adolescents and adults. Using the homicide data from INEGI, I estimate the impact of total homicides at the municipality level to determine whether homicides are associated with cigarette use. I report the ATE for all regressions with a binary dependent variable and continuous variable and the p-value is determined by a two-sided test for all regression results. A lag of one month and two months are included to examine the impact of homicides over time.

Table 2.2: Impact of Homicides on Cigarette Use

Dependent Variables →	Current Smokers	Amount Smoked Per Day	Frequency Smoked	Amount Smoked Based on Frequency
Independent Variables ↓				
Adults				
Total Homicides	0.000598	-0.0233	0.00297	0.000159
	(0.000980)	(0.0211)	(0.00280)	(0.0236)
One Month Lag Homicides	.000691	0.0250**	0.00166	0.0193
	(0.000733)	(0.0121)	(0.00199)	(0.0190)
Two Month Lag Homicides	7.48e-05	-0.0230	0.000620	-0.00671
	(0.00193)	(0.0332)	(0.00519)	(0.0477)
Observations	20,384	8,249	20,384	8,249
Adolescents				
Total Homicides	0.00423*	0.0383*	0.0135*	0.0616**
	(0.00258)	(0.0191)	(0.00768)	(0.0287)
One Month Lag Homicides	-0.000540	-.0315**	-0.00411	-0.0510**
	(0.00204)	(0.0154)	(0.00605)	(0.0242)
Two Month Lag Homicides	0.00254	-0.0303	0.00691	-0.114
	(0.00563)	(0.0498)	(0.0177)	(0.0835)
Observations	3,638	1,571	3,638	1,571

Control variables include: mental health, education, indigenous status, alcohol use, sex, and age. General health and income are omitted because they have very few responses in the survey year of interest (2012). All of the control and dependent variables are at the individual level and come from the ENSANUT survey. Homicide data is from INEGI and is reported monthly at the municipality level. Frequency Smoked is a categorical variable with values for 1. Daily 2. Weekly 3. Monthly 4. Occasionally 5. Yearly, or 6. Never. $^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 2.2 shows that an increase in the lagged value by one homicide a month increases the amount of cigarettes consumed by .025 cigarettes for adults. This is the only statistically significant result in this set of results. For adolescents there is also a statistically significant increase in smoking amounts for both the frequency smoked (smokes daily, weekly, monthly, occasionally, yearly, or never), amount smoked based on frequency, and the amount of cigarettes smoked per day if total homicides increases in an adolescents' municipality of capture. Therefore adolescents who are current smokers increase cigarette consumption as a result of increased homicides. These increases are followed by decreases in the frequency smoked (smokes daily, weekly, monthly, occasionally, yearly, or never) and the amount of cigarettes smoked per day the month following an increase in total homicides. This result indicates that homicides impact the amount that adolescents smoke in the very short run. An increase of one homicide in an adolescents municipality is correlated with an increase of .423 percent in current smokers that month. This is followed by a decrease in current smokers. This again indicates an effect in the very short run, but not the longer run. Table 2.3 includes estimates for equation (2). Note that the location of capture measures the effect of increased violence from a kingpin capture in the municipality where the kingpin is captured and the associated location of DTO measures the effect of the kingpins capture in municipalities that are associated with the captured drug kingpins DTO. There are also two different specifications for these results where one includes Federal Entity by Month Fixed Effects (2) and the other (1) does not.

Table 2.3 illustrates the average treatment effects of increased violence on cigarette use for adults. The first two regressions show how smoking changes in the municipality of a captured kingpin. One regression has federal entity by month fixed effects and the other one does not.

Table 2.3: Average Treatment Effects of Increased Violence on Cigarette Use for Adults

	Location of Capture		Associated Location of DTO	
Short Run Effects by Municipality				
Current Smokers	.0671**	.0722**	.0191	.0340
	(0.0288)	(0.0303)	(0.0581)	(0.0581)
Amount of Cigarettes Smoked Per Day	0.422	0.435	0.197	0.195
	(0.311)	(0.326)	(0.172)	(0.178)
Frequency Smoked	0.0209	0.0329	0.00352	0.00497
	(0.0558)	(0.0568)	(0.0479)	(0.0494)
Amount Smoked Based on Frequency	-0.761	-0.782	0.102	-0.00598
	(0.642)	(0.668)	(0.513)	(0.525)
Medium Run Effects by Municipality				
Current Smokers	-0.0686	-0.0698	0.0166	-.0155
	(.0559)	(0.0601)	(.0284)	(.0284)
Amount of Cigarettes Smoked Per Day	0.118	0.391	0.0508	0.0490
	(0.348)	(0.386)	(0.202)	(0.203)
Frequency Smoked	-0.107	-0.0996	0.0500	0.0520
	(0.0992)	(0.108)	(0.0504)	(0.0516)
Amount Smoked Based on Frequency	-0.525	-0.114	0.78	0.339
	(0.974)	(1.100)	(0.676)	(0.694)
Federal Entity, DOW, Month, and Year Fixed Effects	Yes	Yes	Yes	Yes
Federal Entity, DOW, Month, Year, and Federal Entity by Month Fixed Effects	No	Yes	No	Yes

Refer to Table 2.2 for information about the control variables. The short run (0-5 months) and medium run (6-11 months) effects for the location of capture and associated location of DTO are run in the same regression if they have the same dependent variable. Recall that the location of capture is the municipality where the kingpin is captured and the associated location of DTO are any municipalities that are associated with the captured kingpin's drug trafficking organization. All data is from the ENSANUT survey and spans the normal survey period from 10/2011-03/2012 and is measured on the individual level. Frequency Smoked is a categorical variable with values for 1. Daily 2. Weekly 3. Monthly 4. Occasionally 5. Yearly, or 6. Never. $^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

The second set of regressions examine the impact of increased violence in the associated municipalities of the DTO. The most robust result for adults is the increase in current smokers in municipalities where a kingpin is captured. There is between a 6.71 percentage point and 7.22 percentage point increase in current smokers as a result of increased violence in those municipalities in the short run. These are individuals who have smoked previously in their lives, but who were not smoking prior to the increase in violence. Therefore, adults who have already smoked in their lives are more prone to smoking as a result of increased violence.

The remainder of the results are statistically insignificant, but have relatively consistent signs across specification and area of capture or association. For instance, the amount of cigarettes smoked per day and the frequency smoked (smokes Daily, weekly, monthly, occasionally, yearly, or never) all have positive signs. While these aren't statistically significant, these results indicate a positive relationship between changes in community violence and the amount of cigarettes smoked by citizens in the effected municipalities.

There are no statistically significant results in the municipality of capture for adults in the medium run. The amount of cigarettes smoked per day has positive signs across the municipality of capture and the municipality of association. For frequency smoked (smokes daily, weekly, monthly, occasionally, yearly, or never) and amount smoked based on frequency, there are negative signs on the coefficient estimates for location of capture, but positive signs for the associated location of DTO capture. The lack of statistical significance of these variables, and the inconsistent signs on the variables indicate that there are limited medium run effects on smoking behavior for individuals in effected municipalities.

Overall, the results are very weak for the impact of community level violence on adult smoking behavior. There is a short run impact of violence on smoking uptake behavior for adults in a municipality where a captured kingpin's DTO operates. This effect disappears at the medium run level. Table 2.4 reports the regression results for adolescents.

Table 2.4: Average Treatment Effects of Increased Violence on Cigarette Use for Adolescents

	Location of Capture		Associated Location of DTO	
Short Run Effects by Municipality				
Current Smokers	.125	.161*	.0198	.0380
	(.110)	(.107)	(.081)	(.0826)
Cigarettes Smoked Per Day	0.940*	1.003*	-0.113	-0.193
	(0.507)	(0.518)	(0.389)	(0.377)
Frequency Smoked	0.0719	0.188	0.721***	0.692***
	(0.183)	(0.185)	(0.237)	(0.236)
Amount Smoked Based on Frequency	6.786**	7.143**	1.298	1.196
	(3.113)	(3.320)	(0.885)	(0.860)
Medium Effects by Municipality				
Current Smokers	-.1318	-.1841***	-.1089**	-.0984*
	(.110)	(.0625)	(.0515)	(.0531)
Cigarettes Smoked Per Day	-0.790	-0.643	-0.481	-0.390
	(0.644)	(0.648)	(0.324)	(0.314)
Frequency Smoked	-0.0855	-0.451	0.157	0.166
	(0.374)	(0.439)	(0.124)	(0.125)
Amount Smoked Based on Frequency	-5.052**	-5.205**	-2.798**	-2.598**
	(2.347)	(2.387)	(1.231)	(1.221)
Federal Entity, DOW, Month, and Year Fixed Effects	Yes	Yes	Yes	Yes
Federal Entity, DOW, Month, Year, and Federal Entity by Month Fixed Effects	No	Yes	No	Yes

Refer to Table 2.2 for information about the control variables. The short run (0-5 months) and medium run (6-11 months) effects for the location of capture and associated location of DTO are run in the same regression if they have the same dependent variable. Recall that the location of capture is the municipality where the kingpin is captured and the associated location of DTO are any municipalities that are associated with the captured kingpin's drug trafficking organization All data is from the ENSANUT survey and spans the normal survey period from 10/2011-03/2012 and is measured on the individual level.Frequency Smoked is a categorical variable with values for 1. Daily 2. Weekly 3. Monthly 4. Occasionally 5. Yearly, or 6. Never. $^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

There are more statistically significant results for adolescents. Most smokers start smoking during adolescence, and understanding the reasons for smoking uptake in adolescence is

important for implementing policies to limit smoking. The strongest relationship between location of capture and smoking behavior for adolescents in the short run is on the amount of cigarettes smoked per day and the amount smoked based on frequency. In the short run, adolescents who live in a municipality of a kingpin capture consume between .94 and 1.003 cigarettes per day more than those adolescents that live in other municipalities. Additionally, adolescents in municipalities where kingpins are captured consume 6.786-7.143 more cigarettes in the short run. This result indicates that there is an increase in binge smoking episodes for adolescents after increased community violence.

Although, not statistically significant, the signs on frequency smoked (smokes daily, weekly, monthly, occasionally, yearly, or never) is also positive. The percentage of current smokers increases in the short run. There is a 16.1 percentage point increase in current adolescent smokers in the short run. Only one value is statistically significant, but all of the values are positive. These results indicate that, in the short run, adolescents in municipalities where kingpins are captured increase their smoking amount and smoking uptake behavior as a result of increased violence.

The results for municipalities associated with a captured kingpins DTO are less strong. There is a positive and statistically significant change in the frequency smoked (smokes daily, weekly, monthly, occasionally, yearly, or never) for adolescents in municipalities of association for a captured kingpin. The amount smoked based on frequency is also positive for adolescents living in municipalities associated with a captured kingpin's DTO. Therefore, adolescents who already smoke are increasing their smoking behavior when community level violence increases in their municipalities.

In the medium run, the only statistically significant results are a decrease in the amount

smoked based on frequency. This decrease is statistically significant for both the municipality of capture and the municipalities of association for a captured kingpin. This could be a result of the increased cigarette use in the short run or it could be a result of the substitution effect. The net effect over the short and medium run is still positive for amount smoked, which means that adolescents increase the amount they smoke over those time periods. Additionally, the sign is negative for current smokers for all regressions in the medium run. The results provide evidence that the impact of violence on cigarette use in the medium run is negative, which counteracts increases in cigarette use in the short run.

Table 2.5: Average Treatment Effects of Increased Violence on Cigarette Use for Adults using a Random Effects Model to Estimate the Parameters

	Location of Capture		Associated Location of DTO	
Short Run Effects by Municipality				
Cigarettes Consumed per Week	16.52	16.44	-3.095	-4.660
	(11.12)	(12.46)	(3.633)	(5.028)
Age Started Smoking	-0.808	-2.470*	-0.913	-0.593
	(0.961)	(1.307)	(0.982)	(0.982)
Have Ever Smoked	-0.00521	-0.00799	-0.00381	-0.0204
	(0.0299)	(0.0329)	(0.0219)	(0.0224)
Medium Run Effects by Municipality				
Cigarettes Consumed per Week	-2.288	-4.605	-3.184*	-3.176
	(12.01)	(12.65)	(1.903)	(2.218)
Age Started Smoking	0.756	1.890	1.122**	1.369**
	(1.551)	(1.837)	(0.563)	(0.581)
Have Ever Smoked	0.0350	0.0113	-0.0485***	-0.0345***
	(0.0463)	(0.0514)	(0.00845)	(0.00934)
Federal Entity, DOW, Month, and Year Fixed Effects	Yes	Yes	Yes	Yes
Federal Entity, DOW, Month, Year, and Federal Entity by Month Fixed Effects	No	Yes	No	Yes

Control variables include: education level, indigenous status, general health, house or property ownership status, marital status, sex, and age. Income is not included because it has too many missing observations. Recall that the location of capture is the municipality where the kingpin is captured and the associated location of DTO are any municipalities that are associated with the captured kingpin's drug trafficking organization Model is estimated with a random effects model I utilize the 2005-2006 and 2009-2012 waves in the analysis. $^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 2.5 reports results for the regression using the longitudinal data. They are similar to the results from the ENSANUT results in Table 2.3. In the short run, there are moderately statistically significant results for age started smoking in the second specification in the municipality of a kingpin capture. Consistent with the hypothesis, these results show that the age started smoking decreases and the number of cigarette smokers increases after increases in community level violence. These are short-term effects which are counterbalanced by the medium run effects after a kingpin capture as evidenced by the opposite signs on the

medium run variables. In the medium run there is an increase in the age of smoking in associated municipalities of the kingpins DTO. Individuals in these municipalities may be putting off smoking completely and using other stress coping mechanisms to handle stress from increased community violence.

An intersectional analysis is important for understanding what is driving the results in Table 2.4 for adolescents. An intersectional analysis is an analysis based on an individuals different identities and how that identity might impact the outcome of interest. I analyze the average treatment effects by sex because the research in the literature review shows that individuals respond differently to violence based on their sex. I focus on the results for adolescents because there are few statistically significant changes in smoking behavior for adults. Results are reported in Table 2.6.

The results in Table 2.6 show that there are stronger short-term increases in the amount smoked for adolescent females as opposed to males. Holding all else constant, being located in a municipality where a kingpin is captured increases the amount smoked per frequency smoked by 8.124 cigarettes, on average. Females in these municipalities are binge smoking as a result of increased violence. Alternatively, females in areas of lower increased violence (municipalities with kingpin DTO association) decrease their uptake behavior of smoking. Females could be substituting other goods for cigarettes in those municipalities. Finally, there's a decrease in the medium run for current smokers which is consistent with the main results. These results indicate that females who already smoke increase their smoking as a result of stress, which is consistent with the literature presented in psychology. Males overwhelmingly decrease the amount of cigarettes that they smoke per day in the short run after an increase in violence.

Table 2.6: Average Treatment Effects of Increased Violence by Cigarette Use Results for Adolescents by Sex

	Location of Capture		Associated Location of DTO	
Male				
Short Run Effects by Municipality				
Current Smokers	0.101	0.0606	0.133	0.0531
	(0.0999)	(0.105)	(0.0878)	(0.0944)
Cigarettes Smoked Per Day	-1.439**	-1.402*	-1.970***	-1.882**
	(0.718)	(0.811)	(0.752)	(0.730)
Frequency Smoked	0.0948	0.169	0.283	0.308
	(0.256)	(0.267)	(0.282)	(0.284)
Amount Smoked	-1.804	-2.131	-2.387	-2.056
	(1.371)	(1.465)	(2.024)	(1.968)
Medium Run Effects by Municipality				
Current Smoker	-0.179	-0.0623	-0.0988	-0.0978
	(0.129)	(0.176)	(0.0753)	(0.0750)
Cigarettes Smoked Per Day	1.810	1.826	-0.705	-0.635
	(1.221)	(1.359)	(0.723)	(0.715)
Frequency Smoked	-0.536	-0.859**	-0.190	-0.195
	(0.419)	(0.436)	(0.225)	(0.224)
Amount Smoked	-0.0456	-0.693	-3.828	-3.911
	(3.517)	(3.770)	(3.592)	(3.573)
Female				
Short Run Effects by Municipality				
Current Smoker	0.196	0.217	-0.0997	-0.0711
	(0.152)	(0.141)	(0.105)	(0.0997)
Cigarettes Smoked Per Day	2.032	2.009	-0.561	-0.204
	(1.486)	(1.503)	(0.691)	(0.650)
Frequency Smoked	0.169	0.245	0.0496	0.0875
	(0.536)	(0.546)	(0.362)	(0.371)
Amount Smoked	8.124**	8.144**	-1.933	-1.770
	(3.385)	(3.378)	(2.287)	(2.305)
Medium Run Effects by Municipality				
Current Smoker	-0.152***	-0.0216	-0.0457	-0.0209
	(0.0286)	(0.157)	(0.0804)	(0.0793)
Cigarettes Smoked Per Day	-0.679	-0.403	-1.140*	-1.162
	(1.176)	(1.733)	(0.618)	(0.706)
Frequency Smoked	-0.826	-1.993*	0.0551	0.0722
	(0.719)	(1.080)	(0.248)	(0.253)
Amount Smoked	-4.572	-5.156	-5.466**	-5.631**
	(3.562)	(3.975)	(2.363)	(2.672)
Federal Entity, Day, Month, and Year Fixed Effects	Yes	Yes	Yes	Yes
Federal Entity, Day, Month, Year, and Federal Entity by Month Fixed Effects	No	Yes	No	Yes

Refer to Table 2.2 for information about the control variables. The short run (0-5 months) and medium run (6-11 months) effects for the location of capture and associated location of DTO are run in the same regression if they have the same dependent variable. Recall that the location of capture is the municipality where the kingpin is captured and the associated location of DTO are any municipalities that are associated with the captured kingpin's drug trafficking organization. All data is from the ENSANUT survey and spans the normal survey period from 10/2011-03/2012 and is measured on the individual level. Frequency Smoked is a categorical variable with values for 1. Daily 2. Weekly 3. Monthly 4. Occasionally 5. Yearly, or 6. Never. $^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

To better understand the mechanism for these results I analyze the impact of increased violence on mental health. I utilize the same DD strategy to examine this relationship using the ENSANUT data for adults. The regression specification is the same as in equation (2), but the dependent variables have changed to binary variables which represent if an individual has felt depressed, like they couldn't shake the sadness, had difficulty concentrating, didn't sleep well, or enjoyed life in the past 10 days.

Table 2.7: Impact of Kingpin Captures on Mental Health for Adults

Dependent Variables →	Depressed	Couldn't Shake the Sadness	Difficulty Concentrating	Didn't Sleep Well	Enjoyed Life
Independent Variables ↓					
Short Run					
Municipality of Capture	0.0382	0.0709*	0.0414	0.00141	-0.0104
	(0.0321)	(0.0364)	(0.0385)	(0.0339)	(0.0185)
Municipality of DTO Association	0.0171	-0.00231	-0.0738	-0.0384	-0.0330
	(0.0564)	(0.0465)	(0.0495)	(0.0583)	(0.0336)
Medium Run					
Municipality of Capture	-0.00672	0.0200	0.0118	-0.00557	0.0108
	(0.0202)	(0.0161)	(0.0194)	(0.0187)	(0.00964)
Municipality of DTO Association	-0.0307	-0.0333*	-0.0371	-0.000909	-0.0229*
	(0.0223)	(0.0202)	(0.0230)	(0.0234)	(0.0119)

Refer to Table 2.2 for information about the control variables. A Probit model was used for all variables. The short run (0-5 months) and medium run (6-11 months) effects for the location of capture and associated location of DTO are run in the same regression if they have the same dependent variable. Recall that the location of capture is the municipality where the kingpin is captured and the associated location of DTO are any municipalities that are associated with the captured kingpin's drug trafficking organization. All data is from the ENSANUT survey and spans the normal survey period from 10/2011-03/2012 and is measured on the individual level. $^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 2.7 highlights the results for measures the impact of increased community violence on mental health. In the short run, in municipalities where a drug kingpin is captured, 7.09 percent of adults said that they had an increase in sadness that they couldn't shake. The couldn't shake the sadness variable is a one if an individual couldn't shake the sadness at least once during the week that they were surveyed and a zero otherwise. There are no other statistically significant changes in mental health, but there are positive signs on the estimates for being depressed, difficulty concentrating, and didn't sleep well and a negative sign on enjoyed life. This indicates that increases in community level violence affects the magnitude of changes in mental health in the short run. There are also statistically significant decreases in the percentage of individuals who could not shake the sadness and who enjoyed life in the

medium run in DTO's of association. These results show that increased community violence does impact mental health in the short run. Unfortunately, mental health questions are not included in the adolescent portion of the survey and I am unable to examine this mechanism for adolescents.

To examine if any one DTO is influencing the results in this paper I run a sensitivity check excluding each DTO's area of influence. Table A3 reports the results for the municipality of capture and Table A4 reports the results for the municipality of association. For adults the main finding was that increased violence led to an increase in the current number of smokers. These results hold across the exclusion of different DTO's. They all have positive signs with similar magnitudes. The statistical significance varies, but this is likely a result of lowering the observations from omitting a specific DTO. The sensitivity check supports the impact of increased violence on increasing the number of current smokers across DTO's.

For adolescents, the strongest result was an increase in the amount smoked as a result of a kingpin capture in a specific municipality. This result is sensitive to the exclusion of the La Familia cartel. There are a few possible reasons for this. Firstly, municipalities of a La Familia kingpin capture make up 43 percent of the treated groups observations. This loss of observations can explain some of the variation in the results. Secondly La Familia was a weakened DTO by 2011-2012 (Beittel, 2013). Other drug trafficking organizations also had the perception that La Familia was weakened and that their territories might be available. A weakened DTO results in increased competition for that territory because of the perception that there is no leading DTO in that municipality. Therefore a second reason for this result is that there was a more prominent increase in violence in areas where La Familia kingpins were captured, and thus a stronger mental health response in those municipalities. Thirdly,

La Familia is known for being an extremely violent cartel. For instance, "LFM (La Familia Michoacana) was known for its use of extreme, symbolic violence and a pseudo-ideological or religious justification for its existence (Beittel, 2013)." The extreme violence and La Familia's role as a religious entity may impact mental health outcomes for individuals in those municipalities more than in municipalities where other less violent DTO's are present.

To examine if this could be driving the regression results, I test whether municipalities where a kingpin from La Familia was captured had higher rates of homicides than other municipalities. These results are in Table A5. The results indicate that, on average, these municipalities had 1.80 more reported homicides in the short run. This result is significant at the 5 percent level. Additionally, municipalities of La Familia association had 1.487 more reported homicides in the short run. The results in the medium run were not significant. This further supports that the municipalities where a La Familia kingpin was captured had higher levels of violence. This would result in a stronger mental health response and peer effect response and a higher need for stress coping mechanisms, like cigarette use. To better understand this mechanism, a qualitative analysis of these municipalities and cultural norms would be useful.

As a second sensitivity check, I analyze the impact of violence on alcohol use and run the same regressions with alcohol use as the dependent variable. The purpose of this sensitivity check is to examine whether other changes in substance use occurred because of increased communal violence and to ensure that changes in smoking that I find for adolescents as a result of community level violence is not a result of substitution away from alcohol. The results are reported in Table 2.8.

There are no statistically significant changes in alcohol use for adolescents or adults as a

Table 2.8: Average Treatment Effect of Increased Violence on Alcohol Use

	Location of Capture		Associated Location of DTO	
Adolescents- ENSANUT				
Short Run	.006	.001	.0002	.006
	(.042)	(.043)	(.033)	(.034)
Medium Run	.042	.021	.007	.007
	(.059)	(.066)	(.027)	(.027)
Adults- ENSANUT				
Short Run	.028	.017	-.027	-.025
	(.021)	(.023)	(.038)	(.039)
Medium Run	.018	-.049	.013	.019
	(.032)	(.033)	(.020)	(.020)
Adults- MxFLS				
Short Run	-.018	-.008	.013	.024
	(.015)	(.020)	(.017)	(.020)
Medium Run	-.019	-.012	-.017**	-.017
	(.023)	(.029)	(.008)	(.011)
Federal Entity, Day, Month, and Year Fixed Effects	Yes	Yes	Yes	Yes
Federal Entity, Day, Month, Year, and Federal Entity by Month Fixed Effects	No	Yes	No	Yes

Control variables are the same as Table 2.2, 2.3, and 2.4. The short run (0-5 months) and medium run (6-11 months) effects for the location of capture and associated location of DTO are run in the same regression if they have the same dependent variable. Recall that the location of capture is the municipality where the kingpin is captured and the associated location of DTO are any municipalities that are associated with the captured kingpin's drug trafficking organization. All data is from the ENSANUT survey and spans the normal survey period from 10/2011-03/2012 and is measured on the individual level. $^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

result of increased violence. These results indicate that individuals are increasing cigarette use in response to increased violence in their communities.

The results in this section are consistent with the results found in Lindo and Padilla-Romo (2018). They find that violence increases the most in areas where the kingpin is captured. I find that the effect on cigarette use is strongest in the short run in the municipalites where kingpins are captured. While I can show that community level violence does impact cigarette use, I am unable to test the mechanism for this result. Thus, one shortcoming of the paper is that I am unable to measure whether the results are a function of demand side or supply side changes in the market for cigarettes. Given the time frame of the data, I am unable to examine the longer run effects of kingpin captures. The data spans from 10/2011- 3/2012 and there are only seven kingpin captures that fall within that timeframe. Of those seven kingpin captures only three fall within a year of the start of the dataset and four would be extremely long term effects (2+ years after capture). This is an insufficient number of the sample to measure the long-term impact of kingpin captures. This is another shortcoming of the paper.

8 Conclusion

This paper examines the impact of violence on cigarette use. Research across disciplines indicates that violence leads to increased stress, anxiety, and other mental health disorders which can cause increased cigarette use as a coping mechanism. Previous research highlights two potential outcomes for cigarette use as a result of increased community level violence. First, violence can lead to poorer mental health outcomes, which in turn can lead to increased cigarette use for individuals. Other social factors, like peer effects and endogenous preferences, can further exacerbate this effect. The second mechanism for which community violence can impact cigarette use is through increased competition in illicit substances markets which may lead to decreased cigarette use through the substitution mechanism.

To empirically examine the relationship between substance use and community level violence, I use drug kingpin captures as an exogenous measure of community level violence in municipalities in Mexico. This empirical strategy comes from Lindo and Padilla-Romo (2018), who find that kingpin captures lead to increased violence in the municipality of capture, and smaller increases in violence in the muncipalities associated with the captured kingpins DTO. A DD approach is employed where the treated group consists of municipalities of capture or DTO association of a kingpin and the control groups are unaffected municipalities. I examine the short run and medium run effects to understand if there are significant changes in smoking behavior over time. The results indicate that adolescents who already smoke do increase the amount of cigarettes that they smoke and their cigarettes smoked per day in the short run in areas with higher levels of increased violence. This effect is particularly strong amongst female smokers. The age of smoking is also lower in effected

municipalities for adolescents. For adults, there is an increase in current smokers in the short run in areas with higher levels of violence. Additionally, there are substantial mental health effects in municipalities with high levels of increased violence for adults. These findings do support that community level violence does increase cigarette use in Mexico.

This paper has several policy implications. Smoking habits are primarily formed in adolescence and any factors that contribute to increased smoking use during that time will lead to higher future rates of smoking. The first policy recommendation from this paper is to educate adolescents about the negative health effects from smoking. More importantly, smoking education needs to incorporate information about the impact of cigarette use as a stress coping mechanism and on the peer effects of cigarette use. Public health educators can better help vulnerable populations by assisting communities with high levels of violence. Secondly, it is clear that increases in community violence do lead to short run increases in cigarette use for adolescents. Acknowledging and making resources available for adolescents on how to deal with community level violence is important. Incorporating differences in smoking behavior by sex, but also other identities, will make policies targeting cigarette use more effective.

It would also be beneficial to re-evaluate the kingpin strategy for targeting drug trafficking organizations in Mexico. While this paper just examines one of the negative externalities of the kingpin strategy, there are likely many more. Finally, this paper shows that smoking behavior does change as a result of increased community level violence. Individuals who have smoked previously are particularly vulnerable to increasing their cigarette consumption as a result of changes in community level violence. Ensuring that individuals affected by community level violence have access to mental health resources and healthy forms of

stress coping mechanisms is important for improving health outcomes in those areas. Unfortunately, community level violence exists across the world, and changes to substance use as a result of community level violence needs to be studied in more detail.

References

Acierno, R., Kilpatrick, D. G., Resnick, H. S., Saunders, B. E., & Best, C. L. (1996). Violent assault, posttraumatic stress disorder, and depression: Risk factors for cigarette use among adult women [PMID: 8875812]. *Behavior Modification*, *20*(4), 363–384. https://doi.org/10.1177/01454455960204001

Almond, D., & Currie, J. (2011). Killing me softly: The fetal origins hypothesis. *Journal of Economic Perspectives*, *25*(3), 153–72. https://doi.org/10.1257/jep.25.3.153

Altman, C. E., Gorman, B. K., & Chávez, S. (2018). Exposure to Violence, Coping Strategies, and Diagnosed Mental Health Problems Among Adults in a Migrant-Sending Community in Central Mexico. *Population Research and Policy Review*, *37*(2), 229–260. https://doi.org/10.1007/s11113-018-9460-x

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5* (5th ed.). Autor.

Archibold, R. (2011). Mexican gang kingpin arrested. *The New York Times*. Retrieved June 9, 2021, from https://www.nytimes.com/2011/01/19/world/americas/19mexico.html

Bandiera, F. C., Loukas, A., Li, X., Wilkinson, A. V., & Perry, C. L. (2017). Depressive Symptoms Predict Current E-Cigarette Use Among College Students in Texas. *Nicotine Tobacco Research*, *19*(9), 1102–1106. https://doi.org/10.1093/ntr/ntx014

Becker, G. S., & Murphy, K. M. (1988). A theory of rational addiction. *Journal of Political Economy*, *96*(4), 675–700. http://www.jstor.org/stable/1830469

Beittel, J. S. (2013). Mexico's drug trafficking organizations: Source and scope of the violence. *Congressional Research Service*.

Brown, R. (2018). The Mexican Drug War and Early-Life Health: The Impact of Violent Crime on Birth Outcomes. *Demography*, *55*(1), 319–340. https://doi.org/10.1007/s13524-017-0639-2

Byrne, D., Byrne, A., & Reinhart, M. (1995). Personality, stress and the decision to commence cigarette smoking in adolescence. *Journal of Psychosomatic Research*, *39*(1), 53–62. https://doi.org/https://doi.org/10.1016/0022-3999(94)00074-F

Calderon, L., Ferreira, O. R., & Shirk, D. (2018). Drug violence in mexico: Data and analysis through 2017. *Justice in Mexico*.

Castillo, M. (2011). Mexico targets cell accused of agent's killing. *CNN*. Retrieved June 9, 2021, from http://www.cnn.com/2011/WORLD/americas/02/28/mexico.agent/index.html

CNN Wire Staff. (2011). Mexico says it captures drug-lord's top lieutenant. *CNN*. Retrieved June 9, 2021, from https://www.latimes.com/world/la-xpm-2011-oct-14-la-fg-mexico-zetas-20111014-story.html

Conway, T. L., Vickers, R. R., Ward, H. W., & Rahe, R. H. (1981). Occupational stress and variation in cigarette, coffee, and alcohol consumption. *Journal of Health and Social Behavior*, *22*(2), 155–165. http://www.jstor.org/stable/2136291

Cordoba, J. d. (2010). Key mexican drug figure killed. *The Wall Street Journal*. Retrieved June 9, 2021, from https://www.wsj.com/articles/SB10001424052748704353504575597202442560046?reflink=desktopwebshare_permalink

Cuartas, J., & Roy, A. L. (2019). The latent threat of community violence: Indirect exposure to local homicides and adolescents' mental health in colombia. *American Journal of*

Community Psychology, *64*(1-2), 219–231. https://doi.org/https://doi.org/10.1002/ajcp.12335

Dagnelie, O., Luca, G. D. D., & Maystadt, J.-F. (2018). Violence, selection and infant mortality in congo. *Journal of Health Economics*, *59*, 153–177. https://doi.org/https://doi.org/10.1016/j.jhealeco.2018.02.004

Di Maio, M., & Leone Sciabolazza, V. (2021). Conflict exposure and health: Evidence from the gaza strip. *Health Economics*, *30*(9), 2287–2295. https://doi.org/https://doi.org/10.1002/hec.4364

Dibble, S. (2011). Suspected drug trafficker caught in mexico. *San Diego Union Tribune*. Retrieved June 10, 2021, from https://www.sandiegouniontribune.com/news/border-baja-california/sdut-top-sanchez-arellano-drug-suspect-caught-mexico-2011jul11-story.html

Dubé, C., Gagné, M.-H., Clément, M.-E., & Chamberland, C. (2018). Community violence and associated psychological problems among adolescents in the general population. *Journal of Child Adolescent Trauma*, *11*, 1–10. https://doi.org/10.1007/s40653-018-0218-8

El compayito arrested despite alleged police violations. (2011). *Justice in Mexico*. Retrieved June 8, 2021, from https://justiceinmexico.org/el-compayito-arrested-despite-alleged-police-violation/

Farris, S., Aston, E., Zvolensky, M., Abrantes, A., & Metrik, J. (2017). Psychopathology and tobacco demand. *Drug and Alcohol Dependence*, *177*. https://doi.org/10.1016/j.drugalcdep.2017.03.020

Fowler, P., Tompsett, C., Braciszewski, J., Tiura, A., & Baltes, B. (2009). Community violence: A meta-analysis on the effect of exposure and mental health outcomes of children and adolescents. *Development and psychopathology*, *21*, 227–59. https://doi.org/10.1017/S0954579409000145

Friedman, A. S. (2020). Smoking to cope: Addictive behavior as a response to mental distress. *Journal of Health Economics*, *72*, 102323. https://doi.org/https://doi.org/10.1016/j.jhealeco.2020.102323

Fu, Q., Vaughn, M., Wu, L.-T., & Heath, A. (2014). Psychiatric correlates of snuff and chewing tobacco use. *PloS one*, *9*, e113196. https://doi.org/10.1371/journal.pone.0113196

Goeders, N. E. (2003). The impact of stress on addiction. *European neuropsychopharmacology : the journal of the European College of Neuropsychopharmacology*, *13*(6), 435–441. https://doi.org/10.1016/j.euroneuro.2003.08.004

Grinberg, E., & Trevino, M. (2009). Mexican police, soldiers killed in multicity attacks by drug gang. *CNN*. Retrieved June 9, 2021, from http://edition.cnn.com/2009/WORLD/americas/07/11/mexico.attack/index.html

Grossman, M. (1972). On the concept of health capital and the demand for health. *Journal of Political Economy*, *80*(2), 223–255. http://www.jstor.org/stable/1830580

Hodgson, G. M. (2007). The revival of veblenian institutional economics. *Journal of Economic Issues*, *41*(2), 324–340. https://doi.org/10.1080/00213624.2007.11507019

Imas, A., Kuhn, M. A., & Mironova, V. (2018). Exposure to violence predicts impulsivity in time preference : Evidence from the democratic republic of congo.

Janke, K., Propper, C., & Shields, M. A. (2016). Assaults, murders and walkers: The impact of violent crime on physical activity. *Journal of Health Economics*, *47*, 34–49. https://doi.org/https://doi.org/10.1016/j.jhealeco.2016.01.006

Jannat-Khah, D. P., Dill, L. J., Reynolds, S. A., & Joseph, M. A. (2018). Stress, socializing, and other motivations for smoking among the lesbian, gay, bisexual, transgender, and queer community in new york city [PMID: 28318307]. *American Journal of Health Promotion*, *32*(5), 1178–1186. https://doi.org/10.1177/0890117117694449

La familia cartel boss' mendez vargas held in mexico. (2011). *BBC*. Retrieved June 10, 2021, from https://www.bbc.com/news/world-latin-america-13869573

Lindo, J. M., & Padilla-Romo, M. (2018). Kingpin approaches to fighting crime and community violence: Evidence from mexico's drug war. *Journal of Health Economics*, *58*, 253–268. https://doi.org/https://doi.org/10.1016/j.jhealeco.2018.02.002

Lundborg, P. (2006). Having the wrong friends? peer effects in adolescent substance use. *Journal of Health Economics*, *25*(2), 214–233. https://doi.org/https://doi.org/10.1016/j.jhealeco.2005.02.001

McDonald, C. C., & Richmond, T. R. (2008). The relationship between community violence exposure and mental health symptoms in urban adolescents. *Journal of Psychiatric and Mental Health Nursing*, *15*(10), 833–849. https://doi.org/https://doi.org/10.1111/j.1365-2850.2008.01321.x

Mexican police capture key juárez kingpin. (2011). *The Guardian*. Retrieved June 10, 2021, from https://www.theguardian.com/world/2011/aug/01/mexican-police-capture-juarez-kingpin

Mexico arrests 'top leader of zetas drug gang'. (2011). *BBC*. Retrieved June 10, 2021, from https://www.bbc.com/news/world-latin-america-14019264

Mexico arrests a key leader of zetas gang. (2011). *Los Angeles Times*. Retrieved June 10, 2021, from https://www.latimes.com/world/la-xpm-2011-oct-14-la-fg-mexico-zetas-20111014-story.html

Mexico arrests senior sinaloa drugs cartel suspect. (2011). *BBC*. Retrieved June 11, 2021, from https://www.bbc.com/news/world-latin-america-15191299

Mexico captures high-level cartel member. (2009). *NBC News*. Retrieved June 8, 2021, from https://www.nbcnews.com/id/wbna29773111

Mexico zeta drug gang leader 'el lucky' arrested. (n.d.). *BBC*. Retrieved June 10, 2021, from https://www.bbc.com/news/world-latin-america-16153481

Minehan, E. B., Cedillo, A., & Axolote. (n.d.). Mexico's mass disappearances and the drug war (ayotzinapa: The missing 43 students) : Drug war timeline 1930-2015. *University of Wisconsin-Madison Libraries Research Guides*. Retrieved June 7, 2021, from https://researchguides.library.wisc.edu/c.php?g=560513&p=3904772#The%20War%20on%20Drugs%20in%20Mexico

Monahan, J., & Steadman, H. J. (1996). *Violence and mental disorder: Developments in risk assessment*. Chicago: University of Chicago Press.

National Institute of Statistics and Geography. (2019). *Datos preliminares revelan que en 2018 se registraron 35 mil 964 homicidios*. https://www.inegi.org.mx/contenidos/saladeprensa/boletines/2019/EstSegPub/homicidios2018.pdf

Overstreet, S., & Braun, S. (2000). Exposure to community violence and post-traumatic stress symptoms: Mediating factors. *American Journal of Orthopsychiatry*, *70*(2), 263–271. https://doi.org/https://doi.org/10.1037/h0087828

Pearlin, L. (1989). The sociological study of stress. *Journal of Health and Social Behavior*, 241–256.

Rıos, V., & Coscia, M. (2012). Knowing where and how criminal organizations operate using google. *CIKM*, *12*, 1412–1421.

Romo, R., & Senior Latin American Affairs Editor. (2011). Major mexican drug lord captured. *CNN*. Retrieved June 9, 2021, from https://www.cnn.com/2011/09/19/world/americas/mexico-drug-lord/index.html

Scarpa, A., Haden, S. C., & Hurley, J. (2006). Community violence victimization and symptoms of posttraumatic stress disorder: The moderating effects of coping and social support [PMID: 16501214]. *Journal of Interpersonal Violence*, *21*(4), 446–469. https://doi.org/10.1177/0886260505285726

Serxner, S., Catalano, R., Dooley, D., & Mishra, S. (1991). Tobacco use: Selection, stress, or culture? *Journal of occupational medicine. : official publication of the Industrial Medical Association*, *33*(10), 1035–1039. http://europepmc.org/abstract/MED/1753299

Teesson, M., Degenhardt, L., & Hall, W. (2002). *Addictions (1st ed.)* Psychology Press.

Torres, O., & O'Dell, L. (2015). Stress is a principal factor that promotes tobacco use in females. *Progress in neuro-psychopharmacology biological psychiatry*, *65*. https://doi.org/10.1016/j.pnpbp.2015.04.005

Tsujimoto, T., & Kijima, Y. (2020). Effects of conflict on child health: Evidence from the 1990–1994 northern mali conflict. *Health Economics*, *29*(11), 1456–1474. https://doi.org/https://doi.org/10.1002/hec.4146

UNODC. (2011). Estimating illicit financial flows resulting from drug trafficking and other transnational organized crimes. *United Nations Office on Drugs and Crime*.

U.S. Department of Health and Human Services. (2004). *The health consequences of smoking: A report of the surgeon general*.

Verma, R., Balhara, Y., & Gupta, C. (2011). Gender differences in stress response: Role of developmental and biological determinants. *Industrial psychiatry journal*, *20*, 4–10. https://doi.org/10.4103/0972-6748.98407

Wilkinson, T. (2010). Capture of carlos beltran leyva is another blow to mexico's most violent drug-smuggling gang. *Los Angeles Times*. Retrieved June 9, 2021, from https://www.latimes.com/archives/la-xpm-2010-jan-03-la-fg-mexico-beltran3-2010jan03-story.html

Zavala-Arciniega, L., Reynales-Shigematsu, L. M., Levy, D. T., Lau, Y. K., Meza, R., Gutiérrez-Torres, D. S., Arillo-Santillán, E., Fleischer, N. L., & Thrasher, J. (2020). Smoking trends in mexico, 2002–2016: Before and after the ratification of the who's framework convention on tobacco control. *Tobacco Control*, *29*(6), 687–691. https://doi.org/10.1136/tobaccocontrol-2019-055153

Chapter 3- Do Words Matter? The Impact of the 2016 Election on Health Outcomes

1 Introduction

The 2016 election of Donald Trump to President of the United States was one of the most divisive and surprising elections in modern times. On the night before the 2016 election a majority of polls had Hilary Clinton ahead by a range of 2 percent to 6 percent (Anuta et al., 2017). Donald Trump's rhetoric surrounding immigrants, people of color, and women made him a controversial candidate. Additionally, one of Donald Trump's primary campaign initiatives was to build a wall on the Mexico/United States border. He also promoted anti-immigrant sentiments and often focused his rhetoric on Hispanic and Mexican immigrants. For instance, at one of his campaign rallies Trump proclaimed that all Mexicans were rapists and blamed Mexico for a variety of problems in the US economy (Gabbatt, 2015).

Donald Trump's repeated rhetoric about Hispanic and Latino individuals, Black individuals, and women represents unfair and inappropriate judgment of a group. For instance, a survey conducted two weeks before the 2016 election indicated that 60 percent of voters thought Donald Trump had no respect for women, 59 percent of voters said he had no respect for Black individuals, and 54 percent say that he had no respect for Hispanic individuals (Kiley, 2016). These statistics indicate that individuals in the United States believed that Donald Trump had strong negative beliefs about some groups of individuals before the 2016 election. Donald Trump's election to the highest office in the United States suggested that

negative or discriminatory comments about minority groups did not matter to many Americans. The 2016 election strengthened the perception within America that some individuals were less respected because of their race, ethnicity, or gender. This view was strengthened by Donald Trump winning decisively in many swing states, and in places where Hilary Clinton was projected to win.

Donald Trump's negative comments regarding the Hispanic and Latino community distinguish him from other presidential candidates in this election and in previous elections. He also made controversial comments about women and Black individuals. In America, Black individuals have often been the subject of unfair and unjust treatment with roots back to slavery. While America has made progress in fighting racism towards African Americans and Black individuals, racism still exists. In contrast, discrimination against Hispanic and Latino individuals has often been more subtle than the discrimination against African Americans. Donald Trump is the first candidate in recent decades to overtly make anti-immigrant and anti-Hispanic/Latino comments. His focus on Mexico and the Hispanic and Latino community had the potential to impact members of those communities. I examine whether his rhetoric about ethnicity, race, and gender impacted individuals who identify with those groups. The primary mechanism for this effect is perceived discrimination.

Perceived discrimination is "defined as a behavioral manifestation of a negative attitude, judgment, or unfair treatment toward members of a group (Banks et al., 2007; D. Williams et al., 1999)— (it) is the subject of some debate regarding the accuracy of discrimination as a construct, because it is perceived and reported by subjects without verification of actual events.(Pascoe & Smart Richman, 2009, p.3)." Perceived discrimination is a type of discrimination that varies based on an individual's perception of a specific event or circumstance.

Measuring perceived discrimination is difficult because it is highly heterogeneous across individuals. I do not measure or examine any changes in perceived discrimination as a result of the 2016 election in this paper. I add a stress component to the Becker and Murphy (1988) rational addiction model to illustrate how the consumption of addictive goods changes as a result of increased stress. The outcome indicates that an increase in stress can produce an outcome of increased substance use.

I empirically examine how the 2016 election impacted substance use using a treatment effect strategy and using data from the Behavioral Risk Factor Surveillance System. The survey is conducted every year and surveys upwards of 400,000 households annually. The data allows me to test for any changes in cigarette use or alcohol use. Throughout the paper "substance use" will refer to cigarette and alcohol use. An assumption of the event study is that the 2016 election is exogenous. While elections themselves are endogenous, I argue that the result of the 2016 election was exogenous because no one predicted that Donald Trump would win. The treated groups in the regression analysis vary throughout the paper but include racial minorities, Hispanic individuals, and women. An intersectional analysis, or an analysis of how the election impacted different individuals based on more than one identity, is also included to better understand how the election impacted individuals with different identities by race, ethnicity, gender, and income. The results indicate that the 2016 election was associated with increased cigarette use by Hispanic individuals.

My findings have several implications. First, they provide insights into the impact of national level-politics on individual-level health outcomes. Second, as the political climate in the United States becomes more contentious, it is important to know whether targeted rhetoric by political candidates can impact individual-level health outcomes. Finally, racial,

ethnic, and gender identities are important components of defining who we are as people. This paper examines whether beting a member of specific races, ethnicities, and genders can impact overall health outcomes when political candidates target those identities. The remainder of this paper is organized as follows: Section II (Literature Review), Section III(Theory), Section IV (Data), Section V (Methodology), Section VI (Impact of the 2016 Election on Perceptions and Health), Section VII (Results), Section VIII (Conclusion).

2 Literature Review

There have been no papers in the economic literature that examine the impact of an election on substance use because of stress or other mental health effects. The two most dominant theories in economics about discrimination in health outcomes by gender, race, and ethnicity are statistical discrimination and taste-based discrimination. One possible explanation for differences in health outcomes by race and ethnicity is statistical discrimination in health care because doctors may have a harder time understanding symptoms from patients of color (Balsa & McGuire, 2001; Balsa et al., 2005). There is a large empirical literature supporting the hypothesis that statistical discrimination in healthcare leads to health disparities for racial and ethnic minorities (Balsa et al., 2005; McGuire et al., 2008; Werner, 2004). Becker (1957) introduces taste-based discrimination in his book about the economics of discrimination. Becker argues that discrimination occurs within the labor market because of a taste for discrimination by employees, employers, and customers. These theories are a starting point for the hypothesis in this paper.

There are a number of empirical papers that also examine how discrimination outside

of the healthcare system impacts health outcomes. Johnston and Lordan (2012) examine the impact of the September 11, 2001 attacks in New York City on health outcomes for Muslims using a treatment effects estimation strategy and find that there were significant negative health outcomes as a result of 9/11 on the Muslim community. A different paper looked at how Islamaphobia after the 2017 Catalonia (Spain) attacks impacted the health of newborns of mothers who were from a Muslim country (Armijos Bravo & Vall Castelló, 2021). They find that the number of births with complications and low birth rates rise for the treated group. More similar to this paper, Siddiqi et al. (2019) find that social status threat amongst White individuals has led to an increase in deaths of despair. This paper indicates that stressors based on an individual's racial identity can impact health. These papers speak to the importance of identity in explaining health outcomes.

There are several studies from the field of psychology which examine the relationship between discrimination and substance use. One paper shows that substance use and substance use disorders are higher amongst people who face discrimination based on race (Gibbons et al., 2004). McCabe et al. (2010) argue that individuals who experience more than one type of discrimination based on their different identities are four times more likely to have an issue with substance use. Both authors argue that a key pathway for the increase in substance use is an increase in stress. Tran et al. (2010) found that perceived discrimination against Southeast Asian immigrants was related to being a current smoker. For Hispanic and Latino immigrants perceived discrimination was related to past month binge drinking and for African born black immigrants it was related to past month drinking days (Tran et al., 2010). For White, Black, and Hispanic individuals exposure to disadvantage was correlated with problem drinking (Mulia et al., 2008). Lorenzo-Blanco et al. (2016) argue that there is

a complicated relationship between Latino/a individuals and perceived discrimination, depressive symptoms, youth acculturation, gender, and cigarette use. These studies highlight the relationship between perceived discrimination or discrimination, minority identities, and substance use.

There are also significant differences in substance use by race, ethnicity, and gender. For adults, men consume more alcohol then women and White individuals drink more than Hispanic individuals who drink more than Black individuals, on average (Patrick & Schulenberg, 2013). Additionally, White Non-Hispanic individuals are more likely to smoke daily, while menthol use was higher for Non-Hispanic Black individuals than other groups (Weinberger et al., 2019). Over the 15 year time period of the study, the quitting ratio increased for Hispanic and Non-Hispanic white individuals (Weinberger et al., 2019). This research highlights that there are significant differences in cigarette and alcohol use across race, ethnicity, and gender. An intersectional analysis incorporating these differences will be an important part of the paper. Additionally, I will incorporate many different comparison groups by race, ethnicity, and gender to better understand the effect of the 2016 election on substance use.

Donald Trump's inflammatory rhetoric about racial and ethnic minorities and immigrants certainly led to changes in perceived discrimination for some individuals in those groups. However, there is also evidence that other types of discrimination changed for those individuals during his campaign and after his election. D. R. Williams and Medlock (2017) argue that the election of Donald Trump created increased racial hostility, community-level prejudice, hostility in the larger environment, and hostility towards immigrants. Costella (2016) found that over 50 percent of teachers had reported an increase in racial slurs towards minority students, Muslim students, and immigrants. Edwards and Rushin (2018) contend

that Donald Trump's election caused an increase in hate crimes, and that his election to President validated racial rhetoric in the eyes of perpetrators. They conclude that his election has led to an increase in hate crimes. Hswen et al. (2020) show that of the 2,809,641 tweets containing Mexican(s) and Hispanic(s) within 20 weeks of the 2016 election, 687,291 tweets were negative. Among Hispanic respondents of a Gallup poll, 33.5 percent said they were worried on a daily basis (Hswen et al., 2020). Chavez et al. (2019) find that both positive and negative political rhetoric play a role in the emotion and affect of individuals for whom the rhetoric is about. These studies all indicate that Donald Trump's election did contribute to an increase in perceived and actual discrimination against minority groups. This paper will contribute to this literature by examining how perceived discrimination impacts substance use by identity.

3 Theory

I use the rational addiction model presented in Becker and Murphy (1988) to illustrate the impact of an exogenous stress shock on substance use. I model this as a dynamic programming model as opposed to a continuous time model because the continuous model has unstable roots, making any solutions unreliable (Laporte et al., 2017). Becker and Murphy (1988) model the equation as:

$$Max_{c,y,S_{t+1},S} E_0 \sum_{n=1}^{\infty} \beta^t U(y(t), c(t), S(t)) \tag{1}$$

s.to

$$S_{t+1} = (1-\gamma)S_t + c_t + Z(t) \tag{2}$$

$$a_{t+1} = (1+r_t)a_t - y_t - p_t c_t + wS_t \tag{3}$$

$$c_0 > 0 \tag{4}$$

$$S_0 > 0 \tag{5}$$

$$a_0 > 0 \tag{6}$$

where c_t is the consumption of the addictive good, y_t is the consumption of non addictive goods, S_t is the consumption stock for the addictive good built through consumption of the addictive good, Z_t is different experiences that impact addictive stock, a_t are assets in period t, p_t is the price of the addictive good, and that $u(.)$ is concave. These variables and the model are the same as the rational addiction model presented in Becker and Murphy (1988).

Becker and Murphy (1988) incorporate a variable Z(t) to capture how short term changes in life experiences impact the consumption stock of the addictive good. They argue that a short term shock moves the individual up from the path of consumption that they were on. This will increase the individual's consumption of the addictive good over the course of their lifetime. A stress shock from the 2016 election would be categorized under Z(t) and could cause an increase (or decrease) in the consumption of the addictive good. As pointed out by Friedman (2020), Z(t) covers a wide range of situations, from peer effects in adolescence to divorce (p. 2). To better understand how the election impacts substance use through stress

I extend the Z(t) function to incorporate different components of stress. Stress can result in increased consumption of an addictive good if "(1) it causes a sufficiently large increase in immediate distress, (2) ex ante stress is already high, and (3) the price of the addictive good is low (Friedman, 2020, p. 3).

Stress is determined by the following equation denoted in (Walde, 2018) and incorporates the three criteria above. Stress is assumed to be exogenous to the substance use equation. Based on their model, stress (S(t)) follows a stochastic differential equation that is modeled as:

$$dZ_t = [\phi \frac{p}{b} Z_t - \delta_0 Z_t - \delta_1 m_t]dt - \chi g_t dq_{gt} - \Delta_t d_{\Delta t} \tag{7}$$

The first term $\phi \frac{p}{b} Z_t$ represents different components that describe the source of stress. p/b measures the impact of demand relative to ability and is the source of a change in tension due to stress and ϕ measures personality effects (Walde, 2018). Walde (2018) argues that this allows for the tension from stress to persist, even once the stressor is gone. $\delta_0 Z_t - \delta_1 m_t$ illustrate depreciation effects that reduces the tension of stress. δ_0 is "autonomous stress reduction potential" and is greater than 0, m_t represents stress coping activities, and δ_1 is the productivity parameter of stress coping activities and is greater than zero (Walde, 2018). As time goes by, stress will decrease. These previous terms explain everyday stressors that are expected. Stressors that are surprises are modeled by q_{gt}, which is a Poisson process with an exogenous arrival rate λ^g and determines whether the stressors are positive or negative (Walde, 2018). χ is similar to the appraisal parameter and measures the ability of an individual to ignore negative stressors (χ=0 if an individual isn't impacted by a stressor at all) (Walde, 2018). The last term $\Delta_t d_{\Delta t}$ represent outbursts which only occur during

negative stressors (Walde, 2018). In this model, individuals would like to have $Z = 0$, where stress is at a value of zero. For simplicity I assume that the Poisson process, q_{gt}, generates zero random events in period t-1, t, and t+1 (before, during, and after the election).

One assumption of the model is that $Z_t = 0$ or $Z_t > 0$. The actual value of dZ_t will vary based on an individual's depreciation response, likelihood of outbursts, and personal components of how they deal with stress. Therefore, the stochastic process models the variation of stress levels from the 2016 election.

The primary contribution of this model is the addition of stress as a contributor to addictive capital stock. Therefore, I examine the first order condition S_{t+1} with respect to L_t. This will illustrates how stress impacts the consumption stock of addictive goods. The derivation is in the appendix and is given by:

$$\frac{\partial S_{t+1}}{\partial Z(t)} = \frac{\phi_b^p Z(t) - \delta_0 Z(t)}{Z'(t)} \tag{8}$$

This means that the consumption stock for the addictive good varies depending on whether ϕ_b^p is greater than or less than δ_0 and whether $Z'(t)$ is less than or greater than zero. Recall that the first term refers to personality effects and a source of a change in tension due to stress and δ_0 is an individuals stress reducing potential. Holding $Z'(t)$ constant, $\frac{\partial S_{t+1}}{\partial Z(t)} > 0$ if someone is stress prone and $\frac{\partial S_{t+1}}{\partial Z(t)} < 0$ if someone is stress resistant. Also recall that Z(t) is never negative so if someone is stress resistant the stress shock will have zero effect on the consumption stock of the addictive good. Alternatively, someone who is stress prone will see an increase in the consumption stock of the good. The model predicts that substance use will increase after the 2016 election for individuals who experience a stress shock and who

are stress prone. Becker and Murphy (1988) find that the steady state of addictive goods is unstable. Therefore, this change might have a long term effect, but it could also result in other outcomes depending on an individuals preferences, discount rate, and life events amongst other things.

4 Data

The primary dataset used in this paper is The Behavioral Risk Factor Surveillance System (BRFSS). It is a yearly dataset that asks a variety of questions including questions about alcohol use, cigarette use, demographic questions, and other general questions about health. It is a pooled cross sectional dataset which spans 2014-2018. The BRFSS dataset starts in 1984 and has averaged 400,000 surveys per year. The sampling procedure involves using random digit dialing techniques on both landlines and cellphones. All states use a standardized core questionnaire, and some states have optional modules. Only adults 18 years or older are eligible to take part in the survey. The BRFSS dataset used post stratification to weight BRFSS survey data until 2010, and then switched to iterative proportional fitting (also known as raking), to weight the variables. I utilize the survey commands in STATA to ensure that the survey is representative of the population.

The dependent variables in this paper are variables about mental health, cigarette use, alcohol use, and binge drinking. The variable for cigarette use (***Cigarette Consumption***) is a binary variable which equals 1 if someone has smoked 100 cigarettes or more in their life, and zero otherwise. This gets at overall cigarette use in an individual's lifetime. Alcohol use (***Alcohol Consumption***) is a binary variable that equals one if someone has drank at

least once or more in the past month and zero otherwise. Finally, binge drinking (***Binge Drinking***) is a binary variable whose value is a one if a women has had 4 or more drinks at least once in the past month or a man has had 5 or more drinks at least once in the past month and 0 otherwise. Mental health (***Mental Health***) takes on the values 0-30 and represents the number of poor mental health days that an individual has experienced in the past 30 days. These values are self-reported measures.

Explanatory variables in this paper include general health, sex, education level, income level, number of children, marital status, race and ethnicity, age, and controls for time. Individuals rank their general health on a scale from excellent (5) to poor (1). The categorical variable for education is a variable from never attended school or only kindergarten (1) to college 4 years or more (6). Income is a categorical variable that has 8 categories ranging from less than 10,000 dollars (1) to 75,000 dollars or more (8). Individuals categorize their relationship status as: married, divorced, widowed, separated, never married, or a member of an unmarried couple. Age is measured in years. The race and ethnicity variables include 8 options for race and ethnicity (specified in Table 3.1). Time controls vary based on the regression specification explained in the next section. These explanatory variables were chosen based on the previous economics literature regarding substance use. State fixed effects are also included to control for state-level characteristics. Table 3.1 shows the summary statistics of the data.

The weighted means indicate that 13.89 percent of individuals are Hispanic. The weighted population consists of 10.12 percent Black individuals and 68.60 percent White individuals. The average age is 50.27 years old, the average income level is 5.92 which is equivalent to about 48,000 dollars a year, and the average education level is above high school but below

Table 3.1: Summary Statistics

Weighted Average of Continous Variables	Mean	Standard Error	Observations
Age (in years)	50.27	(.0222)	2,074,896
Number of Children	.619	(.002)	2,067,059
Poor Mental Health Days	3.702	(.010)	2,043,373
Poor Physical Health Days	5.048	(.012)	1,123,733
Percentage of Sample for Binary and Categorical Variables	Percentage	Observations	
Sex			
Male	47.14	(.001)	572,784
Female	52.86	(.001)	647,204
General Health Categories			
Excellent	18.44	(.0516)	221,813
Very Good	32.56	(.061)	397,340
Good	30.90	(.061)	377,120
Fair	13.16	(.044)	161,274
Poor	4.92	(.027)	60,417
Education Level			
Never attended school or only kindergarten	.226	(.008)	2,557
Grades 1 through 8	3.39	(.028)	37,623
Grades 9 through 11	6.10	(.035)	63,070
Grades 12 or GED	25.61	(.056)	299,037
College 1 year to 3 years	27.69	(.058)	325,946
College 4 years or more	36.98	(.062)	489,223
Income Level			
Less than 10,000 dollars	5.45	(.035)	52,434
10,000-15,000 dollars	5.14	(.032)	50,569
15,000-20,000 dollars	7.23	(.037)	71,708
20,000-25,000 dollars	8.73	(.040)	87,978
25,000-35,000 dollars	10.07	(.042)	101,346
35,000-50,000 dollars	13.20	(.042)	133,677
50,000-75,000 dollars	15.25	(.050)	158,340
75,000+ dollars	34.93	(.067)	380,305
Race and Ethnicity			
White, non-Hispanic	68.60	(.063)	828,5444
Black, non-Hispanic	10.12	(.041)	117,523
American Indian or Alaskan Native Non-Hispanic	1.05	(.012)	12,965
Asian, non-Hispanic	3.69	(.031)	42,616
Native Hawaiian or Pacific Islander, Non-Hispanic	.223	(.061)	2,761
Other Race, Non-Hispanic	.602	(.011)	8,163
Multiracial, Non-Hispanic	1.82	(.017)	23,408
Hispanic	13.89	(.053)	164,460

The reported number of observations are the number of observations in the sample (non-weighted).

a completed college degree. This is a brief overview of what my sample looks like after weighting the data.

5 Methodology

The primary methodology in this paper is a treatment effects strategy which is estimated using a difference in differences (DD) estimator. A similar methodology was used in Johnston and Lordan (2012). The authors use the 9/11 terrorist attacks as an exogenous measure to examine how discrimination affects health outcomes. The authors include Muslim Pakastanis and Bangledeshis in their treatment group and non-Muslim Indians in their control group. This paper also builds on the empirical strategy in Pinto et al. (2021). They examine the impact of the 2012 and 2016 elections on subjective well being across political party affiliation. Their empirical strategy consists of a regression discontinuity design. The Regression Discontinuity design (RDD) is a quasi-experimental pretest-posttest design to evaluate the causal effects of a policy. While the regression discontinuity design provides a way to measure the impact of the election on different groups, the absence of a control group is a significant shortcoming of the model. Thus I employ a DD estimation strategy in this paper.

For a DD estimation strategy, the treatment, here the election, must be exogenous. I argue that individuals did not change their behavior in anticipation of the election because Donald Trump was not predicted to win the 2016 election. On the night before the 2016 election a majority of the polls had Hilary Clinton ahead by a range of 2 percent to 6 percent (Anuta et al., 2017). Many election prediction in the 2016 election used probabilisitc

forecasts, which predicted that Hilary Clinton would win the election with odds ranging from 70-99 percent (Lohr & Singer, 2016). Westwood et al. (2020) show that probabilistic forecasting confuses voters and that this type of forecasting increases the certainty about an election's outcome. Someone who sees that Hilary Clinton has an 80 percent chance of winning the election may associate with that as Hilary Clinton is going to win the election. The certainty associated with the 2016 election forecasting also supports the exogeneity of the election.

Trump was also an extremely unorthodox politician and candidate. Jacobson (2017) explains that Donald Trump never should have been competitive because his nomination was opposed by a majority of the Republican establishment, of Trump's misunderstanding of the American political system and US foreign and Domestic policy, of his indifference to the truth, he ignored standard campaign basics, and his methodology to win was to insult his political opponents, Latinos, other minorities, and women. These factors all contributed to him being unlikely to win the election.

A number of finance papers used the 2016 election of Donald Trump as an uncertainty shock to measure the impact of the election on stock market behavior (Cunha & Kern, 2018; Sun et al., 2021; Wagner et al., 2018). As uncertainty shocks are used to measure aggregate fluctuation, this literature further supports the use of Trump's election as a distinctive event appropriate for a DD estimation strategy. Note that uncertainty shocks are not always exogenous, however several authors have argued that the election is exogenous (Cunha & Kern, 2018).

The primary empirical strategy in this paper is to assume that the election was a treatment which had differential impacts across groups. The treated group varies by gender, race,

and ethnicity and the control groups are white individuals, men, and non-Hispanic individuals. I measure the across-group variation in discrimination and its impact on substance use. I first examine the impact of the 2016 election by race and gender by estimating the following equation.

$$DependentVariable_{it} = \beta_0 + \beta_1 Post_{it} + \beta_2 Treatment_{it} + \beta_3 Treatment * Post_{it} + \beta_4 X_i + \theta_i + \omega_t + \epsilon_{it} \tag{9}$$

$DependentVariable_{it}$ is one of the variables discussed in the Data section as a marker of overall health or substance use. $Treatment_{it}$ is a binary variable whose value is a 1 if the interview date was 30 days, 6 months, 1 year, or 2 years after the election. β_2 measures the overall average effect of being in the treated group. The parameter of interest is β_3 and captures the treatment effect of the election. X_i is a vector of individual control variables mentioned in the data section. θ_i is a vector for state fixed effects and ω_t is a vector of time fixed effects including, year, month, and day of week fixed effects. ϵ_{it} is a disturbance term which has a general normal distribution if the dependent variable is continuous and a standard normal distribution if the dependent variable is binary. All regressions use the Behavioral Risk Factor Surveillance System sampling weights. I assume the linear regression model for the continuous dependent variables and the Probit model for the binary dependent variables. I also analyze the treatment effect over time. I use a measure of zero to one month after the election and zero to three months after the election to analyze short term changes as a result of the election, and I use a time period of zero to six months after the election and zero to one year after the election to look at the longer run changes of the treatment after the election. By analyzing the changes over time, I can better understand if changes

in mental health and substance use as a result of the 2016 election are temporary changes or if they are permanent changes. These regressions are run separately.

I also examine the impact of the 2016 election on the health of individuals by ethnicity. In these regressions, the treated group is Hispanic individuals and the control group consists of Non-Hispanic individuals. I examine the effect by race to help control for differences across races as some races were targeted in multiple ways by Donald Trump. To measure the effect of the 2016 election by income group, I organize these regressions by income level and gender. When analyzing groups by gender and income, the parallel trends assumption fails. Therefore, I examine the impact of the 2016 election by separating the treated group by income and gender and then measuring the average treatment effect.

There are a several conditions that must be satisfied for the DD estimator to measure a treatment effect. The first condition is consistency in outcomes. If the treated group experiences one treatment and the control group experiences no treatment at the time of the event, consistency is satisfied. The election is an exogenous event that only occurred once in the time frame of interest. Table A1 uses a regression discontinuity design to test whether White Non-Hispanic individuals had any statistically significant changes in substance use or mental health following the election. In this regression discontinuity design I use the 2016 election as the cutoff and examine how mental health, alcohol consumption, binge drinking, and cigarette consumption changed 1 month, 3 months, 6 months, and 1 year after the election. There are no statistically significant changes for White Non-Hispanic individuals after the election. Thus, the control group appears not to have experienced the treatment. While I utilize many different control groups in the paper, White Non-Hispanic individuals are the control group that is used most often.

Parallel trends is the last assumption which must be satisfied for the DD estimator to be unbiased. Given the number of treatment groups and dependent variables in the sample, showing the parallel trends assumption graphically is infeasible. Graphical analysis of the parallel trends assumption and other common tests often miss pre-trends in the data. To help remedy concern that the parallel trends condition may not be satisfied I utilize the findings from Bilinski and Hatfield (2019) who show that examining the confidence intervals for the treatment effect from equation (8) to the treatment effect from a second DD model with a control for a linear pre-trend will show if the parallel trends assumption is violated. A violation occurs if the difference between the control group and treatment group varies over time. If it is violated they recommend using a cubic spline for the pre-trend to control for any violation of the parallel trends assumption. By including a variable for a linear or cubic spline pre-trend, differences in pre-trends will be captured by that variable and I can accurately capture the average treatment effect. This specification is denoted as:

$$\begin{aligned} DependentVariable_i = \beta_0 + \beta_1 Post_{it} + \beta_2 Treatment_{it} + \beta_3 Treatment * Post_{it} \\ + \Theta d_t * Treatment_{it} + \beta_4 X_i + \theta_i + \omega_t + \epsilon_i \end{aligned} \tag{10}$$

where d_t is the time before the treatment period for the treated group. The cubic spline specification is similar but creates a cubic spline and then includes those in the regressions of interest. Tables A2 and A3 report the estimated treatment effects using the linear and cubic spline, respectively, for the regressions for race and gender and Tables A4 and A5 do the same for the regressions involving Hispanic ethnicity. I present the results with no pre-trend control as my main results and I report both the linear and cubic spline regression results

in the appendix for comparison. The estimated average treatment effects are robust if they are similar in magnitude and statistically significant across all three specifications.

6 Impact of the 2016 Election on Perceived Discrimination and Stress

Before I examine whether the impact of 2016 election on substance use, I will investigate the impact of the 2016 election on mental health and perceived discrimination. The purpose of this section is to highlight how the 2016 election impacted perceived discrimination for different groups. I will however consider whether the election did impact stress and perceived discrimination in this section and I will analyze the impact of the election on substance use and mental health in the results section.

As shown in the theoretical model, stress is one possible mechanism for increased substance use. For the past decade the top sources of stress in America were money, jobs, the economy, and family responsibilities ("Stress in America," 2007-2020). However, in 2017 the Stress in America Survey found a new top source of stress; the future of our nation. This was followed by money, work, and our current political climate ("Stress in America," 2017). Additionally, "The August survey found that more than half of Americans (52 percent) reported the 2016 U.S. presidential election was a very or somewhat significant source of stress" ("Stress in America," 2017). Average stress levels actually increased from a 4.8 to a 5.1 on a scale where 1 means little or no stress and 10 means a great deal of stress ("Stress in America," 2017).

There is evidence that stress from the election also resulted in worse physiological outcomes. For instance, Mefford et al. (2020) found that cardiovascular disease hospitalizations were 1.62 times higher 2 days after the election as opposed to the same two days in the week prior. These findings suggest that, on average, national and political actions have become a greater source of stress for Americans as a result of the 2016 election.

While stress from the election was prevalent among all Americans, there was also a variation in election outcome concerns across different demographic groups. The Stress in America survey found that 69 percent of Black Americans, 57 percent of Asian Americans, 56 percent of Hispanic Americans, and 42 percent of non-Hispanic White Americans said that the outcome of the election was a very or significant source of stress ("Stress in America," 2017). These stressors also differed by age and education level ("Stress in America," 2017). Another study found that Democrats experienced significant increases in stress, depression, and anxiety after the 2016 election, but that their mental health search behavior on Bing did not change after the election (Krupenkin et al., 2019). However, Spanish speaking Latinos had clear, significant, and sustained increases in searches for "depression", "anxiety" "therapy" and "antidepressant" (Krupenkin et al., 2019). The election also generated worse physical health outcomes for Hispanic and Latina women. For example, Gemmill et al. (2019) found that the number of pre-term births among Latina women increased above expected levels after the election. A qualitative study found that Latino immigrants interpreted the sociopolitical context in the US as discrimination towards immigrants, confusion and lack of information, and unpredictable circumstances (Lee & Zhou, 2020). Morey (2018) explains that much of this stress for Latino, Hispanic, and people of color from the 2016 election was associated with discrimination against immigration. Increases in stress lead to worse health

outcomes (Morey, 2018).

This strand of literature illustrates that the election has impacted the mental and physical health of some individuals based on their identity. Stress from the election impacted health outcomes for Hispanic and Latino/a individuals. To examine if there were changes in perceived discrimination, I use the National Survey of Latinos from the Pew Research Center to empirically examine whether ideas about America changed after the 2016 election of Donald Trump. In the survey participants were asked "In your opinion, how easy is it to achieve the American Dream for people like you today? Do you think it is very easy, somewhat easy, somewhat hard or very hard?" They were also asked, "Are you satisfied with the direction of the country?" with a yes or no answer. I use a regression discontinuity design (RDD) and OLS estimator to examine how perceptions about America changed for Hispanic and Latino Americans after the 2016 election. The treatment group consists of Hispanic and Latino survey participants who were surveyed after the 2016 election and the control group is made up of Hispanic and Latino Americans who were surveyed before the 2016 election. I also use a treatment group of Hispanic and Latino individuals who are not US citizens to see if the effect is stronger for this group of individuals. Donald Trump's rhetoric often targeted Hispanic and Latino immigrants and the results should be stronger for this group if the hypothesis in this paper is correct. The control variables are listed at the bottom of the table. These results are not interpreted causally, but are intended to show how the election was correlated with a change in overall perceptions for Hispanic and Latino Americans. These results are in Table 3.2.

Table 3.2 indicates that there was an 11.1 percent decrease in Hispanic and Latino individuals who were satisfied with the direction of the country. This decline was even stronger

Table 3.2: Change in Perceptions about America for Hispanic and Latino Individuals using a Regression Discontinuity Design and the National Survey of Hispanic and Latinos

	All		Non-US Citizens	
	Treatment (Pre and Post Election)	Observations	Treatment	Observations
All				
Satisfied with direction of country	-.111***	4,852	-.193***	1,711
	(.018)		(.030)	
American Dream				
Very Easy	-.024	2,296	-.025	626
	(.016)		(.029)	
Somewhat Easy	.025	2,296	.050	626
	(.025)		(.032)	
Somewhat Hard	-.090***	2,296	-.165***	626
	(.033)		(.059)	
Very Hard	.090***	2,296	.140**	626
	(.028)		(.056)	

Control variables are: a categorical variable for general health, a binary variable for sex, a categorical variable for education level and income level, number of children, a categorical variable for marital status, age, and political party. The treatment variable is the independent variable of interest and is a 1 if someone was surveyed after the 2016 election and a 0 if they were surveyed before. The American dream dependent variable is a categorical variable where participants were asked "In your opinion, how easy is it to achieve the American Dream for people like you today? Do you think it is very easy, somewhat easy, somewhat hard or very hard?" The other dependent variable is satisfied with the direction of the country where participants were asked "Are you satisfied with the direction of the country?". A regression discontinuity design is implemented to measure the impact of the election $^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

for Hispanic and Latino individuals who were not US citizens. The results indicate that there was a 9 percent increase in the answer that achieving the American dream is very hard for people like you. For Hispanic and Latino individuals who were non US Citizens, there was a 14 percent increase for this answer. These results indicate that the campaign and election of Donald Trump had an impact on the perception of America for Hispanic and Latina/o/x Americans. They believed that they had fewer opportunities to achieve economic success because of their ethnicity. These results indicate that perceptions, beliefs, and opinions for Latino/a/x and Hispanic individuals did change as a result of the 2016 election. It is clear that the political environment surrounding the 2016 election changed perceived discrimination for Hispanic and Latino/a/x individuals. Now that I have provided evidence of changes in perceived discrimination, I examine whether the stress coping mechanisms of cigarette use and substance use changed as a result of the 2016 election.

7 Results

In this section I examine the impact of the 2016 election on substance use for individuals. These results give a clearer picture of the magnitude and longevity of the 2016 election. Table 3.3 reports the estimated average treatment effects by race and gender. Here the treated group is the specified race in the table or women and the control group includes individuals who identify as White and men. Each entry in the table is a different regression with varying time specifications (1 month, 3 months, 6 months, 1 year) and varying dependent variables.

Table 3.3 shows how individuals who identify with certain races and genders were impacted by the 2016 election. There are no statistically significant changes in mental health by race as a result of the 2016 election in the short run, medium run, or long run. However, there are statistically significant changes in alcohol use for individuals who identify as Other race. There is an increase of 7.45 percent in the amount of individuals who drink and identify as Other race 30 days after the 2016 election compared to White individuals. This pattern persists and is statistically significant 3 months, 6 months, and 1 year after the election. There is a 1.9 percent statistically significant increase in binge drinking one year after the election for individuals who identify as Other race.

There is a statistically significant increase in cigarette consumption for individuals who identify as American Indian or Alaskan Native. There is a 9.16 percent increase in the amount of people who have smoked at least 100 cigarettes in their lifetime three months after the 2016 election for American Indian and Alaskan Native individuals. This trend persists one year after the election but drops in magnitude to a 3.78 percent increase in cigarette smoking. There is also a statistically significant decrease in cigarette use for individuals who identify

Table 3.3: Estimated Average Treatment Effects of the 2016 Election on Mental Health, Cigarette Use, and Alcohol Use by Race and Gender

Dependent Variables →	Mental Health	Alcohol Consumption	Binge Drinking	Cigarette Consumption
Independent Variables ↓				
Black or African American				
1 Month	-0.280	-0.00713	-0.00348	0.0136
	(0.278)	(0.0163)	(0.0111)	(0.0147)
3 Months	-0.0815	-0.00840	0.00485	-0.00713
	(0.182)	(0.0110)	(0.00756)	(0.00967)
6 Months	0.000969	0.00683	0.00303	0.000728
	(0.148)	(0.00911)	(0.00615)	(0.00795)
1 Year	-0.0776	0.00151	0.000930	0.00531
	(0.102)	(0.00622)	(0.00426)	(0.00563)
American Indian or Alaskan Native				
1 Month	-0.120	-0.0422	0.0047	0.0980**
	(0.1158)	(0.0406)	(0.0307)	(0.0427)
3 Months	-0.226	-0.00149	-0.00166	0.0916***
	(0.496)	(0.0318)	(0.0233)	(0.0302)
6 Months	-0.376	-0.00671	-0.00281	0.0406
	(0.370)	(0.0262)	(0.0190)	(0.0250)
1 Year	0.0246	0.00586	0.00624	0.0378**
	(0.279)	(0.0152)	(0.0119)	(0.0157)
Asian				
1 Month	0.175	0.0345	-0.00543	-0.0418
	(0.412)	(0.0285)	(0.0127)	(0.0284)
3 Months	0.000115	0.0261	-0.00681	-0.0298
	(0.250)	(0.0181)	(0.00821)	(0.0185)
6 Months	-0.0352	0.0140	-0.00736	-0.00972
	(0.202)	(0.0149)	(0.00692)	(0.0150)
1 Year	-0.0302	0.00987	-5.27e-06	-0.00668
	(0.139)	(0.0106)	(.0056)	(0.0107)
Native Hawaiian or other Pacific Islander				
1 Month	-0.952	0.0766	-0.0108	-0.0253
	(1.034)	(0.0722)	(0.0486)	(0.0752)
3 Months	-0.226	0.0535	-0.0321	0.00998
	(0.950)	(0.0497)	(0.0351)	(0.0480)
6 Months	-0.178	0.0606	-0.0210	-0.00137
	(0.718)	(0.0403)	(0.0296)	(0.0489)
1 Year	0.0317	0.0351	0.00642	0.0578*
	(0.530)	(0.0314)	(0.0220)	(0.0322)
Other Race				
1 Month	0.662	0.0745**	0.00803	0.0554
	(0.644)	(0.0330)	(0.0227)	(0.0374)
3 Months	0.213	0.0394*	-0.00139	0.0147
	(0.394)	(0.0221)	(0.0148)	(0.0242)
6 Months	0.218	0.0390**	0.0127	0.0219
	(0.304)	(0.0176)	(0.0123)	(0.0185)
1 Year	0.369*	0.0416***	0.0190**	0.0349***
	(0.214)	(0.0128)	(0.00883)	(0.0134)
MultiRacial				
1 Month	0.769	-0.0175	-0.0163	-0.0679*
	(0.795)	(0.0329)	(0.0240)	(0.0353)
3 Months	-0.0428	-0.000726	-0.00610	-0.0424**
	(0.443)	(0.0215)	(0.0143)	(0.0208)
6 Months	-0.294	-0.00515	-0.00177	-0.0134
	(0.331)	(0.0171)	(0.0115)	(0.0167)
1 Year	-0.0698	-0.00777	0.00294	0.00740
	(0.222)	(0.0118)	(0.00852)	(0.0122)
Women				
1 Month	0.297*	0.0116	0.00545	0.00566
	(0.172)	(0.0103)	(0.00618)	(0.00998)
3 Months	0.220**	0.0118*	0.00975**	0.00421
	(0.108)	(0.00654)	(0.00387)	(0.00636)
6 Months	0.174**	0.00971*	0.00938***	0.0114**
	(0.0877)	(0.00538)	(0.00320)	(0.00517)
1 Year	0.0833	0.00993***	0.00759***	0.00731**
	(0.0601)	(0.00373)	(0.00224)	(0.00357)

Control variables are: a categorical variable for general health, a binary variable for sex, a categorical variable for education level and income level, number of children, a categorical variable for marital status, categorical variables for race and ethnicity, age, and year. Data is from the BRFSS data set, at the individual level, and ranges from 2015-2018 depending on the time frame specified in the table. Individuals who identify in the specified racial group are in the treated group and Non-Hispanic White individuals are in the control group. Men are in the control group and women are in the treated group. Dependent variables are listed at the top of the table. 1 month, 3 months, 6 months, and 1 year are the time frames after the election (and the independent variables of interest) and measure who is in the treated group based on the timeframe.
$^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

as being Multi-Racial. Finally, for individuals who identify as Other race, there is a 3.49 percent increase in cigarette use a year after the election. This result is not statistically significant 3 months and 6 months after the election, but is still positive. One year after the election there is a 3.58 percent increase in cigarette use.

There are statistically significant changes in mental health for women after the 2016 election. Holding all else constant, women experience a statistically significant increase of .297 poor mental health days one month after the election, .220 poor mental health days three months after the election, .174 poor mental health days six months after the election. This result is no longer statistically significant one year after the election but it does have a positive sign. There are also statistically significant increases in alcohol consumption, binge drinking, and cigarette use that coordinate with the increase in poor mental health days. For instance, three months after the election there is a 1.18 percent increase in alcohol consumption and a .975 percent increase in binge drinking for women. Even though women no longer have a statistically significant increase in poor mental health days after the election, they still experience a statistically significant increase in drinking and binge drinking. They also experience a decrease in cigarette consumption 1 year after the election.

Next, I include sensitivity checks to ensure that a violation of the parallel trends assumption is not driving the results. I run one regression with a linear pre-trend and one regression with a cubic spline pre-trend. Table A2 and A3 show these results by race and ethnicity where White individuals are in the control group. White individuals consume more alcohol and cigarettes than racial and ethnic minorities and the parallel trends assumption is violated when White individuals are in the control group. When I control for differences in pre-trends in Tables A1 and A2, most of the results are statistically insignificant across

both specifications.

The results for women were very strong in Table 3.3 without any controls for pretrends. However, these results are mostly insignificant when I add a control for linear pretrends and all insignificant when I add the control for a cubic spline pretrend. The violation of the parallel trends assumption was driving the results for women in Table 3.3 and I conclude that there are minimal significant changes in substance use or stress for women as a result of the 2016 election.

These results indicate that there is not a strong treatment effect by race or gender as a result of the 2016 election of Donald Trump. In the next table I examine the results by ethnicity. In these regression specifications, the treated group is Hispanic individuals and the control group is Non-Hispanic individuals. These results are separated by race. For instance, the portion of the table for White individuals measures the average treatment effect of the 2016 for White-Hispanic individuals compared to Non-Hispanic White individuals.

Table 3.4 indicates that there are some statistically significant changes in mental health and substance use by ethnicity. Holding all else constant, there is an increase of 3.558 poor mental health days per month for individuals who identify as Black-Hispanic one month after the 2016 election and an increase of 1.909 poor mental health days per month three months after the 2016 election. Multi-Racial Hispanic individuals experience a decrease of 4.800 poor mental health days thirty days after the election, holding all else constant.

There are no statistically significant changes in alcohol consumption. Holding all else constant, binge drinking increases by 1.06 percent one year after the election for Hispanic individuals. There are also increases in binge drinking for individuals who identify as Black-Hispanic one year after the election and for American Indian-Hispanic and Alaskan Native-

Table 3.4: Estimated Average Treatment Effects of the 2016 Election on Mental Health, Cigarette Use, and Alcohol Use for Hispanic Ethnicity by Race

Dependent Variables →	Poor Mental Health Days	Alcohol Consumption	Binge Drinking	Cigarette Consumption
Independent Variables ↓				
Hispanic-All Races				
1 Month	-0.230	-0.00225	0.0127	0.0385**
	(0.289)	(0.0163)	(0.0121)	(0.0152)
3 Months	0.138	-0.00297	0.000981	0.0301***
	(0.205)	(0.0113)	(0.00843)	(0.0105)
6 Months	0.172	0.00779	0.00450	0.0225***
	(0.164)	(0.00940)	(0.00688)	(0.00866)
1 Year	-0.00574	0.0234***	-0.0106**	0.0166***
	(0.105)	(0.00631)	(0.00441)	(0.00570)
Hispanic-White				
1 Month	-0.442	-0.00613	-0.0194	0.0370*
	(0.373)	(0.0212)	(0.0156)	(0.0193)
3 Months	0.139	-0.0134	-0.00356	0.0294*
	(0.278)	(0.0145)	(0.0109)	(0.0135)
6 Months	0.236	0.00233	-0.00177	0.0227**
	(0.227)	(0.0123)	(0.00887)	(0.0112)
1 Year	-0.0588	0.0138*	0.00392	0.00731
	(0.136)	(0.00812)	(0.00574)	(0.00742)
Hispanic-Black or African American				
1 Month	3.558**	0.0173	0.00778	0.0903
	(1.777)	(0.0691)	(0.0554)	(0.0666)
3 Months	1.909*	0.0325	0.0444	0.0567
	(1.009)	(0.0464)	(0.0330)	(0.0436)
6 Months	0.568	0.0361	0.0223	0.0405
	(0.804)	(0.0426)	(0.0304)	(0.0369)
1 Year	-0.0842	0.0333	0.0347*	0.0794***
	(0.470)	(0.0303)	(0.0200)	(0.0260)
Hispanic-American Indian or Alaskan Native				
1 Month	-1.508	-0.0970	-0.0429	0.141*
	(1.173)	(0.0851)	(0.0792)	(0.0842)
3 Months	-0.0327	0.0413	0.0767**	0.100*
	(1.022)	(0.0558)	(0.0391)	(0.0541)
6 Months	-0.223	-0.0107	0.0236	0.0491
	(0.744)	(0.0486)	(0.0398)	(0.0462)
1 Year	0.186	0.0495	-0.00892	0.0416
	(0.599)	(0.0314)	(0.0276)	(0.0325)
Hispanic-Asian				
1 Month	3.441	-0.0698		0.0955
	(2.164)	(0.187)		(0.108)
3 Months	1.061	0.00607	0.0230	0.212***
	(1.421)	(0.124)	(0.0816)	(0.0731)
6 Months	0.243	0.0390	0.00867	0.151**
	(1.239)	(0.101)	(0.0738)	(0.0664)
1 Year	0.312	0.105	0.0358	0.0443
	(1.145)	(0.0738)	(0.0533)	(0.0536)
Hispanic-Native Hawaiian or Pacific Islander				
1 Month	-0.582	0.0207	-0.103	-0.0666
	(1.803)	(0.152)	(0.153)	(0.130)
3 Months	1.902	0.0780	-0.0671	0.0324
	(2.344)	(0.110)	(0.0892)	(0.0771)
6 Months	1.864	0.0267	0.0154	0.0331
	(1.556)	(0.0784)	(0.0533)	(0.0560)
1 Year	1.324	0.0265	0.0191	0.00943
	(1.033)	(0.0568)	(0.0440)	(0.0451)
Hispanic-Other Race				
1 Month	-1.607	0.0748	0.00114	0.0887
	(1.732)	(0.0752)	(0.0755)	(0.0601)
3 Months	-0.644	-0.00796	0.0130	0.0549
	(0.999)	(0.0484)	(0.0360)	(0.0435)
6 Months	-0.229	-0.00793	-0.00251	0.00533
	(0.732)	(0.0392)	(0.0321)	(0.0376)
1 Year	-0.160	0.0312	-0.00769	0.0227
	(0.492)	(0.0291)	(0.0261)	(0.0273)
Hispanic- MultiRacial				
1 Month	-4.800***	0.150	0.0967	0.187*
	(1.570)	(0.112)	(0.0846)	(0.110)
3 Months	-0.704	-0.0112	-0.0591	-0.00926
	(1.201)	(0.0671)	(0.0611)	(0.0744)
6 Months	-0.612	0.0268	-0.00879	0.0205
	(0.883)	(0.0490)	(0.0424)	(0.0499)
1 Year	-0.412	0.0616	0.0289	0.0137
	(0.707)	(0.0402)	(0.0354)	(0.0390)

Control variables are: a categorical variable for general health, a binary variable for sex, a categorical variable for education level and income level, number of children, a categorical variable for marital status, categorical variables for race and ethnicity, age, and year. Data is from the BRFSS data set, at the individual level, and ranges from 2015-2018 depending on the time frame specified in the table. Hispanic individuals are in the treated group and Non-Hispanic individuals are in the control group. Dependent variables are listed at the top of the table. 1 month, 3 months, 6 months, and 1 year are the time frames after the election (and the independent variables of interest) and measure who is in the treated group based on the timeframe.

$^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Hispanic individuals three months after the election.

The strongest result for Hispanic individuals is an increase in cigarette consumption. Hispanic individuals experience a statistically significant increase in cigarette consumption 1 month, 3 months, 6 months, and 1 year after the 2016 election. This effect grows smaller in magnitude over time but still results in an increase in cigarette consumption of 1.66 percent over Non-Hispanic individuals a year after the election. The result is driven by a change in smoking for White-Hispanic individuals, American Indian or Alaskan Native Hispanic individuals, Asian-Hispanic individuals, and Multi-Racial Hispanic individuals. Cigarette use increased and persisted from the short run to the long run for Hispanic individuals. As of July 1, 2016 there were approximately 57.5 million Hispanic individuals living in America (United States Census Bureau, 2017). A 1.6 percent increase in cigarette use one year after the 2016 election means that there are 920,000 additional Hispanic smokers in the United States. Xu et al. (2021) estimate that, "in 2011 cigarette smoking made up about 11.7 percent of total healthcare spending, which amounted to 225 billion dollars" (p.1). In addition to direct health costs, there are indirect economic costs of cigarette use, like productivity. Smoking also has negative externalities on the environment and on other people because of secondhand smoke. It is impossible to measure the exact economic impact of the increase in smoking because we do not know the amount smoked by these new smokers or how long that they've increased their cigarette consumption for. However, we do know that there is a substantial economic cost associated with both short and long term changes in smoking behavior.

Table A4 and A5 report estimated average treatment effects with a control for linear pre-trends and non-linear pre-trends by ethnicity. Table A4 highlights that the increase in

cigarette use for Hispanic individuals compared to non-Hispanic holds 1 month, 3 months, 6 months, and 1 year after the election. This result is also positive and statistically significant in Table A4 when a cubic spline trend difference is introduced. The results in Table A4 and A5 indicate that cigarette smoking has increased for Hispanic Americans and that this result is robust.

There are also statistically significant increases in alcohol consumption in Table 3.4. There is an increase of 7.14 percent more Hispanic Americans who report drinking three months after the election, which is followed by an increase of 4.29 percent and 4.28 percent 6 months and 1 year after the election.

For the intersectional analysis I focus on the results by ethnicity because those were the primary statistically significant results in Tables 3.3 and 3.4. I estimate the model for different subpopulations based on the population of interest. I separate the analysis of Hispanic ethnicity by gender subpopulations and income subpopulations. I use the same DD estimation strategy to measure the impact of ethnicity on different genders and income groups. Table 3.5 shows the results by ethnicity and gender. In this table the results are broken up by gender the treated group is Hispanic individuals and the control group is Non-Hispanic individuals.

The results in Table 3.5 illustrate how substance use and mental health changed after the 2016 election by ethnicity. Hispanic women experience statistically significant increases in cigarette use three months, six months, and one year after the 2016 election. There is a 2.5 percent increase in smoking for Hispanic women three months after the election, followed by a 2.63 percent increase six months after the election, and a 1.59 percent increase one year after the election.

Table 3.5: Estimated Average Treatment Effects of the 2016 Election on Mental Health, Cigarette Use, and Alcohol Use for Hispanic Ethnicity by Gender

Dependent Variables →	Poor Mental Health Days	Alcohol Consumption	Binge Drinking	Cigarette Consumption
Independent Variables ↓				
Hispanic Women				
1 Month	-0.460	-0.0192	-0.0112	0.0262
	(0.434)	(0.0223)	(0.0138)	(0.0189)
3 Months	0.0952	-0.00911	0.000810	0.0251*
	(0.301)	(0.0153)	(0.00948)	(0.0128)
6 Months	0.0697	0.0142	0.00204	0.0263**
	(0.241)	(0.0131)	(0.00759)	(0.0108)
1 Year	-0.0163	0.0232***	.0108**	0.0159**
	(0.151)	(0.00862)	(.0055)	(0.00691)
Hispanic Men				
1 Month	0.0364	0.0222	-0.0108	0.0576**
	(0.375)	(0.0242)	(0.0203)	(0.0241)
3 Months	0.217	0.0117	0.00538	0.0451***
	(0.273)	(0.0166)	(0.0143)	(0.0166)
6 Months	0.307	0.00988	0.0112	0.0244*
	(0.216)	(0.0135)	(0.0118)	(0.0136)
1 Year	-0.00157	0.0276***	0.0147*	0.0206**
	(0.145)	(0.00922)	(0.00755)	(0.00902)

Control variables are: a categorical variable for general health, a binary variable for sex, a categorical variable for education level and income level, number of children, a categorical variable for marital status, categorical variables for race and ethnicity, age, and year. Data is from the BRFSS data set, at the individual level, and ranges from 2015-2018 depending on the time frame specified in the table. Hispanic individuals are in the treated group and Non-Hispanic individuals are in the control group. Dependent variables are listed at the top of the table. 1 month, 3 months, 6 months, and 1 year are the time frames after the election (and the independent variables of interest) and measure who is in the treated group based on the timeframe.

$^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Hispanic men also increase their cigarette consumption after the 2016 election. They increase their smoking by 5.76 percent immediately after the 2016 election, followed by 4.51 percent three months after the election, 2.44 percent six months after the election, and 2.06 percent one year after the election. For both Hispanic men and Hispanic women, there is a significant increase in smoking trends in the short run followed by a smaller, but still statistically significant, increase into the long run.

Table 3.6 shows the results for Hispanic compared to Non-Hispanic individuals by income group. Compared to Non-Hispanic individuals making less than 10,000 dollars, the number of poor mental health days decreases for Hispanic individuals who make less than 10,000 dollars a year. This result is statistically significant for the one month, three months, six months, and one year after the 2016 election. Poor mental health days increase by 1.820 days holding all else constant for Hispanic individuals making 35,000-50,000 dollars. One year after the election there is an increase in alcohol consumption for Hispanic individuals making 10,000-

Table 3.6: Estimated Average Treatment Effects of the 2016 Election on Mental Health, Cigarette Use, and Alcohol Use for Hispanic Ethnicity by Income

Dependent Variables →	Poor Mental Health Days	Alcohol Consumption	Binge Drinking	Cigarette Consumption
Independent Variables ↓				
Less than 10,000				
1 Month	-1.767*	0.000763	-0.0206	0.0361
	(1.068)	(0.0554)	(0.0406)	(0.0473)
3 Months	-1.529**	-0.0445	-0.0327	0.0177
	(0.675)	(0.0372)	(0.0252)	(0.0301)
6 Months	-1.498***	-0.0462	-0.0184	0.0121
	(0.539)	(0.0297)	(0.0195)	(0.0256)
1 Year	-1.035**	-0.00640	0.00534	0.00359
	(0.432)	(0.0224)	(0.0116)	(0.0159)
10,000-15,000				
1 Month	0.0135	-0.0649	-0.0173	-0.0835
	(0.977)	(0.0588)	(0.0400)	(0.0560)
3 Months	1.114	0.0101	0.0206	-0.00907
	(0.805)	(0.0407)	(0.0259)	(0.0380)
6 Months	0.933	0.0188	0.00975	0.0307
	(0.669)	(0.0353)	(0.0198)	(0.0314)
1 Year	0.509	0.0665***	0.0249**	0.0152
	(0.427)	(0.0224)	(0.0123)	(0.0180)
15,000-20,000				
1 Month	-0.787	0.0747*	0.0183	0.000736
	(0.706)	(0.0434)	(0.0311)	(0.0372)
3 Months	0.0906	0.0573*	0.0398*	0.0143
	(0.522)	(0.0328)	(0.0214)	(0.0293)
6 Months	0.575	0.0396	0.0349*	0.0209
	(0.477)	(0.0268)	(0.0179)	(0.0227)
1 Year	0.0701	0.0275	0.0124	0.0239*
	(0.304)	(0.0186)	(0.0122)	(0.0143)
20,000-25,000				
1 Month	-0.993	-0.000636	0.00586	0.00375
	(0.713)	(0.0429)	(0.0276)	(0.0379)
3 Months	0.944	-0.0228	0.00104	0.0136
	(0.726)	(0.0319)	(0.0207)	(0.0279)
6 Months	0.649	0.00672	0.00467	0.00199
	(0.546)	(0.0258)	(0.0167)	(0.0226)
1 Year	-0.223	0.0312*	0.00288	-0.00111
	(0.306)	(0.0178)	(0.0110)	(0.0154)
25,000-35,000				
1 Month	-0.843	-0.0555	0.00104	0.0583
	(0.518)	(0.0457)	(0.0260)	(0.0387)
3 Months	0.176	-0.0361	-0.00716	0.0232
	(0.474)	(0.0310)	(0.0212)	(0.0282)
6 Months	0.368	0.00404	0.00120	0.0178
	(0.390)	(0.0257)	(0.0164)	(0.0231)
1 Year	0.197	0.0334*	0.00912	-0.00315
	(0.278)	(0.0180)	(0.0110)	(0.0157)
35,000-50,000				
1 Month	1.820*	0.0104	-0.0327	0.0549
	(1.054)	(0.0457)	(0.0401)	(0.0440)
3 Months	0.908	0.0208	-0.00795	0.0281
	(0.555)	(0.0310)	(0.0228)	(0.0315)
6 Months	0.490	0.0311	-0.0110	0.0279
	(0.413)	(0.0270)	(0.0197)	(0.0263)
1 Year	-0.0177	0.0541***	0.0106	0.0167
	(0.268)	(0.0186)	(0.0126)	(0.0171)
50,000-75,000				
1 Month	0.516	0.0569	-0.0566	0.102**
	(1.094)	(0.0539)	(0.0417)	(0.0491)
3 Months	-0.401	0.0504	-0.00413	0.128***
	(0.566)	(0.0357)	(0.0235)	(0.0320)
6 Months	-0.327	0.0736***	0.00363	0.0792***
	(0.443)	(0.0280)	(0.0192)	(0.0264)
1 Year	-0.262	0.0279	.0106	0.0166***
	(0.307)	(0.0203)	(0.0126)	(0.00570)
75,000 or more				
1 Month	-0.227	0.00139	-0.0367	0.0885**
	(0.567)	(0.0417)	(0.0317)	(0.0392)
3 Months	-0.142	-0.0181	-0.00998	0.0250
	(0.407)	(0.0271)	(0.0219)	(0.0248)
6 Months	-0.0423	-0.0135	0.00380	0.00781
	(0.323)	(0.0216)	(0.0174)	(0.0209)
1 Year	0.00369	0.00774	0.00813	0.0137
	(0.198)	(0.0147)	(0.0111)	(0.0142)

Control variables are: a categorical variable for general health, a binary variable for sex, a categorical variable for education level and income level, number of children, a categorical variable for marital status, categorical variables for race and ethnicity, age, and year. Data is from the BRFSS data set, at the individual level, and ranges from 2015-2018 depending on the time frame specified in the table. Hispanic individuals are in the treated group and Non-Hispanic individuals are in the control group. Dependent variables are listed at the top of the table. 1 month, 3 months, 6 months, and 1 year are the time frames after the election (and the independent variables of interest) and measure who is in the treated group based on the timeframe.

$^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

15,000 dollars, 20,000-25,000 dollars, 25,000-35,000 dollars, and 35,000-50,000. Hispanic individuals who make 10,000-15,000 dollars a month increase their binge drinking by 2.49 percent over Non-Hispanic individuals making 10,000-15,000 dollars a month one year after the election. Similarly, Hispanic individuals making 15,000-20,000 dollars a year also increase their binge drinking three months and six months after the election. For Hispanic individuals making 50,000-75,000 cigarette consumption increases one month (a 10.2 percent increase), three months (a 12.8 percent increase), six months (a 7.92 percent increase), and one year(a 1.66 percent increase) after the 2016 election.

Intersections of identity are very important when analyzing the results. For instance, Table A4 shows that Black Hispanic Americans, Asian Hispanic Americans, Native Hawaiian or other Pacific Islander Hispanic Americans all had statistically insignificant increases in poor mental health following the 2016 election. However, poor mental health may have declined for White Hispanic Americans, American Indian or Alaskan Native Hispanic Americans, and Other Race Hispanic Americans following the 2016 election. Both race and ethnicity are important in determining someone's measure of their perceived discrimination.

In addition to an intersectional analysis, a regional analysis is also important to determine the impact of the 2016 election on the Hispanic community. I use population data from the United States Census Bureau to separate individuals into four different quartiles based on the Hispanic population in their state. For instance, if an individual lives in a state where more than 18.812 percent of the state's population identifies as Hispanic, they would be in the top quartile group. I use the same methodology as in equation 9 to examine the average treatment effect by quartile group. These regressions give insight into the relationship between community identity and individual identity after the 2016 election.

Table 3.7: Estimated Average Treatment Effects of the 2016 Election on Mental Health, Cigarette Use, and Alcohol Use for Hispanic Ethnicity by Hispanic Percentage Quartilies

Dependent Variables →	Poor Mental Health Days	Alcohol Consumption	Binge Drinking	Cigarette Consumption
Independent Variables ↓				
Top Quartile				
Greater than 18.812% Hispanic				
1 Month	-0.415*	0.00435	-0.0148	0.0265
	(0.224)	(0.0209)	(0.0159)	(0.0195)
3 Months	0.0418	0.00363	-0.000810	0.0188
	(0.270)	(0.0150)	(0.0114)	(0.0142)
6 Months	0.0739	0.0108	0.00441	0.0132
	(0.215)	(0.0126)	(0.00936)	(0.0118)
1 Year	-0.0958	0.0304***	0.0150***	0.0117
	(0.135)	(0.00820)	(0.00568)	(0.00743)
2nd Quartile				
Greater than 10.39% less than 18.812% Hispanic				
1 Month	-0.493	-0.0380	-0.0311	0.0447
	(0.390)	(0.0413)	(0.0268)	(0.0400)
3 Months	-0.00798	-0.0143	-0.00785	0.0305
	(0.383)	(0.0237)	(0.0165)	(0.0222)
6 Months	0.111	-0.00605	-0.0120	0.0325**
	(0.311)	(0.0183)	(0.0132)	(0.0164)
1 Year	-0.0795	0.0158	-0.00343	0.0250**
	(0.216)	(0.0133)	(0.00923)	(0.0118)
3rd Quartile				
Greater than 5.200% less than 10.387% Hispanic				
1 Month	0.190	-0.0476	-0.00648	0.0566
	(0.422)	(0.0386)	(0.0296)	(0.0371)
3 Months	0.400	-0.0520**	-0.00520	0.0835***
	(0.406)	(0.0250)	(0.0187)	(0.0215)
6 Months	0.623*	-0.0141	0.00596	0.0630***
	(0.368)	(0.0213)	(0.0159)	(0.0186)
1 Year	0.367	0.00778	-0.0113	0.0307**
	(0.248)	(0.0148)	(0.0113)	(0.0132)
Bottom Quartile				
Less than 5.200% Hispanic				
1 Month	0.939	-0.0237	-0.0372	0.0717
	(0.719)	(0.0645)	(0.0414)	(0.0707)
3 Months	0.616	0.0238	0.0122	0.0765*
	(0.847)	(0.0418)	(0.0265)	(0.0413)
6 Months	0.715	0.0311	0.0166	0.0810**
	(0.709)	(0.0352)	(0.0221)	(0.0341)
1 Year	0.492	0.0197	0.00890	0.0534**
	(0.474)	(0.0254)	(0.0162)	(0.0241)

Control variables are: a categorical variable for general health, a binary variable for sex, a categorical variable for education level and income level, number of children, a categorical variable for marital status, categorical variables for race and ethnicity, age, and year. Data is from the BRFSS data set, at the individual level, and ranges from 2015-2018 depending on the time frame specified in the table. Hispanic individuals are in the treated group and Non-Hispanic individuals are in the control group. Dependent variables are listed at the top of the table. 1 month, 3 months, 6 months, and 1 year are the time frames after the election (and the independent variables of interest) and measure who is in the treated group based on the timeframe.

$^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 3.7 shows the estimated average treatment effects by Hispanic percentage. The results highlight that states where Hispanic people make up less than 10.38% of the population experience statistically significant increases in cigarette use. The magnitude of the statistically significant results varies from an increase in cigarette consumption of 3.07 percent one year after the election for the 3rd quartile, to an increase in cigarette consumption of 8.35 percent three months after the election for the 3rd quartile. This effect corresponds with an increase in poor mental health days. The only statistically significant increase in poor mental health days is an increase of .623 poor mental health days six months after the 2016 election. The positive signs across all time periods indicate that the election may have worsened poor mental health for the bottom quartiles after the 2016 election. Hispanic individuals who lived in states with higher numbers of Hispanic populations were not as negatively impacted by the 2016 election. These individuals may feel less isolated because there are more Hispanic people living around them. This can cause them to have better stress coping mechanisms as a result of increased in-group support. Unfortunately, in states where there are lower proportions of the population that are Hispanic, Hispanic individuals have less in-group support and turn to unhealthier stress coping mechanisms to deal with increased stress from the 2016 election.

As a final robustness check I look at the mental health and substance use results for states where Hispanic and Latino/a/x voter had higher rates of voting for Donald Trump. In North Carolina 39 percent of the Latino population voted for Trump (Sonneland & Fleischner, 2016). This was followed by, Michigan where 38 percent of the Latino population voted for Donald Trump, Florida where 35 percent of the population voted for Trump, Texas where 34 percent of the population voted for Trump, and New Mexico where 33 percent of the

population voted for Trump. In Michigan and North Carolina Latino voters only make up 5 percent of the voting population, whereas in Florida they make up 18 percent of the voting population, Texas they make up 24 percent of the voting population, and in New Mexico they make up 40 percent of the voting population. The effect of the 2016 election on mental health and substance use should be smaller in states where more Latino and Hispanic Americans voted for Donald Trump (Sonneland & Fleischner, 2016).

Table 3.8: Average Treatment Effects of the 2016 election for Hispanic Americans who Live in the Five States with the Highest Voting Shares for Trump

Dependent Variables →	Poor Mental Health Days	Alcohol Consumption	Binge Drinking	Cigarette Consumption
Independent Variables ↓				
1 Month	-0.0459	-0.109**	-0.0670*	-0.0311
	(0.8420)	(0.0435)	(0.0398)	(0.0414)
3 Month	0.385	-0.00813	0.0169	0.00965
	(0.490)	(0.0265)	(0.0213)	(0.0256)
6 Months	0.395	0.0135	0.00227	0.0140
	(0.365)	(0.0213)	(0.0172)	(0.0202)
1 Year	0.177	0.0300**	0.00890	0.0104
	(0.227)	(0.0136)	(0.0104)	(0.0125)

The five states that had the highest share of the Hispanic population that voted for Donald Trump are 1. North Carolina (39 percent of the Latino population voted for Trump). 2. Michigan (38 percent of the Latino population voted for Trump) 3. Florida (Florida where 35 percent of the Latino population voted for Trump) 4. Texas (34 percent of the Latino population voted for Trump) 5. New Mexico (33 percent of the Latino population voted for Trump). (Sonneland & Fleischner, 2016). Control variables are: a categorical variable for general health, a binary variable for sex, a categorical variable for education level and income level, number of children, a categorical variable for marital status, categorical variables for race and ethnicity, age, and year. Data is from the BRFSS data set, at the individual level, and ranges from 2015-2018 depending on the time frame specified in the table. Hispanic individuals are in the treated group and Non-Hispanic individuals are in the control group. Dependent variables are listed at the top of the table. 1 month, 3 months, 6 months, and 1 year are the time frames after the election (and the independent variables of interest) and measure who is in the treated group based on the timeframe.
$^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

The results show that the states with the highest Latino share voting for Trump have no statistically significant changes in cigarette use. The results from Table 3.4 are being driven by states that had lower voting shares for Donald Trump in the 2016 election. There is a 10.9 percent decrease in alcohol use and a 6.7 percent decrease in binge drinking 30 days after the election for Hispanic individuals in these states. This corresponds with a statistically insignificant decrease in poor mental health days. This robustness check further supports that increased cigarette use for Hispanic individuals occurs in states where Donald Trump had less support.

There are a few shortcomings of this paper. First, the dataset clusters all Latino/a/x and

Hispanic individuals together. Donald Trump's rhetoric was primarily focused on Mexican individuals and the increase in smoking may be stronger for Mexican Americans and Mexican immigrants as a result of that rhetoric. A second shortcoming of the paper is that there is only one survey question about mental health. Mental health is complicated and has many different components, and having more specific questions about mental health would have shown the mechanism for the result more clearly. A third shortcoming of the paper is that there is no question about immigrant status. Hispanic and Latino/a/x immigrants were the most frequent target in Donald Trump's rhetoric. Examining these regressions by immigrant status would be an important addition in future work. A final shortcoming is that the paper only examines the impact of the election, and not the impact of policy changes when Trump takes office. Trump issued a number of executive orders that might have influenced Latino/a/x and Hispanic communities at the beginning of his term. The purpose of this paper is to examine how rhetoric and not policy impact substance use for targeted groups. The one month and three month values do not pick up the impact of policy because Donald Trump did not take office until 11 weeks after the election. However, the six month and one year variables could be picking up some of the impact of policy. I also emphasize the trends in cigarette use and if they continue after the three month mark to examine the long term impact of the 2016 election. I don't focus on long run effects (+1 year) because I do not want to pick up on the impact of policy changes from Donald Trump's term. This in combination with a difference in differences estimation strategy should address the issue sufficiently.

8 Conclusion

In this paper I examine the impact of the 2016 election on a number of health behaviors. The 2016 election was one of the most polarizing elections in recent history because Donald Trump used inflammatory rhetoric against underrepresented racial and ethnic minorities and women. This paper models the impact of his election as a stress shock using Becker and Murphy (1988) as the foundation of the model. This shock, created by an increase in perceived discrimination, creates an increase in substance use due to an increasing addictive stock for individuals who do not have strong stress coping mechanisms.

The results show that there was a change in perceptions for Hispanic and Latino individuals about their place in America after the 2016 election. The difference in differences estimation strategy indicates that Hispanic individuals experienced an increase in cigarette use following the 2016 election. It is clear that peoples ethnic identity played an important role in substance use following the 2016 election. The results also showed that alcohol use and cigarette use often move in the same direction. For instance, there is often a decrease in alcohol use, binge drinking, and cigarette use for the same group in the same time period. This indicates that alcohol and cigarettes are complements and not substitutes.

There are several policy implications from this paper. The first is that discriminatory rhetoric from people in power does make a difference to their constituents. Not only should politicians be mindful of their rhetoric, but we also need to be conscious about how controversial individuals retain power in their positions and in the media. Secondly, available health support for individuals who experience increases in perceived discrimination or discrimination need to be made readily available. This paper, in addition to a well documented

literature, illustrate the clear link between discrimination and health. Providing social support for impacted communities after discriminatory events is important. Finally, my results suggest that an increase in discrimination can increase risky behavior. When large scale events occur that increase perceived discrimination or stress for a specific group, mental health resources need to be given to those individuals. Increases in risky behavior only occur because individuals either do not or cannot cope with the increased levels of stress. Of course, policies that increase the accessibility of health care for minority groups are also essential so that individuals can access resources for substance use disorders and resources to help address and overcome stress from discrimination.

References

Anuta, D., Churchin, J., & Luo, J. (2017). Election bias: Comparing polls and twitter in the 2016 u.s. election.

Armijos Bravo, G., & Vall Castelló, J. (2021). Terrorist attacks, islamophobia and newborns' health. *Journal of Health Economics*, *79*, 102510. https://doi.org/https://doi.org/10.1016/j.jhealeco.2021.102510

Balsa, A. I., & McGuire, T. G. (2001). Statistical discrimination in health care. *Journal of health economics*, *20*(6), 881–907. https://doi.org/https://doi.org/10.1016/s0167-6296(01)00101-1

Balsa, A. I., McGuire, T. G., & Meredith, L. S. (2005). Testing for statistical discrimination in health care. *Health services research*, *40*(1), 227–252. https://doi.org/https://doi.org/10.1111/j.1475-6773.2005.00351.x

Banks, K., Kohn-Wood, L., & Spencer, M. (2007). An examination of the african american experience of everyday discrimination and symptoms of psychological distress. *Community mental health journal*, *42*, 555–70. https://doi.org/10.1007/s10597-006-9052-9

Becker, G. S. (1957). *The economics of discrimination*. University of Chicago Press.

Becker, G. S., & Murphy, K. M. (1988). A theory of rational addiction. *Journal of Political Economy*, *96*(4), 675–700. http://www.jstor.org/stable/1830469

Bilinski, A., & Hatfield, L. A. (2019). Nothing to see here? non-inferiority approaches to parallel trends and other model assumptions. *ArXiv*, 1–64. https://arxiv.org/abs/1805.03273v5

Chavez, L., Campos, B., Corona, K., Sanchez, D., & Ruiz, C. (2019). Words hurt: Political rhetoric, emotions/affect, and psychological well-being among mexican-origin youth. *UC Irvine*. https://doi.org/http://dx.doi.org/10.1016/j.socscimed.2019.03.008

Costella, M. B. (2016). Teaching the 2016 election: The trump effect-the impact of the presidential campaign on our nation's schools. *Southern Poverty Law Center*.

Cunha, R., & Kern, A. (2018). Us political shocks, global banks, and international financial markets: Evidence from the 2016 presidential election. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3116303

Edwards, G. S., & Rushin, S. (2018). The effect of president trump's election on hate crimes. https://ssrn.com/abstract=3102652%20or%20http://dx.doi.org/10.2139/ssrn.3102652

Friedman, A. S. (2020). Smoking to cope: Addictive behavior as a response to mental distress. *Journal of Health Economics*, *72*, 102323. https://doi.org/https://doi.org/10.1016/j.jhealeco.2020.102323

Gabbatt, A. (2015). Donald trump's tirade on mexico's 'drugs and rapists' outrages us latinos. *The Guardian*. Retrieved March 13, 2022, from https://www.theguardian.com/us-news/2015/jun/16/donald-trump-mexico-presidential-speech-latino-hispanic

Gemmill, A., Catalano, R., Casey, J., Karasek, D., Alcalá, H., Elser, H., & Torres, J. (2019). Association of preterm births among us latina women with the 2016 presidential election. *JAMA Network Open*, *2*, e197084. https://doi.org/10.1001/jamanetworkopen.2019.7084

Gibbons, F., Gerrard, M., Cleveland, M., Wills, T., & Brody, G. (2004). Perceived discrimination and substance use in african american parents and their children: A panel study. *Journal of personality and social psychology*, *86*, 517–29. https://doi.org/10.1037/0022-3514.86.4.517

Hswen, Y., Qin, W., Q., D. R., K., Viswanath, Subramanian, S. V., & Brownstein, J. S. (2020). Online negative sentiment towards mexicans and hispanics and impact on mental well-being: A time-series analysis of social media data during the 2016 united states presidential election. *Heliyon*, *6*. https://doi.org/https://doi.org/10.1016/j.heliyon.2020.e04910

Jacobson, G. C. (2017). The triumph of polarized partisanship in 2016: Donald trump's improbable victory. *Political Science Quarterly*, *132*(1), 9–41. https://doi.org/https://doi.org/10.1002/polq.12572

Johnston, D. W., & Lordan, G. (2012). Discrimination makes me sick! an examination of the discrimination–health relationship. *Journal of Health Economics*, *31*(1), 99–111. https://doi.org/https://doi.org/10.1016/j.jhealeco.2011.12.002

Kiley, J. (2016). Majorities of women, men say trump has little or no respect for women. *Pew Research Center*. https://www.pewresearch.org/fact-tank/2016/11/04/trump-respect-for-women/

Krupenkin, M., Rothschild, D., Hill, S., & Yom-Tov, E. (2019). President trump stress disorder: Partisanship, ethnicity, and expressive reporting of mental distress after the 2016 election. *SAGE Open*, *9*, 215824401983086. https://doi.org/10.1177/2158244019830865

Laporte, A., Dass, A. R., & Ferguson, B. (2017). Is the rational addiction model inherently impossible to estimate? *Journal of health economics*, *54*, 161–175.

Lee, J. J., & Zhou, Y. (2020). How do latino immigrants perceive the current sociopolitical context? identifying opportunities to improve immigrant health in the united states. *Journal of Social Policy*, *49*(1), 167–187. https://doi.org/10.1017/S0047279419000163

Lohr, S., & Singer, N. (2016). How data failed us in calling an election. *The New York Times*. https://www.nytimes.com/2016/11/10/technology/the-data-said-clinton-would-win-why-you-shouldnt-have-believed-it.html?_r=0

Lorenzo-Blanco, E., Unger, J., Oshri, A., Baezconde-Garbanati, L., & Soto, D. (2016). Profiles of bullying victimization, discrimination, social support, and school safety: Links with latino/a youth acculturation, gender, depressive symptoms, and cigarette use. *The American journal of orthopsychiatry*, *86*, 37–48. https://doi.org/10.1037/ort0000113

McCabe, S., Bostwick, W., Hughes, T., West, B., & Boyd, C. (2010). The relationship between discrimination and substance use disorders among lesbian, gay, and bisexual adults in the united states. *American journal of public health*, *100*, 1946–52. https://doi.org/10.2105/AJPH.2009.163147

McGuire, T. G., Ayanian, J. Z., Ford, D. E., Henke, R. E. M., Rost, K. M., & Zaslavsky, A. M. (2008). Testing for statistical discrimination by race/ethnicity in panel data for depression treatment in primary care. *Health Services Research*, *43*(2), 531–551. https://doi.org/https://doi.org/10.1111/j.1475-6773.2007.00770.x

Mefford, M. T., Mittleman, M. A., Li, B. H., Qian, L. X., Reynolds, K., Zhou, H., Harrison, T. N., Geller, A. C., Sidney, S., Sloan, R. P., Mostofsky, E., & Williams,

D. R. (2020). Sociopolitical stress and acute cardiovascular disease hospitalizations around the 2016 presidential election. *Proceedings of the National Academy of Sciences*, *117*(43), 27054–27058. https://doi.org/10.1073/pnas.2012096117

Morey, B. N. (2018). Mechanisms by which anti-immigrant stigma exacerbates racial/ethnic health disparities [PMID: 29470116]. *American Journal of Public Health*, *108*(4), 460–463. https://doi.org/10.2105/AJPH.2017.304266

Mulia, N., Ye, Y., Zemore, S. E., & Greenfield, T. K. (2008). Social disadvantage, stress, and alcohol use among black, hispanic, and white americans: Findings from the 2005 u.s. national alcohol survey [PMID: 18925340]. *Journal of Studies on Alcohol and Drugs*, *69*(6), 824–833. https://doi.org/10.15288/jsad.2008.69.824

Pascoe, E. A., & Smart Richman, L. (2009). Perceived discrimination and health: A meta-analytic review. *Psychological Bulletin*, *135*(4), 531–554. https://doi.org/https://doi.org/10.1037/a0016059

Patrick, M., & Schulenberg, J. (2013). Prevalence and predictors of adolescent alcohol use and binge drinking in the united states. *Alcohol research : current reviews*, *35*, 193–200.

Pinto, S., Bencsik, P., Chuluun, T., & Graham, C. (2021). Presidential Elections, Divided Politics, and Happiness in the USA. *Economica*, *88*(349), 189–207. https://doi.org/10.1111/ecca.12349

Siddiqi, A., Sod-Erdene, O., Hamilton, D., Cottom, T. M., & Darity, W. (2019). Growing sense of social status threat and concomitant deaths of despair among whites. *SSM - Population Health*, *9*, 100449. https://doi.org/https://doi.org/10.1016/j.ssmph.2019.100449

Sonneland, H. K., & Fleischner, N. (2016). Chart: How u.s. latinos voted in the 2016 presidential election. *AS/COA*. https://www.as-coa.org/articles/chart-how-us-latinos-voted-2016-presidential-election

Stress in america. (2017). *American Psychological Association (APA)*. https://www.apa.org/news/press/releases/stress

Stress in america. (2007-2020). *American Psychological Association (APA)*. https://www.apa.org/news/press/releases/stress

Sun, Y., Qiao, K., & Wang, S. (2021). Uncertainty shocks of trump election in an interval model of stock market. *Quantitative Finance*, *21*(5), 865–879. https://doi.org/10.1080/14697688.2020.1800070

Tran, A., Lee, R., & Burgess, D. (2010). Perceived discrimination and substance use in hispanic/latino, african-born black, and southeast asian immigrants. *Cultural diversity ethnic minority psychology*, *16*, 226–36. https://doi.org/10.1037/a0016344

United States Census Bureau. (2017). Facts for features: Hispanic heritage month 2017. *RELEASE NUMBER CB17-FF.17*. https://www.census.gov/newsroom/facts-for-features/2017/hispanic-heritage.html

Wagner, A. F., Zeckhauser, R. J., & Ziegler, A. (2018). Unequal rewards to firms: Stock market responses to the trump election and the 2017 corporate tax reform. *AEA Papers and Proceedings*, *108*, 590–96. https://doi.org/10.1257/pandp.20181091

Walde, K. (2018). Stress and coping - an economic approach. *CESifo Working Paper Series No. 6966*. https://ssrn.com/abstract=3185975

Weinberger, A. H., Giovenco, D. P., Zhu, J., Lee, J., Kashan, R. S., & Goodwin, R. D. (2019). Racial/ethnic differences in daily, nondaily, and menthol cigarette use and

smoking quit ratios in the united states: 2002 to 2016. *Preventive Medicine*, *125*, 32–39. https://doi.org/https://doi.org/10.1016/j.ypmed.2019.04.009

Werner, R. M. (2004). Testing theories of discrimination in health care: Evidence from new york's cabg report card. *Dissertations available from ProQuest*, *AAI3152124*. https://repository.upenn.edu/dissertations/AAI3152124

Westwood, S. J., Messing, S., & Lelkes, Y. (2020). Projecting confidence: How the probabilistic horse race confuses and demobilizes the public. *The Journal of Politics*, *82*(4), 1530–1544. https://doi.org/10.1086/708682

Williams, D. R., & Medlock, M. M. (2017). Health effects of dramatic societal events — ramifications of the recent presidential election [PMID: 28591522]. *New England Journal of Medicine*, *376*(23), 2295–2299. https://doi.org/10.1056/NEJMms1702111

Williams, D., Spencer, M., & Jackson, J. (1999). Race stress and physical health: The role of group identity. In R. Contrada & R. Ashmore (Eds.), *Self, social identity and physical health: Interdisciplinary explorations* (pp. 71–100). Oxford University Press.

Xu, X., Shrestha, S. S., Trivers, K. F., Neff, L., Armour, B. S., & King, B. A. (2021). U.s. healthcare spending attributable to cigarette smoking in 2014. *Preventive Medicine*, *150*, 106529. https://doi.org/https://doi.org/10.1016/j.ypmed.2021.106529

Appendix

1 Calculation of First Order Condition

First I transform the stochastic differential equation for stress into an integral equation:

$$Z(t) = Z_0 + \int_0^t \phi \frac{p}{b} Z_s - \delta_0 Z_s - \delta_1 m_s ds - \int_0^t \chi g_s dq_{gs} - \int_0^t \Delta_s d_{\Delta s} \tag{1}$$

and the new consumption stock equation is:

$$S_{t+1} = (1-\gamma)S_t + c_t + Z_0 + \int_0^t \phi \frac{p}{b} Z_s - \delta_0 Z_s - \delta_1 m_s ds - \int_0^t \chi g_s dq_{gs} - \int_0^t \Delta_s d_{\Delta s} \tag{2}$$

and this simplifies to:

$$\frac{\partial S_{t+1}}{\partial Z(t)} = \frac{\partial}{\partial Z(t)} \int_0^t \phi \frac{p}{b} Z_s - \delta_0 Z_s - \delta_1 m_s ds + 0 \tag{3}$$

This gives:

$$\frac{\partial S_{t+1}}{\partial Z(t)} = \frac{\phi \frac{p}{b} Z_s - \delta_0 Z_s}{Z'(t)} \tag{4}$$

2 Tables and Figures

Table A1 Chapter 2: Information about Kingpin Captures

DTO Association	Kingpin Name	Category	Date of Capture	Municipality and Federal Entity of Capture	Source and Notes
Sinaloa Cartel	Vicente Zambada Niebla	Son of Leader	3/19/2009	Mexico City	Mexico captures high-level cartel member. (2009). NBC News. Retrieved June 8, 2021, from https://www.nbcnews.com/id/wbna29773111
Gulf Cartel	Hector Manuel Sauceda Gamboa	Leader	2/17/2009	Reynosa,Tamaulipas	Minehan, E. B., Cedillo, A., & Axolote. (n.d.). Mexico's mass disappearances and the drug war (ayotzinapa: The missing 43 students) : Drug war timeline 1930-2015. *University of Wisconsin-Madison Libraries Research Guides*. Retrieved June 7, 2021, from https://researchguides.library.wisc.edu/c.php?g=560513&p=3904772#The%20War%20on%20Drugs%20in%20Mexico
Familia Michoacana	Arnoldo Rueda Medina	Leader	7/11/2009	Morelia, Michoacan	Grinberg, E., & Trevino, M. (2009). Mexican police, soldiers killed in multicity attacks by drug gang. CNN. Retrieved June 9, 2021, from http://edition.cnn.com/2009/WORLD/americas/07/11/mexico.attack/index.html
Beltran Leyva Cartel	Carlos Beltran Leyva	Leader	1/1/2010	Culiacan, Sinaloa	Wilkinson, T. (2010). Capture of carlos beltran leyva is another blow to mexico's most violent drug-smuggling gang. Los Angeles Times. Retrieved June 9, 2021, from https://www.latimes.com/archives/la-xpm-2010-jan-03-la-fg-mexico-beltran3-2010jan03-story.html

Table A1 Chapter 2: Information about Kingpin Captures (Continued)

Gulf Cartel	Antonio Ezequiel Cardenas Guillen	Leader	11/5/2010	Matamoros, Tamaulipas	Cordoba, J. d. (2010). Key mexican drug gure killed. The Wall Street Journal. Retrieved June 9, 2021, from https://www.wsj.com/articles/SB10001424052748704353504575597202442560046
Los Zetas	Flavio Mendez Santiago	Leader	1/18/2011	Villa de Etla, Oaxaca	Archibold, R. (2011). Mexican gang kingpin arrested. The New York Times. Retrieved June 9, 2021, from https://www.nytimes.com/2011/01/19/world/americas/19mexico.html
Los Zetas	Sergio Mora Cortes	Lieutenant	2/27/2011	Saltillo, Coahuila	Castillo, M. (2011). Mexico targets cell accused of agent's killing. CNN. Retrieved June 9, 2021, from http://www.cnn.com/2011/WORLD/americas/02/28/mexico.agent/index.html
La Familia Michoacana	Jose de Jesus Mendez Vargas	Leader	6/21/2011	Aguascalientes	La familia cartel boss' mendez vargas held in mexico. (2011). BBC. Retrieved June 10, 2021, from https://www.bbc.com/news/world-latin-america-13869573
Los Zetas	Jesus Enrique Rejon Aguilar	Leader	7/4/2011	Atizapan de Zaragoza, State of Mexico)	Mexico arrests 'top leader of zetas drug gang'. (2011). BBC. Retrieved June 10, 2021, from https://www.bbc.com/news/world-latin-america-14019264
Arellano-Felix	Armando Villarreal Heredia	Lieutenant	7/11/2011	Hermosillo, Sonora	Dibble, S. (2011). Suspected drug tra cker caught in mexico. San Diego Union Tribune. Retrieved June 10, 2021, from https://www.sandiegouniont

Table A1 Chapter 2: Information about Kingpin Captures (Continued)

					ribune.com/news/borderbaja-california/sdut-top-sanchez-arellano-drug-suspect-caught-mexico-2011jul11-story.html
Juarez Cartel	Jose Antionio Acosta Hernandez	Leader	7/31/2011	Ciudad Juarez, Chihuahua	Mexican police capture key ju arez kingpin. (2011). The Guardian. Retrieved June 10, 2021, from https://www.theguardian.com/world/2011/aug/01/mexican-police-capturejuarez-kingpin
La Mono con Ojos cartel	Oscar Garcia Montoya	Leader	8/12/2011	Tlalpen Mexico City	El compayito arrested despite alleged police violations. (2011). Justice in Mexico. Retrieved June 8, 2021, from https : / / justiceinmexico . org / el - compayito - arrested - despite - alleged-police-violation/
Sinaloa Cartel (operations in Guerrero)	Jose carlos Moreno Flores	Lieutenant	9/19/2011	Mexico City, Tlalpan district	Romo, R., & Senior Latin American A airs Editor. (2011). Major mexican drug lord captured. CNN. Retrieved June 9, 2021, from https://www.cnn.com/2011/09/19/world/americas/mexico-drug-lord/index.html
Sinaloa Cartel	Noel Salgueiro Nevarez	Lieutenant	10/5/2011	Culiacan, Sinaloa	Mexico arrests senior sinaloa drugs cartel suspect. (2011). BBC. Retrieved June 11, 2021, from https://www.bbc.com/news/world-latin-america-15191299
La Familia Michoacana	Martin Rosales Magana	Leader	10/5/2011	Culican, Sinaloa	Mexico arrests senior sinaloa drugs cartel suspect. (2011). BBC. Retrieved June 11, 2021, from https://www.bbc.com/news/

Table A1 Chapter 2: Information about Kingpin Captures (Continued)

					world-latin-america-15191299
Los Zetas	Carlos Olvia Castillo	Third ranking member	10/14/2011	Saltillo, Coahuilla'	Mexico arrests a key leader of zetas gang. (2011). Los Angeles Times. Retrieved June 10, 2021, from https://www.latimes.com/world/la-xpm-2011-oct-14-la-fg-mexico-zetas-20111014-story.html
Los Zetas	Raul Lucio Hernandez Lechuga	Leader	12/12/2011	Cordoba, Veracruz	Mexico zeta drug gang leader 'el lucky' arrested. (n.d.). BBC. Retrieved June 10, 2021, from https://www.bbc.com/news/world-latin-america-16153481
Pacific Cartel in Durango/Chihuahua (Subset of Sinaloa cartel)	Felipe Cabrera Sarabia	Lieutenant	12/23/2011	Culiacan, Sinaloa	CNN Wire Staff. (2011). Mexico says it captures drug-lord's top lieutenant. CNN. Retrieved June 9, 2021, from https://www.latimes.com/world/la-xpm- 2011- oct- 14- la- fgmexico-zetas-20111014-story.html

Table A2 Chapter 2: Information about DTO State Location

Location Information

Cartel	Primary Locations in 2011-2012	Notes
Los Zetas	• Nuevo Leon • Tamaulipas • Veracruz • Tobesco • Campeche • Yucatan • Coahuila	Broke away from Gulf Cartel in February 2010 and were able to gain much of the land from Gulf cartel and other cartels because of military tactics
La Familia Michoacana	• Michoacan	Severely weakened cartel by 2011 with major leaders being captured
Sinaloa Cartel	• Sonora • Sinaloa • Durango • Chihuahua • Jailisco • Nayarit	Also known as Guzman Loera organization, Pacific cartel
Juarez Cartel	• Chihuahua	
Arellano-Felix (Tijuana)	• Baja California (TJ)	
La Mono con Ojos cartel	• Mexico City	Broke off from Beltran Leyva cartel

Source: DEA, May 2011, adopted by CRS (map in outline)

Table A3 Chapter 2: Sensitivity Check for the Average Treatment Effects of kingpin captures on Cigarette Use in the Location of Capture

DTO-controlled municipalities omitted from analysis:	(1) Zetas	(2) Sinaloa	(3) La Familia	(4) Beltran Leyva	(5) Gulf	(6) Juarez	(7) Tijuana
Adults							
Short Run Effects by Municipality For Cigarette Use							
Amount Smoked	0.0363	0.143	0.183	0.0356	0.00478	-0.0109	0.170
	(0.953)	(0.991)	(0.818)	(0.987)	(0.945)	(0.998)	(0.807)
Frequency Smoked	0.0949	-0.0216	0.0551	-0.0178	0.0893	-0.0128	0.0551
	(0.107)	(0.109)	(0.0925)	(0.105)	(0.104)	(0.108)	(0.0906)
Age Started Smoking	-0.292	-0.0762	-0.306	-0.223	-0.208	-0.292	-0.352
	(0.518)	(0.615)	(0.491)	(0.605)	(0.512)	(0.617)	(0.482)
Smoked 100 Cigarettes in Life	0.00803	0.00981	0.000623	-0.00707	0.00543	-0.000986	-0.00380
	(0.0341)	(0.0322)	(0.0309)	(0.0324)	(0.0345)	(0.0323)	(0.0309)
Cigarettes Smoked Per Day	0.276	0.418	0.342	0.463	0.346	0.353	0.441
	(0.982)	(0.997)	(0.829)	(0.998)	(0.972)	(0.998)	(0.815)
Current Smokers	0.0807**	0.0291	0.0581*	0.0310	0.0833**	0.0276	0.0613*
	(0.0380)	(0.0384)	(0.0337)	(0.0366)	(0.0373)	(0.0378)	(0.0332)
Medium Run Effects by Municipality for Cigarette Use							
Amount Smoked	-3.254	-0.928	0.172	0.687	3.359**	0.460	0.0959
	(2.544)	(1.441)	(1.548)	(1.305)	(1.511)	(1.349)	(1.542)
Frequency Smoked	0.611***	-0.0759	-0.327**	-0.0658	-0.227**	-0.0284	-0.343**
	(0.170)	(0.154)	(0.138)	(0.147)	(0.110)	(0.152)	(0.138)
Age Started Smoking	-1.212	-0.549	-0.586	-0.371	4.298***	-0.131	-0.156
	(0.974)	(1.037)	(1.274)	(1.065)	(0.710)	(1.129)	(1.261)
Smoked 100 Cigarettes in Life	0.0511	-0.0293	-0.0396	-0.00542	0.453***	0.00661	-0.0414
	(0.0717)	(0.0444)	(0.0529)	(0.0442)	(0.0353)	(0.0442)	(0.0524)
Cigarettes Smoked Per Day	-3.484	0.488	1.998*	1.074	6.760***	0.584	1.727*
	(2.550)	(1.059)	(1.056)	(1.189)	(0.821)	(1.178)	(1.042)
Current Smokers	0.132*	-0.0490	-0.0920	-0.0289	0.363***	-0.0296	-0.104
	(0.0733)	(0.0629)	(0.0706)	(0.0630)	(0.0448)	(0.0725)	(0.0704)
Adolescents							
Short Run Effects by Municipality For Cigarette Use							
Amount Smoked	4.911**	5.425***	-0.395	6.516***	5.384***	5.289***	5.314***
	(2.044)	(1.818)	(1.200)	(1.734)	(1.887)	(1.873)	(1.863)
Current Smokers	0.187*	0.178*	0.0319	0.179	0.185*	0.166	0.164
	(0.106)	(0.108)	(0.124)	(0.113)	(0.106)	(0.107)	(0.107)
Age Started Smoking	-0.170***	-0.182***	-0.116	-0.164**	-0.177***	-0.158**	-0.160**
	(0.0652)	(0.0617)	(0.0780)	(0.0678)	(0.0660)	(0.0726)	(0.0727)
Frequency Smoked	0.488*	0.489*	-0.0662	0.503	0.487*	0.446	0.444
	(0.287)	(0.296)	(0.289)	(0.322)	(0.295)	(0.302)	(0.300)
Smoked 100 cigarettes	-0.0264	-0.0310	-0.00556	-0.0290	-0.0292	-0.0296	-0.0297
	(0.0261)	(0.0263)	(0.0312)	(0.0259)	(0.0259)	(0.0262)	(0.0262)
Cigarettes Smoked Per Day	0.120	0.0863	-0.392	0.315	0.189	-0.0239	-0.0157
	(0.677)	(0.638)	(0.845)	(0.615)	(0.658)	(0.639)	(0.639)
Medium Run Effects by Municipality for Cigarette Use							
Amount Smoked	-3.635	-2.998*	-3.106***	-0.434	-2.832	-3.624	-3.559
	(3.826)	(3.481)	(1.187)	(2.159)	(3.387)	(3.619)	(3.583)
Current Smokers	-0.398** -	0.300	-0.461**	-0.162	-0.172 -	0.318*	-0.324*
	(0.187)	(0.186)	(0.187)	(0.189)	(0.189)	(0.186)	(0.185)
Age Started Smoking	0.0574	0.0309	0.169	-0.0784	-0.0622	0.0214	0.0156
	(0.130)	(0.131)	(0.117)	(0.123)	(0.121)	(0.138)	(0.139)
Frequency Smoked	0.00720	0.00400	0.00473	-0.00119	0.000746	0.00413	0.00373
	(0.0109)	(0.0101)	(0.0106)	(0.00989)	(0.0102)	(0.0103)	(0.0103)
Smoked 100 cigarettes	0.0166	0.00190	-0.0119	0.00665	-0.0123	0.00214	0.00128
	(0.0301)	(0.0296)	(0.0729)	(0.0322)	(0.0327)	(0.0295)	(0.0295)
Cigarettes Smoked Per Day	1.507	1.608	-2.161**	1.841	1.406	1.351	1.368
	(1.451)	(1.433)	(1.039)	(1.241)	(1.200)	(1.488)	(1.483)

In this table each drug trafficking organization listed at the top of the column is omitted from the analysis and then the average treatment effect is calculated without the drug kingpin captures from those DTO's. This analysis illustrates whether the average treatment effects are being driven by kingpin captures from one DTO. Control variables include: education level, indigenous status, general health, house or property ownership status, marital status, sex, and age. Income is not included because it has too many missing observations. $^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table A4 Chapter 2: Sensitivity Check for the Average Treatment Effects of kingpin captures on Cigarette Use in the Associated Location of the kingpins DTO

DTO-controlled municipalities omitted from analysis:	(1) Zetas	(2) Sinaloa	(3) La Familia	(4) Beltran Leyva	(5) Gulf	(6) Juarez	(7) Tijuana
Adults							
Short Run Effects by Municipality for Cigarette Use							
Amount Smoked	-0.0978	2.006	-0.257	0.168	0.232	-1.279	0.144
	(1.204)	(2.626)	(1.271)	(1.187)	(1.205)	(1.756)	(1.133)
Frequency Smoked	0.245	-0.115	0.274	0.128	0.0976	-0.134	0.0681
	(0.173)	(0.182)	(0.179)	(0.188)	(0.167)	(0.227)	(0.167)
Age Started Smoking	-2.948***	-1.579	-2.271**	-3.193***	-2.328***	-0.518	-2.266**
	(0.876)	(1.461)	(0.974)	(0.918)	(0.886)	(1.521)	(0.882)
Smoked 100 Cigarettes in Life	0.0978	0.204*	0.0538	0.126**	0.0928	0.00143	0.0858
	(0.0616)	(0.109)	(0.0654)	(0.0618)	(0.0625)	(0.0958)	(0.0608)
Cigarettes Smoked Per Day	0.790	1.560	0.903	1.072	0.950	-2.310	1.118
	(0.962)	(1.987)	(1.093)	(1.074)	(0.986)	(1.503)	(0.966)
Current Smoker	0.0882	-0.0253	0.103*	0.0318	0.0346	-0.0753	0.0258
	(0.0581)	(0.0795)	(0.0573)	(0.0648)	(0.0586)	(0.0890)	(0.0586)
Medium Run Effects by Municipality for Cigarette Use							
Amount Smoked	-0.899	1.458	-1.306	-0.477	-0.549	-0.566	-0.682
	(0.832)	(2.548)	(0.915)	(0.837)	(0.838)	(1.275)	(0.804)
Frequency Smoked	0.131	-0.180	0.153	0.0789	0.0604	0.0128	0.0585
	(0.0898)	(0.159)	(0.106)	(0.0910)	(0.0875)	(0.139)	(0.0859)
Age Started Smoking	-0.323	0.815	-0.105	-0.476	-0.146	-0.431	-0.307
	(0.381)	(1.245)	(0.483)	(0.404)	(0.387)	(0.609)	(0.371)
Smoked 100 Cigarettes in Life	-0.0128	0.125	-0.0224	-0.0166	-0.0121	-0.0302	-0.0133
	(0.0321)	(0.107)	(0.0342)	(0.0320)	(0.0313)	(0.0481)	(0.0300)
Cigarettes Smoked Per Day	-0.794	-0.0420	-0.961	-0.754	-0.712	-0.416	-0.563
	(0.635)	(1.829)	(0.708)	(0.652)	(0.652)	(1.018)	(0.615)
Current Smoker	0.0189	-0.0703	0.0195	-0.00858	-0.00737	-0.0185	-0.00666
	(0.0314)	(0.0775)	(0.0353)	(0.0316)	(0.0312)	(0.0490)	(0.0299)
Adolescents							
Short Run Effects by Municipality for Cigarette Use							
Amount Smoked	-3.134	-1.461	-0.436	-0.599	-1.281	1.707	2.036
	(2.656)	(1.810)	(0.720)	(0.953)	(1.598)	(2.084)	(2.041)
Current Smoker	-0.0130	0.110	0.0696	0.113	0.0268	0.0732	0.0206
	(0.130)	(0.0909)	(0.0853)	(0.0886)	(0.0907)	(0.117)	(0.123)
Age Started Smoking	-0.0355	-0.0452	-0.0684	-0.0967*	-0.0899	-0.0730	-0.110
	(0.0647)	(0.0547)	(0.0499)	(0.0552)	(0.0567)	(0.0719)	(0.0768)
Frequency Smoked	0.124	0.292	0.222	0.363	0.153	0.184	0.0980
	(0.342)	(0.257)	(0.230)	(0.237)	(0.243)	(0.325)	(0.335)
Smoked 100 cigarettes	0.0357	-0.0405**	-0.0230	-0.0361*	-0.0222	-0.0207	-0.0242
	(0.0249)	(0.0184)	(0.0182)	(0.0212)	(0.0188)	(0.0248)	(0.0238)
Cigarettes Smoked Per Day	-1.168	-1.264*	-0.922	-1.597**	-1.142*	-0.337	-0.279
	(0.893)	(0.719)	(0.588)	(0.666)	(0.602)	(0.621)	(0.597)
Medium Run Effects by Municipality for Cigarette Use							
Amount Smoked	-4.421	-5.013	0.887	-0.931	-4.126*	-5.838	-5.717*
	(3.078)	(3.076)	(0.857)	(0.981)	(2.469)	(3.553)	(3.454)
Current Smokers	-0.151	-0.0748	-0.00864	-0.0502	-0.111	-0.0794	-0.0712
	(0.107)	(0.0675)	(0.0686)	(0.0731)	(0.0730)	(0.0675)	(0.0657)
Age Started Smoking	-0.0293	-0.0342	-0.0993**	-0.0729	-0.0582	-0.0537	-0.0630
	(0.0478)	(0.0417)	(0.0455)	(0.0489)	(0.0436)	(0.0468)	(0.0484)
Frequency Smoke	-0.344	-0.267	-0.104	-0.113	-0.310*	-0.282	-0.256
	(0.258)	(0.184)	(0.180)	(0.191)	(0.176)	(0.182)	(0.181)
Smoked 100 cigarettes	0.0471**	0.00931	-0.0188	0.0304*	0.00372	0.0137	0.00643
	(0.0224)	(0.0173)	(0.0213)	(0.0178)	(0.0163)	(0.0219)	(0.0214)
Cigarettes Smoked Per Day	-0.217	-0.613	0.0596	0.484	-0.294	-0.898	-0.884
	(0.688)	(0.630)	(0.517)	(0.546)	(0.558)	(0.660)	(0.646)

In this table each drug trafficking organization listed at the top of the column is omitted from the analysis and then the average treatment effect is calculated without the drug kingpin captures from those DTO's. This analysis illustrates whether the average treatment effects are being driven by kingpin captures from one DTO. Control variables include: education level, indigenous status, general health, house or property ownership status, marital status, sex, and age. Income is not included because it has too many missing observations. $^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table A5 Chapter 2: Correlation between areas where the La Familia Drug Trafficking Organization resides and Homicides

	Homicides in Municipalities where La Familia Resides
Short Run Effects by Municipality for Cigarette Use	
Municipality of Capture	1.799**
	(.9112)
Municipality of Association	-.758
	(1.529)
Medium Run Effects by Municipality for Cigarette Use	
Municipality of Capture	1.487
	(1.106)
Municipality of Association	-.2753
	(.6676)

This table examines the amount of homicides in areas where La Familia resides compared to areas where they are not present. Control variables include: education level, indigenous status, general health, house or property ownership status, marital status, sex, and age. Income is not included because it has too many missing observations. $^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table A1 Chapter 3- Regression Discontinuity Design for White Non-Hispanic Individuals

Dependent Variables →	Poor Mental Health Days	Alcohol Consumption	Binge Drinking	Cigarette Consumption
Independent Variables ↓				
1 Month	.1060	-0.0131	0.0847	-0.0352
	(0.1245)	(0.00854)	(0.0578)	(0.0396)
3 Months	.1090	-0.0128	0.0844	-0.0332
	(.1245)	(0.00854)	(0.0577)	(0.0396)
6 Months	.1066	-0.0127	0.0855	-0.0347
	(.1245)	(0.00854)	(0.0576)	(0.0396)
1 Year	.1377	-0.0614	0.0630	-0.0415
	(0.1230)	(0.0406)	(0.0560)	(0.0387)

Control variables are: a categorical variable for general health, a binary variable for sex, a categorical variable for education level and income level, number of children, a categorical variable for marital status, categorical variables for race and ethnicity, age, and year. Data is from the BRFSS data set, at the individual level, and ranges from 2015-2018 depending on the time frame specified in the table. Hispanic individuals are in the treated group and Non-Hispanic individuals are in the control group. Dependent variables are listed at the top of the table. 1 month, 3 months, 6 months, and 1 year are the time frames after the election (and the independent variables of interest) and measure who is in the treated group based on the timeframe.

$^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table A2 Chapter 3- Estimated Average Treatment Effects of the 2016 Election on Mental Health, Cigarette Use, and Alcohol Use by Race: Linear Trend Difference

Dependent Variables →	Poor Mental Health Days	Alcohol Consumption	Binge Drinking	Cigarette Consumption
Independent Variables ↓				
Black or African American				
1 Month	-0.115	-0.0131	0.00613	0.0170
	(0.289)	(0.0172)	(0.0125)	(0.0160)
3 Months	0.134	-0.0133	-0.00478	-0.00312
	(0.207)	(0.0125)	(0.00932)	(0.0112)
6 Months	0.227	0.000944	-0.00303	0.00487
	(0.182)	(0.0111)	(0.00808)	(0.00991)
1 Year	0.194	-0.00464	-0.000530	0.0113
	(0.159)	(0.00950)	(0.00706)	(0.00878)
American Indian or Alaskan Native				
1 Month	-0.815	-0.0384	-0.00150	0.0773*
	(0.695)	(0.0435)	(0.0356)	(0.0433)
3 Months	-0.560	0.00626	0.00604	0.0795**
	(0.548)	(0.0360)	(0.0281)	(0.0337)
6 Months	-0.760*	0.00337	0.00793	0.0297
	(0.460)	(0.0305)	(0.0237)	(0.0294)
1 Year	-0.421	0.0163	-0.00283	0.0313
	(0.426)	(0.0237)	(0.0193)	(0.0236)
Asian				
1 Month	0.167	0.0331	0.00465	-0.0407
	(0.427)	(0.0335)	(0.0197)	(0.0255)
3 Months	0.0269	0.0301	0.00464	-0.0294
	(0.281)	(0.0231)	(0.0137)	(0.0179)
6 Months	-0.0279	0.0184	0.00592	
	(0.243)	(0.0203)	(0.0124)	
1 Year	-0.0200	0.0159	-0.000970	-0.00702
	(0.211)	(0.0179)	(0.0116)	(0.0149)
Native Hawaiian or other Pacific Islander				
1 Month	-1.095	0.0872	-0.00599	-0.0504
	(1.207)	(0.0828)	(0.0613)	(0.0752)
3 Months	-0.317	0.0589	0.00982	-0.00996
	(1.140)	(0.0618)	(0.0464)	(0.0548)
6 Months	-0.360	0.0664	-0.00759	-0.0321
	(0.987)	(0.0544)	(0.0435)	(0.0581)
1 Year	-0.0268	0.0510	-0.0316	0.0113
	(0.958)	(0.0524)	(0.0407)	(0.0491)
Other Race				
1 Month	1.142	0.0535	-0.00548	0.0544
	(0.698)	(0.0351)	(0.0285)	(0.0366)
3 Months	0.473	0.0249	0.00833	0.0125
	(0.444)	(0.0251)	(0.0191)	(0.0250)
6 Months	0.410	0.0255	-0.00508	0.0162
	(0.366)	(0.0215)	(0.0174)	(0.0211)
1 Year	0.559*	0.0244	-0.00567	0.0248
	0.315)	(0.0193)	(0.0154)	(0.0187)
MultiRacial				
1 Month	0.0938	-0.0196	0.00841	-0.0786**
	(0.820)	(0.0357)	(0.0293)	(0.0356)
3 Months	-0.728	0.00442	-0.00275	-0.0586**
	(0.506)	(0.0246)	(0.0198)	(0.0234)
6 Months	-0.897**	-0.000148	-0.00462	-0.0334
	(0.439)	(0.0214)	(0.0172)	(0.0207)
1 Year	-0.880**	0.00240	-0.00874	-0.0219
	(0.380)	(0.0188)	(0.0157)	(0.0188)
Women				
1 Month	0.215	0.000200	0.00663	0.00770
	(0.172)	(0.0105)	(0.00846)	(0.0108)
3 Months	0.169	0.000345	0.00801	0.00640
	(0.114)	(0.00719)	(0.00590)	(0.00738)
6 Months	0.139	-0.00288	0.00898*	0.0138**
	(0.100)	(0.00629)	(0.00515)	(0.00643)
1 Year	0.0704	-0.00465	0.00439	0.0129***
	(0.0861)	(0.00546)	(0.00446)	(0.00370)

Control variables are: a categorical variable for general health, a binary variable for sex, a categorical variable for education level and income level, number of children, a categorical variable for marital status, categorical variables for race and ethnicity, age, and year. Data is from the BRFSS data set, at the individual level, and ranges from 2015-2018 depending on the time frame specified in the table. Hispanic individuals are in the treated group and Non-Hispanic individuals are in the control group. Dependent variables are listed at the top of the table. 1 month, 3 months, 6 months, and 1 year are the time frames after the election (and the independent variables of interest) and measure who is in the treated group based on the timeframe.

$^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table A3 Chapter 3- Estimated Average Treatment Effects of the 2016 Election on Mental Health, Cigarette Use, and Alcohol Use for by Race: Cubic Spline Trend Difference

Dependent Variables →	Poor Mental Health Days	Alcohol Consumption	Binge Drinking	Cigarette Consumption
Independent Variables ↓				
Black or African American				
1 Month	-0.325	-0.00884	0.00567	0.0171
	(0.275)	(0.0163)	(0.0118)	(0.0153)
3 Months	-0.0789	-0.00857	-0.00679	-0.00493
	(0.181)	(0.0111)	(0.00825)	(0.00992)
6 Months	0.00816	0.00665	-0.00423	0.00282
	(0.147)	(0.00921)	(0.00667)	(0.00823)
1 Year	-0.0841	0.00283	-0.00201	0.00762
	(0.102)	(0.00632)	(0.00467)	(0.00591)
American Indian or Alaskan Native				
1 Month	-6.493*	0.0219	0.00417	0.0119
	(3.520)	(0.144)	(0.112)	(0.147)
3 Months	-1.752	0.0101	-0.0302	0.0642
	(1.260)	(0.0715)	(0.0601)	(0.0703)
6 Months	-1.099	0.0252	-0.0401	0.149***
	(1.047)	(0.0601)	(0.0454)	(0.0574)
1 Year	-1.704*	0.0128	-0.0356	0.0839
	(1.006)	(0.0540)	(0.0421)	(0.0527)
Asian				
1 Month	1.218	-0.0121	0.0443	0.0106
	(1.286)	(0.125)	(0.0701)	(0.0945)
3 Months	0.722	0.0805	0.00139	-0.0109
	(0.664)	(0.0533)	(0.0303)	(0.0410)
6 Months	0.882*	0.0738*	-0.0132	
	(0.471)	(0.0421)	(0.0251)	
1 Year	0.752*	0.0648*	-0.0180	-0.0110
	(0.431)	(0.0388)	(0.0234)	(0.0317)
Native Hawaiian or other Pacific Islander				
1 Month	-6.200	0.367	-0.258	-0.211
	(8.570)	(0.379)	(0.261)	(0.292)
3 Months	-3.212	0.131	-0.0938	-0.140
	(3.066)	(0.154)	(0.101)	(0.125)
6 Months	-2.971	0.0404	-0.0132	-0.137
	(2.803)	(0.131)	(0.0893)	(0.103)
1 Year	-3.453	0.0604	-0.0358	-0.185*
	(2.624)	(0.121)	(0.0853)	(0.0967)
Other Race				
1 Month	0.311	0.179	-0.0248	0.185
	(2.391)	(0.122)	(0.0919)	(0.122)
3 Months	2.473**	0.105*	-0.0203	0.101*
	(1.019)	(0.0553)	(0.0439)	(0.0578)
6 Months	1.296*	0.0621	0.0245	0.0224
	(0.787)	(0.0439)	(0.0349)	(0.0446)
1 Year	1.210*	0.0532	0.00648	0.0211
	(0.710)	(0.0411)	(0.0323)	(0.0416)
MultiRacial				
1 Month	-1.215	-0.227*	0.0989	-0.270**
	(3.381)	(0.132)	(0.0981)	(0.135)
3 Months	0.278	-0.0456	-0.0106	-0.0495
	(1.270)	(0.0556)	(0.0451)	(0.0560)
6 Months	-0.176	-0.0265	0.00368	-0.0563
	(0.982)	(0.0448)	(0.0360)	(0.0453)
1 Year	-0.188	-0.0288	0.00502	-0.0434
	(0.893)	(0.0417)	(0.0333)	(0.0421)
Women				
1 Month	0.266	-0.0188	-0.00529	-0.00875
	(0.458)	(0.0271)	(0.0203)	(0.0272)
3 Months	0.0571	0.0133	0.0121	-0.00246
	(0.245)	(0.0144)	(0.0112)	(0.0145)
6 Months	0.138	0.000434	0.00753	-0.00281
	(0.181)	(0.0109)	(0.00854)	(0.0110)
1 Year	0.187	-0.00109	0.00723	-0.000769
	(0.166)	(0.0101)	(0.00784)	(0.00981)

Control variables are: a categorical variable for general health, a binary variable for sex, a categorical variable for education level and income level, number of children, a categorical variable for marital status, categorical variables for race and ethnicity, age, and year. Data is from the BRFSS data set, at the individual level, and ranges from 2015-2018 depending on the time frame specified in the table. Hispanic individuals are in the treated group and Non-Hispanic individuals are in the control group. Dependent variables are listed at the top of the table. 1 month, 3 months, 6 months, and 1 year are the time frames after the election (and the independent variables of interest) and measure who is in the treated group based on the timeframe.

$^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table A4 Chapter 3- Estimated Average Treatment Effects of the 2016 Election on Mental Health, Cigarette Use, and Alcohol Use for Hispanic Ethnicity by Race: Linear Trend Difference

Dependent Variables →	Poor Mental Health Days	Alcohol Consumption	Binge Drinking	Cigarette Consumption
Independent Variables ↓				
All Races				
1 Month	-0.183	0.00167	0.0108	0.0431**
	(0.301)	(0.0173)	(0.0134)	(0.0173)
3 Months	0.174	0.00396	-0.00580	0.0345***
	(0.224)	(0.0127)	(0.0105)	(0.0125)
6 Months	0.208	0.0147	-0.00955	0.0263**
	(0.189)	(0.0111)	(0.00913)	(0.0109)
1 Year	0.0468	0.0299***	-0.0177**	0.0244***
	(0.155)	(0.00954)	(0.00774)	(0.00939)
White				
1 Month	-0.407	0.000250	0.0122	0.0436**
	(0.388)	(0.0225)	(0.0173)	(0.0222)
3 Months	0.171	-0.00160	-0.00646	0.0350**
	(0.299)	(0.0162)	(0.0136)	(0.0163)
6 Months	0.266	0.0112	-0.00973	0.0279*
	(0.255)	(0.0144)	(0.0117)	(0.0142)
1 Year	-0.00854	0.0222*	-0.0174*	0.0158
	(0.197)	(0.0122)	(0.00980)	(0.0120)
Black or African American				
1 Month	1.235	-0.141	-0.450	0.337
	(13.14)	(0.383)	(0.300)	(0.365)
3 Months	3.924	0.0435	0.0444	-0.0406
	(4.024)	(0.148)	(0.132)	(0.160)
6 Months	1.778	0.0606	-0.0685	0.0239
	(2.341)	(0.103)	(0.0954)	(0.101)
1 Year	-0.0747	0.0240	0.0251	0.0167
	(1.334)	(0.0672)	(0.0620)	(0.0658)
American Indian or Alaskan Native				
1 Month	-22.80***	-0.397	0.266	-0.0483
	(4.928)	(0.308)	(0.244)	(0.299)
3 Months	-4.310	-0.186	0.142	0.196
	(3.355)	(0.175)	(0.127)	(0.157)
6 Months	-2.162	-0.0485	-0.0573	0.199*
	(2.279)	(0.119)	(0.0907)	(0.107)
1 Year	-1.444	0.0447	-0.102	0.218***
	(1.450)	(0.0808)	(0.0667)	(0.0777)
Asian				
1 Month	-4.591	-0.887	0.170	0.521
	(20.91)	(1.081)	(0.404)	(1.084)
3 Months	2.901	-0.00461	0.524	0.152
	(4.998)	(0.364)	(0.366)	(0.275)
6 Months	3.466	-0.0317	0.297	0.477**
	(3.444)	(0.275)	(0.225)	(0.198)
1 Year	0.586	0.0412	0.273*	0.241
	(2.541)	(0.173)	(0.156)	(0.154)
Native Hawaiian or other Pacific Islander				
1 Month	-1.642	0.210	0.111	1.016**
	(12.28)	(0.469)	(0.472)	(0.464)
3 Months	6.409	-0.299	0.119	0.104
	(4.510)	(0.264)	(0.199)	(0.260)
6 Months	2.417	0.0400	0.307*	-0.0787
	(2.676)	(0.191)	(0.165)	(0.176)
1 Year	4.692*	-0.0618	-0.0378	0.0528
	(2.764)	(0.159)	(0.121)	(0.126)
Other Race				
1 Month	-1.988	0.255	-0.0507	0.275
	(3.959)	(0.193)	(0.193)	(0.237)
3 Months	-0.510	0.424***	-0.186*	0.170
	(2.690)	(0.132)	(0.112)	(0.140)
6 Months	-1.048	0.213**	-0.0883	0.191*
	(1.897)	(0.104)	(0.0783)	(0.103)
1 Year	0.215	0.104	-0.0233	0.0562
	(1.267)	(0.0704)	(0.0533)	(0.0723)
MultiRacial				
1 Month	-0.00658	0.491	0.661**	1.146***
	(6.218)	(0.397)	(0.291)	(0.395)
3 Months	-0.0599	-0.0446	-0.102	0.567***
	(3.241)	(0.183)	(0.192)	(0.199)
6 Months	1.714	0.101	-0.109	0.0183
	(2.600)	(0.128)	(0.129)	(0.146)
1 Year	0.248	0.0495	-0.0716	-0.0112
	(2.035)	(0.106)	(0.0927)	(0.103)

Control variables are: a categorical variable for general health, a binary variable for sex, a categorical variable for education level and income level, number of children, a categorical variable for marital status, categorical variables for race and ethnicity, age, and year. Data is from the BRFSS data set, at the individual level, and ranges from 2015-2018 depending on the time frame specified in the table. Hispanic individuals are in the treated group and Non-Hispanic individuals are in the control group. Dependent variables are listed at the top of the table. 1 month, 3 months, 6 months, and 1 year are the time frames after the election (and the independent variables of interest) and measure who is in the treated group based on the timeframe.

$^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table A5 Chapter 3- Estimated Average Treatment Effects of the 2016 Election on Mental Health, Cigarette Use, and Alcohol Use for Hispanic Ethnicity by Race: Cubic Spline Trend Difference

Dependent Variables →	Poor Mental Health Days	Alcohol Consumption	Binge Drinking	Cigarette Consumption
Independent Variables ↓				
All Races				
1 Month	-0.670	0.0389	0.00816	0.115*
	(1.143)	(0.0632)	(0.0474)	(0.0628)
3 Months	-0.892*	0.0714**	-0.0143	0.0601**
	(0.513)	(0.0285)	(0.0223)	(0.0282)
6 Months	-0.634	0.0429*	-0.00935	0.0532**
	(0.421)	(0.0244)	(0.0194)	(0.0238)
1 Year	-0.419	0.0428*	-0.00970	0.0485**
	(0.405)	(0.0237)	(0.0187)	(0.0235)
White				
1 Month	-0.814	0.0827	0.0271	0.145*
	(1.289)	(0.0797)	(0.0594)	(0.0778)
3 Months	-1.320**	0.0769**	-0.0154	0.0712**
	(0.672)	(0.0372)	(0.0285)	(0.0359)
6 Months	-1.039*	0.0257	-0.0127	0.0613**
	(0.544)	(0.0316)	(0.0251)	(0.0309)
1 Year	-0.709	0.0296	-0.0140	0.0652**
	(0.510)	(0.0300)	(0.0236)	(0.0295)
Black or African American				
1 Month	5.905	-0.0549	-0.116	-0.182
	(9.393)	(0.307)	(0.254)	(0.306)
3 Months	1.984	0.0637	0.0141	0.0273
	(2.833)	(0.113)	(0.104)	(0.122)
6 Months	1.001	0.0557	-0.0308	0.00120
	(2.152)	(0.0986)	(0.0911)	(0.0989)
1 Year	-0.0476	0.0809	0.0218	-0.0706
	(1.977)	(0.0908)	(0.0846)	(0.0921)
American Indian or Alaskan Native				
1 Month	-8.588*	-0.601**	0.254	-0.252
	(4.934)	(0.282)	(0.286)	(0.335)
3 Months	-3.773*	-0.00532	-0.0588	0.158
	(2.216)	(0.128)	(0.115)	(0.134)
6 Months	-2.081	0.0970	-0.161	0.232**
	(2.135)	(0.116)	(0.0986)	(0.110)
1 Year	-2.994	-0.0505	-0.0441	0.219**
	(1.993)	(0.106)	(0.0919)	(0.106)
Asian				
1 Month	9.395	-0.255	-0.334	1.197*
	(14.42)	(0.863)	(0.611)	(0.701)
3 Months	3.309	-0.00918	0.472**	0.303
	(3.888)	(0.301)	(0.221)	(0.225)
6 Months	3.008	0.114	0.206	0.533***
	(3.371)	(0.272)	(0.223)	(0.199)
1 Year	0.746	0.0247	0.0216	0.535***
	(3.426)	(0.268)	(0.199)	(0.202)
Native Hawaiian or other Pacific Islander				
1 Month	5.007	-0.182	0.0470	-0.141
	(5.212)	(0.515)	(0.304)	(0.382)
3 Months	4.172	-0.100	0.193	-0.146
	(3.772)	(0.242)	(0.195)	(0.219)
6 Months	4.996	-0.0712	0.254	-0.0473
	(3.707)	(0.231)	(0.188)	(0.208)
1 Year	2.176	0.00141	0.283*	-0.0757
	(3.656)	(0.199)	(0.153)	(0.191)
Other Race				
1 Month	-1.083	0.277	-0.0333	0.316*
	(3.324)	(0.173)	(0.149)	(0.177)
3 Months	0.742	0.152*	-0.0467	0.106
	(1.731)	(0.0905)	(0.0698)	(0.0873)
6 Months	0.137	0.122	0.0272	0.0397
	(1.378)	(0.0791)	(0.0594)	(0.0752)
1 Year	-0.268	0.115	0.00485	0.0593
	(1.243)	(0.0725)	(0.0556)	(0.0712)
MultiRacial				
1 Month	2.167	-0.176	0.452	0.503
	(6.405)	(0.387)	(0.339)	(0.374)
3 Months	-0.469	0.189	-0.215	0.330*
	(2.957)	(0.154)	(0.158)	(0.169)
6 Months	1.939	0.0320	-0.0921	0.0223
	(2.739)	(0.141)	(0.130)	(0.149)
1 Year	2.820	-0.0557	-0.000186	0.0308
	(2.555)	(0.135)	(0.123)	(0.144)

Control variables are: a categorical variable for general health, a binary variable for sex, a categorical variable for education level and income level, number of children, a categorical variable for marital status, categorical variables for race and ethnicity, age, and year. Data is from the BRFSS data set, at the individual level, and ranges from 2015-2018 depending on the time frame specified in the table. Hispanic individuals are in the treated group and Non-Hispanic individuals are in the control group. Dependent variables are listed at the top of the table. 1 month, 3 months, 6 months, and 1 year are the time frames after the election (and the independent variables of interest) and measure who is in the treated group based on the timeframe.

$^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Source: DEA, January 2012

Notes: The DEA uses the term "cartel" in place of DTO. Also, the DTO identified as the Knights Templar in the report text is labeled in the map key by its Spanish name, "Los Caballeros Templarios."

Figure A1 Chapter 2: DEA Map of DTO's in late 2011