Promoting Access while Mitigating the Effect of Substance Abuse Clinics Offering Methadone Maintenance Treatment on Crime

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Acronyms*

CDC- Center for Disease Control

HHS- Health and Human Services

MMT- Methadone Maintenance Treatment

SAMHSA- Substance Abuse and Mental Health Administration

SES-Socioeconomic Status

Glossary[1]

Buprenorphine - a semisynthetic narcotic analgesic that is administered in the form of its hydrochloride to control moderate to severe pain and treat opioid dependence. Buprenorphine is administered by injection to control pain, is used in the form of a transdermal skin patch to control pain or treat opioid dependence, and is used in combination with naloxone in the form of a dissolvable tablet placed under the tongue or film placed inside the cheek to treat opioid dependence.

Demographic - the statistical characteristics of human populations (such as age or income)

Heroin - a strongly physiologically addictive narcotic that is made by acetylation of but is more potent than morphine and that is prohibited for medical use in the U.S. but is used illicitly for its euphoric effects

Methadone - a synthetic analgesic drug that is similar to morphine in its effects but longer acting, used as a substitute drug in the treatment of morphine and heroin addiction.

Naloxone - Naloxone is administered by injection or as a nasal spray to reverse the effects of opioids especially in the emergency treatment of opioid overdose.

Opioids – Opioids are a class of drugs that include the highly addictive and illegal drug heroin, synthetic opioids such as fentanyl, and pain relievers available legally by prescription, such as oxycodone (OxyContin®), hydrocodone (Vicodin®), codeine, morphine, and many others.

Opiates - a drug (such as morphine or codeine) containing or derived from opium and tending to induce sleep and alleviate pain

Population Density - the number of people living in square mile of an area

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[1] Definitions taken from the Merriam-Webster Dictionary & the National Institute on Drug Abuse

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Executive Summary

The opioid overdose rate has increased from 4.8% in 2004 to nearly 14% in 2016 in Virginia alone (CDC, 2016). To address this crisis in Virginia and in the United States, state and federal legislation has funded programs and drugs to control overdose rates including the opioid overdose reversal drug, naloxone, and opioid management drugs, Methadone and Buprenorphine. Despite this, a 2004 legislation in Virginia restricts the licensure of substance abuse centers from locating within one-half mile of a school. This legislation stems from neighborhood concerns regarding such facilities negative effect on crime.

Research indicates that while such facilities may increase crime substantially in neighborhoods that have low population densities and high medium incomes, these facilities can reduce crime by up to 16% in neighborhoods with median incomes in the lowest quartile. To improve access and mitigate the effect of these clinics on crime the viable policy options include
1. Let current trends continue (Status Quo)
2. Remove the restriction of MMT licensure based on geographic or demographic features
3. Limit the licensure of clinics offering MMT to only neighborhoods with median incomes below $44,000
4. Limit the licensure of clinics offering MMT to neighborhoods with population densities equal to or greater than 3,000 persons per square mile.

These options are evaluated using four criterion: cost-effectiveness, crime, access, and equity. Given the evaluation of these criteria, it is recommended that the General Assembly pass legislation limiting licensure of clinics offering MMT to only neighborhoods with median incomes below $44,000. In addition to pushing the General Assembly to pass such legislation, framing the issue from one of reducing crime to one of improving access is crucial in the improving policy surrounding the opioid epidemic.

Problem Definition:

Last year, over 1,300 people died from opioid overdoses in Virginia representing a 15% increase in opioid overdoses in the past five years. Methadone Maintenance Programs are a proven tool to help reduce opioid and opiate dependence. Despite this, substance abuse clinics in urban Virginia are in jeopardy.

Over the past two decades, as the number of clinics offering Methadone Maintenance Programs increased in the state, the public became increasingly concerned over the implications for community safety surrounding new clinics to treat opioid dependence. As a result, the Commonwealth of Virginia passed legislation prohibiting the licensure of clinics and recovery centers offering methadone and other opioid replacement drugs within one-half mile of public or private licensed day care centers or K-12 schools under §37.2-406. In the city of Richmond, there are over 43 schools within the 62.3 square miles of the city. *The Commonwealth of Virginia, specifically Richmond, Virginia, faces increasing demand for opioid dependence treatment facilities; however, current legislation restricts the licensure of such facilities to protect the surrounding neighborhoods from crime.*

Background:

The Rise of Opioid Abuse in the United States and Virginia

In the United States, the number of opioid (including prescription opioids and heroin) related deaths today is over 5 times higher than the number of related deaths in 1999 (CDC, 2017). Congruently, in Virginia the number of opioid overdoses has increased from approximately 4.8% in 2004 to nearly 14% in 2016 as seen in Figure 1 (CDC, 2017). The driving cause of this epidemic is overdoses from prescription opioids sold from pharmacies, hospital, and doctors at nearly quadruple the rate of prescriptions sold in 1999 (CDC, 2017). Despite this increase in the prescription of pain medication, the annual amount of pain reported by Americans today is not statistically different than that reported nearly two decades ago (CDC, 2017). As such, today, the United States population- which accounts for approximately 5% of the global population-- consumes over 80% of the world's opioid supply (CDC, 2017). This

Figure 1: Overdose Rate by Year

epidemic level increase stems from misinformed doctors, mass marketing by pharmaceutical companies, and the government's failure to limit opioid distributions (Johnson, Eriator, & Rodenmeyer, 2018).
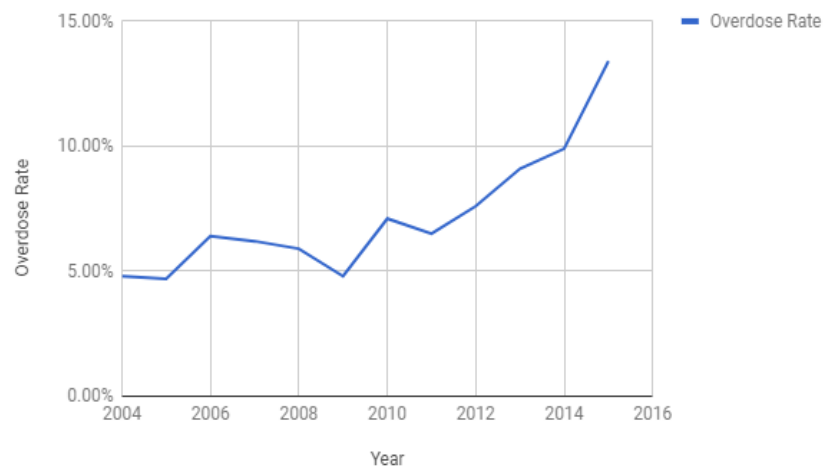
For thousands of years, opiates have been understood as highly addictive and highly lethal. With the invention of synthetic opioids, the representation surrounding such drugs altered as longer acting opioids such as Oxycodone and Vicodin became available. These drugs did not have the highs and lows associated with heroin and thus were seen as not addictive when treating pain (Johnson, Eriator, & Rodenmeyer, 2018). This belief spread the prescribing of prescription opioids past terminal cancer patients to individuals suffering from chronic pain. Doctors began prescribing the drug under the belief that when treating pain, these drugs were not addictive. Furthermore, pharmaceutical companies pushed this belief. This misinformation in combination with the government's inability to regulate these drugs through monitoring programs and stricter guidelines has contributed to the issue.

Such prescription medication are costly particularly when used without restraint by dependent individuals. As a result, individuals previously at low risk for addiction turn to the more lethal, less

expensive opioid option, heroin (Monico & Mitchell, 2017). Thus, the crisis has led to an increase in the number of individuals in demand of treatment to address their addiction. Likewise, withdrawal symptoms are particularly harsh for opioid addicts (Forsyth, Biggar, Chen, & Burstein, 2017). While most drugs see a 60% relapse rate, heroin and opioid abusers see a relapse rate of 80%. Furthermore, withdrawal symptoms can be so severe for addicts that the symptoms can result in death in extreme cases. As a result, drug abuse treatment is crucial in addressing opioid addiction as recovery is nearly impossible without such treatment. In sum, the nature of opioids and the opioid crisis requires not just treatment facilities to mitigate the harsh withdrawal symptoms and reduce relapse rates of opioid addicts but also to increase the availability and accessibility of facilities that treat the increasing number of opioid addicts.

Addressing the Crisis:

In response to the crisis, in early 2017, the Trump Administration signed the American Cures Act which appropriated approximately two billion dollars to address the issue through the Health and Human Services' (HHS) Substance Abuse and Mental Health Services (SAMHSA) (Thompson, 2017). The legislation encouraged states to increase funding for opioid dependence programs and treatment such as Methadone Maintenance Treatment (MMT) and Buprenorphine, Naloxone, and prescription monitoring programs.

In the Commonwealth of Virginia, this resulted in the formulation of House Bill 2161 and Senate Bill 1179 which create stricter prescription guidelines as well as increase drug monitoring programs within the state (VA House of Delegates & Senate, 2018). Likewise, in 2016, the Virginia legislature passed HB 1672 approving family and friend training to administer the overdose reversal drug, naloxone (VA House of Delegates, 2016). Additionally, the 21st Century Cures Act allocated $9,762, 332 to Virginia's HHS to fund such treatment, overdose reversal drugs, and monitoring programs.

Virginia's Legislative Paradox:

Despite this increase in funding and legislation, Virginia faces a conflicting state of legislation. In 2004, a town in southwest Virginia opened a substance abuse clinic offering Methadone Maintenance Treatment near a public school. In southwest Virginia, a rural region highly affected by the crisis, addicts and families descended upon the region. The locals became concerned that these new residents and customers were having negative external effects on the neighborhood such as increasing rates of crime. As a result, the region concerned for the local children, advocated for legislation to prevent such facilities from opening within half a mile of the school (Virginia General Assembly, 2004).

While this law may prove effective and practical in more rural communities, it has been particularly challenging and constricting in more urban areas of Virginia such as Richmond, Virginia. As scene in

Figure 2, schools are densely located throughout the city. As such, finding a location that is not within half a mile of a school is not only challenging, but nearly impossible. Thus, cities throughout Virginia face this restriction on the placement of clinics offering MMT and Buprenorphine while also facing an increasing demand for such drugs to address the crisis as demonstrated in Figure 3.

Figure 2: Schools in Richmond, VA

As more clinics face heightening restrictions, public concern for the issue has led to the creation of House Bill 155 and Senate Bill 329. This legislation allows for Henrico County and Richmond to permit the licensure of Substance Abuse Clinics offering MMT and Buprenorphine to be located within half a mile of schools if they are in locations previously used for such purposes. In other words, the legislation allows Methadone Clinics to sell the businesses to larger clinics; however, it does not allow for the creation of more clinics in other areas within half a mile of a school. Thus, while it may maintain the number of clinics it does not permit increasing the number of clinics to serve the increasing demand for treatment services.

Figure 3: Areas approved for MMT Licensure in Richmond, VA
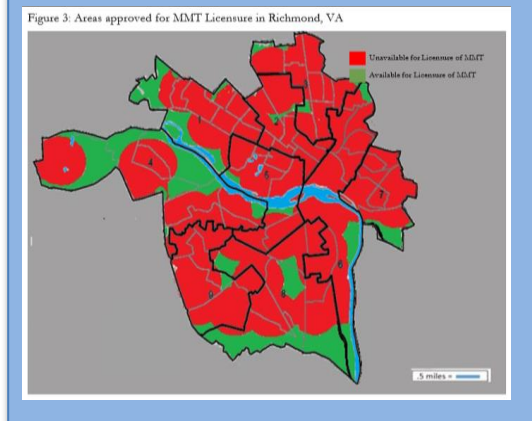
Guiding Assumptions:

In the current state, it is believed that MMT and Buprenorphine are the most feasible and widely accepted way to treat opioid addiction in the United States. In some situations, Buprenorphine is preferable as it allows individuals to simply take a pill once a day in the privacy of a doctor's office. However, MMT is particularly useful for providing a combination of medication and counseling for addicts that need more support and structured treatment (FCCR, 2018). Likewise, research indicates that relapse rates are higher among individuals using Buprenorphine than using MMT (Fischer et al, 1999). As such, this analysis will focus primarily on MMT as an important tool for mitigating the opioid crisis in Virginia that is currently in jeopardy for concerns regarding the community safety associated with the program.

An underlying guiding assumption in this research is that supply of treatment would match demand in a situation in which no legislation restricting the licensure of clinics existed as seen in Figure 4. Though there are many factors affecting the placement and expansion of Substance Abuse Clinics, this analysis is assuming the supply of clinics will increase directly at the same rate that demand

increases. Likewise, this assumption hinges on the belief that overdose rates and addiction rates are highly correlated. Furthermore, this research looks at four alternatives. Each policy alternative restricts the available area of Richmond for the licensure of MMT facilities differently. This is incorporated by calculating the percentage of the city's neighborhoods available for a licensed clinic to open as demand increases. In other words, if a legislation restricts licensure of MMT to 80% of neighborhoods, then this analysis will project the number of clinics to equal 80% of the projected number of clinics under a policy with no legislative restrictions.

Figure 4: Increase in Opioid Related Overdose and Projections in Substance Abuse Clinics Offering MMT
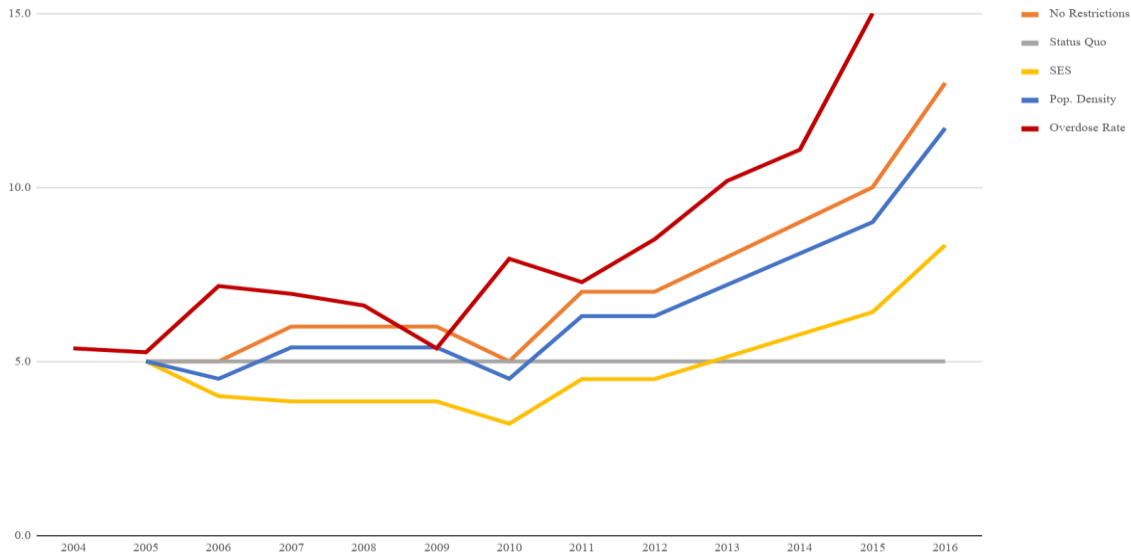
Literature Review:

Every three weeks approximately 3,000 individuals die from opioid overdose in the United States. While the implications of these overdoses and drug addictions are well studied in regard to the economic and demographic implications, little research currently exists studying the effect of the epidemic on crime. Furthermore, research regarding substance abuse clinics and specifically methadone treatment centers effect on crime rates is relatively scarce. This paper will review the relevant literature that speaks to opioids effect on crime rates. As well, it will review the impact of methadone clinics and other substance abuse centers or treatment efforts on crime rates.

Methadone clinics are increasingly used to reduce the number of opioid overdoses in the past fifteen years. In a study conducted by Schwartz et al., they found that the number of individuals treated by methadone clinics was inversely related with the number of individuals that overdose from opioids. Furthermore, a study conducted by Kleber found that opioid dependent patients utilizing methadone treatment were more likely to hold stable jobs, reduce dependence, and have a lower likelihood for disease.

Effects of Methadone Treatment on Individual Crime

Despite these positive indications, many fear that methadone clinics and interventions may have adverse effects on neighborhood crime rates. In a study conducted by Löbmann & Verthein, (2009) they looked at the effect of heroin and methadone intervention compared to no intervention on self-reported and local crime in subjects suffering from opioid dependence. For the heroin treatment, the study administered three small doses of heroin daily during the course of the study. For the methadone treatment, addicts received one dose of methadone daily during the course of the study. Crime data was collected using self-reported data as well as police records.

The study found that the percentage of individuals who had committed a crime in the respective year dropped from 79 to 45% in the heroin group and 79 to 63% in the methadone group (Lobmann, 2009). Likewise, the number of offenses in the heroin treatment dropped from 76.7 to 26.8, the number of offenses in the methadone treatment group declined from 79.7 to 49.9 (Lobmann, 2009). Both treatment groups saw a decrease in the total amount of crime in the subjects analyzed. Additionally, the research indicated that while the heroin group saw a greater reduction in crime and retention in participants, there is reason to believe that within the United States, the methadone maintenance treatment is more feasible as it only requires a single daily administering compared to the three provided by the heroin intervention. This allows recovering addicts to hold steady jobs leading to quicker recovery.

However, a study conducted by Carrier et al. (2017) found that for heroin-addict that were receiving treatment, whose individual criminal activity prior to treatment was more indicative of crime following treatment, criminality substantially decreased. Likewise, the longer an individual remained on the treatment the less likely the individual was to commit a crime following the treatment

(Carrieri et al., 2017). Again, it appears that the methadone maintenance treatment is at least somewhat effective at decreasing crime in the long term.

Effects of Methadone Clinics on Neighborhood Crime

While the research convincingly indicates that methadone treatment has positive implications for crime reduction for opioid addicts, research regarding the effects of the clinics on neighborhood crime is necessary to understanding larger effects of these treatment centers on neighborhood dynamics.

A study conducted by Furr-Holden et al. (2016) looked at the crime rates surrounding seventy-eight publicly funded drug treatment centers, liquor stores, corner stores, and convenience stores in Baltimore, MD. After normalizing confounded neighborhood factors such as poverty levels and other demographic differences, the study looked at mean violent crime averages by proximity to the designated locations (Furr-Holden et al., 2016). It found that mean violent counts near drug treatment centers was statistically lower than both corner stores, convenience stores, and liquor stores at a 99% confidence level (Furr-Holden et al., 2016).

Likewise, the study found that crime rate decreased more rapidly further from liquor, convenience, and corner stores than from treatment centers. Crime spiked near these locations leveling off further from these facilities (Furr-Holden et al., 2016). While not all methadone clinics are publicly funded clinics, these clinics do qualify as substance abuse centers often offering a number of different treatments. Thus, while crime rates are higher near these types of buildings, the research indicates that drug treatment centers are relatively safer from violent crime.

However, research conducted by Taniguchi and Salvatore (2012) found that these substance abuse clinics' may prove contingent on the socioeconomic statuses of neighborhoods. Taniguchi and Salvatore (2012) looked at crime data in different socioeconomic neighborhoods in Pennsylvania. The research found that when controlling for demographics the relationship between treatment centers and crime was slightly negative. However, areas with high socioeconomic status saw an increase of 26% in crime with more treatment facilities compared to areas with a moderate number of treatment facilities, and areas with lower socioeconomic status a decrease of approximately 16-20% fewer violent crimes in areas with high numbers of treatment facilities.

Effects of Methadone Clinics on City Crime

Similarly a study by Bondurant, Lindo, & Swensen (2016) examined the effect of Substance Abuse Treatment on local and city crime by measuring the change in city crime rates following an increase in the number of Substance Abuse Treatment centers. The findings indicated that a .15 percent decline in social costs associated with violent crime, a .010 percent decrease in all felony-type crimes, and lastly a .14 percent decrease in social costs per SAT facility present. In sum, while the results may seem substantively weak, the results were statistically significant and could save hundreds of thousands of dollars at the local level, and lastly indicate strong evidence that such facilities *did not*

increase crime- a crucial finding in the decision to expand or restrict the licensure of Substance Abuse Treatment facilities offering MMT.

Likewise, research by Wen, Hockenberry, and Cummings (2014) studied the effect of the expansion of the Affordable Care Act and the increase in the number of Substance Abuse Treatment Facilities on crime. The study found that a 10 percent increase in the SUD treatment rate had the potential to "reduce the robbery rate by 3 percent, reduce the aggravated assault rate by 4 to 9 percent, and reduce the larceny theft rate by 2 to 3 percent" (Wen, Hockenberry, and Cummings, 2014).

Conclusion

In sum, the research indicates that methadone clinics are effective means in reducing not only dependence on opioids but decreasing addicts' involvement in crime. While methadone clinics may prove one of several options available for decreasing opioid dependence, the research indicates that such treatment is likely the most feasible in the United States as a result of work schedules and social norms. Furthermore, these treatments can improve life quality and job retention for these individuals potentially improving the economic productivity of areas with such treatment facilities.

Despite these potential benefits, many individuals fear that the introduction of clinics offering methadone maintenance programs will also introduce new crime to their areas as addicts move closer to treatment or are drawn to local clinics. While the research by Furr-Holden (2016) indicates that crime in immediate proximity to the drug treatment centers may not increase, further research is necessary to understand at large neighborhood crime. Furthermore, while Furr-Holden (2016) look specifically at large results, Taniguchi and Salvatore (2012) demonstrate that research is necessary in understanding how demographics and demographic makeup may impact these results. Both studies were conducted in urban areas; however, these studies were located in different states with different demographic and socioeconomic makeups. Thus further research is necessary to analyze how such clinics are relevant in Virginia specifically and what policies can both provide relief to the opioid epidemic as well as protect citizens.

Alternatives:

Option 1: Status Quo:

In the Commonwealth of Virginia, concerns regarding crime, greater youth access to drugs, and "not in my backyard" principles drive legislation preventing substance abuse clinics offering methadone maintenance treatment from gaining licensure within half a mile of a school. These principles would continue to restrict licensure of substance abuse clinics offering MMT. In other words, no new treatment facilities offering MMT would be permitted within half a mile of a school regardless of the other socioeconomic and demographic features of the area. The current legislation does permit the licensure of these facility locations in the case that the business occupying these spaces wishes to sell their space to another MMT offering organization (Virginia Senate, 2018).

Option 2: No Restrictions:

This option would remove any legislation limiting the MMT licensure based on local geographic or demographic features, such as schools, parks, income, etc. As such, this option would allow clinics to open where demand for treatment arose. This option is founded in research that clinics offering MMT service may have an insignificant effect on crime as well as research that might look at how improving access to treatment substantially increases the likelihood an individual will remain in treatment.

Option 3: Limit Methadone Licensure to Neighborhoods with Low Average Income:

This option would only permit the licensure for methadone distribution in neighborhoods with medium or low incomes below $40,000. Research indicates that these treatment facilities may decrease crime in medium to low income neighborhoods whereas they may increase crime in higher income neighborhoods. This would specifically restrict the licensure of these programs to neighborhoods that fall in the lowest of the income bracket.

Option 4: Locate Clinics in Higher Population Dense Neighborhoods:

This option would prohibit the licensure of methadone clinics in undeveloped or lower population dense areas in urban settings. This option is founded in research that population density and foot traffic is one of the greatest indicators of crime. Likewise, research comparing convenience stores, alcohol distribution stores, and substance abuse clinics found that substance abuse clinics had the lowest rates of crime. This is largely as a result of reductions in foot traffic. Thus, it is reasonable to expect that promoting such facilities in these areas will reduce violent and property crime in these regions as well. This option will look at land usage data to determine the change in crime associated with the presence of a substance abuse clinic compared to a viable alternative such as a corner shop. This option would restrict clinics to neighborhoods and regions with population densities of 3,000 persons per square mile or more.

Criteria:

The following criteria will be measured using a score of 1 to 4 where a score of one will indicate the weakest criteria score and a score of four will indicate that strongest criteria score. Each criteria will be weighted according to its importance to the analysis.

#1 Cost effectiveness (25%):[2]
This criteria will measure the number of dollars spent per crime prevented. It will sum the costs used by methadone clinics such as facility space, equipment, personnel, and other treatment needs. These costs will then be weighed against the number of crimes prevented. The number of crimes prevented are determined depending on the socioeconomic and population densities of the different neighborhoods which are permitted to license MMT under the different legislations.

#2 Crime Reduction (35%):[3]
This criteria will look at neighborhood crime and city crime. This criteria seeks to provide a more clear understanding of the direct implications for crime of the different options in the direct neighborhoods where these facilities are located as well as in the city at large.

The neighborhood crime aspect will compare the percentage of crimes decreased per neighborhood by each alternative. Crime will include both violent and property crime. This portion of this criteria will compare the projected crime level in the presence of a substance abuse clinic offering MMT to the crime level in neighborhoods without these facilities. Furthermore, this criteria will only look at the specific neighborhood receiving the clinic, excluding surrounding neighborhoods.

City crime will use the projected number of clinics in combination with research that indicates that with each additional substance abuse center city crime will on average decrease by .14%. Thus, if there are two facilities, crime will be approximately .28% lower than in the absence of these two facilities.

Neighborhood crime will be weighted slightly more (60%) than city crime (40%) for this analysis for two reasons. First, neighborhood crime is a primary focus of this research. As such, this criteria will seek to further supplement this cost effectiveness analysis through a more qualitative approach yet not overemphasize its relative importance. Second, while the primary focus of this analysis is on the neighborhood effects, the increase in the number of clinics has substantial positive effects both in terms of criminal activity and overdose rates at the city level. This dual emphasis on city crime and neighborhood crime will more clearly demonstrate the larger effects of these clinics on crime as well as contrast the interaction between the two.

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[2] See Appendix 3
[3] See Appendix 4

#3 Access (25%):[4]

This criteria will look at the projected number of facilities and the likelihood that a clinic could be placed in the most affected neighborhoods in the city. The research indicates that Methadone Maintenance Treatment reduces mortality rate by 25 deaths per 1000 persons per year in treatment. Likewise, other research indicates that individuals who live within a mile of treatment are 50% more likely to stay in treatment longer and in many situations complete treatment entirely (Schmitt, Phibbs, & Piette, 2003). Thus, this criteria will analyze whether the most affected neighborhoods are permitted to license substance abuse clinics offering MMT, and the projected increase in the number of clinics. This criteria will assume that policies that are more likely to be placed in high need neighborhoods and more likely to permit new clinics will reach more individuals and thus save more lives.

Over the past fifteen years, individuals between the ages of 18-25 identifying as Non-Hispanic, White making between $20,000 and $49,999 have seen the greatest increase in heroin and opioid use (CDC, 2018). As such this criteria will look at the percentage of neighborhoods with these age, income, or racial demographics that would be permitted to license MMT. This criteria will utilize the Guiding Assumption of the number of clinics increasing in tandem with addiction and overdose rates to determine the number of new clinics (See page 11).

This criteria will weight targeting affected neighborhoods more heavily than the projected increase in total number of clinics. Targeted access will account for 60% of the final score and the increasing number of clinics will account for 40% of the final score. This is for two primary reasons: first, the data for increasing access is more concrete than the assumptions underlying the projections on the number of new facilities. Second, research suggests that even if the number of clinics increase, if they are not located within one mile of the patient, they are unlikely to retain the patient.

#4 Equity (15%):[5]

Equity is defined as whether every neighborhood has an equally likely chance of receiving a facility regardless of income, age, or race under the different policy options using both a quantitative (90% of weighted score) and a qualitative approach (10%).

This quantitative aspect will measure the number of neighborhoods identifying as minority majority or white majority, earning a median income above or below $50,000, and in three different age groups[6] as a percentage of the total neighborhoods then compare this percentage to the percentage of these types of neighborhoods available for licensure under the four policy options. To develop the quantitative final score: race will account for 50%, income will account for 35%, and age will

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[4] See Appendix 5
[5] See Appendix 6
[6] Age Group One 19-25, Age Group Two 25.1-40, and Age Group Three Older than 40 years.

account for 15% of the score. This will establish race as the most important criteria for developing equity followed by equity then age.

The qualitative aspect will look at the different mappings by neighborhoods to develop a better understanding of the layout of different policies. This will serve two purposes. First, two of the options are drawn by neighborhood whereas one option is not. This tool will help analyze sub neighborhood trends. Second, some neighborhoods may not have direct access to a facility, but a nearby neighborhood could.

Policy Option #1: Status Quo

Criteria #1: Cost-Effectiveness

Cost – Lowest Cost, $36,855,000

The cost of continuing this option is the least expensive of the options as it does not create any more facilities; however, per facility it is more costly than Option #3. The cost of continuing the policy option is approximately $36,855,000.

Effectiveness- Poor, 319 crimes per five years more than in the absence of these facilities

This option would has a drastic increase in crime when compared to the neighborhoods given no substance abuse clinic offering MMT. This result is extreme because there are so few clinics hence they are heavily skewed by those clinics located in low density, low income neighborhoods.

Cost-Effectiveness- Poor, $178,000 per crime created

This option would cost $178,000 per crime created. This is counter to the policies goal. However, it is preferable to the No Restrictions option as it appears it is more costly to increase crime under this policy option. Likewise, because no new clinics are created the number of crimes are largely controlled to only the four neighborhoods in which the clinics already exist.

Criteria #2: Crime

Neighborhood Crime - Poor, Negative Effect resulting in increased crime

There are six substance abuse clinics in Richmond, Virginia located in four different neighborhoods. In 2016, two of these clinics were located in neighborhoods with a median income of $37,123, two with a median income of $54,044, one with a median income of $46,588, and one with a median income of $53,082. In two of these neighborhoods, crime is approximately slightly higher than if there was no clinic given their population density and socioeconomic features. In the remaining neighborhoods, there is no significant effect.

City Crime - Poor, .7% Reduction in City Crime

However for every new facility, city crime is projected to decrease by .14%. For five facilities, this is a decrease in city crime by .7% when compared to the situation in which no clinics existed.

Total- Poor, Least Effective of the Four Options at Reducing Neighborhood and City Crime (weighted)

While this is the weakest reduction in city crime of the four options, preventing nearly half of the crimes of other policy interventions, it is comparable to the No Restriction Option in affecting neighborhood crime. Though this option does not address the relationship between treatment

facilities, crime, and other neighborhood features in determining the location of these facilities to prevent externalities such as property or violent crime, this option is unlikely to contribute to additional crime as none of the current neighborhoods in which the current clinics are located are high income or low population neighborhoods which are the most at risk neighborhoods for treatment facilities to increase crime.

Criteria #3: Access

Targeted Affected Population (60%) - Most Restrictive, on average reaches 5.71% of most affected neighborhoods
Under the status quo, 0% of neighborhoods with median ages between 18 and 25 are permitted licensure for MMT, only 5.13% of neighborhoods with median incomes between $20,000 and $49,999 are permitted for MMT licensure, and lastly, only 12% of majority white neighborhoods are available for MMT licensure. Of the four policy options, this option restricts access to the highest in-need populations the most.

Number of Neighborhoods Served (40%) - Most Restrictive, Zero Projected Increase in Number of Clinics
Furthermore, the status quo would restrict further production of clinics. However, because the legislation permits the continuation of clinics already in place prior to the legislation, the number of clinics in Richmond will remain at six. Likewise, with recent legislation that permits these businesses to sell their locations to other MMT providers, these six clinics are likely to remain operating for decades to come. This policy option is the most restrictive on the creation of future clinics.

Total- Most restrictive legislation on promoting access
These restraints on access from the promotion of such facilities in high risk neighborhoods as well as the restraints on increasing the total number of potential patients by increasing the number of clinics drastically curb this option's ability to address the growing demand for opioid dependence treatment, and thus, is the weakest option in decreasing the total number of opioid related deaths.

Criteria #4: Equity

Racial, Income, and Age Demographics (90% of Criterion) - Excellent, on average no difference between the expected proportion and the policy coverage proportion
Because this legislation is not determined by neighborhoods or their racial, socioeconomic, or age demographics it is equally restrictive to the opening of new clinics offering MMT in all neighborhoods. Likewise, because this option does not analyze sub neighborhood trends it fails to demonstrate potential incongruences in this regard.

Mapping (10%) - Moderate-Excellent, areas outside of central Richmond are slightly more available for Licensure

This analysis will analyze sub neighborhood trends more effectively. As shown in Figure 5.1-5.3, the red shaded areas in the left map are areas with greater percentage of white individuals, whereas the right map shows the areas permitted for MMT licensure as green and the restricted areas in red. Thus, the northwestern neighborhoods of the city are less restricted than the remaining area of the city. This area is primarily populated by white, higher income individuals than Richmond as a whole. Furthermore, while the northwestern area is not necessarily restricted by legislation, some of the green shaded region consists of parks or major roads, thus it is not truly available for the placement of Substance Abuse Clinics offering MMT.

Total – Moderate-Excellent, Restricts clinics mostly equally regardless of income, race, or age.

While at the neighborhood level it completely restricts the further licensure of MMT equally regardless of these demographic features, the mapping analysis reveals that certain areas in the northwest of Richmond appear to be more accessible for MMT licensure. As such, it is slightly less equitable than the option to remove licensure restrictions.

Figure 5.1. White Majority Neighborhoods
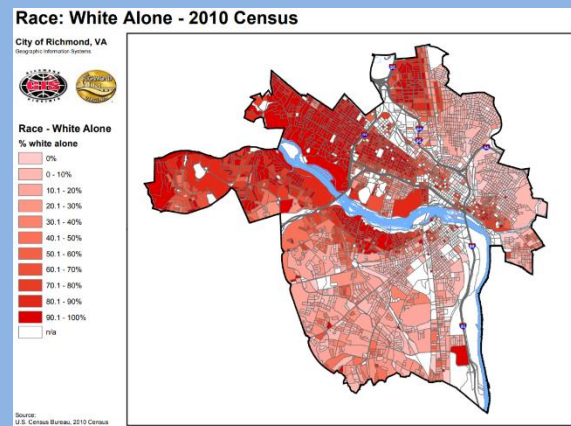
Figure 5.2. Status Quo Policy Map
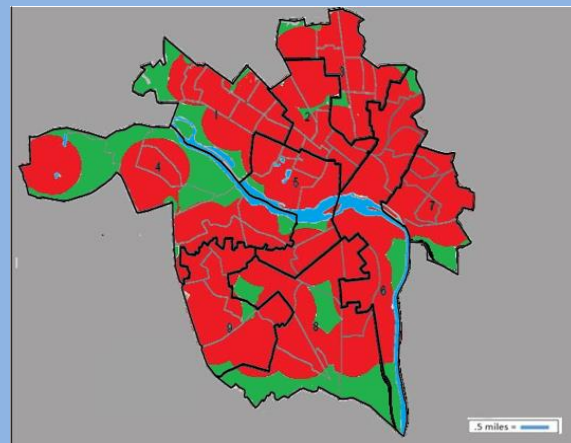
Figure 5.3. Income by Neighborhood

Criteria Summary

Cost-Effectiveness (25%)	Crime (35%)	Access (25%)	Equity (15%)
Poor, $178,000* per crime created	Poor, Increase average neighborhood crime in four neighborhoods slightly. Excellent, Decrease city crime by .7%	Poor, 5.71% of affected neighborhoods will have a MMT facility. Poor, Number of facilities will remain at 5	Excellent, All neighborhoods are equally restricted from further MMT licensure Moderate-Excellent, slight qualitative findings of inequity
1 Point	1 Point	1 Points	3 Points
TOTAL POINTS: 1.3			
*this number is skewed by the low number of clinics in the city as well as the fact that these four of the clinics are located in a neighborhood with another clinic			

Policy Option #2: No Restrictions

Criteria #1: Cost-Effectiveness

Cost: Highest Cost, $142,709,000 to expand licensure to this degree

This option is the most expensive option as the average location the number of projected clinics and the average cost of the average clinic under this option are the highest. The average cost of this policy option is $142,709,000.

Effectiveness - Poor, Increase crime in direct neighborhood on average by 69 incidents per five years

This option actually increases crime. With approximately 14 neighborhoods projected to decrease crime by 16%, 25 neighborhoods projected to see no change in crime, and 14 neighborhoods expected to see an increase of crime of approximately 25%, this policy option will on average increase crime by approximately five incident per additional clinic and 69 incidents total in all neighborhoods with these clinics.

Cost-Effectiveness - Poor, $2,036,000 per crime added

On average this option projects a cost per crime added of $2,036,000. This result is counter to the proposed policies at large objective.

Criteria #2: Crime Reduction

Neighborhood Crime - Poor, Increase average neighborhood crime by 2.25%

This policy option is the most likely policy option to increase crime. Because this option does not restrict the placement of these facilities, such treatment facilities offering MMT are likely to appear in neighborhoods where such clinics can have drastic negative effects outweighing their positive effects. For example, while placing a treatment facility in a low income neighborhood may decrease crime by approximately 16 to 20%, placing a treatment facility in a high income neighborhood may increase crime in these neighborhoods by over 25%. Likewise, this policy option is the only option that has the potential to place a clinic in a neighborhood where such drastic negative effects are possible. To be precise, under this policy option approximately 25% of neighborhoods in Richmond with high socioeconomic status would be available for MMT licensure and at risk for increasing neighborhood crime by approximately 25%.

City Crime - High Reduction, Decrease city crime by 1.68% to 1.82%

Despite this, removing licensure restrictions will incentivize more clinics to meet the demand presented by the crisis. In 2016, the city of Richmond saw 1300 overdoses, lethal and nonlethal. The average substance abuse clinic that administers MMT, treats approximately 200 individuals. This includes individuals addicted to opioids as well as other illicit, addictive substances. According to

data from the Department of Health and Human resources, nearly a quarter of individuals admitted to treatment were seeking treatment for opioid and opiate abuse (HHS, 2010). Of the eight primary substance abuse clinics in Richmond, VA, five offer methadone maintenance. These clinics were all founded before 2004. From 2004 to 2006 the number of individuals addicted to opioids in Virginia has increased by over 260% (KFF, 2016). If the number of facilities offering treatment increased with demand this would theoretically increase the number of clinics from five to between 12 and 13 clinics. If each of these new facilities would decrease the level of crime by .14%, then this expansion would decrease crime by approximately 1.68% to 1.82%.

Total - Moderate-Poor, Highest Rate of Neighborhood Crime while Lowest Rate of City Crime
While this option has the greatest potential to reduce city crime followed by the Population Density Option (1.26% and 1.4%), this option is the most likely option to drastically increase crime in certain neighborhoods. As such, when weighting neighborhood crime more heavily (60%) than city crime (30%), this option is third most effective at limiting crime associated with substance abuse clinics.

Criteria #3: Increasing Access

Target Affected Population (60%) - Excellent, Licensure permitted to 100% of neighborhoods with median ages 18-25, incomes $20,000 to $49,999, and any race
This option provides the greatest opportunity for increasing access to opioid dependence treatment. In this option, 100% of neighborhoods with median ages between 18 and 25, making an income between $20,000 and $49,999, and identifying as majority white neighborhoods are available for the licensure of MMT under this policy option. As such, facilities in theory would be able to locate in the most in-need neighborhoods to respond to the greatest opioid addiction problems.

Number of Neighborhoods Served (40%) - Excellent, projected 12 to 13 clinics
Similarly, this option is not only most effective at reaching the most at risk neighborhoods, but also is the least restrictive in potentially expanding the total number of clinics in Richmond, Virginia. As mentioned, prior to the 2004 legislation, the number of clinics in the city roughly equaled the opioid overdose rate. Assuming this trend continued, the number of clinics in 2016 would equal approximately 12 to 13, including those operating in 2004.

Total - Excellent, Most effective option as increasing targeted access and number of facilities
This option is thus most effective at reaching the most at risk populations as well as expanding the total number of facilities and thus increasing access to opioid dependence services in general. This remains the case even when weighing targeted access (60% of total score) more heavily than simply potential to increase the total number of clinics (40%).

Criteria #4: Equity

Racial, Income, and Age Demographics (90% of Criterion) - Excellent, on average no difference between the expected proportion and the policy coverage proportion

No restrictions in Richmond, Virginia would allow clinics to locate where demand is highest. Often population density, socioeconomic status, or other geographic details are correlated with different races, income groups, or age groups. Because this legislation is not tied to any of these features, each neighborhood has an equal chance that a clinic will open in that neighborhood holding other factors such as land costs, neighborhood types, and other related factors constant.

When compared this option to the other options through the quantitative analysis, this option is as effective as the status quo option at promoting equity. While the status quo equally *restricts* the licensure of MMT regardless of race, income, or age, this option equally *permits* the licensure of MMT regardless of these demographics.

Neighborhoods by Mapping (10%) - Excellent, Licensure is not limited by any demographic feature

However, policy maps below demonstrate that this option is the most effective at improving equality when looking at sub neighborhoods, which the quantitative analysis fails to capture. Thus, as seen in Figures 6.1-6.3, regardless of the clear neighborhood disparities, allowing the licensure of any neighborhood will allow clinics to locate based on demand rather than based on demographic divides between neighborhoods.

Figure 6.1. White Majority Neighborhoods
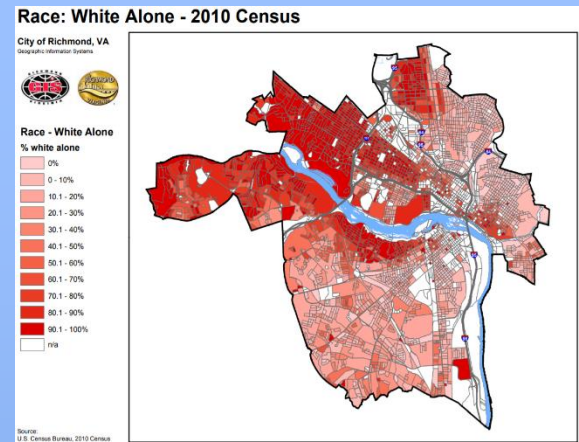
Figure 6.2. No Restrictions Policy Map

Figure 6.3. Income by Neighborhood
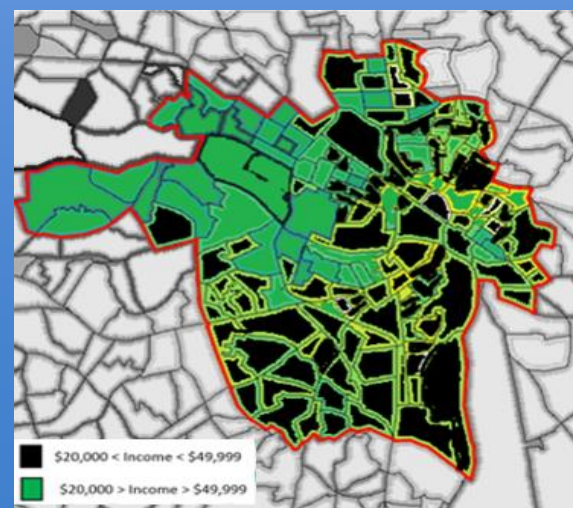
Option #2: Criteria Summary

Cost-Effectiveness (25%)	Crime (35%)	Access (25%)	Equity (15%)
Poor, $2,036,000 per crime *added*	Poor, Increase average neighborhood crime by 2.25% Excellent, Decrease city crime by 1.68% to 1.82%	Excellent, 100% of most affected neighborhoods permitted for licensure Excellent, Increase Number of Clinics to 12 to 13	Excellent, Not limited by any demographic features Excellent, no qualitative findings of inequity
1 Point	**2 Points**	**4 Points**	**4 Points**
TOTAL POINTS: 2.55			

Policy Option #3: Low-Medium SES

Criteria #1: Cost-Effectiveness Analysis:

Cost – Moderate to Excellent, Average Annual Cost of Policy of $63,133,000
This option is the second least costly to the status quo. The general operating costs of one clinic under this option are less than any of the other options due to lower rent costs; however, the increase in the number of facilities under the policy increases the projected costs to **$63,133,000** for all 8 clinics in a single year.

Effectiveness - Excellent, Decrease crime by 590 incidents per five years
This option is the most effective option at decreasing the average number of crimes in these neighborhoods. With approximately 14 neighborhood crime rates projected to decrease crime by 16% and the remaining 25 neighborhoods covered under the policy expected to see no change in crime, this option will decrease crime on average by approximately 590 crime incidents per year.

Cost-Effectiveness - Excellent, $107,000 per crime prevented
On average this option projects a cost per crime elimination of $107,000. This result is the most cost-effective measure of the policy options.

Criteria #2: Crime Reduction

Neighborhood Crime (60%) - Excellent, Reduce Crime on Average in Placement Neighborhood by 6.12%
Research indicates that in neighborhoods with more substance abuse centers or a substance abuse center that offer MMT that are in lower SES neighborhoods saw approximately 16 to 20% less crime than areas with higher income and no MMT treatment centers present. Likewise, neighborhoods with high SES are associated with approximately 25% more crimes with the presence of treatment facilities. This indicates that restricting these clinics to neighborhoods with low SES would decrease neighborhood crime by approximately 16- 20%. Low socioeconomic status is defined as neighborhoods with median incomes in the twenty-five percent. This means that this policy option would decrease crime by approximately 16 to 20% in approximately 14 neighborhoods, and the remaining twenty neighborhoods that would permit the licensure of MMT would either have no change in crime rates or a slight decrease in crime. On average, this option would decrease neighborhood crime by 6.12% in every location where a clinic opens.

City Crime (40%) - Moderate-Excellent, Reduce crime by 1.26% to 1.54%
At the city level, this legislation is much less restrictive than the current status quo. Under the status quo legislation, no neighborhood is okay for the placement of a substance abuse clinic offering

MMT. Thus, relocation is improbable and continuation of these facilities in the coming decades is at risk. Under this option, as shown in Figure 1, the projected number of clinics would equal approximately 9 to 11. Using the .14% decrease in crime figure, this option would expect to decrease total crime in Richmond, VA by 1.26% to 1.54%.

Total Crime Reduction

While this option is the most effective at decreasing neighborhood crime, it less effective at decreasing city crime than the Population Density Option (1.26% to 1.4% decrease) and the No Restrictions option (1.68% to 1.82% decrease). Despite this lower score in city crime reduction, when weighting neighborhood crime reduction more heavily than city crime, it is the **most effective** at mitigating or improving the effect of crime overall of the four options.

Criteria #3: Access

Target Affected Population (60% of Criterion) - Moderate-Excellent, Reach 81.18% of the most affected neighborhoods
Limiting MMT licensure to neighborhoods with medium to low average income is the second most effective option at increasing access to the most at risk neighborhoods in Richmond. Of the eleven neighborhoods with a median age between 18 and 25 years, all eleven of these neighborhoods are available for MMT licensure. In neighborhoods with median incomes between $20,000 and $49,999, 74.36% of neighborhoods are available for MMT licensure. This is the second highest rate to the No Restrictions option. Lastly, 69.17% of neighborhoods which identify as white majority neighborhoods are available. This is a lower percentage than both the Population Density Option (78.57%) and the No Restrictions Option (100%).

Number of Neighborhoods Served (40% of Criterion) - Moderate-Poor, License to 64.15% of neighborhoods & increase number of clinics to 8
This option would permit MMT licensure in only 64.15% of the neighborhoods in Richmond. The number of clinics in the city under this legislation would equal roughly 8 clinics[7]. As such, this option falls behind both the No Restrictions option (12 to 13 facilities) as well as the High Population Density Option (9 to 10 facilities).

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[7] This number was found by multiplying the no restrictions projection of 12.6 (between 12 and 13) clinics by the percentage of neighborhoods available for licensure (.6415).

Total - Moderate-High, Second most effective option at improving targeted access and total access (weighted)

When weighing access to certain groups as slightly more important than increasing the raw number of clinics, this policy option is projected to be the second most effective policy option overall at reducing the number of overdoses in Richmond, Virginia. While this option is the third most effective at increasing the total number of facilities, it is the second most effective when weighing targeted access (60%) as slightly more important than simply increasing the number of facilities (40%). In sum, this option is second most effective at improving targeted access and third most effective at increasing the number of facilities. It is the second most effective overall at reducing the number of opioid related overdoses through improving access.

Criteria #4: Equity

Racial, Income, and Age Demographics (90% of Criterion) - Poor, on average 21 percentage point difference between expected proportion and policy coverage proportion

Race- While approximately 45% of the neighborhoods in Richmond are minority neighborhoods about 54% of the neighborhoods that would permit the licensure of MMT would be minority neighborhoods. While approximately 54% of the neighborhoods in Richmond are majority white neighborhoods only 45% of the neighborhoods permitting the licensure of MMT would be white neighborhoods. Minority neighborhoods would have a greater chance of receiving these clinics and both the resulting positive and negative externalities associated with these clinics when compared to white neighborhoods.

Income- Approximately, 55% of Richmond neighborhoods have a median income of less than $50,000 a year while the remaining 45% make $50,000 a year or more. Under this option only, neighborhoods making less than $50,000 a year would be permitted to open a clinic offering MMT. Individuals making over $50,000 a year have no chance to receive a clinic in its neighborhood.

Age- Lastly, neighborhoods with median ages between 19 and 25 (age group one) make up approximately 20% of Richmond's neighborhoods, neighborhoods with median ages older than 25 and younger than 40 (age group 2) account for approximately 61% of Richmond's neighborhoods, and lastly, neighborhoods with median ages 40 years or greater (age group three) account for approximately 20% of the city's neighborhoods. However, 32% of neighborhoods available for MMT licensure would fall into age group one neighborhoods, 52% would fall into age group two neighborhoods, and 14.7% of available neighborhoods would fall into age group three. In other words, age group two and three would have a much smaller chance of receiving a clinic in its neighborhood than what is to be proportionally expected based on Richmond's neighborhood demographics. Likewise, age group one neighborhoods would have a much greater likelihood of receiving a clinic than what would be expected given Richmond's neighborhood demographics.

Mapping Analysis (10%) - Poor, Clear visual differentiation between types of neighborhoods and available neighborhoods for licensure

As seen in Figures 7.1-7.3, the neighborhoods represented as white majority are also nearly exactly the neighborhoods in which MMT licensure would be prohibited. Likewise, this inequity trend holds true in Figure 7.3, as the higher income areas will have limited possibility of these clinics opening in their neighborhoods regardless of need or available space. This is the most inequitable option given the map analysis.

Total - Poor, least equitable in all demographic categories and mapping analysis

This is the most divisive option of all the options as it is most inequitable regarding racial as well as income demographics. This holds constant for both the quantitative analysis of individual neighborhood demographics and the qualitative review of demographic maps and the corresponding legislative zoning map.

Figure 7.1. White Majority Neighborhoods
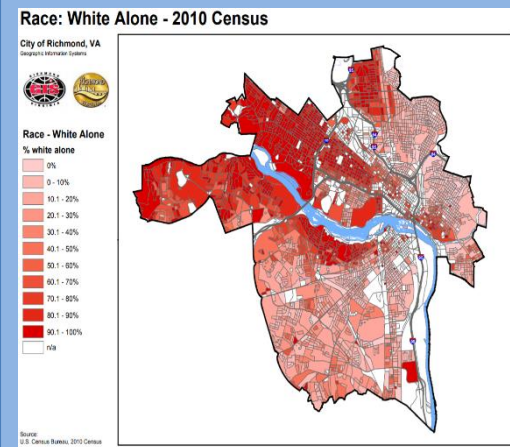
Figure 7.2. SES Policy
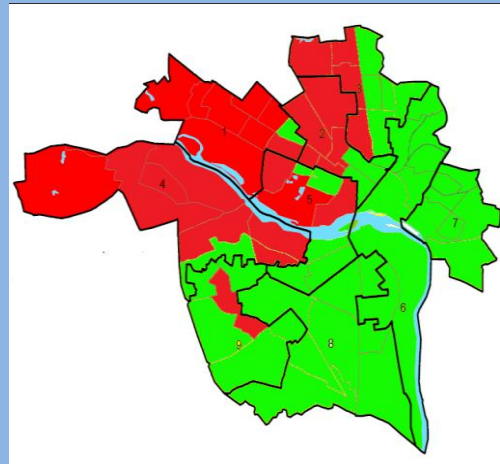
Figure 7.3. Income by Neighborhood
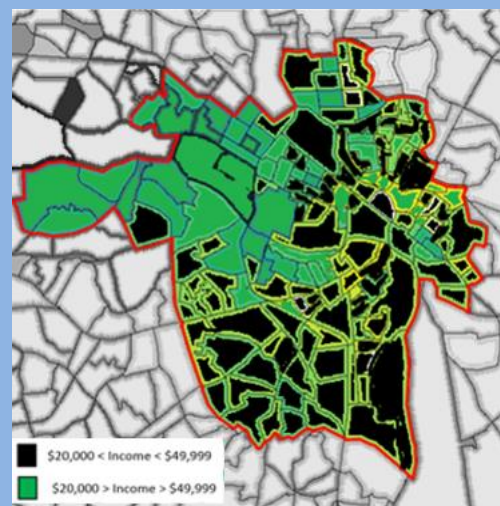
Criteria Summary

Cost-Effectiveness (25%)	Crime (35%)	Access (25%)	Equity (15%)
Excellent, $107,000 per crime prevented	Excellent, decrease crime in neighborhoods on Average by 6.12%	Moderate-Excellent, Reach 81.18% of the most affected neighborhoods	Poor, on average 21 percentage point difference between expected and policy coverage proportion
	Moderate-Excellent, Reduce crime by 1.26% to 1.54%	Moderate-Poor, License to 64.15% of neighborhoods & increase number of clinics to 8	Poor, Clear visual differentiation between types of neighborhoods and available neighborhoods for licensure
4 Point	**4 Points**	**2 Points**	**1 Point**
TOTAL POINTS: 3.05			

Policy Option #4: High Population Density

Criteria #1: Cost-Effectiveness

Cost – Moderate to Excellent, $67,050,000

This option is the second most costly as it permits the second greatest number of potential clinic licensures of the options and the projected costs of facilities is only slightly lower than the No Restrictions Option. The cost of this option is approximately $67,050,000.

Effectiveness – Moderate to Excellent, 143 crime less per five years

This option is the second most effective in decreasing crime. The mitigating effect of crime in high population dense locations reduces the negative implications of allowing these facilities in high socioeconomic neighborhoods. As such, this options is projected to decrease the number of crimes in the neighborhoods where these facilities are located on average by 143 crimes per five years.

Cost-Effectiveness - Moderate, $470,000 per crime prevented

On average the cost per crime eliminated is $470,000. This option is the second most cost-effective option of the proposed policies.

Criteria #2: Crime

Neighborhood Crime- Moderate, decrease neighborhood crime by 1.25%

This option does not permit the licensure of MMT clinics in the most affluent, less populated neighborhoods. As such it protects four of the most at risk neighborhoods where these clinics would likely increase crime substantially. Likewise, it only permits these clinics to open in neighborhoods with high population densities and foot traffic where these clinics are shown to reduce crime compared to alternative land uses. When taking into account the mitigating effect of these clinics in high population dense areas regardless of income with the type of neighborhood, crime is projected to decrease on average by approximately 1.25% in each neighborhood where a facility is located.

City Crime- Moderate, decrease city crime by between 1.26% and 1.4%

This option is the second most effective at reducing city level crime. This option would increase the number of facilities to between approximately 9 and 10 clinics. Thus, with an average city reduction in crime of .14% per facility this is projected to decrease crime by between 1.26% and 1.4% in total. This is less than the No Restrictions Option (1.68%-1.82%), but greater than the Status Quo Option (.7%).

Total- Moderate, second most effect policy at decreasing neighborhood and city crime

This option is the second most effective at decreasing crime associated with MMT treatment facilities when weighting neighborhood crime (60%) as more important than city crime (40%).

Criteria #3: Access

Targeted Affected Population- Moderate-Poor, 69.16% of the most affected neighborhoods will have access to licensure
This option is the third most effective at targeting the most in need populations. 57.14% of neighborhoods with median ages between 18 and 25 are available for MMT licensure under this legislation. 71.79% of neighborhoods with median incomes between $20,000 and $49,999 are available. 78.57% of majority white neighborhoods are available for MMT licensure.

By Number of Neighborhoods Served - Moderate-Excellent, 75.47% of all neighborhoods are available for licensure, increasing the number of clinics to approximately 9 or 10
This option is the second most effective option at increasing the projected number of clinics in the city. This option permits that 75.47% of all Richmond neighborhoods would be allowed to license MMT. As such, this is projected to increase the number of clinics in the city to between 9 and 10 clinics. This is the second most effective at increasing the number of clinics to the No Restrictions Option (12 to 13 clinics).

Total - Moderate-Poor, Third most effective at reaching those most affected and increasing total treatment
It is the third overall most effective when weighting targeted access (60%) as slightly more important than simply increasing the number of facilities (40%). As such this option is the third most effective at reducing the number of opioid related overdoses.

Criteria #4: Equity

Racial, Income, and Age Demographics (90% of Criterion) - Moderate, An average 7.93 percentage point difference between expected proportion and policy coverage proportion
Race- In Richmond, 45% of its neighborhoods are majority minority neighborhoods while approximately 55% of its neighborhoods are majority white neighborhoods. Under this policy option, exactly 45% of the neighborhoods available for MMT licensure are located in minority majority neighborhoods while exactly 55% of neighborhoods available for MMT licensure are located in white majority neighborhoods. This is nearly perfect equitability as the proportion of available neighborhoods for MMT licensure appears almost exactly proportional to the proportion of minority to white neighborhoods in the city.

Income- Approximately 55% of neighborhoods in Richmond make less than $50,000 a year while the other 45% of neighborhoods in Richmond make $50,000 or more a year. Under this policy option, approximately 74% of neighborhoods available for MMT licensure are located in neighborhoods with median incomes of less than $50,000 a year, while only about 26% of neighborhoods with median incomes $50,000 or greater are available for MMT licensure. In other words, neighborhoods with an income less than $50,000 have a much greater likelihood on average of receiving a clinic when compared to neighborhoods making $50,000 or more.

Age- Approximately 20% of neighborhoods in Richmond fall into age group one, approximately 61% fall into age group two, and the remaining 19% fall into age group three. Of the neighborhoods available for MMT licensure 10% are in age group one neighborhoods, 70% are in age group two neighborhoods, and 20% are in age group three neighborhoods. In other words, age group one neighborhoods are proportionally less likely to receive a clinic offering MMT than age group two or three with age group two neighborhoods more likely to receive a clinic than proportionally expected and age group three neighborhoods having almost exactly the number of neighborhoods available for licensure as proportionally expected.

Mapping Analysis (10% of Criterion) - Excellent, no visual evidence of racial or income placement inequities
When looking at Figure 8.1-8.3, the areas coded as unavailable for MMT licensure are unrelated to racial or income demographics. As such, it appears mostly equitable through this qualitative analysis.

Total – Moderate to Excellent, third most equitable by neighborhood and second most equitable map analysis
While this option is the third most equitable of the options, it is highly effective because it is neither entirely restrictive nor unrestrictive thus resulting in a slightly lower score. Despite this, it is still extremely fair particularly when viewing the legislative map and the corresponding demographic layout of the city.

Figure 8.1. White Majority

Figure 8.2. High Population Density

Figure 8.3. Income by Neighborhood

Option #4: Criteria Summary

Cost-Effectiveness (25%)	Crime (35%)	Access (25%)	Equity (15%)
Moderate-Excellent, $470,000 per crime prevented	Moderate, decrease neighborhood crime by 1.25% Moderate- Excellent, decrease city crime by between 1.26% and 1.4%	Moderate-Poor, 69.16% of the most affected neighborhoods will have access to licensure Moderate-Excellent, 75.47% of all neighborhoods are available for licensure, increasing the number of clinics to approximately 9 or 10	Moderate, An average 7.93 percentage point difference between expected and policy coverage proportion Excellent, no visual evidence of racial or income placement inequities
3 Point	**3 Points**	**2 Points**	**2 Point**
TOTAL POINTS: 2.6			

Outcomes Matrix:

	Cost-Effectiveness (25%)	Crime (35%)	Access (25%)	Equity (15%)	Total Points
Status Quo	Poor, $178,000* per crime *added*	Poor, Increase average neighborhood crime in four neighborhoods slightly.	Poor, 5.71% of affected neighborhoods will have a MMT facility.	Excellent, All neighborhoods are equally restricted from further MMT licensure	**1.3**
		Excellent, Decrease city crime by .7%	Poor, Number of facilities will remain at 5	Moderate-Excellent, slight qualitative findings of inequity	
	1 Point	**1 Point**	**1 Points**	**3 Points**	
No Restrictions	Poor, $2,036,000 per crime *added*	Poor, Increase average neighborhood crime by 2.25%	Excellent, 100% of most affected neighborhoods permitted for licensure	Excellent, Not limited by any demographic features	**2.55**
		Excellent, Decrease city crime by 1.68% to 1.82%	Excellent, Increase Number of Clinics to 12 to 13	Excellent, no qualitative findings of inequity	
	1 Point	**2 Points**	**4 Points**	**4 Points**	
Low-Medium SES	Excellent, $107,000 per crime prevented	Excellent, decrease crime in neighborhoods on Average by 6.12%	Moderate-Excellent, Reach 81.18% of the most affected neighborhoods	Poor, on average 21 percentage point difference between expected and policy coverage proportion	**3.05**
		Moderate-Excellent, Reduce crime by 1.26% to 1.54%	Moderate-Poor, License to 64.15% of neighborhoods & increase number of clinics to 8	Poor, Clear visual differentiation between types of neighborhoods and available neighborhoods for licensure	
	4 Point	**4 Points**	**2 Points**	**1 Point**	
Population Density	Moderate-Excellent, $470,000 per crime prevented	Moderate, decrease neighborhood crime by 1.25%	Moderate-Poor, 69.16% of the most affected neighborhoods will have access to licensure	Moderate, An average 7.93 percentage point difference between expected and policy coverage proportion	**2.6**
		Moderate-Excellent, decrease city crime by between 1.26% and 1.4%	Moderate-Excellent, 75.47% of all neighborhoods are available for licensure, increasing the number of clinics to approximately 9 or 10	Excellent, no visual evidence of racial or income placement inequities	
	3 Point	**3 Points**	**2 Points**	**2 Point**	

Implementation:

It is recommended that the Virginia General Assembly pursue option three to restrict the licensure of clinics offering MMT to only neighborhoods with median incomes below $44,000 per year to maximize access while minimizing crime levels. In 2018, the Virginia General Assembly passed legislation permitting the resale of locations already licensed to dispense MMT to other substance abuse clinics offering these services. This legislation came in the wake of great public concern for the rising opioid epidemic; however, this legislation is not enough as it simply maintains the current six MMT offering clinics in Richmond, Virginia rather than allowing the supply to meet the growing demand for these services.

The Virginia General Assembly and an educational grassroots campaign must reframe and redefine the issue from one regarding crime to one regarding access in order to address opioid addiction. The grassroots campaign must redefine the issue to emphasize that these clinics can actually have positive effects on crimes when placed appropriately, and emphasize the need to increase access to services. The General Assembly must continue to push the need for legislation that removes the restrictions on these services in order to effectively address the crisis. Without legislation that removes these restrictions, it is unlikely that urban areas, specifically Richmond, Virginia, will be able to appropriately respond to the opioid crisis within Virginia.

Appendix 1: Projected Number of Clinics

Projected Number of Clinics by Policy Option					
Year	Overdose Rate	No Restrictions (NR)	Status Quo	SES (NRx0.64)	Pop. Density (NRx.9)
2004	4.80%	-			
2005	4.70%	5.0	5.0	5.0	5.0
2006	6.40%	5.0	5	4.0	4.5
2007	6.20%	6.0	5	3.8	5.4
2008	5.90%	6.0	5	3.8	5.4
2009	4.80%	6.0	5	3.8	5.4
2010	7.10%	5.0	5	3.2	4.5
2011	6.50%	7.0	5	4.5	6.3
2012	7.60%	7.0	5	4.5	6.3
2013	9.10%	8.0	5	5.1	7.2
2014	9.90%	9.0	5	5.8	8.1
2015	13.40%	10.0	5	6.4	9.0
2016	-	13.0	5	8.3	11.7

Appendix 2: Neighborhood Data

Neighborhood	Race Majority	Median Income	Median Age	Population Density	SES	No Restrictions	Status Quo
Barton Heights	Minority	$35,508	37.65	1	1	1	0
Barton Heights Cemeteries	Minority	$27,500	41.4	1	1	1	0
Battery Park	Minority	$44,386	43.3	1	0	1	0
Belle Isle	Minority	$34,103	32.5	0	1	1	0
Bellevue	White	$45,852	57.75	1	0	1	0
Blackwell	Minority	$39,309	30.5	1	1	1	0
Boulevard	White	$52,260	29.8	1	0	1	0
Broad Rock	Minority	$37,189	36.8	0	1	1	0
Broad Street Commercial	White	$28,513	24.9	1	1	1	0
Brookland Park	Minority	$39,732	45.8	1	1	1	0
Capital Square	White	$37,123	24.65	0	1	1	0
Carver	White	$41,219	25	1	1	1	0
Chestnut Hill	Minority	$31,218	44.1	1	1	1	0
Chimborazo Park	White	$71,404	38.45	1	0	1	0
Church Hill Central	Minority	$37,319	39.35	1	1	1	0
Church Hill North	Minority	$45,370	36.65	1	0	1	0
Commonwealth Club	Minority	$24,265	23.45	1	1	1	0
Court End	Minority	$28,006	19.3	0	1	1	0
Downtown	Minority	$28,186	26	1	1	1	0
East	Minority	$34,568	34	1	1	1	0
East Franklin Street	White	$37,123	28.25	0	1	1	0
Fan	White	$46,572	27.55	1	0	1	0
Fan Extension	White	$34,097	23.35	1	1	1	0
Far West	White	$107,673	40.05	0	0	1	1
Forest Hill Park	White	$46,588	44.65	1	0	1	0
Ginter Park	Minority	$40,562	40.55	1	1	1	0
Grace Street Commercial	White	$28,678	24	0	1	1	0
Hermitage Road	White	$45,111	58.8	0	0	1	0
Hollywood Cemetery	Minority	$37,478	32.7	0	1	1	0
Huguenot	White	$101,946	46.15	0	0	1	0
Jackson Ward	White	$28,125	24.5	1	1	1	0
Laburnum Court	Mixed	$65,854	40.8	1	0	1	0
Manchester	Minority	$20,316	18	0	1	1	0
Midlothian	Minority	$50,951	38.95	1	0	1	0
Monroe Park	White	$15,898	19.2	1	1	1	0
Monroe Ward	White	$28,678	25.1	1	1	1	1
Monument Avenue	White	$53,082	31.4	1	0	1	1
Museum District	White	$54,044	32.3	1	0	1	0
Near West	White	$57,469	34.55	1	0	1	0
North	Minority	$34,435	37.85	1	1	1	0
Old South	Minority	$50,170	38.05	1	0	1	0
Oregon Hill	White	$26,833	26.05	1	1	1	0

Shockoe Bottom	White	$43,389	29.4	1	1	1	1
Shockoe Slip	White	$37,123	28.25	0	1	1	0
Springhill	Minority	$50,357	29.35	0	0	1	0
St. John's Church	White	$50,698	33.3	1	0	1	0
Tobacco Row	White	$38,766	29.1	1	1	1	0
Two Hundred Block West Franklin	Minority	$24,265	23.45	1	1	1	0
Union Hill	Minority	$40,209	29.5	1	1	1	0
West Broad Street	White	$35,158	25.45	1	1	1	0
West Franklin Street	White	$24,551	25.7	1	1	1	0
West Grace Street	White	$43,720	29.45	1	1	1	0
Woodland Heights	White	$54,316	34	1	0	1	0

Appendix 3: Cost-Effectiveness Analysis

Cost-Effectiveness Analysis:

General Assumptions:	Value	Justification
Discount Rate	7.00%	
All costs occur at end of Year	Year End	
Scope	Neighborhood	
Time Frame	5 Years	
Outcome of Interest	Lowest Cost Per Crime Avoided	
Average Crime Per Neighborhood	236.25	
Clinics Weights	1.2	Staffing Was Determined by Interview with Medium to Small Facility so these values are adjusted to reflect and average size facility serving approximately 200 patients.
Average Cost Counseling Staff	$40,768	references
Average Cost of Nurse	$60,687	references
Average Cost of Clinical Staff	$66,950	references
Average Cost of PNR Pharmacist	$127,017	references
Average Cost of Physician	$196,262	references
Average Cost of Administrative Staff	$40045	references
Average # Nurses Weighted	3.6	Interview Data*Weight
Average # Clinical Staff Weighted	7.2	Interview Data*Weight
Average # PNR Pharmacists Weighted	0.12	Interview Data*Weight
Average # Counseling Staff Weighted	6	Interview Data*Weight
Average # Physician Weighted	0.3	Interview Data*Weight
Average # Adminstrative Staff Weighted	2.4	Interview Data*Weight
Average # Nurses	3	Interview Data
Average # Clinical Staff	6	Interview Data
Average # PNR Pharmacists	1	Interview Data
Average # Counseling Staff	5	Interview Data
Average# Physician	1	Interview Data
Average # Administrative Staff	2	Interview Data
Cost of Methadone Treatment/Per Year	23040	Interview Data
Average Sq. Ft of Treatment Facility	6000	References

Basic Assumptions for Each Option		
No Restrictions Crime Calculations		
Crime Change	**# Neighborhoods**	**Crime % Contribution**
-16.00%	14	-4
0.00%	25	0
25.00%	14	6.6
Total Crime Change		**2.60 Increase**
Basic CEA Assumptions for No Restrictions Options		
Total Crime Change	69	# Facilities x Crime Change x Average Neighborhood Crime
Projected Number of Facilities	13	
Cost of Facility/Year	1014000	Average Square Foot of Facility * (Cost Per Square Foot)
$/Square Foot/Year	13	
Crime Status Quo Calculations		
Crime Change	**# Neighborhoods**	**Crime % Contribution**
-16.00%	0	0
0.00%	2	0
8.00%	3	4.8
Total Crime Change		**4.8 Increase**
Basic CEA Assumptions For Status Quo		
Total Crime Change	0.032	# Facilities x Crime Change x Average Neighborhood Crime
Projected Number of Facilities	5	
Cost of Facility/Year	240000	Average Square Foot of Facility * (Cost Per Square Foot)
$/Square Foot/Year	8	
Low to Medium SES Neighborhoods Calculations		
Crime Change	# Neighborhoods	Crime % Contribution
-16.00%	13	-4
0.00%	21	0
25.00%	0	0
Total Crime Change		**6.12 Decrease**
Basic CEA Assumptions for SES Option		
Total Crime Change	115.668	# Facilities x Crime Change x Average Neighborhood Crime
Projected Number of Facilities	8	
Cost of Facility/Year	360000	Average Square Foot of Facility * (Cost Per Square Foot)
$/Square Foot/Year	7.5	
Population Dense Neighborhoods Crime Calculations		
Crime Change	# Neighborhoods	Crime % Contribution
-16.00%	11	3.32%

0.00%	21		0%
25.00%	11		-2.07%
Total Crime Change		**1.25% Decrease**	
Basic CEA Assumptions or Population Density Option			
Total Crime Change	27.94	# Facilities x Crime Change x Average Neighborhood Crime	
Projected Number of Facilities	9.5		
Cost of Facility/Year	456000	Average Square Foot of Facility * (Cost Per Square Foot)	
$/Square Foot/Year	8		

Net Present Value Formula:

$$NPV = -C_0 + \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2} + \ldots + \frac{C_T}{(1+r)^T}$$

$-C_0 = Initial\ Investment$
$C = Cash\ Flow$
$r = Discount\ Rate$
$T = Time$

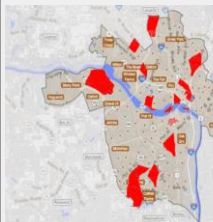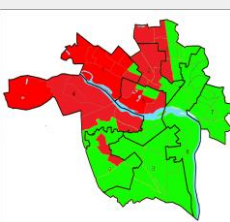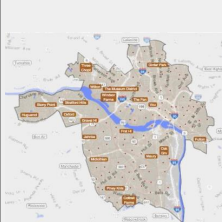This formula was used to calculate the NPV of cost as well as the NPV of crime over a five year period.
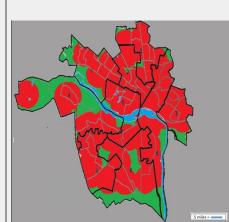
Appendix 4: Crime

Projected Decrease in Neighborhood Crime (60%)				
	Population Density	**Socioeconomic**	**No Restrictions**	**Status Quo**
Neighborhood Crime Reduction	Limited or Positive Effect	Positive Effect	Limited or Negative Effect	Limited or No Effect
Points	**3 points**	**4 points**	**1 points**	**2 point**
Projected Decrease in City Crime (40%)				
	Population Density	**Socioeconomic**	**No Restrictions**	**Status Quo**
Number of Clinics	9 to 10	8	12 to 13	5
Projected # Clinics	1.26% to 1.4%	1.12%	1.68% to 1.82%	0.70%
Points	**3 points**	**2 points**	**4 points**	**1 point**
Criteria Points w/ Weights	**3**	**3.4**	**1.9**	**1.7**

Appendix 5: Access Summary Table:

Percentage of Neighborhoods with Possibility of Receiving Treatment by High Risk Groups (60% of Total Criteria Score)				
	Population Density	Socioeconomic	No Restrictions	Status Quo
18-25 (109% increase)	57.14%	100.00%	100.00%	0.00%
$20,000-$49,999	71.79%	74.36%	100.00%	5.13%
White Neighborhoods	78.57%	64.00%	100.00%	12.00%
Average	69.17%	79.45%	100.00%	5.71%
Points	**2 points**	**3 points**	**4 points**	**1 point**
Projected Increase in Number of Clinics (40% of Total Criteria Score)				
	Population Density	Socioeconomic	No Restrictions	Status Quo
Restrictive as %	0.7547169811	0.641509434	1	0
Projected # Clinics	9.509433962	8.083018868	12.6	5
Points	3 points	2 points	4 points	1 point
Criteria Points w/ Weights	**2.4**	**2.6**	**4**	**1**

Appendix 6: Equity

Quantitative Equity Review				
Racial Proportionality of Legislations (50% of Quantitative)				
(Expected %) - (Actual % Available)	**Population Density**	**Socioeconomic**	**No Restrictions**	**Status Quo**
Minority Majority Neighborhoods	-0.28%	9.26%	0.00%	0.00%
White Majority Neighborhoods	0.28%	-9.26%	0.00%	0.00%
Absolute Value Sum:	**0.57%**	**18.52%**	**0.00%**	**0.00%**
Points	**2 points**	**1 points**	**4 points**	**4 point**
Weighted Points				
Income Proportionality of Legislations (35% of Quantitative)				
	Population Density	**Socioeconomic**	**No Restrictions**	**Status Quo**
<$50,000	19.64%	45.28%	0.00%	0.00%
$50,000 or Greater	-19.64%	-45.28%	0.00%	0.00%
Absolute Value Sum:	**39.28%**	**90.57%**	**0.00%**	**0.00%**
Points	**2 points**	**1 points**	**4 points**	**4 point**
Age Proportionality of Legislations (15% of Quantitative)				
	Population Density	**Socioeconomic**	**No Restrictions**	**Status Quo**
19-25	-9.08%	12.75%	0.00%	0.00%
25-40	7.64%	-7.84%	0.00%	0.00%
40<	1.44%	-4.90%	0.00%	0.00%
Absolute Value Sum:	**18.16%**	**25.49%**	**0.00%**	**0.00%**
Points	**2 points**	**1 points**	**4 points**	**4 point**
TOTAL QUANTITATIVE WEIGHTED	**2 POINTS**	**1 POINT**	**4 POINTS**	**4 POINTS**
Qualitative Equity Review (10% Total)				
	Population Density	**Socioeconomic**	**No Restrictions**	**Status Quo**
Points	3 points	1 point	4 points	3 points
TOTAL WEIGHTED POINTS	**2.1**	**1**	**4**	**3.9**

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