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Smoke and Mirrors?

Examining the Relationship Between

Medical Cannabis Dispensaries on Crime

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Medical cannabis dispensaries (MCDs) are storefront businesses that distribute cannabis to qualified patients for medical purposes. Opponents of MCDs have criticized policies in California and other states that allow for storefront distribution of the drug, which they allege attracts crime. Proponents, on the other hand, contend that regulated MCDs actually reduce crime in their communities. This study seeks to evaluate these competing claims by analyzing crime rates, MCD density, and other neighborhood characteristics across 189 census tracts in San Francisco using data for the year 2010. Reported crimes are collected from the San Francisco Police Department and classified into violent crimes (assault and robbery) and property crimes (arson, burglary, larceny-theft, vandalism, and motor vehicle theft). Location data for 26 MCDs and 43,688 reported crimes in San Francisco from the year 2010 are geocoded and aggregated into census tracts using GIS software. Regression models are used to test for the criminogenic effects of MCD density and three "exogenous sources of social disorganization": socioeconomic disadvantage, family disruption, and residential instability. Findings indicate a weak but statistically significant relationship between MCD density and crime. Stronger relationships are found between crime and the three categories of control variables drawn from social disorganization theory. These findings cast doubt on the claim that MCDs are magnets for criminal activity, but more research is needed to clarify this link.

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INTRODUCTION

Sixteen states have legalized the medical use of cannabis, and several others may do so by the end of the 2012 election cycle.[1] Medical cannabis dispensaries (MCDs)—storefronts that dispense the drug to qualified patients—have proliferated in several of these jurisdictions.[2] California was the first state to legalize medical cannabis, and there are now hundreds of dispensaries serving an estimated 300,000 patients throughout the Golden State (Americans for Safe Access 2011, 1). In the legal grey area between California law and federal prohibition, a handful of cities have taken it upon themselves to regulate MCDs within their jurisdiction. Unfortunately, the debate surrounding medical cannabis tends to be intensely polarized, heavy on political ideology, and light on empirical evidence. In this paper I aim to contribute knowledge that can be used objectively by researchers and policymakers interested in the effects of locally regulated MCDs on crime. Using spatial data and linear regression models, I explore the relationship between MCDs and crime across 189 census tracts in San Francisco. In framing a land use question, this study strives to analyze dispensaries in the same way that local government officials and staff might analyze bars, retail stores, or any other business in their community. Some constituents may want them, and others may not. From a policy standpoint, I argue that the interesting question is not *whether* to allow for the distribution of medical cannabis, but *how*. Every other legal substance—from alcohol to azithromycin—is dispensed by some type of storefront retailer. In California, cannabis is a legal substance within certain medical contexts. In this study I investigate whether, and to what extent, storefronts that provide medical cannabis (i.e. MCDs) are associated with higher crime rates.

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[1] The terms "cannabis" and "marijuana" are used interchangeably in this paper.
[2] The District of Columbia has also legalized medical cannabis. For a list and a map of medical cannabis states see National Organization for the Reform of Marijuana Laws, 2011, *Medical Marijuana Overview*, http://norml.org/marijuana/medical (accessed December 12, 2011).

BACKGROUND

The Current Debate Surrounding Medical Cannabis Dispensaries

Opponents of medical cannabis, most notably law enforcement officials, have argued that

MCDs attract crime. In the words of Melinda Haag, current U.S. Attorney for Northern

California:

> Marijuana dispensaries are full of cash and they're full of marijuana and everybody
> knows that. And many of them are very public about their operations. Some of them go
> on television, most of them have web sites, and everybody knows where they are. They
> are at risk of being robbed and many of them are robbed.[3]

Of course, if she had omitted the word "marijuana", Haag could have just as easily been talking

about banks (which have more cash and are even more accessible to the public than MCDs). But

nonetheless, her point is a valid one: criminals looking for a big score probably do consider

MCDs to be attractive targets.

Law enforcement groups have mounted organized resistance against the proliferation of

MCDs, focusing their attacks first and foremost on California—the state that opened Pandora's

box, as it were. A 2009 report entitled *Marijuana Dispensaries and the Federal Government:*

Recommendations to the Obama Administration stated that: "In, California, dispensaries have

had 13 years to flourish, and it is in California that their abuses have become evident" (Friends of

the D.E.A. 2009, 10). In 2009 the California Police Chiefs Association also published its *White*

Paper on Marijuana Dispensaries. It alleges that dispensaries "have been tied to organized

criminal gangs" and that murders and armed robberies occur commonly as "ancillary byproducts

of their operation" (California Police Chiefs 2009, 5). It goes on to relate a series of sensational

anecdotes involving "hooded home invaders", victims bleeding to death, and even poisonings (8-

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[3] Montgomery, Michael. "Interview with US Attorney Haag on Pot Operations." *KQED News*, March 15, 2012.
http://blogs.kqed.org/newsfix/2012/03/15/interview-w-us-attorney-haag-on-pot-operations-if-its-close-to-children-
thats-a-line-were-going-to-draw/ (accessed March 16, 2012).

10). In neither report do the authors include statistical analyses indicating that MCDs attract these crimes at rates higher than any other business.

Proponents of medical cannabis dispensaries contend that regulated dispensaries actually reduce crime and restrict access to cannabis by minors, and they point to several successful jurisdictions in making the case that regulation is preferable to prohibition. In a report released in early 2011, Americans for Safe Access, a non-profit advocacy organization representing medical cannabis patients and MCDs, cites agreement from local government and law enforcement officials representing municipalities as diverse as Kern County, Oakland, and Sebastopol. In Oakland, a notoriously high-crime jurisdiction, city administrator Barbara Killey was quoted as saying that since enacting its dispensary ordinance, "the areas around the dispensaries may be some of the safest areas of Oakland" (Americans for Safe Access 2011, 6). In this paper I aim to test these competing claims empirically using data collected for the year 2010 across 189 census tracts in San Francisco.

The Legal Environment Surrounding Medical Cannabis Dispensaries

California legalized medical cannabis through a 1996 ballot initiative known as Proposition 215 ("The Compassionate Use Act"). Prop 215 protects physicians who recommend medical cannabis as well as those qualified patients and caregivers who cultivate, possess, and use cannabis with a valid recommendation. The word "dispensary", however, does not appear in the law. To this day, dispensaries in California hold a precarious legal existence.[4] The uncertainty created by federal cannabis prohibition is major contributing factor.[5]

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[4] The United States Supreme Court ruled in *Gonzalez v. Raich (2005)* that the federal government may continue to enforce cannabis prohibition even in states that have legalized medical cannabis.
[5] Hoeffel, John, "Federal Crackdown on Medical Pot Sales Reflects a Shift in Policy," *Los Angeles Times,* 7 October 2011.

To the extent that there are "legal" dispensaries in California, they are authorized and regulated at the municipal level. Governor Jerry Brown recently indicated an intention that this policy remains in effect. In vetoing S.B. 847, a bill that would have imposed a statewide prohibition on dispensaries within 600 feet of residential areas, Brown issued the following statement to the California Senate, dated September 20, 2011:

> I have already signed AB 1300 that gave cities and counties authority to regulate medical marijuana dispensaries—an authority I believe they already had. This bill goes in the opposite direction by preempting local control and prescribing the precise locations where dispensaries may not be located. Decisions of this kind are best made in cities and counties, not the State Capitol.[6]

California is a large state with a population of more than 37 million people; it includes 58 counties and nearly 500 incorporated cities.[7] In such a state, a policy of "local control" has diverse and far-reaching consequences.

Although Prop 215 extends its protections to designated individuals ("primary caregivers") who may cultivate cannabis on behalf of qualified patients, the original law is silent as to how medical cannabis might be distributed outside of the patient-caregiver relationship. In 2003 the California legislature passed Senate Bill 420, the "Medical Marijuana Program Act", which established an optional statewide registry system for patients and caregivers. Although S.B. 420 was intended to clarify the provisions of Prop 215, it largely ignored the question of distribution.

Beyond the statutory restrictions of Prop 215 and S.B. 420, the State of California imposes very few regulations on medical cannabis. Jerry Brown, then Attorney General of California, issued a directive to law enforcement in 2008 regarding the state's medical cannabis

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[6] Brown, Edmund Jr., Letter to the California State Senate dated 20 September 2011, http://gov.ca.gov/docs/SB_0847_Veto_Message.pdf (accessed December 12, 2011).
[7] Metropolitan Transportation Commission and the Association of Bay Area Governments, undated, "Bay Area Census," < http://www.bayareacensus.ca.gov/index.html > (accessed December 10, 2011).

laws. He noted that "dispensaries" are not defined by law but posited that storefront dispensaries that are properly organized as cooperatives or collectives may be legal if they meet certain requirements (Brown 2008). He listed requirements similar to those already found in some municipal ordinances, including: non-profit status, restriction of membership to qualified patients and caregivers (and verification thereof), and prohibition of sales to non-members. The California State Board of Equalization has issued seller's permits to dispensaries since a 2005 ruling that sales tax must be assessed on all medical cannabis transactions, regardless of their legality (Calfornia State Board of Equalization 2009). In 2010 Governor Arnold Schwarzenegger signed A.B. 2650, prohibiting dispensaries within 600 feet of schools. Beyond these scant regulations at the statewide level, responsibility for MCDs has largely been left to the discretion of municipal governments.

WHY SAN FRANCISCO?

This study examines the effect on crime of 26 medical cannabis dispensaries operating in San Francisco during the year 2010. San Francisco was one of the first municipalities to formally authorize MCDs, and I argue that it does so effectively—compared to other jurisdictions—by setting up a permitting process for MCDs and placing reasonable restrictions on their location and operation. Thus San Francisco represents an important manifestation of this study's primary independent variable, which is not medical cannabis per se but the set of *policies* governing medical cannabis *dispensaries*. Specifically, San Francisco presents an opportunity to test the effect of *locally regulated* MCDs on surrounding neighborhoods.

METHODOLOGY

Crime data for this study were obtained from the San Francisco Police Department (SFPD). A formal request was made under the California Public Records Act for lists of serious

crimes at the citywide level for the year 2010 including date, category of crime, and location by city block. Lists were also compiled of the addresses of all MCDs operating in the city in 2010, using data from the Public Health Department. Borrowing from a research design presented by Williams, Freisthler, and Sims (2011a), all data were aggregated to census tract boundaries. Census tracts are convenient units of analysis because they have fairly consistent populations (averaging about 4,000 residents) and their boundaries tend to align with the physical environment.[8] Regression analyses are conducted to test the criminogenic effect of locally regulated MCDs, controlling for socioeconomic disadvantage, family disruption, and residential instability.

FINDINGS

Findings indicate a weak but statistically significant relationship between MCD density and crime. It appears that, in San Francisco, neighborhoods containing MCDs have slightly higher rates of crime than neighborhoods that do not contain MCDs. Due to the limited number of cases—26 dispensaries across 16 census tracts, compared to 173 non-MCD-containing tracts—I am cautious about speculating as to the causal nature of this link. Stronger links are found between crime and some of the other variables examined by this study, which are derived from the criminological literature on social disorganization theory. According to social disorganization theory as put forward by Sampson and Groves (1989, 780), high crime rates can be explained by the presence of certain "exogenous sources of social disorganization" including socioeconomic disadvantage, family disruption, and residential instability. Measures of each of these concepts are significantly associated with crime, and with much greater explanatory power than is found for MCD density. Based on these findings, I conclude that prohibitory MCD

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[8] U.S. Census Bureau, Geography Division, "Census Tracts and Block Numbering Areas," 19 April 2000, < http://www.census.gov/geo/www/cen_tract.html > (accessed December 10, 2011).

enforcement policies are unlikely to be an effective use of scarce law enforcement resources, insofar as such policies are rooted in the assumption that MCDs attract crime.

OVERVIEW OF FOLLOWING SECTIONS

In chapter II, I review the existing literature on cannabis, MCDs, and crime, and discuss important theoretical and empirical issues that arise in spatial analyses of this sort. Routine activities theory provides a useful lens through which to analyze competing claims about the potentially criminogenic effects of certain land uses (in this case, MCDs). In chapter III, I present a conceptual model for explaining the relationship between crime, MCDs, and selected "exogenous sources of social disorganization". The research design employed by this study is described in greater detail in chapter IV along with a presentation of results and a discussion of findings. I conclude in chapter V by discussing some important implications for policymakers.

CHAPTER II.
CANNABIS, MCDs, AND CRIME

Introduction

The State of California has recognized cannabis as a legitimate medical treatment since 1996. In this paper I argue that the important policy question, then, is not *whether* but *how* to allow for the drug's distribution. One model of distribution that has proliferated in recent years is the medical cannabis dispensary (MCD). In the political arena, proponents and critics of MCDs have made antithetical claims about the relationship between MCDs and crime. Proponents claim that MCDs decrease crime, while critics allege that they are magnets for criminal activity (Americans for Safe Access 2011; California Police Chiefs Association 2009). In this paper I explore these competing claims and their empirical implications, which have received little attention to date from the academic community. Specifically, this study explores the spatial relationship between MCDs and crime in San Francisco.

In this chapter I review the relevant literature on cannabis, crime, and urban sociology. I first discuss the alleged link between cannabis use and crime, which has been challenged by research in economics and criminology. The drug-crime link seems especially weak with respect to cannabis, compared to alcohol and other drugs (MacCoun, Kilmer, and Reuter 2003; Pacula and Kilmer 2003; Resignato 2000). In the second section I present an ecological framework known as routine activities theory, which attempts to explain crime based on the *circumstances* in which it occurs. Specifically, routine activities theory states that three convergent factors are required in order for a direct-contact predatory crime to occur: motivated offenders, suitable targets, and lack of capable guardianship (Cohen and Felson 1979; Williams, Freisthler, and Sims 2011). The third and final section of this chapter discusses social disorganization theory, which attempts to explain the relationship between crime and certain neighborhood

characteristics. Building on the work of urban sociologists Henry Shaw and Clifford McKay, social disorganization theorists have identified economic deprivation, residential instability, population heterogeneity, and family disruption as categories of neighborhood characteristics that explain crime (Sampson and Groves 1989; Shaw and McKay [1942] 1969; Veysey and Messner 1999). I incorporate these insights into the model of urban crime that I present and test in subsequent chapters.

CANNABIS AND CRIME

In the next two sections I aim to clarify the important distinction that exists between cannabis and medical cannabis dispensaries (MCDs), and how these different concepts might affect crime. This paper is concerned with the latter. In the empirical analysis that I present in the following chapters, the key independent variable under review is not a drug per se but a *land use* that distributes a drug to certain qualified individuals. This study is not designed to address the relationship between cannabis, as a substance, and criminal behavior—a question that would require controlled behavioral experiments or field research. Instead, I explore the criminological impact of MCDs as retail businesses that operate in complex urban environments. The policy question is therefore one of land use, not substance control per se. Nonetheless, it is possible that MCDs could have an indirect effect on neighborhood crime rates via the underlying effects of cannabis (i.e. as an illicit psychoactive compound), if the latter were independently associated with crime. Toward that end, I review in this section the relevant literature on cannabis and crime.

The alleged link between cannabis and socially undesirable behavior dates almost as far as back any other mention of the drug in United States history. In fact, a compelling argument can be made that modern cannabis prohibition has its roots in the historical perception, fueled by

racist and xenophobic stereotypes of Mexican immigrants, that use of the drug (then known as "marihuana") led to violent criminal behavior. In 1914, an article appeared in the *Los Angeles Times* linking a mysterious plant with Mexican immigrants and "many revolting crimes."[9] Years later, a Montana lawmaker would say of the drug: "When some beet field peon takes a few rares of this stuff, he thinks he has just been elected president of Mexico so he starts out to execute all his political enemies."[10] These stories from the west were relayed nationally by outlets like the *New York Times*, who quickly caught on to the stereotype of the violent, marihuana-fueled Mexican criminal. One piece in 1925 ran with the headline, "Mexican, Crazed by Marihuana, Runs Amuck With Butcher Knife." It went on to describe the violent slaying of six hospital patients by a veteran of the Mexican Army, who was allegedly intoxicated at the time of the murders.[11] When the United States Congress first discussed a proposal to prohibit the drug federally in 1937, its members likely had these violent images in mind.

Fast forward to present day. The link between marijuana and violent criminal behavior has been challenged by research in economics and criminology. In 2000 the economist Andrew Resignato reviewed existing drugs-crime research and concluded that—despite the assumption made by national drug control policies that there is a clear and causal relationship between drugs and crime—greater evidence may actually exist to suggest a link between "drug enforcement/control/prohibition" and crime. Benson and other scholars have also found that drug enforcement policies have effects on crime rates, independently of drug use (Benson and Rasmussen 1991; Benson et al. 1992). These findings highlight a core challenge faced by drug policy researchers. It is impossible, in most cases, to study the social consequences of a drug

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[9] "Drugs To Rise Like Incense: Officials Destroy Contraband." *Los Angeles Times (1886-1922)*, October 16, 1914. http://www.proquest.com/ (accessed March 10, 2012).
[10] Quote from Gray (1998, 77).
[11] "Kills Six In a Hospital: Mexican, Crazed by Marihuana, Runs Amuck With Butcher Knife." *The New York Times (1923--Current File)*, February 21, 1925. http://www.proquest.com/ (accessed March 10, 2012).

(e.g. criminal behavior) without considering, at the same time, the legal status of that drug and what conditions that might impose on users of the drug.

Much of the relevant drugs-crime literature employs a tripartite theoretical framework put forward by Goldstein (1985; Weiner and Wolfgang 1989). Goldstein identified three mechanisms through which drugs might contribute to criminal behavior: psychopharmacological factors, economic compulsion, and systemic violence. "Psychopharmacological risk" of criminal behavior refers to the possibility that the psychoactive components of a drug might make a user more likely to engage in criminal behavior, strictly in terms of his or her neurobiology. "Economic compulsion" refers to the process by which drug users might engage in criminal activity in order to fund their potentially expensive drug habits. "Systemic violence" occurs when drug markets are enmeshed in broader networks of crime and violence, in which drug users become involved.

Pacula and Kilmer (2003) report a positive association between marijuana use and reports of nonviolent crime, but did not find a causal link between marijuana use and violent crime. They concluded that marijuana use might play a greater role in a criminal getting caught than in the original decision to commit the crime. Indeed, a large number of arrestees test positive for cannabis in the United States (National Institute of Justice 1999; Pacula and Kilmer 2003; Taylor et al. 2003). But correlation does not mean causation. Several explanations exist for the high rate of marijuana use among criminal offenders that do not rely on a causal link between the drug and criminal behavior. First, there is the simple observation that cannabis use is very prevalent in the United States. In 2010 an estimated 22.6 million Americans above the age of 12 were "current users" of illicit drugs; of these, 17.4 million—or 6.9% of the population —were current users of

cannabis (Substance Abuse and Mental Health Services Administration 2011).[12] Given these

high rates of use, one would expect significant portions of *any* sample of Americans to test

positive for marijuana; that a majority of criminal offenders test positive for marijuana is not, in

itself, a very interesting finding. Taylor and colleagues report that between 34% and 61% of

adult males used cannabis at least once in the year 2000, including between 17% and 63% of

violent criminal offenders and between 34% and 74% of offenders in property crimes (2003,

278-279). These findings, while far from definitive, do not suggest a clear and direct link

between cannabis use and crime.

Many arrestees who test positive for cannabis also test positive for alcohol or other drugs

(National Institute of Justice 1999; Taylor et al. 2003). This makes it difficult for researchers to

infer the extent to which a certain behaviors can be attributed to specific substances.

Furthermore, because of the way that marijuana is metabolized by the human body, positive tests

for marijuana (e.g. THC) only indicate use within the past month, and therefore do not

necessarily signify that a particular crime was committed while under the influence (Pacula and

Kilmer 2003). In fact, in some studies cannabis has been shown to *inhibit* aggression and

violence (Miczek et al. 1994; White and Gorman 2000). Thus, although it may appear that

marijuana use is associated with criminal arrests, there are many reasons to be skeptical about

that correlation.

The drug-crime link, in psychopharmacological terms, is stronger for alcohol than it is for

illicit drugs (MacCoun, Kilmer, and Reuter 2003). "In the case of marijuana," Resignato

concludes, "the assumed psychopharmacological connection between use and violent crime has

been almost completely disproved in the research" (2000, 682). Research on economic-

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[12] "Current use" is defined as self-reported use within the past 30 days (Substance Abuse and Mental Health Services Administration 2011).

compulsive drug related crime (i.e. crime that is committed by a drug user in an attempt to obtain drugs or money to buy them) tends to focus on drugs with higher addictive potentials than cannabis, most notably heroin and cocaine (for reviews see MacCoun, Kilmer, and Reuter 2003; Resignato 2010). Perhaps the most compelling mechanism through which drugs might lead to crime is through the occurrence of systemic violence (Goldstein 1985). The violence associated with markets for illegal drugs is at least indirectly caused by drug prohibition and enforcement, "a relationship that may be underestimated by many policy officials" (Resignato 2000, 683). It is plausible that this would apply to retail vendors of medical marijuana—although arguably less so than the illicit dealers of the drug, who are displaced by legal or quasi-legal cannabis businesses (i.e. MCDs). This is the dynamic explored by the present study.

I conclude from the available literature that cannabis has no significant relationship with crime via its psychopharmacological effects or its capacity to bring about economic-compulsive criminal behavior in its users (Goldstein 1985; Pacula and Kilmer 2003; Resignato 2000). I argue that the only plausible link between cannabis and crime lies in the extent to which the drug attracts "systemic violence", due to its illicit status and high market value. The following chapter presents a conceptual model that can be used to test empirically whether or not medical cannabis dispensaries are associated with crime in city neighborhoods.

MEDICAL CANNABIS DISPENSARIES AND CRIME

Do medical cannabis dispensaries increase crime? It depends who you ask. Empirical evidence is scant and is almost entirely overshadowed by anecdotal reports and sensationalized hearsay. For example, a 2009 report compiled by the Coalition for a Drug-Free California alleges that "marijuana escalates the level of mental illness, crime and all related problems" (Morgan 2009, 2). But the report offers little empirical evidence in support of these claims. The California

Police Chiefs Association (CPCA)—an organization representing California's municipal law enforcement agencies—has also been a vocal critic of dispensaries.[13] Its 2009 *White Paper on Medical Marijuana Dispensaries* concludes that the presence of dispensaries "poses a clear violation of federal and state law; they invite more crime; and they compromise the health and welfare of law-abiding citizens" (California Police Chiefs Association 2009, 47). The underlying evidence is entirely anecdotal: the CPCA presents no statistical analysis supporting the conclusion that medical cannabis dispensaries cause crime at a higher rate than any other business. The CPCA's assertion that dispensaries increase crime stands in conflict with an analysis conducted by the Police Department of Denver, Colorado, which in 2010 projected that dispensaries attract crime at a similar rate as pharmacies and a lower rate than banks or liquor stores.[14]

A recent study conducted by researchers at the UCLA Luskin School of Public Affairs examined crime data in 95 census tracts in Sacramento (Williams, Freisthler, and Sims 2011). No clear link was found between the density of marijuana dispensaries and the rate of violent or property crime, suggesting that dispensaries do not increase crime and that some security steps taken by dispensaries may actually reduce local crime.

Despite the insistence of organizations such as the Coalition for a Drug-Free California and the California Police Chiefs Association, there does not appear to be an obvious link between medical cannabis dispensaries and criminal behavior in surrounding areas. Limited reports from California and Colorado suggest a neutral or negative correlation between MCDs and crime, but more empirical research is needed to substantiate a generalized claim to that

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[13] California Police Chiefs Association "Medical Marijuana Dispensary Information", http://californiapolicechiefs.org/?page_id=806 (accessed March 14, 2011).
[14] Ingold, John, "Analysis: Denver Pot Shops' Robbery Rate Lower Than Banks'," *Denver Post*, 27 January 2010, http://www.denverpost.com/ci_14275637#ixzz15T3uaWQw (accessed September 28, 2011).

effect. This study aims to extend current knowledge about the relationship between MCDs and crime through a geospatial analysis of crime data from San Francisco.

ROUTINE ACTIVITIES THEORY

In the final sections of this chapter, I review the theoretical literature that informs the present analysis of MCDs and crime. Routine activities theory is an ecological approach that attempts to explain crime by identifying the circumstances in which it is most likely to occur. According to this theory, crime rates are affected by the convergence of three factors: motivated offenders, suitable targets, and absence of capable guardians. The routine activities model of crime, first proposed by Cohen and Felson (1979), is presented in Figure 2.1 below.

Figure 2.1 Routine Activities Theory.

Taking away one or more of these three ingredients, Cohen and Felson argue, "is sufficient to prevent the successful completion of a direct-contact predatory crime" (1979, 589). The types of crime that this theory attempts to explain are "predatory" in that the offender "definitely and intentionally" does harm to the victim or the victim's property (Glaser 1971, 4). "Direct-contact" refers to the idea that these crimes occur when the offender and victim (or victim's property) are in direct physical contact, meaning that they take place at a precise point in space and time. This is a key element of routine activities theory and one with significant implications for empirical research (Cohen and Felson 1979, 589):

> Unlike many criminological inquiries, we do not examine why individuals or groups are inclined criminally, but rather we take criminal inclination as given and examine the manner in which the spatio-temporal organization of social activities helps people to translate their criminal inclinations into action.

Thus routine activities theory attempts to explain crime by looking at the ecological circumstances in which it occurs, while other criminological approaches (including social disorganization theory, discussed subsequently) tend to focus on the characteristics of criminal offenders. Both are useful to the present study, which analyzes whether crime is related to MCD presence (a condition of the local human ecology) in city neighborhoods but is also interested in controlling for demographic characteristics related to crime across those neighborhoods.

Regarding the number and concentration of *motivated offenders* in an area, MCDs could have a positive, negative, or neutral effect on crime. If cannabis use directly or indirectly leads to criminal behavior, then MCDs might increase crime in a neighborhood by concentrating a large number of cannabis users in one place. It is also possible that MCDs could reduce criminal behavior in a neighborhood by displacing illicit dealers of the drug. And it is of course possible that MCDs have no effect whatsoever on the number or concentration of motivated criminal offenders in an area.

From a routine activities perspective, the most likely link between MCDs and crime is probably in the extent to which MCDs present *suitable targets* for crime. Components of target suitability include value, visibility, and accessibility (Cohen and Felson 1979, 595). With respect to value, MCDs tend to possess large amounts of cash and cannabis, which are high-value targets for theft. As Felson notes, "lions look for deer near their watering hole" (1987, 914).[15] Patients, vendors, and especially staff are potential targets of crime: "Employees of the dispensaries can be at-risk for violent crimes, such as robbery or assault, as they are gatekeepers to both the marijuana

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[15] Quoted in Roncek and Maier (1991).

products and the cash at the site" (Williams, Freisthler and Sims 2011a, 5). In California it is

estimated that MCDs conduct roughly $1.9 billion in gross sales annually.[16] Beyond the fairly

obvious point that criminals like to steal things of value—which is just as true for MCDs as it is

for banks, pharmacies, and other retail businesses—there are other valid reasons to believe that

criminals would perceive MCDs as suitable targets.[17] Most MCDs are open systems that are

constantly seeking new members through advertising and other means. Thus they present, in

many cases, highly visible targets for crime.

Although few empirical studies have examined the relationship between MCDs and

crime, existing research has explored the criminogenic effects of other land uses A study by

Roncek and Lobosco (1983) reported that high schools elevate local crime rates, probably

through the concentration of likely offenders (i.e. teenagers). Brantingham and Brantingham

(1982) found an inverse relationship between crime rates and distance from the nearest

McDonald's. As Felson explains, the restaurants themselves may be safe—but they attract

customers who are "in prime offending and victim ages, producing high crime risk for nearby

properties" (1987, 921). There is strong evidence to suggest that bars and other establishments

that serve alcohol meet the criteria for target suitability (Roncek and Maier 1991). This provides

an interesting point of comparison for medical cannabis dispensaries and other retail businesses.

A criminal might reasonably perceive that a patron entering or leaving such businesses would be

in possession of some amount of cash and therefore be an attractive target for theft (Williams,

Freisthler, and Sims 2011). The establishments themselves operate largely in cash and are

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[16] This estimate extrapolates from data released by the San Francisco Controller's Office that suggests, based on
sales tax revenues, that MCDs in S.F. conducted $41 million in gross annually between 2010 and 2011. For more
see Downs, David. "San Francisco Dispensaries' Annual Sales Estimate: $41 Million." *East Bay Express*. Oakland,
January 31, 2012. http://www.eastbayexpress.com/LegalizationNation/archives/2012/01/31/san-francisco-
dispensaries-annual-sales-estimate-41-million (accessed March 9, 2012).
[17] This is essentially the claim made by political opponents of MCDs (e.g. California Police Chiefs Association
2009).

accessible to the public, in many cases advertising themselves in an effort to increase their

accessibility. The perception that these would be easy targets is compounded by the perception

that patrons and staff might be medically ill (in the case of MCDs) or intoxicated (in the case of

bars or MCDs that allow on-site consumption). Thus, as Roncek and Maier conclude in the case

of bars, "the patrons and the businesses have all the components of target suitability" (1991,

726).

The degree to which MCDs present suitable targets for crime—a notion that is subject to

considerable debate—is largely dependent on the effectiveness of MCD security measures. Here

we see an inverse relationship between target suitability and the third core component of routine

activities theory, *capable guardianship*. As guardianship increases, a potential target becomes

less and less accessible (and therefore less *suitable*) to predatory crime. By definition, members

of MCDs suffer from medical conditions that qualify for medical cannabis treatment. This could

create a perception of vulnerability that is attractive to criminals seeking to obtain cannabis

and/or cash without a fight. It is also possible that criminals perceive MCD operators to be less

likely to report crime due to their precarious legal existence and a resulting incentive not to

attract attention from law enforcement. Thus it is plausible that the presence of MCDs might

increase crime in a neighborhood by presenting, in the terms of routine activities theory,

accessible targets for crime. But it is also possible that criminals do not perceive MCDs to be

suitable targets for crime, or that they consider them no more attractive than other retail

businesses with high-value inventories and large amounts of cash. Furthermore, it is possible

that—compared to other potential targets in the neighborhood—criminals actually perceive

MCDs to be unsuitable targets. This largely depends on the effectiveness of *guardianship* in a

neighborhood to prevent crime. Compared to other businesses, MCDs might represent superior

guardianship in a neighborhood and thereby serve to reduce the frequency of crime. Security

protocols are one way in which an MCD might do this.[18] Many dispensaries implement security

protocols—in order to comply with local mandates or simply to protect their patients, vendors,

and staff—that might serve to increase the level of guardianship in a community and thereby

reduce crime in a neighborhood, as routine activities theory suggests.

In a recent working paper for the California Center for Population Research at UCLA,

Nancy Williams and colleagues present a routine activities approach for examining the link

between MCDs and crime. They examined 95 census tracts in Sacramento and found that tracts

containing dispensaries were not significantly associated with higher rates of crime when controlling

for other neighborhood characteristics (Williams, Freisthler and Sims 2011a). This study borrows

from their work in applying a routine activities approach to MCDs in San Francisco.

SOCIAL DISORGANIZATION THEORY

Introduction

Social disorganization researchers have identified several neighborhood characteristics

that are positively associated with crime. This study borrows from their work in selecting control

variables to address the fact that social and demographic characteristics vary widely across city

neighborhoods, with significant implications for social and economic activity, public health and

safety, and other outcomes. Whereas routine activities theory focuses on the *circumstances* in

which crime occurs, social disorganization theorists point to the social and demographic

characteristics of surrounding communities in explaining outcomes of high crime and violence.

Social disorganization has been concisely summarized by Sampson and Groves: "The general

hypothesis is that low economic status, ethnic heterogeneity, residential mobility, and family

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[18] This claim has been made by proponents of MCDs (e.g. Americans for Safe Access 2011).

disruption lead to community social disorganization, which, in turn, increases crime and delinquency rates" (1989, 774). This approach is summarized in Figure 2.2 below.

Figure 2.2. Social Disorganization Theory.

According to this theory, crime is associated with what Sampson and Groves call "exogenous sources of social disorganization" (1989, 780). This study controls for three such categories of neighborhood characteristics: economic deprivation, residential instability, and family disruption. Low socioeconomic status (SES) translates to lower levels of formal and informal social control. High residential turnover disrupts social relations and erodes collective efficacy. Higher rates of family disruption, i.e. a higher proportion of single-parent versus married-couple households, results in decreased parental supervision and a relative lack of guardianship (Cohen and Felson 1979; Sampson 1987; Sampson and Groves 1989). These conceptual links to crime, expounded originally by Shaw and McKay ([1942] 1969), have received more nuanced theoretical attention from Kornhauser (1978), Sampson and Groves (1989), and Veysey and Messner (1999). The explanatory power of their empirical correlates is discussed in the following section, which describes the measures to be analyzed in the present study.

Socioeconomic Disadvantage: Poverty and Unemployment

In the original test of social disorganization theory by Sampson and Groves (1989), low SES was found to be significantly associated with crime. The link between economic deprivation

and crime may be more complex than the simplistic explanation that poor people have higher incentives to commit crime and suffer lower opportunity costs for doing so. For example, Sampson reports in an earlier work that low SES neighborhoods have higher levels of police supervision, independent of actual law violate behavior (Sampson 1986). Sampson concludes that "the influence of SES on police contacts is contextual in nature, and stems from an ecological bias with regard to police control" (1986, p. 884). Whether economic deprivation has a direct relationship with crime through individuals' behavioral mechanisms (i.e. weighing costs and incentives), or an indirect effect on crime rates through the operation of police bias, there is a strong theoretical basis for the finding that poor neighborhoods report higher crime rates than rich ones. The measures of economic deprivation that are controlled for in this study are poverty and unemployment.

Mollie Orshansky developed the original poverty thresholds in 1963-64 when she was an economist working for the Social Security Administration, shortly before the declaration of a "War On Poverty" by President Johnson (Fisher 1992). An individual or household is in poverty when its total cash income falls below the applicable threshold, determined by family size and composition (Fisher 1992; N. White 2011). The 2010 poverty thresholds range from $11,139 for a single individual living alone to $42,156 for a family of eight or more people living in the same household.[19]

Indicators of socioeconomic disadvantage, including poverty and unemployment, have been associated with higher crime rates in Miami, Florida and Columbus, Ohio (Martínez, Rosenfeld, and Mares 2008; Peterson, Krivo, and Harris 2000). Other studies show that rates of crime and violence are extremely high in neighborhoods containing public housing

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[19] U.S. Census Bureau, Current Population Survey, 2011 Annual Social and Economic Supplement. http://www.census.gov/hhes/www/cpstables/032011/pov/new35_000.htm (accessed March 12, 2012).

developments, which are areas of extremely concentrated socioeconomic disadvantage (Fagan and Davies 2000; Griffiths and Tita 2009). In their study of medical marijuana dispensaries in Sacramento, Williams and colleagues (2011a, 9) found that violent crimes were significantly associated with "concentrated disadvantage", a variable constructed from 2008 poverty guidelines. Property and violent crimes were not associated with density of marijuana dispensaries, but both categories were significantly related to unemployment rate (Williams, Freisthler, and Sims 2011). Further evidence of the link between crime and unemployment is found in crime data from across the United States in the 1990's, a decade of incredible crime reduction. Raphael and Winter-Ebmer (2001) found that a substantial amount of the reduction in property crimes could be explained by the corresponding decline in unemployment rate. A weaker relationship existed between unemployment and violent crime, according to the researchers. Freeman (2001) presents similar findings and concludes that as much as one-third of the drop in crime in the 1990's can be explained by the expanding job market.

Family Disruption

Theorizing from earlier empirical work by Sampson (1987), which found that macro-level indicators of family disruption were related to rates of juvenile crime, Sampson and Groves include family disruption among their "exogenous sources of social disorganization" (1989, 780). The theoretical basis for this lies in the notion that "traditional" families (i.e. married couples and their biological children) provide their communities with greater parental-supervisory resources, compared to single-parent families. Additional supervision results in greater social control and more effective prevention against crime (Cohen and Felson 1979; Sampson and Groves 1989).

This theoretical link is supported by empirical evidence. In their reassessment of Sampson and Groves's (1989) original analysis, Veysey and Messner (1999) report that family disruption has significant relationship with crime even independently of other social disorganization processes. Indeed, percent of single person households was significantly related with crime in the Sacramento dispensary studies conducted by Williams and colleagues (Williams, Freisthler, and Sims 2011).

Residential Instability

According to social disorganization theory, communities with higher levels of residential turnover suffer from correspondingly lower levels of social control and are therefore likely to report higher rates of crime (Hipp, Tita, and Boggess, 2009; Sampson and Groves 1989; Shaw and McKay 1969). The present study conceptualizes "residential instability" as an index of the percent of housing units in a given census tract that are vacant and the percent of individuals living within the tract who are between the ages of 18 and 29. These variables are also used by Martínez and colleagues (2008) in their study of crime and drug use in Miami neighborhoods. Williams and colleagues (2011a; 2011b) found that property crimes—but not violent crimes— were significantly associated with percent of owner-occupied households, which is a measure of residential stability. Hipp and colleagues examined residential turnover in an ethnic context and found it to be significantly associated with crime. They conceptualized "residential stability" as the average length of residence of households in the relevant census tract (Hipp, Tita, and Boggess, 2009, 12-13).

Population Heterogeneity

Although it is not included in the forthcoming analysis, there is one final measure of social disorganization that appears in the theoretical literature which is relevant to the present

discussion of crime in city neighborhoods: population heterogeneity (Sampson and Groves 1989; Shaw and McKay [1942] 1969; Veysey and Messner 1999).[20] The argument here is that segregated communities suffer from lower rates of communication and interaction, which prevent them from organizing collectively to reduce crime and delinquency—even when the different population groups have a shared interest in law and order. A number of studies have found that population (i.e. racial/ethnic) heterogeneity is associated with higher crime rates (Bellair 1997; Hipp 2007; Roncek and Maier 1991; Sampson and Groves 1989, 1989).

Conclusion

In this chapter I have reviewed the literature on cannabis, MCDs, and crime that is relevant to the present study. Particular attention has been given to routine activities theory (Cohen and Felson 1979; Felson 1987; Williams, Freisthler, and Sims 2011a) as well as social disorganization theory (Sampson and Groves1989). In the next chapter I extrapolate from these theories in developing a conceptual model of crime to test for the criminogenic effect of MCDs.

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[20] Unlike "family disruption", which was incorporated into the social disorganization model by Sampson and Groves (1989), "ethnic heterogeneity" was one of the three components of social disorganization theory originally put forward by Shaw and McKay ([1942] 1969).

CHAPTER III.
A MODEL OF URBAN CRIME

Introduction

In this chapter I present a conceptual model for testing the relationship between medical cannabis dispensaries (MCDs) and crime across city neighborhoods. I test this model empirically in the next chapter. Two competing hypotheses are drawn from routine activities theory. Routine activities theory explains that crimes occur when there is a convergence of three factors: suitable targets, likely offenders, and lack of capable guardianship (Cohen and Felson 1979; Williams, Freisthler, and Sims 2011a). Applied to the present research question, I consider the following hypotheses:

> (H1): MCDs can promote crimes because they represent *suitable targets* for crime and/or attract *likely offenders* to the surrounding area.

> (H2) MCDs can also prevent crimes because their security protocols represent *increased guardianship*, which has a deterring effect on crime in surrounding areas.

> (H3) The net effect of MCDs on crime will depend on the relative strength of these mechanisms.

Empirical testing is needed in order to assess the strength of these claims. I develop the model that will be used to test these claims in the first section of this chapter. In the latter sections I describe the various measures that comprise this model, which are tested in the following chapter.

In comparing crime rates across city neighborhoods, it is important to control for neighborhood characteristics that are related to crime independently of MCDs. In the present study I consider three vectors of social and demographic variables, drawn from social disorganization theory, that will be used as control variables in my model: economic deprivation, family disruption, and residential instability (Sampson and Groves 1989; Shaw and McKay

1969).[21] "Social disorganization" is a concept used to describe communities in which there is a lack of sufficient social cohesion among members—characterized by low socioeconomic status, fewer stable families, and high residential turnover—that would otherwise serve as a deterrent against crime. Higher levels of these social disorganization indicators are associated with higher crime rates at the citywide and neighborhood level (Hipp, Tita, and Boggess, 2009; Martínez, Rosenfeld, and Mares 2008; Morenoff, Sampson, and Raudenbush 2001; Sampson and Groves 1989). Controlling for these variables across city neighborhoods will help determine whether, and to what extent, MCDs have an independent effect on crime.

Current debates about the relationship between MCDs and crime tend to revolve around politicized rhetoric and anecdotal claims (Americans for Safe Access 2011; California Police Chiefs Association 2009). The only scholarly discussion of this question known by this author at the time of this writing consists of a pair of studies out of UCLA that examined crime data from 95 census tracts in Sacramento for the year 2009 (Williams, Freisthler, and Sims 2011a; 2011b). Nancy J. Williams and colleagues found that crime rates were not significantly associated with neighborhood density of medical marijuana dispensaries. The researchers identified several other variables with higher explanatory power with respect to crime, including unemployment, percent of the population that is young, and percent of one-person households. These findings correspond with the assertion made by social disorganization researchers that low levels of SES, high residential instability, and high rates of family disruption correspond with relatively higher rates of crime. In the following sections of this chapter, I will discuss these and other measures that comprise the empirical model developed by this study. First, I will briefly review the two

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[21] Historically, social disorganization researchers have also considered a fourth category of variables, "population heterogeneity", which is generally an index of ethnic diversity (Sampson and Groves 1989), demographic transition (Hipp, Tita, and Boggess, 2009), immigration status and/or linguistic isolation (Martínez, Rosenfeld, and Mares 2008). This vector is not included in the present model.

criminological theories that I draw upon: routine activities theory and social disorganization theory.

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BRIEF OVERVIEW OF RELEVANT THEORIES

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Stemming from human ecology, routine activities theory attempts to explain crime on the basis of three conjoining factors: suitable targets, likely offenders, and absence of capable guardians (Cohen and Felson 1979). This approach suggests that MCDs could potentially lead to crime by increasing the concentration of *likely offenders* in the local neighborhood, or, more directly, by themselves presenting *suitable targets* for crime. These are precisely the sorts of claims that are made by critics of MCDs (California Police Chiefs Association 2009). Conversely, it is conceivable that MCDs might decrease crime in a neighborhood by introducing increased *guardianship*, which could serve as a deterrent against crime. Proponents of MCDs make arguments of this type when asserting that dispensaries—especially those in compliance with local regulatory schemes requiring stringent security protocols—actually reduce crime in their neighborhoods (Americans for Safe Access 2011).[22] Routine activities theory is an appropriate and compelling lens through which to analyze these competing claims. It is appropriate because it presents direct causal mechanisms through which MCDs might affect crime, and it is compelling because those mechanisms plausibly run in either direction (i.e. towards increased or decreased crime).

Another useful approach found in the criminological literature is social disorganization theory, first developed by Shaw and McKay, which links urban crime to the concept of "social disorganization" ([1942] 1969). Studies have identified several measures of social

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[22] The San Francisco Medical Cannabis Act states that as applications for MCD permits must demonstrate "… security measures for the medical cannabis dispensary, including lighting and alarms, to ensure the safety of persons and to protect the premises from theft" (City and County of San Francisco 2005, Sec. 3304(c)). Under the Berkeley law, MCD security requirements are promulgated by the Chief of Police (City of Berkeley 2008, Sec. 23E.16.070)

disorganization that are positively associated with crime (Martínez, Rosenfeld, and Mares 2008; Morenoff, Sampson, and Raudenbush 2001; Sampson and Groves 1989). In the present study I examine three "exogenous sources of social disorganization": socioeconomic deprivation, residential instability, and family disruption. If these neighborhood characteristics predict crime, as social disorganization theory suggests, then they ought to be incorporated into more specific models of urban crime—including the present attempt to explain the relationship between MCDs and crime. I do not argue that there is a direct relationship between MCDs and social disorganization. Rather, I look to social disorganization theory to identify neighborhood characteristics, independent of cannabis, which might confound the real relationship between MCDs and crime. Variables from each of the three categories of social disorganization variables used in the present model are summarized in Table 3.1 below. For a more thorough review of the underlying theories and concepts, see the previous chapter.

Table 3.1. Selected "Exogenous Sources of Social Disorganization"		
Category	**Component Variables**	**Relation to Crime Rate**
Economic Deprivation / Low SES	▪ Poverty ▪ Unemployment	The traditional explanation is that poor people have higher incentives and lower opportunity costs associated with crime. A more complex explanation may be that low SES city neighborhoods tend to experience higher rates of police contact, independent of actual criminal behavior, and that this police bias results in higher rates of reported crime.[i] (Sampson 1986).
Family Disruption	▪ Single-parent households with children under 18	Family disruption is linked to crime independently of SES and other characteristics. Fewer parents means fewer adults to supervise teenagers who are at risk for criminal behavior and a general lack of "social control", leading to decreased capacity to prevent crime (Cohen and Felson 1979; Sampson 1987).
Residential Instability	▪ Percent of units that are vacant ▪ Percent of population ages 18-29	Communities with high levels of collective efficacy look out for each other, report suspicious characters, and take other preventative measures against crime. High residential turnover makes it difficult for communities to establish collective efficacy (Sampson, Raudenbush, and Felton Earls 1997).

Note: See the previous chapter for a more detailed discussion of these theories studies and their empirical findings.

[i] Sampson, Robert J. 1986. "Effects of Socioeconomic Context on Official Reaction to Juvenile Delinquency." *American Sociological Review* 51(6): 876–885.

[ii] Sampson, Robert J, Stephen W. Raudenbush, and Felton Earls. 1997. "Neighborhoods and Violent Crime: A Multilevel Study of Collective Efficacy." *Science* 277(5328): 918–924.

[iii] Sampson, Robert J. 1987. "Urban Black Violence: The Effect of Male Joblessness and Family Disruption." *American Journal of Sociology* 93(2): 348–382.

The aim of this study is not to explain crime *per se*, but to explore the extent to which variation in crime frequencies across city neighborhoods can be explained by the presence of medical cannabis dispensaries in those neighborhoods, controlling for factors that are related to crime. In the next section of this chapter I present the empirical model to be tested by this study and explain its relation to the existing models put forward by routine activities theory and social

disorganization theory. In the next chapter I will define these measures more precisely and assess their relative significant with respect to crime.

A CONCEPTUAL MODEL OF CRIME TO TEST FOR THE EFFECT OF MCDS

As is also true in the classic models of routine activities theory and social disorganization theory, the dependent variable that the present study seeks to explain is crime. Unique to this study is the primary independent variable, which is the density of MCD(s) across city neighborhoods. The null hypothesis generated by this model is that there is no direct relationship between MCDs and crime. This is represented by Figure 3.1, below.

Figure 3.1. A Model of MCDs and Crime.
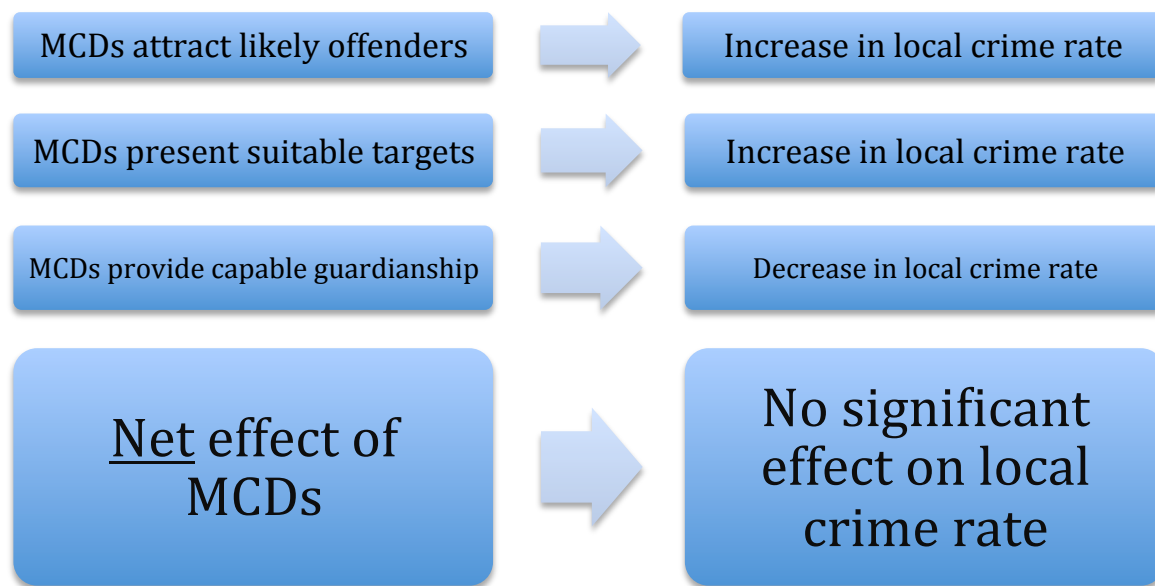
Using data for 189 San Francisco census tracts in 2010, I test this model empirically in the following chapter.

CHAPTER IV.
SPATIAL ANALYSIS OF CRIME AND MCD DENSITY

Introduction

This study examines the spatial relationship between medical cannabis dispensaries (MCDs) and crime across 189 census tracts in San Francisco in the year 2010. I test two hypotheses drawn from the theoretical literature on routine activities theory (Cohen and Felson 1979), controlling for neighborhood characteristics drawn from social disorganization theory (Sampson and Groves 1989; Shaw and McKay [1942] 1969). The first is that MCDs increase crime by attracting *likely offenders* and presenting them with *suitable targets*; the second is that MCDs actually decrease crime by protecting their surrounding community with adequate security measures and thereby providing *capable guardianship*. The theoretical bases for these claims are discussed in greater length in the previous two chapters. In this chapter I present the research methodology employed by this study and discuss their implications. Data are collected from the San Francisco Police Department, Planning Department, and Department of Public health; the California Department of Finance; the American Community Survey (ACS); and the United States Census Bureau. Linear regression models are tested using four dependent variables at the census tract level: total property crimes, property crimes per 1,000 residents, total violent crimes, and violent crimes per 1,000 residents. Findings are largely but not perfectly consistent across these different models with respect to the spatial relationships between crime, MCD density, and the seven other neighborhood characteristics analyzed: poverty, unemployment, family stability, vacancy rate, percent of the population ages 18-29, percent of the population that is male, total population size, and percent of land commercially zoned.

Findings indicate a consistently weak but statistically significant relationship between MCDs and crime. MCD-containing tracts have slightly higher rates of both property crime and violent crime than tracts that do not contain MCDs. The link is stronger for violent crime (assault and robbery) than property crime (arson, burglary, larceny/theft, vandalism, and vehicle theft). I am careful not to infer too much from this finding, due to the limited number of cases under review—26 dispensaries across 16 census tracts, compared to 173 non-MCD-containing tracts.

Crime is more strongly predicted by the social disorganization variables examined by this study: socioeconomic disadvantage, family disruption, and residential instability. Consistent with social disorganization theory, socioeconomic disadvantage and family disruption are found to be strong predictors of high crime rates. Poverty is a strong predictor of high crime rates across all four models—much stronger than MCD density. By "stronger" I mean that it has a larger correlation coefficient and a higher degree of statistical significance (see Table 4.2). "Family stability" (a measure of how many individuals in a given tract live in married-couple family housing) is negatively associated with crime across all four models. Again, this link is stronger than the link between MCD density and crime. The third category of variables drawn from Sampson and Groves' "exogenous sources of social disorganization" (1989, 780), residential instability, was not as strongly predictive of crime as socioeconomic disadvantage or family disruption. In the following sections I explore these findings more deeply and discuss their implications for research as well as policymaking.

AREAL UNIT: CENSUS TRACT

In a recent working paper for the California Center for Population Research at UCLA, Nancy Williams and colleagues present a routine activities approach for examining the link between MCDs and crime. They examine 95 census tracts in Sacramento using data for the year

2009. Their findings indicate that tracts containing dispensaries are not significantly associated

with higher rates of crime when controlling for neighborhood characteristics associated with

crime (Williams, Freisthler and Sims 2011a). This study borrows from their work in conducting

a cross-sectional analysis of the spatial relationship between MCDs and crime in 189 San

Francisco census tracts for the year 2010.

All measures are aggregated to the level of census tracts. Census tracts are convenient

units of analysis because they have similar population sizes, their boundaries align with the

physical environment, and they are intended to be homogenous with respect to population

characteristics and living conditions (U.S. Census Bureau, Geography Division 2000; Williams,

Freisthler, and Sims 2011a; 2011b).[23] Thus they roughly approximate city neighborhoods. From

a routine activities perspective, I argue that it is reasonable to assume in the case of densely

populated cities like San Francisco that *likely offenders*, in choosing whether, where, and when

to commit a crime—that is, in weighing the *target suitability* and *guardianship* of potential

victims—are going to consider targets within an area roughly the size of a census tract. Maps

presented in the forthcoming analysis should illustrate the geographic implications of this

assumption. Another advantage to using census tracts as the spatial unit of analysis is that there

is an abundance of demographic information available at the census tract level via the U.S.

Census Bureau and ACS. This provides for an excellent range of control variables. But this

approach is not without its disadvantages. As Tita and Greenbaum (2009, 145) have noted:

> Modeling the clustering of crime through spatial regression requires two important
> decisions. First, one must choose a unit of analysis that is consistent with the social
> processes believed to be driving the observed patterns. Second, one must consider the
> relationships among these units such that the model captures the influence the activities
> in other areas have on outcomes in the neighborhood.

While I maintain that census tracts are an appropriate unit of analysis for the present study in that

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[23] For a discussion of different spatial units of analysis, see Tita and Greenbaum (2009).

they meet the first criteria—census tracts reasonably capture the social process under examination, i.e. crime—I accept that this approach is vulnerable to criticism along Tita and Greenbaum's second line of contention. The present model does not account for criminal activity in other tracts and therefore misses the "spillover effects" that a land use such as MCDs may have on crime in neighboring tracts. This presents a significant limitation for the present model—although one that could theoretically be corrected for, to some extent, through more sophisticated spatial analyses. Considering the lack of empirical evidence currently available with respect to this issue—and its significant implications for policymaking and future research—I argue that, as a preliminary analysis, this study has tremendous value despite this and other limitations. It may not account for inter-tract crime, but it does provide new knowledge about the nature of intra-tract crime. City residents probably are concerned about businesses in adjacent neighborhoods; but when it comes to crime they are concerned, first and foremost, with the people next door.

CASE SELECTION AND TIME FRAME: SAN FRANCISCO, 2010

In this paper I examine the relationship between MCDs and crime in San Francisco for the year 2010. San Francisco provides an excellent case study for analyzing the social impact of MCDs because, unlike most jurisdictions in which MCDs have emerged in recent years, the local government in San Francisco has been regulating MCDs effectively for years. In some other cities, local governments and MCD operators have undergone heated legal battles with one another. This has resulted in a "regulatory vacuum" with respect to MCDs in most jurisdictions in which they exist (Cohen 2010). Perhaps the most notable example of this is Los Angeles, where MCDs have been in legal limbo for years. In early 2012 the *Los Angeles Times* editorial board, responding to a recent motion to ban all MCDs in the city, described the L.A. city

government's approach to dispensary regulation as a "roller-coaster ride".[24] At one point there were an estimated 1,000 MCDs operating throughout the city, leading to the observation that medical cannabis was more popular in L.A. than Starbucks.[25]

By contrast, in San Francisco, MCDs are governed by a comprehensive municipal ordinance that has survived judicial scrutiny to date. The San Francisco "Medical Cannabis Act" (first enacted in 2005) sets up a permitting system for MCDs and places certain restrictions on their location and operation. The Act requires that all MCDs comply with California state law as well as guidelines written in 2008 by then-Attorney General Jerry Brown entitled "Guidelines For The Security And Non-Diversion Of Marijuana Grown For Medical Use".

Brown's guidelines state that "a properly organized and operated collective or cooperative that dispenses medical marijuana through a storefront *may be lawful* under California law" (emphasis added) if they meet certain requirements, including: operating on a not-for-profit basis, obtaining all of the relevant permits and licenses from state and local government, taking steps to verify that their members are qualified patients under state law, acquiring and distributing only marijuana that has been cultivated legally, prohibiting sales to non-members, and providing adequate security (Brown 2008, 11). Regarding security, Brown states that MCDs must "provide adequate security to ensure that patients are safe and that the surrounding homes or businesses are not negatively impacted by nuisance activity such as loitering or crime." Expanding on this theme, the San Francisco Medical Cannabis Act prohibits "any breach of peace… or any disturbance of public order or decorum by any tumultuous,

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[24] "Editorial: L.A.'s Medical Marijuana Roller-Coaster Ride." *Los Angeles Times*. January 4, 2012. http://www.latimes.com/news/opinion/opinionla/la-ed-marijuana-20120104,0,2171968.story (accessed March 12, 2012).
[25] Martin, Michel. "In California, Marijuana Dispensaries Outnumber Starbucks". National Public Radio, October 15, 2009. http://www.npr.org/templates/story/story.php?storyId=113822156 (accessed March 12, 2012).

riotous or disorderly conduct" within permitted MCDs.[26] MCDs are required to submit security

plans as part of their permit application.[27] This study examines whether such security protocols

amount to *capable guardianship*, which is an effective deterrent against crime according to

routine activities theory (L. E. Cohen and Felson 1979; Williams, Freisthler, and Sims 2011a).

San Francisco is not the only municipality that has regulated MCDs. Other California

cities have enacted similar ordinances, including two prominent examples that can be found

directly across the water from San Francisco in the cities of Berkeley and Oakland. But as a case

study San Francisco has several advantages over these and other alternatives. First and foremost,

it is a major city with a large sample of MCDs (n = 26) in the year for which data are collected.

By comparison, Berkeley and Oakland have smaller populations and "hard caps" on the number

of dispensaries allowed.[28] So although they present interesting pieces of the legal, social, and

political puzzles presented by California's medical cannabis law, their small sample size limits

the extent to which they are useful cases for empirical study.

Cities that regulate MCDs tend to have so few of them that spatial analysis becomes

impossible. In cities that do not regulate MCDs, it is difficult to determine when and where

dispensaries operate, and for how long. It is also much harder, in the case of unregulated

dispensaries, to infer whether MCDs implement security protocols amounting to *capable*

guardianship against crime, from a routine activities perspective (Cohen and Felson 1979).

Simply put, San Francisco is the largest California to have enacted meaningful legislation with

respect to MCDs. It has done so in a way that reasonably controls for crime, at least in theoretical

terms. Thus it provides an excellent case study for analyzing the spatial relationship between

crime and locally regulated MCDs.

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[26] Sec. 3308(e).
[27] Sec. 3304(c)(9).
[28] Berkeley currently has a cap of four MCDs; Oakland recently voted to authorize four more, for a total of eight.

All data analyzed in this study are for the year 2010, a year in which there were 26 permitted MCDs in San Francisco. Although it is too early to say, it is possible, due to the current federal crackdown on MCDs in California and MCDs, that 2010 will end up being the last full year for which this type of analysis can be conducted. Since research for this project began in the summer of 2011, at least ten Bay Area MCDs have closed, including five in San Francisco, under pressure from Melinda Haag, the US Attorney for the Northern District of California.[29] Not surprisingly, Haag's justification for the crackdown is that MCD's attract crime and endanger communities.

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PRIMARY VARIABLES: CRIME RATE AND MCD DENSITY

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Crime Frequency

Crime data were collected from the San Francisco Police Department in late 2011. The Crime Analysis Unit provided lists of serious crimes reported in 2010 along with the date and approximate location (i.e. city block or nearest intersection) of each crime. Here, "serious crimes" refer to those classified as Part I offenses by the Federal Bureau of Investigation (FBI) in its Uniform Crime Reports. The crime variables used in this analysis include measures of "violent crime" (assault and robbery) as well as "property crime" (arson, burglary, larceny/theft, vandalism, and vehicle theft); both as total counts and as rates per 1,000 residents.

The lists of crimes and addresses were geocoded and aggregated into census tracts using ArcGIS software.[30] Geocoding refers to the process by which tabular data (in this case, street addresses and intersections) are attributed spatial components by a geodatabase. Geocoding resulted in a successful match for more than 98% of all crimes, which were the aggregated into

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[29] Montgomery, Michael. "Interview with US Attorney Haag on Pot Operations." *KQED News*, March 15, 2012. http://blogs.kqed.org/newsfix/2012/03/15/interview-w-us-attorney-haag-on-pot-operations-if-its-close-to-children-thats-a-line-were-going-to-draw/ (accessed March 16, 2012).

[30] A special thanks to John Ridener at the UC Berkeley Earth Sciences and Map Library for his generous support with ArcGIS.

census tracts using a "spatial join" analysis. The remaining 1-2% of crimes were discarded from analysis. In addition, some reported crimes were removed from analysis because their geocoding confidence ratings were below 95%. In the end 43,688 reported crimes were analyzed out of the original 44,422 for which the San Francisco Police Department (SFPD) provided 2010 data. For the purpose of analysis, these crime measures were aggregated together by census tract and transformed by natural logarithm to correct for a right-skewed distribution. Descriptive statistics for these various categories of crime are presented in their original form in Table 4.1.

Density of Medical Cannabis Dispensaries

The primary independent variable under review is the density of MCDs. Lists of MCD names and addresses ($n = 26$) were compiled using information provided by the San Francisco Department of Public Health. These MCDs were located across 16 census tracts primarily in the downtown area, as illustrated by Maps 4.1 and 4.2. The MCD addresses were geocoded to 100%. As with crime frequency, data for MCDs are presented in two forms. Descriptive statistics presented in Table 4.1 include MCD density as the number of dispensaries per square mile in a given census tract. For the regression analyses presented by Table 4.2, this variable is transformed by natural logarithm to address a right-skewed distribution.

Crime rates by census tract are presented in Map 4.1 (property crimes) and Map 4.2 (violent crimes) on the following pages. MCD locations are marked by green crosses. Property crimes include arson, burglary, larceny-theft, vandalism, and vehicle theft. Violent crimes include assault and robbery. Census tracts are assigned to one of five classes (symbolized by the five shades of grey that fill out the census tracts in Maps 4.1 and 4.2) based on their crime rates.

Map 1. Property Crimes Per Census Tract, San Francisco, 2010.
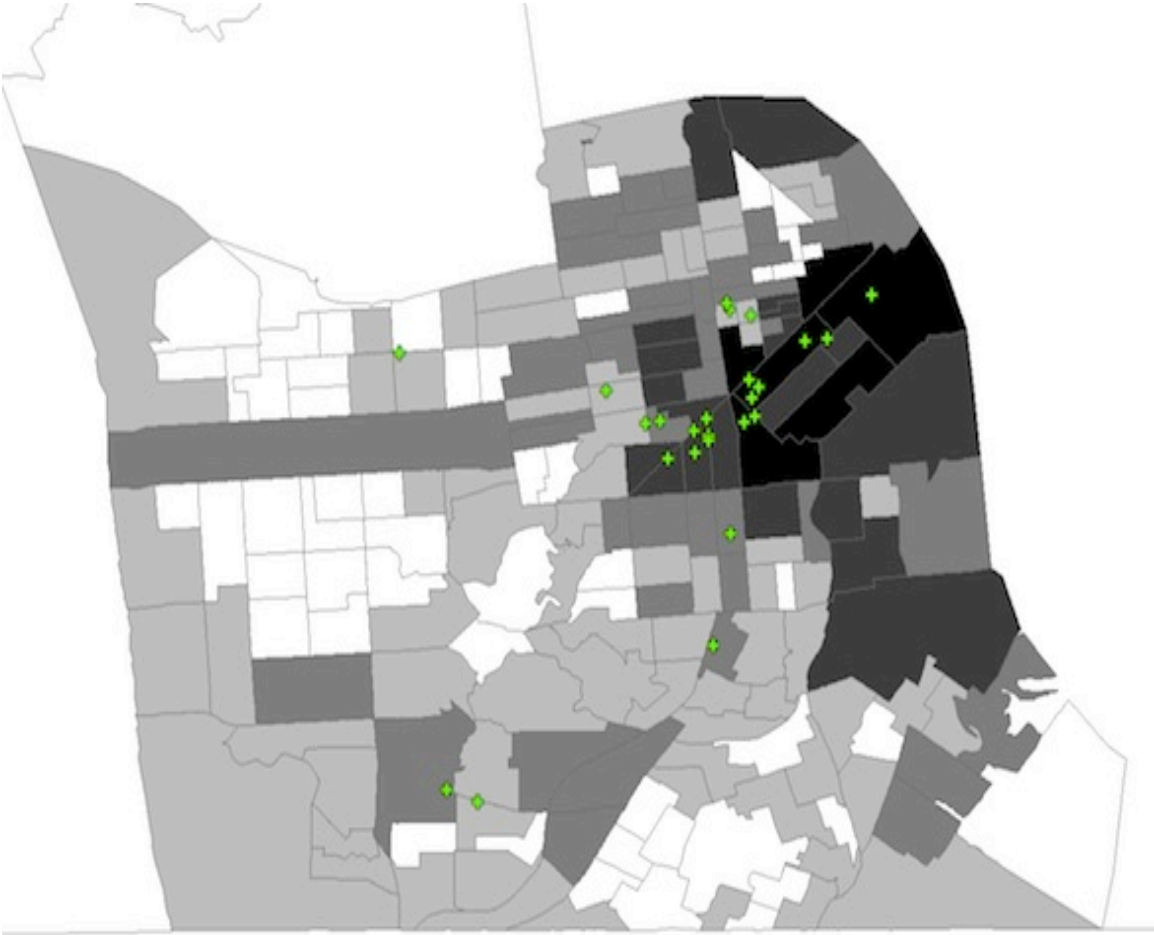
Map 2. Violent Crimes Per Census Tract, San Francisco, 2010.

SECONDARY VARIABLES: EXOGENOUS SOURCES OF SOCIAL DISORGANIZATION

In addition to the primary variables already discussed, data were also collected for several neighborhood characteristics that could potentially confound the relationship between MCDs and crime. These neighborhood characteristics are drawn from social disorganization theory, which associates higher rates of crime with socioeconomic disadvantage, family disruption, residential instability, and population heterogeneity (Sampson 1987; Sampson and Groves 1989; Martínez, Rosenfeld, and Mares 2008; Hipp, Tita, and Boggess, 2009; Veysey and Messner 1999). From these, the present study examines the criminogenic effect of poverty, unemployment, percent of single-parent households, percent of housing units that are vacant, and percent of the population between the ages of 18 and 24. Demographic data are collected from the American Community Survey (ACS) database of the United States Census Bureau via the American FactFinder website, as well as the Demographic Research Unit of the California Department of Finance. With regard to the census data, variables are constructed from the ACS 5-year estimates for the year 2010.

Poverty. Criminological research has found that indicators of socioeconomic disadvantage—including poverty and unemployment—have been associated with higher crime rates (Martínez, Rosenfeld, and Mares 2008; Peterson, Krivo, and Harris 2000). In the present study economic data are collected from the ACS. The U.S. Census Bureau calculates the poverty status of individuals based on whether their total income in the past 12 months falls below the applicable poverty threshold, which is determined by age, family size, and family composition (American Community Survey 2011, 102). [31] The 2010 poverty thresholds range from $11,139 for a single individual living alone to $42,156 for a family of eight or more people living in the

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[31] American Community Survey. 2011. *S1701: Poverty Status in the Past 12 Months (2006-2010 American Community Survey 5-Year Estimates).*

same household.[32] For the present analysis, "poverty" means the number of individuals with incomes under their applicable poverty threshold in the past twelve months, divided by the total number of people for whom poverty status is calculated within a given tract

Unemployment. According to the United States Census Bureau, an individual is considered unemployed if he or she did not have a job *and* has been actively looking for work during the last four weeks *and* was available to start a job at the time of the survey (American Community Survey 2011, 62).[33] "Unemployment", in the present analysis, means the unemployment rate in each tract as estimated by the ACS. Research examining crime rates in the United States during the 1990's suggests that the job market can provide powerful explanations for criminal behavior (Freeman 2001; Raphael and Winter-Ebmer 2001). Poverty and unemployment are important measures in the model currently being tested, as they control for varying levels of socioeconomic disadvantage across city neighborhoods, which according to social disorganization theory affect crime rates in significant ways (Sampson and Groves 1989).

Family Disruption. In this study I use "family stability" as an inverse measure of family disruption. I calculate family stability by taking the number of individuals living in married-couple family housing and dividing it by the number of people living in single-parent family households. Scholars of both routine activities theory (L. E. Cohen and Felson 1979; Felson 1987) and social disorganization theory (Sampson 1987; Sampson and Groves 1989; Veysey and Messner 1999) predict that higher concentrations of married-couple families are associated with lower crime rates in urban areas, because more parents can provide more supervision and

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[32] U.S. Census Bureau, Current Population Survey, 2011 Annual Social and Economic Supplement. http://www.census.gov/hhes/www/cpstables/032011/pov/new35_000.htm (accessed March 12, 2012).
[33] American Community Survey. 2011. *S2301: Employment Status (2006-2010 American Community Survey 5-Year Estimates)*.

therefore more social control. From a routine activities perspective, both "family stability" and

"residential stability" correspond with the notion of *capable guardianship*.

Vacancy. According to social disorganization theory, residential instability weakens a

community's social cohesion and therefore its ability to deter and prevent crime within its

territory. In this study I use vacancy rates as measure of residential instability. I calculate

"vacancy" by dividing the number of vacant housing units within a census tract by the total

number of units within that tract. Data for this measure comes from the Census 2010

Redistricting Plan.[34]

Percent Young. Another indicator of residential turnover discussed in the criminological

literature is the percent of the sample population that is young (i.e "young adult"; older than 18

but not much older). The idea is that neighborhoods with a high concentration of young adults

will have correspondingly fewer older adults and children, which results in a lack of social

cohesion and crime-preventive capacity much in the same way as the other precursors of "social

disorganization" already discussed. The variable "percent young" was constructed using ACS

population estimates by dividing the total number of individuals between the ages of 18 and 29

by the total tract population.[35]

Other. Although they are not of particular theoretical interest, the following measures are

included as demographic control variables: population size, percent of the population that is

male, and percent of land that is commercially zoned. Population size and gender composition

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[34] California Department of Finance. Demographic Research Unit. 2011. *Total and 18+ Population by Race (Hispanic exclusive) and Hispanic or Latino and Total Housing Units, Occupied, and Vacant Units*. http://1.usa.gov/An2kgu (accessed March 15, 2012). Original data from the United States Census 2010 Redistricting (P.L. 94-171) Data File.
[35] American Community Survey. 2011. *B01001: Sex by Age (2006-2010 American Community Survey 5-Year Estimates)*.

are adapted from the 2010 Census. "Percent of land commercially zoned" was calculated in

ArcGIS using zoning shapefiles provided by the San Francisco Planning Department.

RESULTS AND DISCUSSION

Table 4.1 presents descriptive statistics for the measures analyzed in this study. Here the

crime data are provided as total counts by category, but in the regression analysis that follows the

crime variables are transformed by natural logarithm to correct for a right-skewed distribution.

All other variables are presented as described in the previous section. A total of 189 census tracts

within San Francisco County are analyzed using data for the year 2010. Five census tracts (i.e. of

an original 194) were removed from analysis because only partial data were available; these were

low population tracks with no MCDs and therefore their loss is not analytically significant.

Of the tracts analyzed, the average population size is 4,234. The average crime rate is

197.38 property crimes per year (or 51.64 per 1,000 residents). The average violent crime rate is

much lower: only 28.65 reported instances per year (or 7.02 per 1,000 residents). As conveyed

by the results of regression analyses presented in Table 4.2, the model put forward by this study

is better at explaining property crime than it is violent crime. The simplest explanation for this is

that substantially more property crimes are committed on a yearly basis than violent crimes.

Descriptive statistics for the independent variables analyzed by this study are also

presented in Table 4.1 These include "% Unemployed" and "% Under Poverty" as measures of

socioeconomic disadvantage; "% of Housing Units Vacant" and "% of Population Ages 18-29"

and measures of residential instability; and "% In Married-Couple Families" as a measure of

family stability (an inverse measure of family disruption). These variables are included in the

present model to test the explanatory power of social disorganization theory, which associates

higher crime rates with "exogenous sources of social disorganization" (Sampson and Groves

1989, 780), including socioeconomic disadvantage, residential instability, and family disruption.

Additional control variables presented in Table 4.1 under "Other Tract Characteristics" include

population size, population density, percent of land commercially zoned, and percent of the

population that is male.

Table 4.1. Descriptive Statistics for Dependent Variables, Independent Variables, and Other Neighborhood Characteristics for 189 Census Tracts in San Francisco (2010).

	Mean	Min	Max
Dependent Variables[†]			
Property Crimes	4.86 (0.81)	2.89	7.64
Property Crimes per 1,000 Residents	3.47 (0.81)	1.72	6.78
Violent Crimes	2.64 (1.2)	0	5.68
Violent Crimes Per 1,000 Residents	1.28 (1.13)	-1.26	4.24
Independent Variables			
MCD Density (per mi^2)	1.17 (5.73)	0.00	55.83
% Unemployed	0.07 (0.05)	0.01	0.34
% Under Poverty	0.12 (0.09)	0.01	0.53
% In Married-Couple Families	0.08 (0.04)	0.00	0.20
% Of Housing Units Vacant	0.08 (0.04)	0.03	0.38
% Of Population Ages 18-29	0.2 (0.08)	0.04	0.72
Other Tract Characteristics			
Population	4,234.13 (1,480.92)	1,500.00	11,502.00
Population Density (per sq mi.)	30,467 (22,691.93)	995.09	161,496.30
% Of Land Commercially Zoned	0.01 (0.02)	0.00	0.17
% Male	0.51 (0.06)	0.38	0.70
Property Crime			
Arson	1.76 (12.17)	0.00	167.00
Burglary	47.01 (323.19)	0.00	4,466.00
Larceny/Theft	236.81 (1,638.19)	3.00	22,497.00
Vandalism	65.22 (448.68)	3.00	6,196.00
Vehicle Theft	41.87 (287.72)	1.00	3,978.00
Total Property Crimes	197.38 (288.56)	18.00	2,073.00
Property Crimes Per 1,000 Residents	51.64 (94.88)	5.56	878.30
Violent Crime			
Assault	23.81 (164.29)	0.00	2,262.00
Robbery	33.18 (229.07)	0.00	3,152.00
Total Violent Crimes	56.99 (393.27)	0.00	5,414.00
Violent Crimes Per 1,000 Residents	7.02 (10.89)	0.00	69.65

Notes: n = 189. Sample includes all census tracts within San Francisco County, minus five tracts for which relevant data is only partially available. Standard deviations in parentheses. Crime data provided by the Crime Analysis Unit of the San Francisco Police Department. Tract characteristics collected from the American Community Survey of the U.S. Census Bureau and the Demographic Research Unit of the California Department of Finance.
[†]Crime categories were aggregated together and transformed by natural logarithm (see text for details).

For the vast majority of census tracts (177 out of 189) the value of the primary independent variable, MCD density, is zero. The 26 dispensaries operating in San Francisco in 2010 were largely clustered downtown. MCDs are not uniformly distributed throughout San Francisco. But neither is crime. Most crime also occurs downtown, with a large amount being reported in just a handful of densely populated census tracts. The fact that some of these high-crime tracts also contain the majority of San Francisco's dispensaries make it especially difficult, in the present analysis, to rule out a spurious correlation. This presents a limitation to the present analysis, albeit one that is intimately tied to the nature of the research question.

Table 4.2 presents the results of four different linear regression analyses. The independent variables are the same in each, and so are the cases (n = 189 census tracts). What differs is the dependent variable: (1) total property crimes, (2) property crimes per 1,000 residents, (3) total violent crimes, and (4) violent crimes per 1,000 residents.

The primary independent variables are MCD density (transformed by natural logarithm) and the five variables drawn from social disorganization theory: poverty, unemployment, family stability, vacancy, and percent of the tract population between the ages of 18 and 29. Additional control variables include population size, percent of the population that is male, and percent of land that is commercially zoned.

Table 4.2. Regression Analysis Results: Property and Violent Crime Rates by Total Count and Per 1,000 Residents across 189 San Francisco Census Tracts (2010).

	Total Property Crimes (1)	Property Crimes Per 1,000 Residents (2)	Total Violent Crimes (3)	Violent Crimes Per 1,000 Residents (4)
(Intercept)	0.00	0.00	0.00	0.00
	(0.06)	(0.06)	(0.06)	(0.06)
MCD Density	0.10^	0.11^	0.14*	0.15*
	(0.06)	(0.06)	(0.06)	(0.06)
Poverty	0.25**	0.24**	0.30***	0.32***
	(0.08)	(0.08)	(0.08)	(0.09)
Unemployment	-0.13^	-0.14	0.04	0.02
	(0.07)	(0.07)	(0.08)	(0.08)
Family Stability	-0.41***	-0.41***	-0.22**	-0.21*
	(0.08)	(0.08)	(0.08)	(0.08)
Vacancy	0.17**	0.20**	0.00	0.02
	(0.06)	(0.06)	(0.07)	(0.07)
Young	-0.12^	-0.13^	-0.06	-0.06
	(0.07)	(0.07)	(0.07)	(0.07)
Population	0.32***	-0.079	0.28***	-0.00
	(0.06)	(0.06)	(0.06)	(0.06)
Male	0.14*	0.15*	0.20**	0.23***
	(0.06)	(0.06)	(0.06)	(0.06)
Commercially Zoned	-0.11^	-0.13^	0.05	0.05
	(0.07)	(0.07)	(0.07)	(0.07)
R^2 =	0.43	0.41	0.40	0.37

Notes: n = 189 census tracts. All measures presented in standard units. Standard errors in parentheses. Crime data provided by San Francisco Police Department. Tract characteristics adapted from U.S. Census (2010), American Community Survey, California Department of Finance, and San Francisco Planning Department. Measures of crime, MCD density, and percent of land commercially zoned were transformed by natural logarithm.
^ Significant at 10%; * significant at 5%; ** significant at 1%; *** significant at 0.1%.

As Table 4.2 indicates, the four models are fairly consistent in their findings with respect to which variables predict what, and with what power. One interesting difference is that MCD density is a stronger predictor of violent crime than property crime—although the property crime models have slightly better explanatory power over all (R^2 values of 0.4279 and 0.4097, as opposed to 0.3988 and 0.3728). The relationship between MCD density and crime is weak but statistically significant, according to this model.

Of the other independent variables under review, the strongest predictors of crime—much more so than MCD density—are poverty and family stability. Poverty provides the strongest explanation for differences in violent crime rates across tracts, while family disruption provides the strongest explanation for property crime rates. As with MCD density, poverty is found to be a better predictor of violent crime than property crime. The opposite is true for family stability. As family stability increases, crime rates decrease. This holds across all four models. But the strength of that correlation for violent crime is nearly twice what it is for property crime (ß coefficients of -0.4071 and -0.4122, as opposed to -0.2163 and -0.2076). These findings are consistent with past research on social disorganization theory (Sampson and Groves 1989; Veysey and Messner 1999).

Findings suggest that residential instability—as conceptualized by the present study—is not as strongly correlated with crime as the other "exogenous sources of social disorganization". Like family stability, vacancy is a stronger predictor of property crime but not violent crime. But unlike family stability, vacancy is statistically insignificant with respect to violent crime.

LIMITATIONS

These findings should be considered in light of the limitations faced by the present study, which are several. Foremost among these is the narrow conception of the question. The link between MCDs and crime is an intriguing puzzle academically, and one that deserves greater attention. But for policymakers it is just one piece of a much larger puzzle. There are a multitude of factors to consider when deciding whether and how to regulate MCDs. Public safety is, of course, a necessary consideration. But in California so is the provision of state law, passed by a majority of voters in 1996, that qualified patients should have legal access to medical cannabis. And so are a number of other factors, ranging from potential effects on children and teenagers to the budgetary impact of MCD regulation and taxation by local governments. Thus, this study should be considered in light of its narrow academic approach to a broad real world problem. To the extent that this study says anything about the relationship between MCDs and crime, it must also be noted how little it has to say about these other factors.

In addition, there are certain technical limitations to this study that merit discussion. This study lacks breadth in both the quantity and quality of its case selection, which means that one should be cautious in generalizing from these findings. Moreover, the research design is purely observational (there is no experimental or quasi-experimental component). This makes causal identification impossible—observed associations could run in either direction, or they could be spurious. This study does not account for longer term (i.e. pre-2010) trends in crime frequency or neighborhood characteristics, a problem that could be corrected by future research that incorporates longitudinal data. If, for example, the crime data obtained for this study (i.e. by category, date, and precise location) could also be obtained for 1990 and 2000—years in which

MCDs were nonexistent and virtually non-existent, respectively—then a "before and after" analysis could be conducted for San Francisco and other cities.

The neighborhood data examined in this study also have their own limitations. While census tracts are convenient units of analysis, they are not perfect. They are imagined boundaries. The demographic data provided by the ACS provide a reasonably accurate picture of the people who live in a census tract, but do not account for the fact that people—and criminals in particular—tend to move from tract to tract. Nor do they account for tourists, transients, or anyone else unlikely to respond to census surveys.

The MCD data are also limited. It is possible that some of the MCDs included in this analysis were not open for the entire calendar year in 2010, or that there were some MCDs operating in 2010 without recognition from their local government (in which case they would not have been included in this analysis). There is also the question of other cannabis distributors not classified as MCDs. These include illicit dealers, medical cannabis delivery services, and small patient collectives without storefront locations. Whatever effect these groups may have on crime is not captured by the present study.

The crime data suffer from limitations as well. This study inherits all of the imperfections that accrue in reporting, recording, and transmitting data within and from police departments. Furthermore, because they are reported by approximate location (city block or nearest intersection), these crime data suffer from a lack of precision. Furthermore, because this study limits its analysis to a subset of crimes classified as Part I offenses by the FBI, it is not a very broad measure of crime. Policymakers might also be interested in less serious categories of crime when making decisions related to MCD regulation.

Final Conclusions

In this paper I have sought to contribute towards a more informed understanding of the spatial relationship between MCDs and crime. Findings suggest that there may be a relationship between the number of crimes reported in a neighborhood and the density of MCDs within the surrounding census tract. But this correlation does not take us very far in understanding the nature of this link. Do MCDs cause crime, or do they simply tend to locate in higher crime areas?

Regression analysis casts doubt on the allegation that MCDs are "magnets for crime" by suggesting that some neighborhood characteristics are better predictors of crime than MCD density. The neighborhood characteristics tested by this study are drawn from the literature on social disorganization theory (Sampson and Groves 1989). Of the measures analyzed, the best predictors of high property crime rates are, in descending order of strength and significance: family instability, poverty, percent of housing units that are vacant, percent of individuals between the ages of 18 and 29, and unemployment. The best predictors of violent crime rates are poverty and family instability. MCD density is a better predictor of violent crime than it is property crime.

In many cases the relationship between one or more of these factors and crime is stronger than the relationship between MCDs and crime. Thus it may be the case that certain neighborhoods would have even *higher* rates of crime if not for the presence of MCDs—ongoing longitudinal research should test whether this is the case. And generally speaking, future research should address the uncertainty in these findings by collecting larger bodies of data across longer periods of time. As more thorough and better-controlled analyses are conducted across the many jurisdictions currently grappling with MCD regulation, a clearer picture will emerge of the relationship between medical cannabis dispensaries and crime.

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