Incarceration's HIV Challenges and Opportunities: The Communal Health Impact of Incarcerating Individuals

by

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TABLE OF CONTENTS

LIST OF TABLES

Number *Page*

LIST OF FIGURES

Number *Page*

Abstract

HIV and incarceration represent two epidemics facing the African American community, specifically, but the larger American population, as well. Most of the existing literature focuses on the disadvantages incarceration creates with regard to employment, voting rights or disenfranchisement, health insurance and governmental benefits, economics, social relationships and disengagement, conditions of incarceration within prison walls, and other aspects of effective citizenship. While there is growing speculation that incarceration also has health-related spillover effects both inside and outside prison walls, there are only a few studies that empirically test this relationship. This study seeks to fill that void by directly examining the effects of incarceration on the health of the larger community outside of prison walls, with specific attention given to HIV. Results suggest that increases in incarceration may decrease community HIV cases, signaling that incarceration itself can serve as a possible public health intervention in the HIV epidemic. One of the suggested intervention mechanisms is the introduction of HIV testing within state prisons. Although current HIV data is relatively limited and future inquiry is definitely needed to further unpack the possibility of the intervention of prisons, this study introduces a much-needed conversation with regard to looking to criminal justice policy as public health policy, not just for those incarcerated but for the entire population. Since what happens in prison can spill over to the outside community, prison policy needs to be considered in conjunction with larger health strategies in areas such as infectious disease. More importantly, additional attention and caution should be taken in interpreting the results of this

study so as to not construe them to mean that more incarceration is the solution to slowing the spread of HIV. Incarceration itself poses many societal injuries, and much attention is being drawn toward reducing prison rolls. Instead, studies like this one should be used as a starting point to explore how current structures can be used to address health problems, while future policies are devised to build alternative interventions that avoid the harm of incarceration.

Chapter 1: Introduction

Statement of the Problem

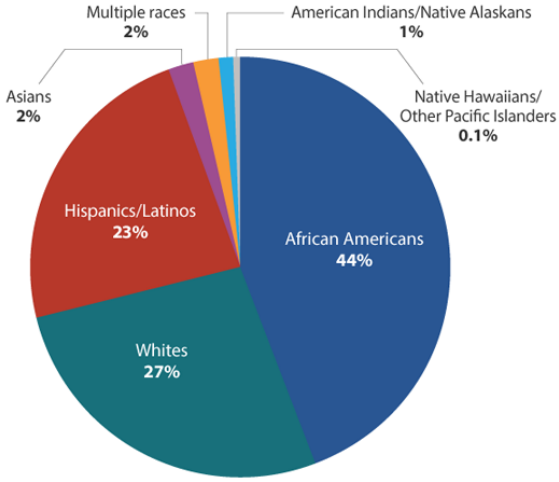
In the United States, African Americans continue to be disproportionately affected by a number of health, social, political, and economic disadvantages. In the midst of the myriad of issues facing the black community, increasing incarceration rates and the contract of human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) are amongst the most pressing. Blacks are incarcerated and test positive for HIV at much higher rates than the general population. These two issues represent dual epidemics that may seem unrelated on the surface but actually share a multitude of commonalities. While there are a plethora of statistics denoting the prevalence of HIV/AIDs and incarceration rates among blacks, there has been much less examination of how high rates of incarceration may be facilitating the spread of HIV. This study seeks to fill that void and identify potential relationships between incarceration and the prevalence of HIV. Specifically, this study investigates how incarceration affects the health of the community outside of the prison walls.

According to the Office of Minority Health, Blacks accounted for 44% of HIV/AIDS cases in 2010, while representing only around 13% of the United States population.[1,2] Thus, Black males are 7.8 times more likely than White males to be infected with HIV, and Black females are 23 times more likely than White females to be infected by the disease, while Black children are twice as likely to contract HIV as White children. By 2011, Blacks were 8.6 times more likely to be diagnosed with HIV, compared to the White population overall. According to the Centers for Disease Control (CDC), Blacks experience a high rate of exposure to and

transmission of other sexually transmitted infections, which increases the likelihood of transmitting or contracting HIV if exposed. The significance of other sexually transmitted infections for contracting HIV is particularly relevant for our consideration of the effects of incarceration that follows, as prisons contain high volumes of sexually transmitted diseases.

A 2013 Kaiser Family Foundation report states that one in six African Americans surveyed believed HIV/AIDS is the number one health problem in the US, and Blacks were significantly more worried about an immediate family member being infected than any other racial or ethnic group.[3] Combining this fear with the statistics, HIV represents one of the starkest health disparities facing Black communities.

Figure I:
New HIV Diagnoses by Race/Ethnicity (2014, n=44,073)

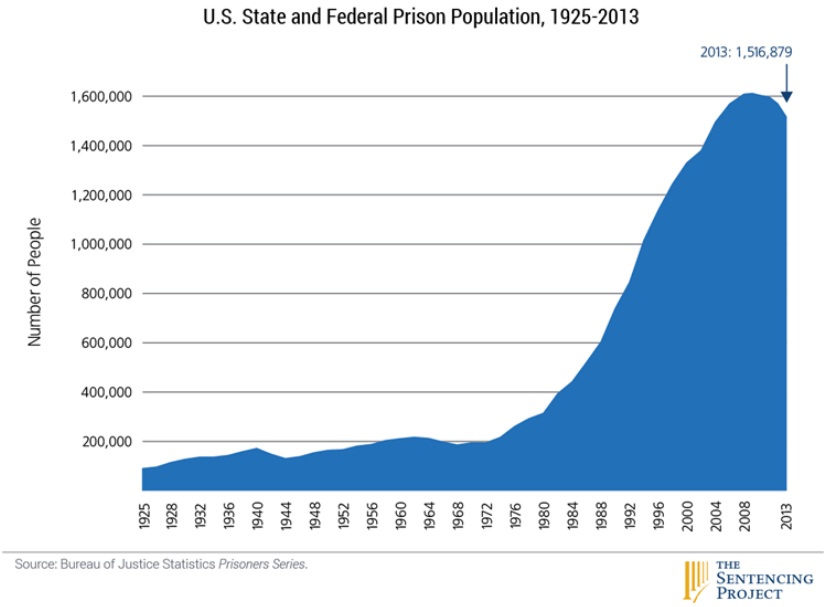


Source: Division of HIV/AIDS Prevention, National Center for HIV/AIDS, Viral Hepatitis, Sexual Transmitted Diseases and Tuberculosis Prevention, Centers for Disease Control and Prevention[4]

Simultaneously, incarceration rates are rapidly growing in the general population, especially among Blacks. The Bureau of Justice Statistics (BJS) estimates that by the end of 2011, 6.98 million people were under correctional supervision, which is defined as being in prison, jail, on probation, or on parole. This represents nearly 2.9% of the US population or about 1 in every 34 adults. Nearly 70% of this population was on probation or parole, which

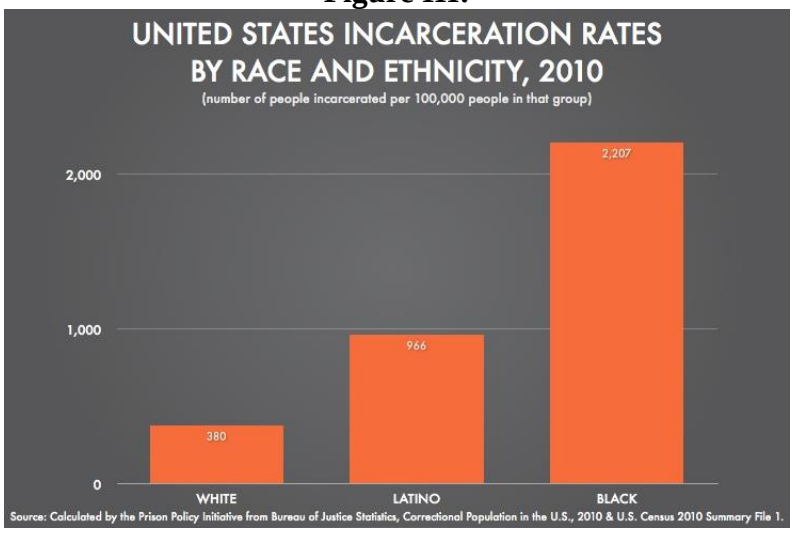
means that a significant number of the people considered under correctional supervision—the parolees—had passed through some type of correctional facility and re-entered their communities. In a global perspective, by 1993, the United States had incarcerated five to ten times the number of individuals as other industrialized democracies. As other countries, particularly European, appear to be making greater investment in social welfare services, the United States' comparative disinvestment from the welfare state has been matched by a significant investment in the criminal justice system (Western and Beckett, 2000). Blacks represent a disproportionately large share of those incarcerated, and it has been projected that Black men have nearly a 1 in 4 chance of being incarcerated at some point in their lifetimes.[5]

Figure II:



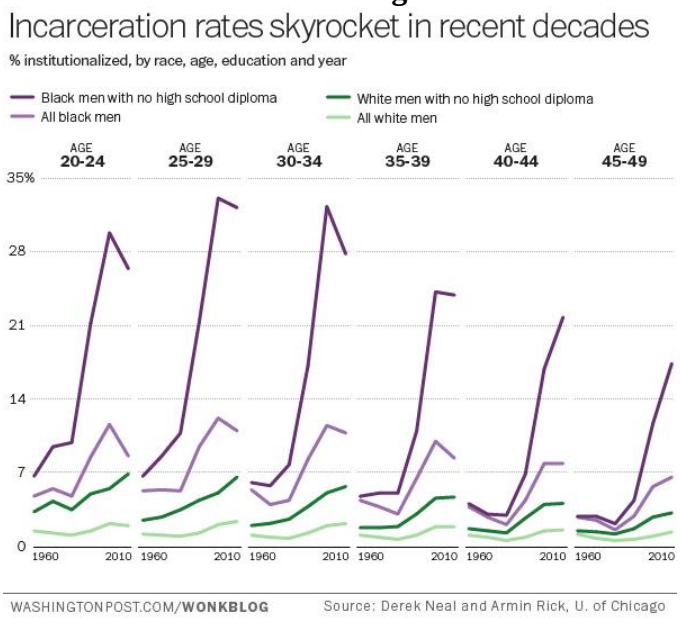
Source: The Sentencing Project[6]

Figure III:



Source: Statistics as of June 30, 2010 and December 31, 2010 from Correctional Population in the United States and from U.S. Census Summary File 1. (Graph: Peter Wagner, 2012)[7]

Figure IV:



Source: Pew Research Center: "The Chart of the Week: The black-white gap in incarceration rates"[8]

Most of this boom in the prison population was driven by nonviolent first time drug offenders and property offenders. Similarly, chances of imprisonment are considerably influenced by level of police surveillance, rates of convictions, and geographic scattering of

sentencing patterns. Many of these factors, especially police surveillance, are known to occur more in poorer, urban, and minority communities.

Correctional facilities, however, are not permanent placements, but often serve as temporary holding facilities. Nearly 700,000 individuals are released from jails and prisons annually.[9] To put the incarceration inflows and outflows into perspective, the National Center for Education found that the number of men who are released from prison each year is approximately equivalent to the number of men graduating college. The flow in and out of the nation's jails and prisons has been called a revolving door phenomenon, as many inmates who leave the system re-enter.[10,11,12] This inflow and outflow provides increased opportunity for any health concerns within prison walls to be spread to the general community as people cycle between the community and prison.

Primer to HIV and Incarceration

Assumptions surrounding sexually transmitted diseases and infections (STDs/STIs) tend to focus on the individual. Transmission of these health concerns is believed to be the result of individual behavior. As sex is often considered an act based solely on individual behavior and actions, most policies targeted at the reducing sexually transmitted diseases consist of individual level interventions such as abstinence, condom use, or monogamy. Thus, interventions take place at the individual level with needle exchange programs, distribution of syringes, preaching abstinence or condom use, and encouraging testing and doctor visits. More often than not, money pumped into intervention programs and treatment centers goes toward narrowly focused efforts to treat the disease after infection occurs or to reduce individual risky behaviors, rather than to take a broader systemic approach to risk and transmission reduction. Public health policies that seek to address the spread of STDs and STIs take a similarly narrow approach.

While individuals are believed to have personal agency, one's life chances, social environment, circumstances, and life path are also influenced by social forces. Patterns and rates of sexually transmitted diseases and infections (STDs/ STIs) such as HIV (among other concerning health problems) are associated with several social forces, such as incarceration, geographic segregation, job market inequities, policies leading to distrust of health care systems, uneven educational opportunities, and income inequality. In the United States, social stratification, geographic separation, and historical experience greatly define the lives of racial and ethnic minorities. The health of these populations is not exempt from this reality and inequities are largely formed and perpetuated by social forces.

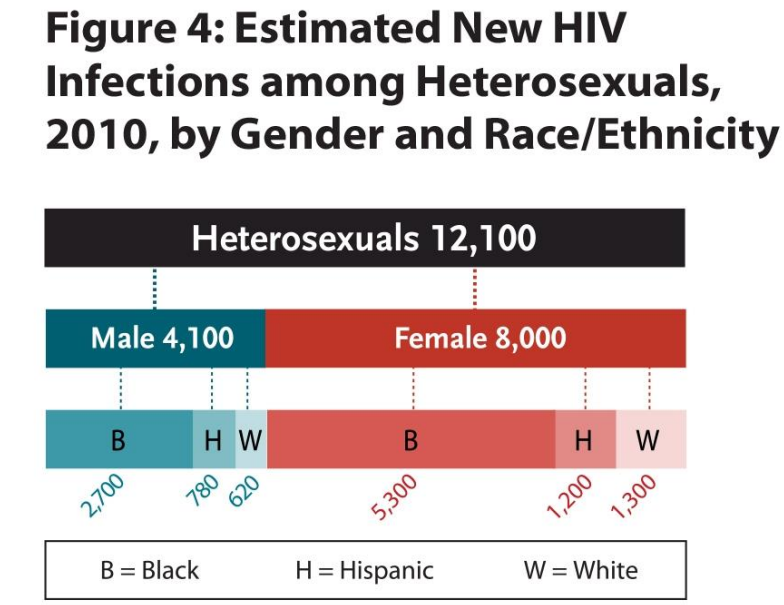
When it comes to HIV and other STIs, their nature, pattern, and distribution are often more complex than other health disparities. This complexity is due, in large part, to the functioning of systems rather than individual behavior.[13] The significance of systemic concerns is evidenced by the higher prevalence of these diseases in Black populations without higher levels of risk behaviors. One study, using data from a national survey in 2002, found that White women reported larger numbers of sexual partners.[14] Thus, while Whites acquire STIs from high risk behaviors, Blacks seemed to acquire them even at low risk behaviors through sex with infected partners, as prevalence is higher in their communities. Hence, it is believed that social determinants such as systems must play a role in altering the risk profile for Blacks when it comes to STIs. As HIV has largely become concentrated in prisons and jails,[15] and Blacks represent an overwhelming share of the those populations, it is possible for one of these social determinants to be exposure to and release from the criminal justice system.

Many prisons and jails are plagued by the high transmission of communicable diseases due to tight living quarters, pervasiveness of communal areas, and frequent participation in risky

behavior. With respect to HIV, infection rates in prison are five to six times higher than the general population, and it has been estimated that nearly one-fourth of all HIV-positive individuals have passed through a correctional facility at some point.[16.17,18] Methods of HIV transmission in prison include sexual activity, tattooing, and intravenous drug use, among other pathways. Many of these activities begin before entering a correctional facility and continue inside and after exiting a facility. Thus, correctional facilities represent the highest concentration of HIV positive individuals who are already predisposed to risky behavior patterns. This concentration means that correctional facilities house an already vulnerable population and pool together more individuals who are at high risk for a disease that is spread through the activities inmates engage in before, during, and after incarceration.

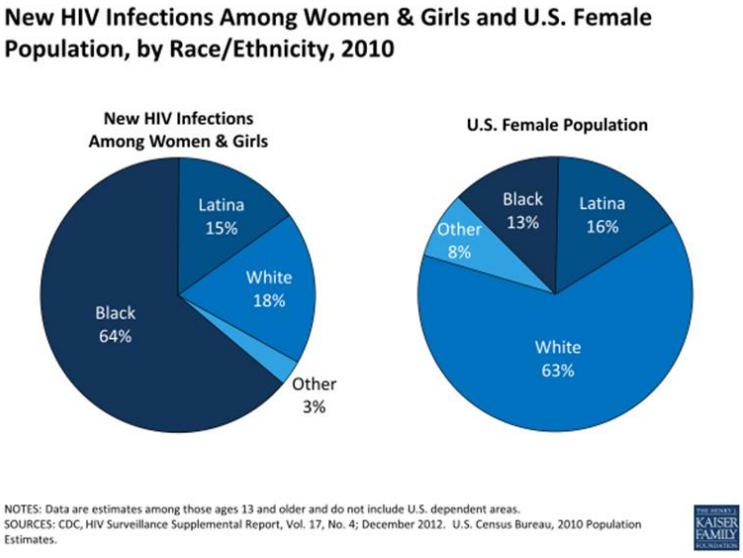
HIV is a communicable disease that is mainly transmitted through intravenous drug use—specifically sharing needles—and sexual contact. Many of the risk behaviors for HIV are practiced by the prison population prior to entry, during incarceration, and post release. While HIV is often thought to be most prevalently transmitted through homosexual contact, among African Americans it is becoming increasingly transmitted through heterosexual contact. In a 2010 HIV/AIDs Surveillance Report, 87% of Black females living with HIV in 2007 contracted it through heterosexual contact. Several studies have found that a significant number of Black women infected with HIV have had a partner that has been incarcerated and that HIV positive Black men have a high rate of incarceration, combined with a reluctance to disclose their status to partners. [19,20,21] Thus, HIV represents a challenge for Black intimate relationships that is intertwined with the criminal justice system and represents a major health crisis in the Black community. The figures below offer a picture of the uneven distribution of new HIV infections among different racial groups in the United States.

Figure V



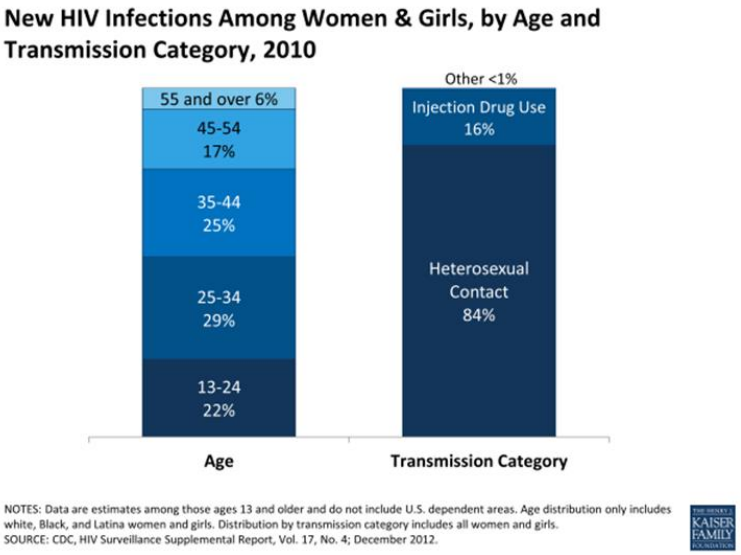
Source: "Incarceration, African Americans, and HIV: Advancing a Research Agenda," by N. Harawa and A. Adimora, 2008, Journal of the National Medical Association 100 (1), p. 57–62. [21]

Figure VI:



Source: The Henry J. Kaiser Family Foundation: "Women and HIV/AIDS in the United States"[22]

Figure VII:



Source: The Henry J. Kaiser Family Foundation: "Women and HIV/AIDS in the United States"[23]

Contributions to Literature

Political science, sociology, criminology, and other areas of the relevant current literature focus on the consequences of incarceration with regard to reduction of employment opportunities, lower wages, recidivism, disenfranchisement, psychological impact on children whose parents are incarcerated, and mental health issues.[24,25,26] Other studies focus on the intra-prison transmission of diseases due to cramped quarters, behavior, and population characteristics. While the relationship between incarceration and HIV is widely mentioned, there are few studies that actually try to explore empirically the posited relationship between the two. Most existing literature in this area is anecdotal, descriptive, and speculative. I seek to contribute to the relatively scant empirical work focusing on incarceration and infectious diseases, such as HIV.

There are two proposed ways in which incarceration can impact HIV transmission. The first is through direct transmission whereby a former inmate infects others in the larger community. HIV statistics show that HIV is increasingly concentrated in prison settings. According to the CDC, roughly 1 in 7 people living with HIV will pass through a correctional

facility each year. Those incarcerated have increased risk for acquiring HIV by partaking in risky behavior and are more likely to be involved in commercial sex work, suffer from untreated mental illness, be in a lower socioeconomic class, and be exposed to prison rape.[27] Therefore, health concerns within prisons pose potential community health concerns for the areas in which prisoners are released, particularly with regard to intimate relationships that are disrupted as individuals enter prison and are likely to be continued upon release.

It has been estimated that over half of men that are released from prison have an intimate partner in the community and that the majority of these men have unprotected sex within hours of release.[28] These behaviors are particularly troubling if inmates are unaware of their HIV status upon release or fail to disclose their status to their partners. Further, studies suggest that individuals that seroconvert to HIV positive while in prison are often infected by strains of HIV that are resistant to current antiretroviral medication.[29] These resistant strains are an even larger public health concern, as they are more transmittable and dangerous. Those released from prison are also more likely to return to or rely on prior relationships, since they are released with few resources needed for survival back in the community at large.

The second possible pathway of impact is through disrupting social, familial, and communal environments so the social environment itself contains increased risk factors for HIV spread. Higher levels of incarceration, particularly among males, reduce the number of possible mates in the community.[30] As nearly one fifth of all Black adult men serve time in a correctional facility at least once, Black women are almost twice as likely to report having concurrent partners and a larger number of lifetime partners.[31] The increased number of partners increases the chance of coming in contact with HIV, particularly when within an already vulnerable population. Incarceration can also negatively influence social cohesion and control by constantly

removing community members, which increases risky sex practices.[32] Additionally, many men are the financial providers for—or at least contributors to—households; when they are incarcerated that familial income is lost, which can perpetuate the cycle of poverty--another risk factor for HIV.[33] Lastly, prison can serve as a mixing pot of people from low risk profiles and high risk profiles. As many individuals join gangs or other deviant groups for survival, these links can forge new relationships that continue upon release and affect sexual networks by bringing previously unconnected high and low risk profiles together in the same social networks.[34]

It is beyond the scope of this study to determine which of these methods, or some alternative, is driving any relationship found between incarceration and HIV. The purpose of this study is to contribute to the insufficient literature on the relationship between incarceration and infectious disease and provide empirical evidence that a relationship exists. Additionally, the main goal is to provide further acknowledgment of and evidence for social determinants of health, policy collateral consequences, and criminal justice spillover effects.

Larger Implications of Research and Policy

Over the past few decades, criminal justice spending and maintenance of correctional facilities has consumed growing portions of state budgets, often at the expense of other social needs. With states facing larger shortfalls and more fiscal pressure, combined with the requirement to balance the budget annually, cutbacks are inevitable. With respect to correctional spending, these cutbacks often involve rehabilitative services, educational programs, and healthcare. Similarly, people may be more supportive of cuts to correctional spending, as opposed to education or public health spending, particularly if taxpayers are aware that it costs nearly $23,000 per year to incarcerate one inmate and that the number jumps to $60,000 annually

for an inmate with HIV.[35] However, the health of the population in prison may have a large effect on the health of the larger community, and any health concerns within prison walls may pose public health challenges not only to those within correctional facilities, but outside of them, as well. Therefore, prisons may present effective public health opportunities to address the transmission of several STDs and STIs, specifically HIV. Budget cutbacks to health services and conditions within prisons may present more consequences than anticipated. If incarceration poses significant health risks for prisoners and their communities, the health consequences of incarceration and the role of correctional facilities in facilitating disease spread warrant the attention that the political, social, and economic consequences of incarceration have received.

Since the early 1980s, when HIV was first diagnosed, to the rapid increase of incidences in the 1990s, a considerable amount of funding has been allocated toward treatment, prevention, and research. Some scholars argue that much of the money devoted toward combating HIV has already outpaced the effort to target HIV/AIDS directly.[36] Accordingly, new interventions are necessary. These new interventions may require expanding the conventional definition of public health policy/strategy. This expansion may include looking at prison policy or treatment of prisoners as an overall public health strategy for combating the spread of HIV, especially within already vulnerable communities. Specifically, this study can provide further evidence needed to draw attention to the social and political determinants of health, rather than the sustained individualistic focus.

Much of the HIV epidemic today calls for public policies to change the risk profile and environment in order to combat the disease more effectively. This means using policies in areas such as homelessness, housing conditions, and especially incarceration as health policies to address the spread of HIV. Research drives policy, especially when focusing on such a

marginalized and politically excluded population. In order to get political buy-in to address such a population with little to no political mobilization, research studies such as this one have to pave a path of urgency, justification, and necessity to draw attention to their needs. Placing individuals been behind bars has collateral consequences, and policy should be developed with an eye toward those consequences.

Plan of Study

This study seeks to evaluate the community effects of incarceration with regard to infectious disease transmission. Specifically, it seeks to identify any potential relationship between high incarceration and prevalence of disease within the Black population compared to the population overall.

Chapter 2 provides a literature review of what is currently known about HIV, incarceration, and their proposed association. As this association is a question that has been frequently hypothesized and speculated, but much less frequently empirically tested, there is limited literature directly addressing such a relationship. Building on literature from diverse disciplines including, but not limited to, political science, public health, sociology, law, economics, and criminology, a foundation for the proposed relationship between incarceration and HIV is described.

Chapter 3 provides a description of all the data and methods use to test the proposed relationship. This chapter includes an introduction to the models used in the empirical sections, variables, data sources, and choice of statistical methods. Each of the empirical sections will more specifically indicate any model nuances or differences that pertain to specific models.

Chapter 4 begins the empirical analysis with an exploration of how state incarceration impacts infectious disease spread within respective states nationwide. This involves exploring

the proposed relationship between AIDS, along with Tuberculosis (TB), and incarceration at the state level and then within racial and gendered subgroups. Given data limitations, these relationships will be investigated using both AIDS and HIV data over different periods of time. AIDS is the focus of Chapter 4, while HIV is the focus of Chapter 5. Data years will overlap for the two different disease stages where possible.

Chapter 5 refines the nationwide analysis by introducing an exploration of HIV. Given the lack of consistent comprehensive data, this is an oft-described, yet novel analysis, as most previous studies focus solely on AIDS cases or deaths. Similar to the AIDS analyses, this chapter will include racial and gendered subgroup models, as well as a preliminary look at different transmission pathways such as heterosexual transmission and intravenous drug use.

Chapter 6 introduces the public health intervention of HIV testing within prisons. This Chapter will compare models with states that exhibit different levels of HIV testing in corrections facilities. State prisons vary from mandatory testing to only incident-related testing. These differences can possibly be exploited to see if more strict or consistent testing would result in a protective effect of increasing knowledge of HIV status, which might in turn reduce spread upon release back into the outside community.

Lastly, Chapter 7 wraps up the conclusions from the entire analysis and provides some extended discussion on the implications and future aspirations of this research. As with all research, this study faces limitations that should be heeded in interpreting the results and crafting policy prescriptions. These limitations, as well as possible ways to address them in future studies, are discussed in this chapter, as well. Finally, this chapter considers a future research agenda and makes some policy prescriptions.

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Chapter 2: Literature Review

As mentioned in the introduction, there are two proposed pathways for incarceration to influence the spread of STDs. The first is through disrupting the social environment of communities by cycling individuals in and out of corrections facilities. This cycling dismantles stability, social cohesion, political power, and economic prosperity (among other issues), as this forced migration creates an environment rich in the factors that correlate with disease spread. The second pathway is through direct transmission from ex-prisoners to others in the communities to which the ex-prisoners return. With factors such as high rates of partner concurrency and diminished marriage markets, incarceration breeds circumstances that can translate into high intrapersonal transmission. The following chapter will explore the state of the literature with regard to these proposed pathways, as well as situate this investigation within the scope of what is known about the predicted relationship.

There are several major ways incarceration can influence the risk profile of African Americans in general. The first is by locking up large numbers of community members in a high risk and health plagued environment and then releasing them back in already disadvantaged communities. The second is via the policies that constrain the options for ex-offenders upon release and for their families living in communities outside of prison walls. As mentioned above, ex-offenders face reduced job prospects; bans on benefits; and decreased educational opportunities that impact HIV risk factors, such as poverty, access, and environmental factors. The third ways is that prison is a place where risk behavior is rampant, and inmates can pick up negative risk behaviors, such as drug use. As research shows, women are most likely to be

introduced to intravenous drugs through a partner; thus, these behaviors have the potential to spread beyond ex-inmates.

Criminal Justice System as a Political and Social Institution

Crime rates have substantially fallen since the 1990s, yet increasing numbers of individuals find themselves within prison facilities. Correction spending has outpaced almost all other categories on state budgets, leading it to be the third highest spending category, behind only healthcare and education in most states. In the early 1990s, corrections spending surpassed $90 billion, whereas only $41 million was spent on unemployment benefits and related services, and by 1992, the public cost of incarceration facilities was estimated at $31 billion. [1,2] In 2006, states alone spent $40 billion on corrections representing a 548% increase since.[3] To underscore the importance of these statistics, the main cause of increased correctional spending has been state policy rather than public safety or crime rates. The expanding expenditures are largely a function of longer sentences and redefining who is sentenced to correctional facilities.

Several changes in this area are due to a shift away from a rehabilitative retributive mind set. Criminal justice reform issued in the 1980s and 1990s with mandatory minimums, three strike policies, and truth in sentencing, all policy prescriptions, redefined the punishments for several crimes. The political "get tough on crime" and "just say no" rhetoric shaped the national perception and understanding of the American drug problem, thereby fueling the War on Drug policies. Some of the harshest policies and consequences associated with the War on Drugs will be discussed later in this section, but the significance of the War on Drugs is noted here as an example of the deep political entanglement involved in growing the criminal justice system. Thus, the corrections system itself can be considered a political institution as incarceration patterns are a demonstration of politics and power (Shannon and Uggen, Chapter prepared for

the Blackwell Companion to Political Sociology).[4] Consequently, the corrections system acts as a stratifying political and social institution by shaping the social, political, and life outcomes of those imprisoned and their communities.[5]

While states differ on laws that allow prisoners to vote while in corrections facilities, felon disenfranchisement laws mean that many states continue to exclude ex-inmates from voting rolls after release. These laws range from time-bound waiting periods to lifelong bans. This exclusion redistributes government resources and power, since those areas with high concentrations of incarceration lack relative amounts of the political power necessary to engage government or other authorities to address the needs of their communities. The United States Bureau of Justice Statistics indicates that disenfranchisement laws leave an estimated 3.9 million Americans permanently unable to vote, 1.4 million of which are Black (as of 1998). States vary in their use of disenfranchisement laws. Two states have no restrictions. In some states, inmates are not able to vote while incarcerated; in eight states, prisoners permanently lose all voting rights, and in five states, certain classes of felons are permanently disenfranchised. In Alabama and Florida, these policies have resulted in over 30% of the African American population being unable to vote with numbers continually growing. Having large numbers of people ineligible to vote reduces the strength of democracy, denies basic constitutional rights, and decreases the incentive for politicians to address the issues facing the most vulnerable members of society. If incarceration is concentrated in specific communities, it can potentially render entire areas with little to no political ability to change the burdens they face.

In addition to disenfranchisement, ex-offenders are shown to have diminished levels of civic and political engagement, hold less trust in government, and have lower feelings of efficacy or belief that they can influence politics. [6] This reduced sense of efficacy leads to reduced

political attention and participation by disadvantaged communities that often most need attention, further exacerbating the cycle of disadvantage and unequal distribution of social ills in the country.

Advancing the idea of the correctional system as largely a system of social control and a major stratifying institution, Michelle Alexander (2010)[7] defines the criminal justice system as "The New Jim Crow." She argues that in an era of "colorblindness," or the social impermissibility of using race as the basis for discriminatory practices, the criminal justice system has become the new mechanism to withhold full participation in American society from Blacks, in the same manner Jim Crow laws did decades ago. Racially based exclusion has not been eradicated, but merely redesigned. Under Jim Crow, Blacks were excluded from voting, housing, education, public benefits, employment, running for office, and jury service. Currently, being a convicted felon carries the same exclusions that being Black or Colored did years ago. Felons are often disenfranchised; have reduced job prospects; are cut from public benefits, including housing and assistance; and are restricted from obtaining school loans, as evidenced below in the War on Drugs discussion.

From a social and communal perspective, inmates often come from poor, minority, urban, and resource-deprived areas. These cycles of disadvantage are compounded by the "disqualifying credential" a criminal record attaches to ex-offenders.[8] While all offenders face obstacles in gaining sufficient employment post release, Blacks face the worse employment prospects and reduction in earnings and wages (Western, 2006).[9] Similarly, removing large numbers of able-bodied individuals from communities' workforces can negatively impact the economic conditions of such communities. As employment-based health insurance is still the top source of insurance, lower employment prospects can mean reduced opportunities to access health care for

ex-inmates and their familial dependents. This lack of access to health care comes on top of the already known mental and physical health concerns of inmates. Just as Blacks are more impacted by post incarceration employment prospects than their counterparts of other races, they are also at increased risk for poorer health outcomes given their disproportionate exposure rates as a result of incarceration.[10] Many scholars have argued that the expanded scope of the criminal justice system is producing the emergence and expansion of a new "felon class."[11] Incarceration removes large segments of people out of the general population for extended periods of time, thereby severing communal and familial ties, which are crucial for future assimilation back into society after release. Moreover, households stand to lose a source of income and/ or public assistance benefits.

Other scholars have called the penal system a "labor market institution," as it serves several important functions with regard to evaluating the context of the economic environment and determining the long term employment prospects of large groups of individuals.[12] In determining the American unemployment rate, those incarcerated are excluded from the unemployed category, which artificially lowers the true unemployment figures. Adjusted unemployment figures that include the corrections populations reveal trends that show the United States labor market actually performed worse than Europe's over the last few decades.[13] In the American context, these scholars found a particularly strong effect on Black unemployment in both the short and long term, where unemployment in this group is understated by nearly two thirds of seven percentage points due to incarceration. Couple this level of unemployment with the voting and other limitations imposed on ex-offenders and the vast systemic exclusion from full participation in American society is clear.

While the short-term issue is underestimating the unemployment needs of the country, the long-term impact is rendering large concentrations of individuals jobless over the course of

their lives. Being a convicted felon or having served time attaches a stigma that reduces employment prospects, and it is easy to find such a status in public records.[14,15] Continual expansion of the criminal justice system will continue to increase unemployment as more and more people are labeled with the offender badge. This impact on lifetime employment prospects is further compounded by the fact that the largest numbers of inmates come from minority, poor, resource-deprived, disadvantaged areas. Ex-prisoners often find it difficult to obtain legitimate work and housing, particularly if they have not maintained familial ties while being locked up. The United States Department of Justice estimates that nearly 60% of released inmates remain unemployed a year after release. This likelihood of unemployment is particularly problematic for those inmates suffering from health conditions, as employment remains the number one source of health insurance; for those who qualify for Medicaid or Medicare, waiting periods often apply.

Of significance to this inquiry, and as an example of the policy entanglement shaping the collateral consequences of the incarceration boom, the War on Drugs sheds light on the perpetuation of racial and socioeconomic inequalities. While at first glance, the War on Drugs appears to be a "tough on crime" response for placing drug-dealing or -using criminals behind bars, the War on Drugs, like so many criminal justice policies, has collateral consequences that span beyond punishing individuals for crimes committed and affect people beyond those who serve time behind bars. These collateral consequences range from health concerns to political removal to societal challenges that need to be considered when making broad sweeping criminal justice polices. While it is well documented that ex-prisoners have a decreased ability to find employment, much less attention has been given to the larger communal impacts of these realities, including limited (and in some cases no) access to government programs, along with long delays in receiving coverage from the programs for which they are eligible. Many are

released into poverty, remain jobless over a year after release, and have no connection to whatever community resources may exist. All of these factors limit the ability of ex-inmates to gain medical coverage or other necessary life-sustaining resources, increase recidivism, and place the communities to which they return at higher risk.

Policy Cycle of Disadvantage: The War on Drugs

The War on Drugs adds several significant caveats to problems faced by prisoners and their loved ones, who may never have been incarcerated. In 1998, Congress passed an amendment to the Higher Education Act of 1965 that prohibits individuals convicted of drug-related crimes from receiving federal financial aid for a college education.[16] This provision covers drug convictions and not murder, rape, or most other classes of convictions. While there are time limits to the aid bans, and they can potentially be lifted by completing a federally approved drug treatment program, this law nonetheless has a disparate impact on minorities, the poor, and other vulnerable populations, given the target of drug convictions and policies in the post-War on Drugs era. Minority communities are more likely to be policed for drugs, resulting in minorities making up the majority of drug arrests and convictions. Simultaneously, as described below, such policies cyclically increase negative social and environmental conditions—including lower educational attainment and unemployment—that increase one's chances of being HIV positive.

The Department of Justice estimates that African Americans make up approximately 13% of the US population; however, they represent 55% of convictions and 70% of incarcerations for drug possession. This translates to already marginalized populations being denied access to higher education opportunities, given the rising cost of a college education. Education has long been viewed as the key to upward mobility: a way out of impoverished areas and a way for

individuals to better themselves and their families. These War on Drug policies add barriers to educational access, a factor of particular importance in the context of HIV, since more educated people are more likely to use preventive measures and adhere to medication regimes, among other health measures. Further, research has noted a higher prevalence of HIV infection among those with lower educational attainment and in areas of concentrated low educational attainment. Denying access to federal loans for education, particularly to African Americans who already face societal disadvantages, aids in perpetuating disparities and contributes to an increased HIV risk factor presence. (ACLU pdf https://www.aclu.org/files/FilesPDFs/final%20brochure.pdf)

Moving beyond education, in 1996, the Department of Housing and Urban Development (HUD) enacted a "One Strike and You're Out" policy that states that a single drug conviction on or off public housing premises can result in the eviction of an entire household. Under this policy, any drug eviction renders tenants ineligible for public housing for three years. Evictions can come as a result of involvement in drug-related activity by a tenant or another household member or even guests or anyone associated with the tenant. The ACLU estimates that in six months after these guidelines were passed, evictions jumped from 9,835 to 19,405.

The policy gives public housing officials the ability to deny housing to anyone they believe has a pattern of drug use, thereby affording public housing officials broad decision-making powers. Moreover, this policy, combined with the targeting of poorer minority areas for drug enforcement, entangles not only those using drugs, but innocent family members, neighbors, and community members, in a web of larger systemic inequalities that increase the risk of contracting HIV or of living in areas of higher HIV prevalence. Expanding the reach of these drug-related policies has the potential to be particularly harmful to the incarcerated population, since when they return home from prison, they have few resources and are often

forced to rely on familial and friendly ties. If people know that they themselves can be evicted for associating with someone who was convicted of drug-related crimes, they may be less inclined to lend assistance to help those previously incarcerated assimilate back into the larger society. In addition, since prisoners are often offered little to no drug rehabilitation, the stress of being thrust back into society from a prison environment, with little to no resources for assistance, can lead to increased risky behavior. In these situations, ex-prisoners are likely to fall back into previous habits and possibly re-cycle back into prison.

The One Strike policy was strengthened in 2002 when the Supreme Court upheld this policy in HUD vs. Rucker. A unanimous court upheld the evictions of a grandmother whose mentally disabled daughter was arrested for cocaine possession three blocks from their public housing apartment, along with the evictions of two other residents who were evicted when their grandchildren were caught smoking marijuana in the parking lot and the eviction of a resident who was evicted because his caregiver was found with cocaine in the apartment. The court ruled that Congress did not intend for the evictions to extend to innocent tenants, even if the law allows for the eviction of those who had no knowledge of the drug-related crimes or those who could not control the actions of other individuals. For those living in impoverished areas, public assistance may be their only lifeline, especially when large numbers of employable men are incarcerated. Furthermore, as mentioned above, high concentrations of poverty, overlapping with high levels of incarceration, eviction and homelessness, have the ability to reduce residents' ability or desire to comply with preventative measures and have the potential to further increase poverty, another risk factor for HIV.

Policies like the "One Strike" drug policy run counter to the aims that public housing was initially created to fulfill and exacerbate the problems that public housing was intended to

alleviate. By evicting innocent bystanders, these policies increase homelessness, family instability, and neighborhood instability. Familial instability can reduce marriage markets and increase the likelihood of having concurrent sexual partners, as there is no primary relationship or marital commitment.

Similar to the HUD Policy, the Welfare Reform Act, passed in 1996, made drug offenders ineligible for welfare benefits. This is a lifetime ban, and no other crimes—not even murder and rape—result in such a consequence. Since its passing, 19 states continue to uphold the ban in its entirety, while 31 states and the District of Columbia have eliminated or modified the ban. As drug convictions continually target people of color, this ban disproportionately affects minorities, their families, and already disadvantaged communities. Children often are hardest hit by policies like these, which deprive children of the necessary means to fulfill their basic needs and heighten the incidence of family dissolution. Thus, these policies exacerbate disparities and preventing people from attaining a better life for themselves and from reducing their risk factors for both HIV and incarceration.

The War on Drugs, like other policy experiments of the past, such as the Tuskegee Experiment, has also worked to strain an already tense relationship between many minority communities—particularly African American communities—and government entities. African Americans have high levels of distrust for authorities. This level of distrust can easily be parlayed into a decreased willingness to seek medical attention from doctors, get tested for HIV, or listen to educational information disseminated by health officials.

Concentration of Incarceration

While research exists on the political, economic, and social prospects of ex-offenders, until recently, much less attention has been paid to health consequences and the transmission of

disease, particularly HIV. Prison poses potential unintended public health consequences that need to be explored and addressed. With high concentrations of incarceration disrupting the political strength of already vulnerable communities, it is necessary to find any evidence possible to justify expending resources to help these communities.

The constant revolving door in and out of prison facilities has an exacerbated effect on certain communities more than others, as incarceration is often geographically concentrated. The Justice Mapping Center and the Spatial Information Design Lab at Columbia University conducted a project that spatially maps the money spent on incarceration by city blocks. The Million Dollar Blocks Project found that there are city blocks that spend upwards of a million dollars to incarcerate each of those city blocks residents. These blocks are located in some of the nation's largest cities, with special focus on New York, Wichita, Phoenix, and New Orleans. More importantly, for this study, 95% of inmates are eventually released, and most return to the neighborhoods from which they came. Within three years of release, more than 40% are rearrested. The cyclical nature of incarceration in these communities, combined with significant concentrations of incarcerations, presents several risk factors for the transmission of HIV infection, especially given the physical similarities of the communities in the study. A pattern emerged in which cities with the highest concentration of prison admission also display an overlap of concentrations of people of color and people living in poverty. This provides increased opportunities for any health concerns within prison walls to be spread to the general community as people cycle between the community and prison.

Many of these communities are plagued by disinvestment and abandonment as the main policy responses to their plight. Simultaneously, these neighborhood disinvestments have been matched with increasing investments in the criminal justice system. This disinvestment not only

fuels the high number of prison re-entries, but also sets the stage for the spread of HIV by creating and sustaining many of the socioeconomic and social risk factors mentioned previously. In such communities, incarceration is only one of a myriad of problems that fuel each other, problems faced not just by offenders, but by their families and other community members, as well.

American Context for HIV

At the same time as the corrections system is expanding, there has been a shift in the demographics of the HIV/AIDS burden. When HIV was first diagnosed in the 1980s, the initial profile of the disease burden fell on white homosexual males. Since the early 1990s, African Americans have carried a significant proportion of the HIV/AIDS disease burden in the United States. Geronimus et al. (1996) found excess mortality rates in impoverished areas in comparison to age standardized annual death rates for Whites. These results hold especially true for African Americans, and HIV was the principal cause of excess death among men in Harlem and the Lower East Side. Homicide and HIV accounted for the majority of excess younger deaths before age 65. Furthermore, in 2004, low income Black and Latina women accounted for 82% of all newly diagnosed HIV cases. Of particular interest to this study, health outcomes for African Americans appeared to be markedly better at higher income levels. Given the consequences of incarceration—including fewer employment opportunities, lower income, reduced housing opportunities, and the concentration of offenders coming from already vulnerable areas—the formerly incarcerated are likely to face poverty and reduced health outcomes. These factors become increasingly stark in view of the proportion of African Americans incarcerated compared to their percentage in the American population.

Several socioeconomic risk factors for HIV work simultaneously with racial disadvantage to create intersecting disadvantages. The Centers for Disease Control (CDC) lists the following concerns as common individual HIV risk factors: poverty, discrimination, stigma, homophobia, community prevalence of HIV and other STDs, high incarceration rates among men, language barriers, unemployment, lower educational attainment, and immigration status. Many, if not all, of these factors are more prevalent in minority populations than among their white counterparts. These factors are also prevalent in the communities that inmates are likely to originate from and return to, and these factors are also part of the cycle of disadvantage incarceration can perpetuate. The National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention at the CDC, found an inverse relationship between all indicators of socioeconomic status (SES) and HIV/AIDS prevalence. In a nationwide study of 23 cities with greater than or equal to 20% of residents living in poverty, education, poverty level, annual household income, employment, and homeless status were all linked to higher HIV prevalence. Several other studies have also linked lower socioeconomic status with disproportionately higher rates of HIV and the development of AIDS.

According to the CDC, although HIV itself is an STD, Blacks experience a high rate of exposure and transmission of other sexually transmitted infections, the presence of which increases the likelihood of transmitting or contracting HIV if exposed. This is particularly relevant when we consider the effects of incarceration, as prisons represent high volumes of sexually transmitted diseases. The most common STDs include Chlamydia, Gonorrhea, Hepatitis, Human HIV/AIDS, and Syphilis (Centers for Disease Control). When it comes to STDs and STIs, Blacks report higher rates of infection, as well as worse economic and social conditions, which leads to a reduced ability to protect against sexual risk. In 2012, Black women

were found to have Chlamydia at a rate of over six times that of White women, while Black men had a rate over eight times that of White men. With regards to Gonorrhea, rates for Blacks were 14.9 times that of Whites, and Syphilis rates were 6.1 times that of Whites (CDC, 2014). While many consider the US context for HIV to be an epidemic among men who have sex with men (MSM) and injection drug users, as opposed to a general population epidemic, data shows that it is actually concentrated in populations beyond these two groups. This disease has a disproportionate impact on the economically disadvantaged in urban areas.

Disparate Impact of HIV on African American Women

African American women hold a unique place within American society, comprised of intersecting identities that often put them at the nexus of racism, sexism, and classism, rendering them little interpersonal power. This lack of power translates into their risk of contracting STIs being more defined by their partner(s)' risk than their by their own. Some of the most salient factors defining HIV risk for Black women are overestimation of monogamy in their relationships, low levels of condom use, sex-ratio imbalance and disrupted marriage networks, and the risk associated with Black men. Reduced interpersonal power in intimate relationships leads to a lowered ability to refuse illicit drug use or to negotiate safe practices such as condom use. Black women are more likely to be introduced to illicit drugs by their partner over any other method of introduction, which is significant since IV drug use is a risk factor for HIV. Such diminished abilities in the context of relationships may also increase the pressure for needle sharing and other unsafe practices. Comparatively, in the American climate, the reality of life for Black males is often plagued with incarceration, which, in turn, means that incarceration—and what happens behind bars—enhance the risk profile of Black women.

One important factor defining the STI risk profile of Black women is their overestimation of monogamy in relationships. This overestimation is particularly troubling when men and women appear to be incongruent in their beliefs surrounding monogamy. Women tend to overestimate the monogamy of their male partners, while men underestimate their partner's monogamy. Women are found to build "monogamy narratives" to self-justify behaviors such as unprotected sex with partners. On the other hand, men tend to underestimate their partner's monogamy, possibly as a means to self-justify their own concurrent relationships. False beliefs with regard to monogamy increase the risk of STD transmission, since a misperception of monogamy reduces the inclination to use preventative measures. In addition, the misperception of safety provided by monogamy is matched with the misperception that Black women themselves do not carry a significant risk of contracting HIV. This latter belief is driven by the belief that HIV is a disease that predominates within the White homosexual male population, or at least within homosexual male populations. Thus, Black women feel isolated from HIV, believing that if their partners are with them, they cannot also be homosexual.

These views, however, are contrary to what statistics suggest and may actually increase chances of contraction. The CDC and other health assessments show that African American women aged 14 to 44 is the fastest growing population with new HIV diagnoses. Black men who have sex with men (MSM), on the other hand, are more likely to self-identify as heterosexual or bisexual for a host of reasons, including cultural and social stigma (McNair and Prather, 2004). This premise increases the HIV risk for Black women, as it results in Black women being unaware or incorrectly informed of their partner's sexual history, preferences, and behavior. Together with the overestimation of partner monogamy places, Black women are in a precarious position with regard to HIV risk.

Further enhancing the chance of HIV transmission among heterosexuals are the rates of condom use acceptance. Black women often face the stressor that in order to have companionship, they reduce the importance of protection. Several studies found that women refrain from negotiating condom use for fear of reprisals or inconvenience or because of their own negative attitudes towards condom use (Bedimo et. al. 1998; Hobfall et. al., 1993; Kalichman, Hunter, and Kelly, 1992; Wingood and DiClemente, 1998). The reluctance to use protection is additionally driven by major contextual factors that Black women face, namely their relationship history, victimization experiences, and environmental stress. Past victimization often makes women fearful of reprisal of abuse in future relationships, rendering them less likely to stand up for safe practices in their intimate relationships. Another important aspect of such deep cross marginalization is the need to address competing issues. Black women often have other daily life concerns—such as poverty, relationship violence, stress, income, poor access to health and social services, and child care—that take precedence over giving attention to preventative measures against HIV (McNair and Prather, 2004). All of the above concerns contribute to the complex set of social and contextual factors that place Black women at risk for poor health outcomes, including the contraction of HIV.

The sex imbalance between men and women presents a double concern, as it increases the level of partner concurrency and reduces the ability of women to take preventative measures. The growing numbers of young Black males being incarcerated reduces the number of possible mates for Black females in their communities (Blankenship et. al, 2006). As nearly one fifth of all Black adult men serve time in a correctional facility at least once, Black women are almost twice as likely to report having concurrent partners and a larger number of lifetime partners as compared to White women (Focus, 2006). These circumstances are considered disruptive to a

community's marriage market. A marriage market is defined as the interaction of race, age, and location, as those are the attributes that typically constrain marriage prospects (Charles and Luoch, 2010). Higher rates of incarceration reduce the number of "eligible" marriage partners and thus contribute to lowering marriages rates (Charles and Luoch, 2010). Since the late 1980s, scholars have posited that the low marriage rates among Blacks might be due to a reduced supply of "marriageable men," which is defined as young men with stable to high earnings (Wilson, 1987). As a result, many women are more likely to settle or tolerate certain behaviors they might not otherwise tolerate, circumstances that decrease women's interpersonal power to negotiate the use of protection.

The functioning of intimate relationships is not only disrupted by removing individuals and thus leaving fewer possible mates, but also by severing relationships that currently exist. The institution of prison itself sets parameters around the intimate relationships between those incarcerated and their partners left outside. A large number of prisoners report that they are in or were in a committed relationship prior to their incarceration. Comfort et al. (2005) conducted interviews regarding the maintenance of sexual intimacy with their incarcerated partners with twenty women whose partners were in San Quentin prison. These scholars found that given the strict nature of prison rules regulating visitors—such as dress, lack of privacy, and prohibitions on physical contact—women build "monogamy narratives" to remain close to their incarcerated partner. It is important to note that in this study, 50 percent of inmates said they considered themselves in monogamous heterosexual relationships, so there are men as well as women at least claiming monogamy. Such narratives built on both contextual factors and false premises lead to increased risky behavior and thus facilitate the transmission of HIV and other STDs upon the release of the incarcerated partner. Many of the women described their desire to engage in

sex with their newly released partner as fueled by the need to rekindle the relationship, desire for physical closeness, and a need for sexual relief. These circumstances decrease the use of protection, which women feel counteracts the abovementioned desires. This decreased use of protection is further advanced by some women's desire to have children with a newly released partner in order to draw closer to him, as well as by a belief that sex will counteract any jealousy-induced domestic violence. Additionally, strict policies with regard to technical parole violations cycle many offenders in and out; such a situation can engender a sense of empathy and foster a desire to right the wrong their partners have been done by a discriminatory criminal justice system (Comfort et al., 2005). This situation further limits the ability of women to set limits or enforce safe behaviors in their intimate relationships.

The general assumption is that incarceration would increase an individual's desire to have sex upon release. A study in North Carolina found that after release, the average time until inmates engaged in sexual behavior was six days (Thomas and Sampson, 2005). Similarly, partners of inmates have pledged their devotion and loyalty to their partner while incarcerated and thus engage in sex upon release as a physical display of such devotion.

As with misperceptions of monogamy, women often have misperceptions about prison practices and behaviors. Many women believe their partners are tested for HIV in prison as a matter of protocol, which is not necessarily the case and varies by state. Even if a partner in prison was tested, HIV positive Black men exhibit a reluctance to disclose their status to their partners (Lichtenstein, 2005; Adimora et al., 2000; Lichtenstein, 2009). While this set of circumstances lays the foundation for women to believe that their partners have to be HIV negative, this mindset is further expanded by the belief that since there are no women in prison, their male partners don't have the opportunity to have sex with anyone else (Comfort et al.,

2005). This belief is combined with the perception that prison is a strictly regulated environment that prohibits illicit drug use or other behaviors that can transmit disease. This perception is inaccurate, as sexual activities and other risky behaviors, such as needle sharing and tattooing, take place concurrently in prison settings (Kim et al., 2002). If inmates did not participate in these activities before entering, they can pick up risky behaviors in prison that they may carry with them back into the community. These newly adopted sexual or drug behaviors leftover from time in prison may lead to higher transmission of disease. Whether these beliefs are due to a lack of knowledge or to self-protective thinking, they lead to behaviors that more easily facilitate the spread of disease.

HIV within Corrections Systems

As noted in the Introduction, HIV is a communicable disease that is mainly transmitted through intravenous drug use (specifically sharing needles) and sexual contact. Those incarcerated often come from impoverished and disadvantaged communities, with limited access to physical and mental healthcare. This limited access to healthcare leads to a concentration of infectious communicable diseases at a much higher rate than in the general population. Studies corroborate the prevalence of active tuberculosis, hepatitis C, various sexually transmitted infections (STIs), and HIV/AIDS within prison environments. The presence of any of the aforementioned concomitant infections increases one's susceptibility to HIV/AIDS and the likelihood of transmitting it to another. The restriction of preventative items such as condoms and the concentration of many people with histories of physical and sexual abuse further threaten the health of those confined. On the other hand, preventative items such as condoms and clean syringes run counter to security measures and spark deep political backlash in a punishment-oriented society.

Many prisons and jails are plagued by the high transmission of communicable diseases due to tight living quarters, pervasiveness of communal areas, and frequent participation in risky behavior. With respect to HIV, infection rates in prison are five to six times higher than in the general population, and it has been estimated that nearly one-fourth of all HIV-positive individuals have passed through a correctional facility at some point (Harman, Smith, and Egan, 2007; Spaulding et al., 2002; Freudenberg, 2001). Methods of HIV transmission in prison include sexual activity, tattooing, and intravenous drug use, among other pathways. Many of these activities begin before entering a correctional facility and continue inside and after exiting the facility. Thus, correctional facilities represent the highest concentration of HIV-positive individuals who are already predisposed toward risky behavior patterns, meaning that correctional facilities house an already vulnerable population and pool together more individuals who are at high risk for disease spread through activities inmates engage in before, during, and after incarceration.

According to the CDC, roughly 1 in 7 people living with HIV will pass through a correctional facility each year. While most inmates acquire HIV before they arrive at a correctional facility, they often do not learn of their HIV status until they are incarcerated. Those incarcerated have an increased risk for acquiring HIV by partaking in risky behavior and are more likely to be involved in commercial sex work, suffer from untreated mental illness, be in lower socioeconomic classes, and be exposed to the growing concern of prison rape (Aguilar, 2012).

Therefore, health concerns within prisons pose potential community health concerns for the areas into which prisoners are released, particularly with regard to intimate relationships that are disrupted as individuals enter prison and are likely to be picked up upon release. It has been

estimated that over half of men that are released from prison have an intimate partner in the community and that the majority of these men have unprotected sex within hours of release (Harman, Smith, and Egan, 2007). These behaviors are particularly troubling if inmates are unaware of their HIV status upon release or if they fail to disclose their status to their partners. Further, a few studies suggest that individuals that seroconvert to HIV positive while in prison are often infected by strains of HIV that are resistant to current antiretroviral medication (Aguilar, 2012). These kinds of infections are an even larger public health concern as resistant strains are more transmittable and dangerous.

This context opens up a myriad of avenues for incarceration to influence the transmission of HIV in communities to which ex-prisoners return. Prisons can increase both exposure and risk. Prisons foster direct transmission by placing already vulnerable individuals in an environment with elevated HIV levels, thereby increasing exposure to the disease and thus the likelihood of contracting it. The disparities with regard to exposure and risk are compounded by the cycle that incarceration can begin. It is already well documented that ex-prisoners have a decreased ability to find employment, limited access—and in some cases no access at all—to government programs, and long delays in receiving coverage from the programs for which they are eligible. Many are released into poverty, remain jobless over a year after release, and have no connection to whatever community resources may exist. All of these factors limit the ability of ex-inmates to gain medical coverage or other necessary life-sustaining resources, increase recidivism, and place the communities in which they return at higher risk.

A growing portion of the existing literature on HIV transmission and incarceration focuses on disease prevalence and spread within correctional facilities. As mentioned before, rates of HIV among the custodial population are much higher than in the general population, and

many HIV positive individuals serve time at some point. Vlahov and Putnam (2006) reviewed four main US studies that show that the transmission of HIV in prison occurs frequently in the United States, but is much less frequent in an international context. However, these scholars question these results as being relatively outdated and cite an increased need for more current studies. Spaulding et. al. (2009) found that although the volume of inmates entering and exiting correctional facilities has increased, the number testing positive for HIV actually declined from 1997 to 2006. Surprisingly, however, they found that the number of people leaving facilities who were HIV positive remains nearly the same across that time period. While HIV prevalence and intra-prison transmission appears to be declining, it remains a concern for the community at large, as prisoners who are HIV positive continue to cycle through the community and correctional facilities at the same rates. Most other literature on transmission focuses on risk behaviors and theoretical notions of disease spread, which means there is ample opportunity and need for further investigation.

Other research focuses on the healthcare actually provided to inmates in custody. For many, their first contact with effective health services occurs while being held in custody, due to legal mandates that require prisons to provide the same quality of care offered outside correctional facilities (Braithwaite and Arriola, 2003). Those entering custody usually have the demographic profile of being less educated, poorer, and legitimately unemployed than average, which decreases their likelihood of having accessed health services before being arrested. Several states require HIV testing upon entry or exit from a facility, while some inmates receive court-ordered testing. Prison represents a place where individuals can learn their HIV status for the first time, which is beneficial, since many inmates partake in risky behaviors, such as drug use, before incarceration and often continue while in custody (Braithwaite and Arriola, 2003).

While correctional facilities are legally required to provide care, there are often many holes within the system that result in prisoners going without care or being unaware of their HIV status. Therefore, it is possible for inmates to be at increased risk for contraction while in custody, but not to learn of their status, even though health services should be provided. Being unaware of one's HIV status poses significant health risks for the offenders and for the community. Only by knowing one's status can an individual make a conscious decision to modify his or her behavior or to become educated about living with the disease. Thus, HIV education for those infected in prison may be another crucial part of an effective public health strategy.

Another growing portion of existing research centers on continuity of care for inmates who are HIV positive. In custody, inmates have a legal right to health care, yet this care is not guaranteed upon release. Since prison often represents a chance to learn one's HIV status, as well as to receive care and treatment for HIV, many prisoners have problems maintaining that care upon release. They face the stigma of having a record and unfavorable economic and employment opportunities that would provide the resources necessary to access care. Several studies have found that after release, HIV positive prisoners have deteriorating health conditions and face barriers to accessing generally needed treatment (Lauer et al., 2002; Stephenson et. al, 2005; Marlow et al., 2010; Strauss, 2006). The federal government has responded to this situation by funding several demonstration projects that involve case management, provision of services, and integration of correctional and community health care for HIV positive ex-offenders (Zellers et al., 2008). However, the continuity of care studies, within prison transmission studies, and health care services studies have focused mainly on the health of prisoners themselves and largely do not investigate the community effects of prisoner health.

Precursory Insight into Incarceration and HIV Link

As pointed out above, racial disparities exist for both incarceration rates and the prevalence of HIV, but literature that goes beyond assumption-based connections between the two is limited. Of the few studies that seek to bridge the gap between conventional assumption and analytical evidence, Blankenship et. al. (2005) attributes much of the Black-White disparity in HIV rates to exposure to the correctional system through the use of drug policy. They argue that changes to drug policy, primarily in the 1980s and 1990s, such as the aforementioned War on Drugs, have had a larger impact on African Americans than on their White counterparts. These scholars attribute the disparities in incarceration, and the resulting disparities in HIV rates, to the introduction of mandatory minimum sentences, differential treatment for possession of powder versus crack cocaine, and restrictions on clean syringe availability. Such policies have tripled female incarceration rates and amplified the Black male incarceration rate from 1 in 30 in 1984 to 1 in 15 in 1997.

Furthering the work of Blankenship et. al (2005), Johnson and Raphael (2006) attribute the majority of the disparity in HIV/AIDS infection rates between Blacks and Whites to incarceration and the correctional system. Through their investigation of incarceration rates and AIDS incidences from 1980 to 1996, they find that infection rates increased the most among demographics that had the largest increases in male incarceration—an increase in incarcerations at one point in time led to more new AIDS cases over the subsequent ten years—and that high incarceration rates among African American males explained the vast majority of the disparity of AIDS cases between African American women and other women. Importantly, these scholars used a design that shows that a lag exists between increased incarceration rates and the prevalence of new AIDS cases, given that there is HIV requires an incubation time to develop or

seroconvert into full blown AIDS. Additionally, these scholars investigated the effects of litigation with regard to overcrowding in state prisons, which subsequently increased the number of releases from prison. Again, they found that an increase in the number of releases at one point in time led to an increase in the AIDS prevalence rate 5 to 10 years later. This research further sheds light on the connection between incarceration and HIV/AIDS, but is one of the only comprehensive examinations of incarceration as the primary determinant of the racial HIV/AIDS disparity. Thus, there is a significant need for future research to try to confirm and build on their results.

Schnittker and John (2007) draw conclusions that are somewhat contrary to those of Johnson and Raphael (2006). These scholars find that incarceration only moderately contributes to racial health disparities. In their study, a history of incarceration similarly resulted in worse health outcomes post release. However, this study draws conclusions about the inmates themselves and cannot be used to extrapolate effects on larger communities. A similar study found conditional effects of incarceration on state health incomes (Uggen et al, 2015 working paper). States with high numbers of ex-prisoners saw a reduction in tuberculosis and syphilis cases. Conversely, states with high numbers of ex-prisoners also saw an increase in chlamydia cases and HIV/AIDS deaths. These scholars' conclusion was that incarceration may have a protective effect resulting in the reduction of diseases that are routinely tested in prison, as high numbers of prisoners means increased testing. In this manner, prisons can act as an important public health ally or intervention. While this study introduces a five year lag for the HIV/AIDS model, it is possible that this lag is not enough when using a measure such as deaths. Due to the introduction of antiretroviral drugs and other advancements, people are living longer with HIV, and death rates may result from differential access to treatment, rather than from incarceration.

However, as the few studies that exist appear to have some discrepancies, further studies such as this one are needed to add more insight into the possible impact of incarceration on individual and communal health.

Beyond these four informative pieces of scholarship, it appears there exists only limited comprehensive empirical nationwide study of the influence of incarceration on health outcomes. Wilderman (2012) investigates incarceration's impact on various measures of population health. He finds that incarceration is negatively associated with things such as infant mortality and, similar to Johnson and Raphael (2006), Wilderman finds that incarceration not only affects Blacks and Whites differently, but accounts for a portion of the health disparities between them. Both of these studies lay a foundation for investigating incarceration and its effects on health, but they are only the beginning and future research is necessary to validate or challenge their findings.

A few more recent studies try to assess the neighborhood and community effects of prisoner health and disease. Many studies have offered theoretical analysis and suggestions for how to address potential community effects, but have not directly tested those effects (Leh, 1999; Freudenberg, 2001). In an attempt to investigate the spatial relationships between prison facilities and HIV/AIDS rates, Kutch (2009) performed a geographical/spatial study to see if the location and size of correctional facilities in Texas is related to the spatial distribution of HIV/AIDS within the state. Interestingly, she found that populations living within close proximity to a prison are at higher risk for exposure to HIV/AIDS. This study, however, stopped short of exploring the mechanisms or characteristics of living close to a prison facility that actually influenced the distribution of HIV/AIDS in the larger community.

At the community level, other studies have concluded that in counties with high rates of incarceration, there are also high rates of sexually transmitted infections (STIs) (Thomas and Sampson, 2005; Thomas and Torreon, 2006). Perhaps one of the most direct tests of the community effects of incarceration on the prevalence of STIs was undertaken by Thomas et. al. (2007) in an investigation of the relationship between incarceration and the prevalence of gonorrhea and Chlamydia in Durham, North Carolina. These scholars found strong correlations between the rates of these two STIs in Durham county over two years and three measures of incarceration: time spent in prison for the given census tract, percent of census tract entering prison, and percent of the census tract exiting prison. Unlike previous studies, Thompson et. al (2007) acknowledges the importance of release back into the community as a facilitator of disease spread. Just as incarceration rates vary, so does the number of inmates returning to their communities writ large. Thus, this study will similarly explore varying measures of incarceration, including both admissions and releases.

The proposed study builds on much of the existing literature but diverges in key areas that seek to expand our knowledge of any relationships between incarceration and HIV/AIDS. First, this study will examine the relationship between incarceration and community incidences of HIV, AIDS, and tuberculosis. The tuberculosis analysis was included to see if conditional effects are found similar to those found by Schtikker and John. AIDS will also be used as the main dependent variable to explore if similar results are obtained as those noted in the literature. Many previous studies stray away from the use of HIV, as there is limited comprehensive data available. This study will try to foster conversation on HIV in its early stages, rather than on AIDS, using the limited years' data currently available. Second, direct examination of the effects of incarceration and HIV within the Black community, as well as in the general population, will

be conducted to allow for the comparison and identification of any divergent trends more similar to those found by Johnson and Raphael (2006) and Wilderman (2012). Lastly, a few methodological differences, such as the construction of variables and the use of incarceration rates as well as HIV rates among the incarcerated population, will be tested. Given the vast gaps in existing knowledge on both current and future issues in this vein, studies like the one that follows are necessary for redirecting political and social attention and fostering a sense of urgency in dealing with vulnerable populations.

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Chapter 3: Data and Methods

This chapter is dedicated to describing the data and methods used in undertaking this investigation. It begins by laying out the relevant hypotheses and assumptions, followed by a discussion of data and methods. As there is no existing comprehensive database that includes the data of interest for this study, data was collected from a variety of government agencies, surveys, and organization websites. The specific data sources and variables used are noted below, followed by the chosen statistical methods. The timeframe for this study spans from 2000 to 2013. Given the data limitations, different sections will use different periods of time within this range; however, the largest timeframe for which data is available is used for each respective empirical section and model. The specific time period for each model will be explained below in its respective section, as well as specific nuances pertaining to limited sections.

Hypotheses

The main hypothesis of this study is that higher levels of incarceration will increase the presence of infectious diseases. Model specific hypotheses are listed below:

AIDS:

- Higher levels of incarceration will increase the presence of AIDS in the state population.
- Higher levels of Black incarceration will increase the presence of Black AIDS cases more than higher levels of White incarceration will increase the presence of White AIDS cases.
- Higher levels of Black incarceration will increase the presence of Black AIDS cases.
- Higher levels of White incarceration will increase the presence of White AIDS cases.
- Higher levels of Black male incarceration will increase the presence of Black female AIDS incidence.
- Higher levels of White female and male specific incarceration will not differ from combined incarceration in increasing the presence of White AIDS cases.

HIV:

- Higher levels of incarceration will increase the presence of HIV in a state population.
- Higher levels of Black incarceration will increase the presence of Black HIV cases more than higher levels of white incarceration will increase the presence of White HIV cases.
- Higher levels of Black male incarceration will increase the presence of Black female HIV incidence.
- Higher levels of Black male incarceration will increase the presence of Black female HIV incidence through heterosexual transmission.
- Higher levels of Black male incarceration will increase the presence of Black female HIV incidence through intravenous drug transmission.

TB:

- Higher levels of incarceration will increase the presence of TB.
- Higher levels of Black incarceration will increase the presence of Black TB cases.
- Higher levels of White incarceration will increase the presence of White TB cases.

HIV Testing:

- States that have more circumstances under which they test for HIV in state prisons will have lower state HIV prevalence.

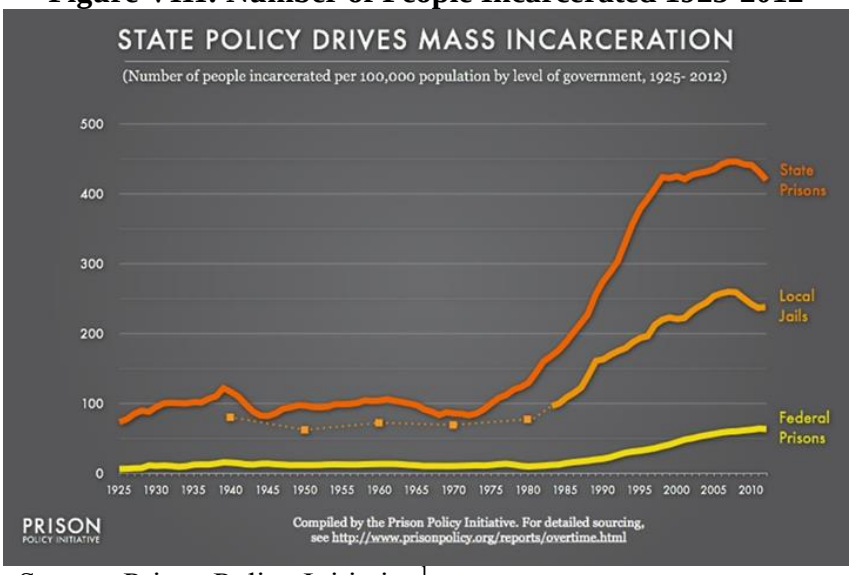
Assumptions

The main assumption is that state policies have created divergent trends in the expansion of incarceration and that these trends can be exploited to see if they impact incidences of HIV/AIDS and TB. Similarly, due to a myriad of factors such as economic prosperity, racial composition, and public health resources, among others, rates of infectious disease also represent divergent trends at the state level. Given that incarceration facilities hold (or at one point held) large segments of populations inflicted with such diseases, it is possible for incarceration itself to serve as a factor in the spread of disease.

The next assumption calls for excluding federal prisons and focusing the analysis at the state prison level. Unlike the federal system, which operates as one centrally controlled system, state prison systems are controlled by state-level politics and policies. This structure at the state level provides an opportunity to understand whether or not policy variation results in varying levels of disease incidence. Such variation is not testable at the federal level. Second, the vast

majority of state prisoners originate from the states in which they are incarcerated, making it easier to hypothesize about communal linkages and effects. While some states have adopted policy solutions to prison overcrowding that involve contracting prisons, both public and private, in other states to house their prisoners, this practice currently affects only a small percentage of population. Third, in the federal system prisoners can be sent to various places across the country, resulting in their geographic location not being as constrained as in the state system. This difference potentially opens the opportunity for ex-inmates to return either to their original home community or to a new community surrounding the place of incarceration. Given the possibility of greater geographic dispersion, it is likely more difficult to track these individuals in the federal system. In order to speculate about a relationship of the kind at the center of this study, geography matters, since it constrains the population which is at greatest risk of contracting communicable diseases. Lastly, federal prison admissions represent only around one tenth of the number of state prison admissions. State prisons account for nearly 87% of all prisoners in the United States, which provides a fairly comprehensive population to study. Given the small volume in federal prisons compared to state prisons, it is believed any relationship between incarceration and HIV is more likely to be uncovered at the state level due to sheer volume. This volume discrepancy is displayed in Figure VIII below.

Figure VIII: Number of People Incarcerated 1925-2012



Source: Prison Policy Initiative[1]

The third assumption excludes jails from the analysis. Jails are usually temporary homes for the incarcerated. In 2000, the average sentence to a local jail was around six months, while the average sentence to a state prison was nearly four and a half years.[2] There is a suspected time element to the relationship between disease and incarceration, with the assumption being that the longer the exposure (time incarcerated), the higher the probability of being infected by infectious disease. The relatively short duration of jail sentences may not meet a threshold for length of exposure to the risk. Similarly, the effect may be watered down as the sentence length can vary from days to years. To be clear, this study does not make any specific inference about the length of exposure needed to contract a disease. Rather it is speculated that increased exposure through longer sentences increases the likelihood of contracting an infectious disease. The issue of duration of exposure is something that would be beneficial for consideration in future studies dependent on the results of the current study. Lastly, counting the state jail population may lead to some prisoners being double counted, as many serve time in jail awaiting trial or sentencing. If convicted, these individuals are later sent to a prison facility. As this study uses an annual year-

end count of prisoners, individuals could potentially be counted in the jail and prison population in the same year.

The last critical assumption is that sexually transmitted diseases tend to show a lagged effect on spread in the larger community. This means that incarceration in a given year may not exhibit an influence on infectious disease rates until a year or more after incarceration. Prior studies show that the strongest county-level effects of associations between incarceration and STDs occur with a one year lag for the STDs.[3] Since this study utilizes the state as the unit of analysis, county conditions may not apply. However, it is still believed that a lagged structure of the dependent variable is needed, to some degree. This lag may be particularly important in regard to AIDS, as AIDS is stage 3, or advanced stage, HIV. Individuals first contract HIV, and over time, the disease progresses to AIDS. Thus the effects of incarceration are not likely to immediately impact AIDS cases. Currently there is no consensus on just how long of a lag pertains to any or specific diseases, just evidence that a lag structure may exist.

Analyses

This study is comprised of three major empirical sections. The first section probes a national model testing the relationship between incarceration and AIDS. This model is explained in more detail in its respective chapter and takes several cuts at the relationship. The first model in this section includes the entire population, inclusive of all races and ethnicities, as well as transmission mechanisms. This first model is enhanced by subsequent models that test all AIDS cases obtained through intravenous (IV) drug use and cases contracted through heterosexual contact. This second set of models followed a set of gendered models considering total incarceration on both male and female AIDS cases, as well as male and female incarceration on total, same sex, and intersex AIDS cases. A third set of models more directly seeks to explore

racial differences in the incarceration-HIV/AIDS relationship by separating the population into racial subgroups. Models for Blacks as well as Whites were run separately, followed by models specific to racial and gendered combined subgroups. These models explore how incarceration influences Black and White Female AIDS cases. Where applicable, these models also included transmission mechanisms, IV drug use, and heterosexual contact run on these racial and gendered subgroups. The final component of the first empirical section seeks to explore some of the contradictory findings in previous literature regarding the conditional impact of incarceration and disease testing. This investigation is done by exploring models focusing on the influence of incarceration on TB in the entire state population, as well as in Black and White racial subgroups. The TB models are similar to those for HIV, with the exception that the TB models exclude the IV drug and heterosexual contact mechanisms, as well as the gendered models.

Where applicable, this section considers two measures of incarceration. The first incarceration variable measured is the rate of incarceration. This first variable serves as a general measure of incarceration that is standardized (rate) across the different state populations. The second incarceration variable measured is releases from state prisons. With an estimated 7.5 million people returning to their home communities from prisons and jails each year, there is an enhanced possibility that the ailments plaguing those incarcerated will travel with them back to their local communities. The mechanism necessary for ailments within prison to enter the larger society is through release and return back to communities. Therefore, releases are a critical factor in the study. Due to data limitations, the number of releases by racial subgroup is not available and is excluded. The racial models only use a single measure for incarceration: incarceration rate. This data is available by gender, so the gendered models include both measures of incarceration.

The second empirical chapter (Chapter 5) explores the relationship between HIV and incarceration. As mentioned before, most previous analyses use AIDS, cases or deaths, as the dependent variable, due to a lack of comprehensive and consistent HIV data. These studies focus mainly on time periods through the 1980s and 1990s. To try to take advantage of more recent efforts to collect reliable HIV data, this study runs the same models as in Chapter 4, but with HIV data from 2008 to 2013. This study marks one of the first attempts to use HIV as a dependent variable. In the long run, HIV is the more desired variable, as advancements in antiretroviral drugs are allowing individuals to live longer with HIV before seroconverting to AIDS. Similarly, the distribution of such medications is uneven among regions and subgroups, resulting in differentials in time to AIDS, which may prove important for such inquiries. This section repeats the methodical steps outlined in the prior AIDS chapter and simply switches the dependent variable to HIV. While there may not be enough data available yet to fully explore the relationship between incarceration and HIV, this inquiry serves as a conversation starter for how and when HIV data can be used for similar tasks.

The last empirical section focuses on state differences in the implementation of HIV testing strategies. As high numbers of HIV positive inmates enter prisons, where conditions are ripe for disease spread, testing has been suggested as a possible public health intervention to address this issue. It is possible for such testing to have an interventionist effect by lowering HIV community rates, since prisons serve as a place for finding out one's status and receiving medical and educational assistance. Knowing one's status may entice individuals to use safer sex practices or communicate with partners post release. The fact that states are not uniform in their implementation of HIV testing presents an opportunity for exploring differences between states with varying levels of strictness in their testing policies. Accordingly, states are divided in two

groups based on strictness of HIV testing circumstances, and models are run separately on each group before being compared. Testing strategies range from mandatory to voluntary and fall under nearly ten different circumstances. A more in-depth discussion of these testing circumstances and data division is found the methods section.

Data and Description of Variables

Dependent Variables

This investigation includes three main dependent variables, HIV, AIDS, and TB. AIDS and TB data are available spanning the entire expanded time frame of this study, 2000 to 2013, but HIV data are only available for part of the time frame of interest, 2008 to 2013. All three of these variables are measured similarly. AIDS is measured as the number of AIDS cases in a state in a given year. HIV is measured as the number of HIV diagnoses in a state in a given year. The HIV variable is measured the same way with regard to the gender and race specific models. For example, Black HIV cases are measured in the same way as the number of HIV cases among Blacks in a state in a given year. TB is similarly measured as the number of TB cases in a state in a given year. The TB racial and gendered models are measured in the same manner as the AIDS and HIV racial and gendered models. AIDS, TB, and HIV data were collected through CDC Wonder, an online data collection for epidemiological research, and through the National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention (NCHHSTP) Atlas. Data in both sources are reported annually by state and local health departments.

Independent Variables

The main independent variable, incarceration, is measured using populations in state prisons and annual releases from state prisons. Thus, there are two different measures of incarceration, rates and releases. State level incarceration data was obtained from the Bureau of

Justice Statistics (BJS) Corrections Statistical Analysis Tool, which provides annual counts by state beginning in 1978. Data in this tool is collected through the National Prisoners Statistics Program (NPS). In this preliminary investigation, number of total releases was used, since this study does not attempt to differentiate by types of sentence, type of release, or specific time served. If this investigation results in significant findings, those factors would be of value in future studies in order to tease apart more specifics of those relationships. Similarly, any type of prison admission is included in the incarceration rate, as there is no differentiation based on type of offense or length of sentence. Those differences may also be a question for investigation by future studies.

Another key aspect of the incarceration variable is that it includes measures of total, male, and female incarceration. Female incarceration is on the rise, although male inmates occupy the lion's share of the state corrections systems. Models with each specific subtype in the incarcerated category follow; in addition, incarceration by race is also be used as an independent variable. Race and gender specific incarceration data was collected from the NPS. Total and gendered incarceration data was available in the form of incarceration rate, as well as total releases. Racial and race and gender combined incarceration data is only available by rate. Number of releases is not available for these groups and has been excluded from the analysis. These models only include the singular measure of incarceration rate.

Control Variables

The first set of control variables focus on the demographics of state populations that could potentially impact disease prevalence and levels of incarceration. As incarceration and HIV/AIDS have disproportionate burdens on minority communities, the percents of the state population that is Black and Hispanic are included. This data was gathered from Census

population estimates. Similarly, as individuals 18 to 34 are most likely to be diagnosed with HIV, age cohorts and breakdowns are included, as well. Borrowing from other studies in this area, the following three age ranges are analyzed: 24 and under, 24 to 44, and 45 and older. The age structure of the population is also likely correlated to the marriage rate, given that people are more likely to marry others of the same age range in similar geographic locations. Accordingly, marriage rate is the next independent variable. Marriage rate is measured as the number of married residents per 100,000 residents. Marriage is suspected to increase chances of monogamy, which reduces the occurrence of concurrent partners. As described previously, heterosexual transmission is an increasingly frequent mode of transmission for HIV, particularly for African American women. The removal of large quantities of eligible men from communities reduces the number of available men with whom women might settle down. As previous studies have shown, incarceration deprives geographical areas of eligible marrying mates, specifically men; the decrease in eligible mates reduces women's ability to marry or to command interpersonal power in relationships. Thus, it is believed that the lower the marriage rate, the more likely concurrent relationships are, leading to an increased ease for transmitting sexually transmitted diseases such as HIV. Marriage rate data was collected from the National Vital Statistics Program of the CDC.

The next applicable demographic variable is educational attainment. Higher educational attainment is associated with improved health outcomes through access to better economic and work opportunities, as well as through an increased likelihood of partaking in healthy lifestyles and behaviors.[4] Higher levels of education are subsequently believed to decrease the likelihood of contracting an infectious disease and of being incarcerated. To account for the influence of

educational attainment on health outcomes, the percentage of the state population that has a bachelor's degree or higher is included as a measure of education.

Outside of personal demographic factors, communities can be defined by their social fabric and interactions. Diseases such as HIV, AIDS, and TB are considered communicable diseases spread from one person to another. Factors such as close proximity, hygiene, behaviors, and living environment can all contribute to the spread of such diseases. With regards to HIV/AIDS, an often sexually transmitted disease, its transmission can be dependent upon social control and norms of personal and sexual behavior. Social capital is often considered to invoke trust, reciprocity, and cooperation within a community. Those communities with high levels of social capital and participation are able to enforce communal norms, values, and behaviors, including sexual norms and behaviors, which may reduce the transmission of HIV.[5,6] Consequently, one measure of social capital, the number of social organizations in a given community, has been included to gauge the level of social capital. In turn, the level of social capital has been hypothesized to reduce HIV transmission. Using a measure similar to the Robert Wood Johnson County Health Rankings, social capital is measured as the number of social organizations per 100,000 residents. Data was collected from the Census County Business Patterns under the North American Industry Classification System (NAICS) NAICS Code 813410. This code is a count of all social organizations in a state in a year. Unlike the County Health Rankings, this study only uses the single code for social organizations, while the County Health Rankings include a composite measure comprised of additional codes for other organizations, such as bowling centers, golf clubs, and religious organizations. It is believed that using this initial count of social organizations is strong enough for this study, since it is among the first of its kind to include a direct measure of social capital. Some of the possible variance in

types, nature, and breadth of social organizations can be accounted for with the use of state fixed effects, described later.

The second social variable of interest is the communal rate of other STDs. The CDC suggests that having another STD, such as syphilis, gonorrhea, herpes, or chlamydia, increases the likelihood of contracting or transmitting HIV. This increased likelihood is largely due to the fact that the same behaviors and circumstances that lead to contracting the initial STD are similar to the behaviors and circumstances that lead to contracting or transmitting HIV. These circumstances include increased unsafe sexual practices or symptoms of STDs, such as sores on the body that provide additional pathways for HIV to enter the body. To control for the influence of other STDs, the state levels of gonorrhea and chlamydia rates per 100,000 citizens are included in the regression equations.[7]

The last social variable included is the percentage of the state population using illicit drugs, other than marijuana, in the past year. A measure for drug use is often excluded from studies of this nature, as it is hard to measure drug use accurately and consistently. Most data is based on admissions to drug treatment facilities, hospitals, or self-report. Given the uneven access to treatment facilities and the possible stigma attached to self-report, this type of data is not ideal. However, since this study focuses on HIV, and a major mechanism for transmission of HIV is IV drug use and needle sharing, it is important at least to begin to consider exploring data on drug use. A measure that excludes marijuana was chosen because marijuana often consumes a large portion of drug use and is not a direct risk factor for HIV, unlike drugs that require injection. Including marijuana is likely to bias the data by overstating drug use. Along the same lines, this measure used here is likely to include other drugs that are not administered through a needle, which has the potential to inflate the results; however, given the existing available data,

the measure used here represents the closest proxy to IV drug use. In understanding relationships such as those between HIV, drug use, and incarceration, better data on specific drugs and their administration methods is needed in order to provide a clearer picture of any effects and to enhance study efforts.

In addition to sexual behaviors and drug use, social environment and economic disadvantage can also be risk factors for HIV. In a CDC study of 23 cities with census tracts with at least 20% of their residents living below the federal poverty line, the authors concluded that, for urban impoverished areas, the increased prevalence of HIV was extremely high, surpassing the CDC's threshold for a generalized epidemic of 1%. Importantly, the lower the collective socioeconomic status of a given area, the higher the prevalence of HIV.[8] In order to control for this correlation, two variables were deemed necessary for inclusion: the level of unemployment and the percentage of residents living below the poverty level. Unemployment data, namely the state rate of unemployment, was collected from the Bureau of Labor Statistics Current Population Survey, which provides estimates for the civilian non-institutionalized workforce. This survey provides unemployment rates in total, as well as by race. The race specific models will include the race specific unemployment data. For example, Black and Black female models will include the state Black unemployment rate as a control. Poverty data was gathered from the Census Bureau Current Population Survey Annual Social and Economic Supplement and is measured as the percent of the state population living in poverty.

Moving beyond individual and communal factors, state infrastructure is also likely to influence both incarceration rates and incidence of these three diseases. The first of these measures is state gross domestic product (GDP). This data was collected from Department of Commerce Bureau of Economic Analysis Regional Project Division. Given state autonomy and

control over many aspects of policy and infrastructure, together with varying state-level demographics, states are likely to differ in the resources available for public health. The second state-level variable is a measure of public health infrastructure. Currently there is no single measure that is agreed upon in the literature to account for public health infrastructure. Studies use a variety of measures such as workforce enumerations, expenditures, and number of facilities. Each of these has their shortcomings and is available in limited comprehensive datasets. For this analysis, the best proxy to measure public health infrastructure is the percent of state and local expenditures spent on health programs per capita. This data was obtained from Sage Stats, an online database compiling annual data from more than 200,000 government and nongovernmental sources; Sage Stats extracted the varying years' data in this category from several sources, including the Census Bureau Government Division yearly report on State and Local Government Finances, Census of Governments, and the American Hospital Association. There are several caveats to this measure; for example, states with sicker populations will most likely have to spend more on health. In addition, state resources vary greatly in the importance, urgency, and ability to push funding towards public health endeavors. However, the measure used in this study is believed to be better than a measure of blanket state health expenditures or of employment in both public and private health facilities, since states are generally believed to have decision-making power in choosing the amount of money they wish to devote to health programs.

Lastly, since crime rates do not map onto incarceration trends over the last few decades, alternative explanations for increases in incarceration have been explored. One of the more common explanations is partisanship and party control of the state government. Previous studies have found that the larger the percentage of seats in the state legislature held by democrats, the

lower the state's incarceration rate. As for governor party affiliation, the result was in the same direction: democratic governors have lower crime rates, but governor party affiliation did not achieve statistical significance.[9] Additionally pronouncements from prominent figures such as governors or candidates can lead to increases in public concern over crime and punishment.[10] Republicans often tap into anti-minority sentiment among southern voters by depicting democrats as "soft on crime."[11] Consequently, it is believed that partisanship at the state level will factor into incarceration rates. To control for this possibility, the party of the state governor in each respective year is included as a measure of state partisanship.

Methods

As this analysis focuses on the national level, all 50 states and the District of Columbia were considered for inclusion, before reducing the population based on incomplete data or anomalous state corrections structures. The United States territories were excluded. Alaska, Connecticut, Delaware, Hawaii, Rhode Island, and Vermont were excluded due to the fact that their prison and jail systems form a single integrated corrections system. Thus, their annual data include both prison and jail populations, whereas the rest of the states only have data included for prisons. Given the combined nature of the data, there is no way to separate jail from prison data in these six states. As mentioned before, jails are excluded from this study, and including the handful of states that include jail populations has the potential to skew results, as jail populations are not included for the majority of the other states. Similarly, the District of Columbia is excluded due to data limitations in the incarceration variable, as well as other variables such as the political variable and the party of governor. Similarly, New Hampshire was excluded due to incomplete data in several of the race specific models. This leaves 43 states in the analysis.

The data in this investigation is panel or longitudinal cross-sectional data. While panel data can be analyzed in a number of ways, the selection for this study will be state fixed effects in a negative binomial regression model. Fixed effects are used for variables assumed to take on fixed values and to control for time variant differences between individuals, so coefficients should not be biased by omitted characteristics. With regard to this study, those omitted characteristics could be, for example, culture, religion, environment, policy changes, etc.--characteristics that are difficult or impossible to measure. An additional reason for using the negative binomial model is for the sake of comparison. As the negative binomial model is the most consistent analytical method used in previous studies, it is used here to see if similar results are obtained. The specifics of each of the individual models will be explained further in each of their respective chapters.

When using count data, the differences in small states and larger states must be accounted for, as larger populations may have larger raw numbers but lower rates when compared to the total population. To address this issue, an exposure variable is added to each model. In general, the exposure variable is the state's total population in a given year. For the gendered models, the exposure variable is changed to the respective gender population, male or female, in a state in a given year. Similarly, for the racial subgroup models, the exposure variable is the total population of that subgroup in a state in a given year. The same concept is continued in the racial and gender subgroup combined models. For example, the exposure variable in the Black female models will be a state's Black female population in a given year.

The final empirical chapter (Chapter 6) breaks the states into two groups based on the number and type of conditions under which they test for HIV in state prisons as of 2008. Since the data for HIV begins in 2008, this year was chosen to serve as the snapshot for examining the

testing landscape. The analysis will consider both AIDS data beginning in 2000 and HIV data beginning in 2008. While it is possible for testing policies to change over time, most changes were not introduced until later in the 2000s decade. Since the most desired data is HIV data, and since tests are aimed at intercepting HIV testing as of 2008, beginning the HIV data in this study in 2008 made sense as the cut point.

The states are spilt into two groups, less strict testing and stricter testing, based on a numerical assignment, designated by the researcher and dependent upon type and number of testing circumstances. HIV testing in states ranges from voluntary to mandatory and from all inmates to certain groups. Tables 5 and 6 below display the conditions under which each state tests inmates for HIV, as well as the researcher's designated numbering. Any testing condition that falls under all inmates was assigned two points per condition. Any testing condition that only applies to some inmates was assigned one point per condition. This was done to weight those conditions that can apply to all (versus some) of the state's correction populations. Those conditions that apply to all inmates are stricter than those than can only apply to specific inmates. Using this scheme, the number of circumstances for each state was added and is displayed in the last column of Table 3.1 and 3.2. In order to maintain a relatively balanced pool of states in each category, the cut off was between 5 and 6 points assigned. This resulted in 22 states in the less strict analysis and 21 states in the stricter testing analysis. Models were separately run for each group of states for HIV and AIDS and then compared to see if any differences existed.

Table 3.1: HIV Testing in State Prison Systems (2008) Less Strict States

	All inmates										
State	**Entering**	**In Custody**	**Upon Release**	**Random**	**High-risk**	**Inmate Request**	**Court Order**	**Clinical Indication**	**Involvement in Incident**	**Other**	**Ranking Score (By Investigator)**

West Virginia					X						1
Colorado	X										2
Massachusetts					X				X		2
New Mexico					X		X				2
Oregon					X	X					2
Kentucky				X			X		X		3
Maine					X	X	X				3
North Carolina					X	X	X				3
Arizona				X	X	X	X				4
California					X	X	X		X		4
Louisiana					X	X	X		X		4
Montana					X	X	X		X		4
New Jersey					X	X	X		X		4
Pennsylvania					X	X	X		X		4
Wyoming	X				X		X				4
Georgia	X				X	X			X		5
Michigan	X				X	X			X		5
South Dakota					X	X	X		X	X	5
Tennessee				X	X	X	X		X		5
Utah	X			X			X		X		5
Virginia					X	X	X		X	X	5
Wisconsin				X	X	X	X		X		5

*http://www.bjs.gov/content/pub/pdf/hivp08.pdf

Table 3.2: HIV Testing in State Prison Systems (2008) Stricter States

	All inmates										
State	**Entering**	**In Custody**	**Upon Release**	**Random**	**High-risk**	**Inmate Request**	**Court Order**	**Clinical Indication**	**Involvement in Incident**	**Other**	**Ranking Score**
Florida			X			X	X	X	X		6
Illinois					X	X	X	X	X	X	6
Kansas					X	X	X	X	X	X	6
Maryland					X	X	X	X	X	X	6
Minnesota	X					X	X	X	X		6

Nebraska	X					X	X	X	X		6
Ohio	X					X	X	X	X		6
Indiana	X				X	X	X	X	X		7
Mississippi	X				X	X	X	X	X		7
New York				X	X	X	X	X	X		7
Oklahoma	X					X	X	X	X	X	7
South Carolina	X					X	X	X	X	X	7
Washington	X				X	X	X	X	X		7
Idaho	X	X				X	X	X	X		8
Iowa	X	X				X	X	X	X		8
North Dakota	X	X				X	X	X	X		8
Texas	X		X		X	X	X	X	X		9
Missouri	X	X	X		X		X	X	X		10
Nevada	X	X	X			X	X	X	X		10
Alabama	X		X	X		X	X	X	X	X	11
Arkansas	X		X	X	X	X	X	X	X	X	12

*http://www.bjs.gov/content/pub/pdf/hivp08.pdf

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Chapter 4: Incarceration and State AIDS and TB cases

Introduction

This chapter begins the empirical investigation. Using the methods described in Chapter 3, this chapter explores the relationship between incarceration and AIDS and incarceration and TB separately. It also explores other state and population factors that influence disease incidence at the state level.

Incarceration and AIDS

The main infectious disease of interest in this study is HIV. AIDS is advanced or stage three HIV. In comparison to HIV, there is more consistent and comprehensive data available on AIDS, over a longer period of time. For this reason, most studies on this subject use AIDS as the dependent variable, measured as cases or deaths. Since AIDS is advanced stage HIV, most individuals contract HIV first; then, over time, their disease develops into AIDS. Thus, if a study such as this one is seeking to tap into the contraction mechanism or time point, a measure of HIV is the preferable dependent variable. HIV is further preferable as there are many factors, such as access to medication, that influence how fast and when a person seroconverts from HIV to AIDS. Many of these factors cannot be easily or reliably measured at this time. However, in an effort to explore a longer period of time and to expand the current literature, it is important to investigate the proposed incarceration-AIDS link, despite the limitations. Additionally, as AIDS is a stage of HIV, it is possible to pick up some effects, if they exist, that also pertain to HIV.

Data and Methods

Chapter 3 lays out a fully detailed account of the data and methods with regard to the AIDS section of this analysis, but a brief overview of the aspects pertinent to this specific section is provided again here. The unit of analysis in this section is the state. The main dependent variable is the number of AIDS cases in a state in a respective year. An all-inclusive model of the entire state population is followed by gender and race specific models. In the gendered models, the dependent variable is changed to the number of male or female AIDS cases in a state in a given year. In the racial models, the dependent variable becomes the number of Black AIDS cases or White AIDS cases in a state in a respective year. The same logic applies to race and gendered combined models. For example, in the Black female models, the dependent variable is the number of Black female AIDS cases in a state in a given year. The same goes for each other race and gender group, Black males, White females, and White males.

The main independent variable is incarceration, which is measured in two ways for most of the models. Incarceration measured as a rate is the main independent variable used across all different AIDS models. Much like the AIDS variable, this variable changes according to race and gender specific or combined models. In the total population models, the incarceration rate is measured as the rate of incarceration among the entire state population, while, in the gendered models, it is measured as either male incarceration rate or female incarceration rate. In the racial models, this variable is measured as the Black incarceration rate or White incarceration rate, and in the race and gender models, it is measured as the Black male incarceration rate, Black female incarceration rate, White male incarceration rate, or White female incarceration rate. A second measure of incarceration, the number of releases, is used for the total and gendered only models. This difference is largely due to data limitations, as releases were only available by total population and gender.

The other covariates included are state unemployment rate, state marriage rate, state percent population living in poverty, state gross domestic product (GDP), percent population that is Black, percent population that is Hispanic, gonorrhea rate, chlamydia rate, three age cohorts (24 and under, 25 to 44, and 45 and older), percent of state population holding a bachelor's degree or higher, percent of state population that used an illicit drug other than marijuana in the past year, and number of social establishments according to the Census county business patterns. Lastly, models are run both with and without a one year lag, given that previous literature pertaining to infectious disease shows increased results with at least a one year lag. This is considered especially important as AIDS is advanced stage HIV, and there is likely an incubation period before detecting AIDS in positive individuals. While there is consensus that there are likely lagged effects, there is no relative consensus on the length of such a lag. Previous studies have ranged from using a five year lag to ten plus year lag.[1, 2] A previous study that used AIDS deaths as the dependent variable used only a five year lag, leaving room for some credence that the use of a single year lag for AIDS cases is not that far out of reason.[3] With the advancements of antiretroviral drugs, people are living longer with AIDS. If previous scholars predicted five years as reasonable for deaths, one year seems plausible for simply using cases.

All models are estimated using negative binomial regression analysis, since the dependent variables are count data. The use of count data requires standardizing large and small states as population size alone may contribute to larger counts of the dependent variable. To address this concern an exposure variable is added to each regression model. In general, the exposure variable is the state population in each respective year. Much like the other variables, this variable varies for the gendered and racial models. In the gendered models, the exposure variable is changed to either the male or female state population in each year. In the racial

models, the exposure is the Black or White state population in each year. Lastly, in the race and gender combined models, the exposure variable is the state Black female, Black male, White female, or White male population in each year.

Results and Discussion

Total Population AIDS Models

The results for the total population AIDS models are displayed in Tables 4.1 through 4.4. Tables 4.1 and 4.2 show the results for both measures of incarceration without a lagged dependent variable, while Tables 4.3 and 4.4 present the same data with a one year lagged dependent variable. In each table, the first column of coefficients is for all AIDS cases regardless of contraction mechanism. The far right two columns of coefficients show AIDS cases contracted through intravenous (IV) drug use and heterosexual contact separately. The right models introduce a more novel discussion of transmission mechanism differences. While IV drug use and heterosexual contact are two of the major ways to contract AIDS, it is unknown if they operate in the same manner or are impacted by incarceration to the same degree, if any. Similarly, large portions of inmates are known IV drug users, as well as in committed relationships prior to entering prison. These mechanisms become even more important later, when considering the racial models, since a large portion of HIV/AIDS positive Black women contracted HIV/AIDS through heterosexual contact. While most other studies consider AIDS along racial and gendered lines, there is limited literature that directly tests specific transmission methods, other than through speculation.

Table 4.1: Total State Population AIDS Negative Binomial Regression with Incarceration Rates (Including Transmission Mechanisms)

Independent Variable	Total AIDS Cases	Total AIDS IV Drug Use	Total AIDS Heterosexual Contact
Incarceration Rate	-.00014**	-.00005	-.00013

Male Incarceration	-.0000608	-.0000296	-.00006
Female Incarceration	-.00035	-.00003	-.00063
Unemployment	-.00798	-.02726*	-.02461*
Poverty	.000417	-.001276	-.0191049
Marriage Rate	.0039253	.0042248	-.0083088
State GDP	4.11e-07	-3.78e-07	-3.39e-07
Percent Black	-.0974588	-.0218303	-.1803743
Percent Hispanic	-.0265714	-.0543781	-.0778772
24 and Under	5.80e-07*	1.91e-07	6.98e-07**
25 to 44	-5.21e-07	1.54e-07	-1.58e-08
45 and older	-3.24e-07**	-2.73e-07**	-2.59e-07**
Spending on Health programs (per capita)	-.0003847	-.0013524**	-.0005919
Governor Party	.0062728	-.001536	-.0297172
Percent holding a Bachelors' or higher	-.037142**	-.0465721**	-.0177195
Chlamydia Rate	-.0006614**	-.0020578**	-.0002193
Gonorrhea Rate	-.0003127	-.0004129	-.0033367**
Percent Drug Use (except Marijuana)	-.009415	-.0357396	.095312**
Number of Social Organizations	-.0002242	-.0004194*	-.0007185**

*Significant at the .05 level
** Significant at .01 level

Table 4.2: Total State Population AIDS Negative Binomial Regression with Incarceration Measured as Releases (Including Transmission Mechanisms)

Independent Variable	Total AIDS Cases	Total AIDS IV Drug Use	Total AIDS Heterosexual Contact
Total Releases	-2.40e-06**	-1.17e-06	-1.54e-06*

Male Releases	-2.96e-06*	2.77e-07	-2.01e-06*
Female Releases	-.0000194*	-7.30e-06	-.0000157*
Unemployment	-.0068342	-.026295*	-.0150794
Poverty	.0036341	.0003544	-.0129707
Marriage Rate	.003873	.004083	-.0040909
State GDP	4.48e-07	-3.72e-07	-3.90e-07
Percent Black	-.0919401	-.0172594	-.084424
Percent Hispanic	-.0637399	-.0779225	.0323066
24 and Under	6.28e-07*	1.86e-07	1.14e-06**
25 to 44	-5.60e-07	1.55e-07	-8.39e-07**
45 and older	-3.36e-07**	-2.73e-07*	-2.61e-07**
Spending on Health programs (per capita)	-.0002689	-.0013085**	-.0006822*
Governor Party	.0026988	-.0054403	-.0368669
Percent holding a Bachelors' or higher	-.0336748**	-.0451696**	-.0126858
Chlamydia Rate	-.0006675**	-.0020617**	-.000872**
Gonorrhea Rate	-.0003982	-.000392	-.0013118
Percent Drug Use (except Marijuana)	-.0119988	-.0364431	.0205445
Number of Social Organizations	-.0002265	-.0004097*	-.0004943**

*Significant at the .05 level
** Significant at .01 level

The first interesting result is the negative direction on all of the incarceration coefficients across all of the models. In general, this suggests that an increase in incarceration provides a decrease in AIDS cases. With regard to the first measure of incarceration—rates—only the model for total AIDS cases and total incarceration have a statistically significant result. Male and female

incarceration individually did not reach statistical significance for total cases or for cases by either transmission mechanism. These results can be interpreted using incidence ratio rates calculated as exp(coefficient). Accordingly, a one percentage point increase in incarceration decreases AIDS cases by .01%. This is a very small decrease, but it is statistically significant.

Looking at the results of the models measuring incarceration as the number of releases, there are substantially more statistically significant results for the incarceration variables. These coefficients are again in the negative direction, consistent with the incarceration rate coefficients. However, when releases are used total, male, and female, releases have a significant effect on both total and heterosexual AIDS cases. Using incidence ratio rates, a one percentage point increase in total releases decreases total AIDS cases by .0002%, a one percentage point increase in male releases decreases total AIDS cases by .0003%, and a one percentage point increase in female releases decreases total AIDS cases by .002%. With regards to heterosexual AIDS cases, a one percentage point increase in total releases decreases heterosexual AIDS cases by .0002%, a one percentage point increase in male releases decreases heterosexual AIDS cases by .0002%, and a one percentage point increase in female releases decreases heterosexual AIDS cases by .002%. Similar to the significant incarceration rate coefficients, these reductions are very small, but they are significant. Interestingly, none of the coefficients in the model for IV drug AIDS cases reached statistical significance. This may provide preliminary evidence that any relationships between incarceration and AIDS by transmission mechanisms are impacted differentially. This possibility raises cause for future study of AIDS by different transmission mechanisms and for possible interventions.

Similarly, the larger number of significant findings in the release versus rate models might be due to the accuracy or effectiveness of the measure. In order for infectious disease

within prison settings to have spillover effects into the community, prisoners must be assumed to have contact with individuals not in prison. The presumed mechanism for this interaction is through the release of inmates from prison facilities back into the larger community. Since the incarceration rate is a measure of the number of individuals currently under correctional supervision in a year, it does not directly measure the needed mechanism of release in the same manner or clarity that the number of releases does. Given some significant results for both measures, in addition to the increased significant results of the release measure, there does appear to be some evidence that the action of release significantly contributes to disease spread in the community. Future studies may want to consider using a measure of incarceration that captures the current number of ex-prisoners in the community or the volume of releases as a superior measure to admissions or current prisoners. In general, these results do show that incarceration has an impact, measured either way, on the spread of infectious disease.

The results for both measures of incarceration are against the hypothesized relationship that higher levels of incarceration increase AIDS cases. Recalling previous work, it is possible that these results provide some evidence to support the conditional theory that incarceration may decrease the presence of diseases that are routinely or more frequently tested in prisons.[4] AIDS, or its early stage HIV, is increasingly being tested in prison settings. If the assertion that incarceration may decrease the presence of diseases tested in prisons is true, then prisons may serve as a place for public health intervention or as a public health ally in the strategy to combat infectious and sexually transmitted diseases.

Considering the other covariates, the older age group (45 and older) showed the most consistently significant results across all models. The negative coefficients suggest that the lower the number of older individuals in the population, the more AIDS cases there are. This is as

expected, since people over 50 only accounted for 18% of HIV diagnoses in 2013.[5] The largest number of HIV diagnosis are often made for those between the ages of 20 and 34.[6] Further indication of the impact of a younger population is seen in the positive coefficients on the 24 and under age cohort, which suggests that the more young individuals there are in the population, the more AIDS cases are present. For both measures of incarceration, the younger cohort is significant for both total AIDS cases and heterosexual AIDS cases. With regard to the latter, this association between age and number of AIDS cases may be due to the increased number of possible sexual partners among younger populations, since younger people are less likely to be of marrying age than the older cohorts. Looking at incidence ratio rates, these effects are marginally small and under 1%, but are nevertheless significant and in the hypothesized direction.

The next significant covariate, unemployment, is opposite the expected direction. The significant coefficients are negative, which suggests that an increase in unemployment decreases AIDS cases. While low socioeconomic status, homelessness, and financial instability are factors associated with unemployment that are also risk factors for AIDS, it is possible that the unemployment variable is picking up on other employment characteristics such as insurance access. In the United States, employer based insurance remains the number one source of individual health insurance. In order to receive employer-sponsored insurance, one must be employed. If higher employment rates produce increases in insurance coverage, it is possible that greater coverage leads to increased use of medical services. More interaction with medical services can increase AIDS diagnoses due to greater opportunities for testing. The alternative to this possibility is that there may be a high level of AIDS that remains undiagnosed, thus artificially lowering AIDS estimates. This notion is further evidenced by CDC estimates

indicating that nearly 1 in 8 people are unaware of their HIV status.[7] Therefore, caution must be used when interpreting this result. It should not be understood that higher unemployment rates decrease the presence of AIDS, but rather it should spark a conversation regarding access to effective testing and how to tease apart indications of more cases due to increased testing versus indications of more cases due to socioeconomic barriers.

The next covariate that reached significance for some models in both measures of incarceration is state per capita spending on health programs. The negative coefficients suggest that lower spending increases AIDS cases. This result makes sense, since lower spending on health programs can also mean reduced spending on public health strategies to combat AIDS, such as testing, needle exchange programs, and educational outreach. It is important to keep in mind that this measure is not specific to any particular type of health program, so there is no way to postulate directly that spending more or less in a given program helps or fuels AIDS spread. However, this association between health spending and AIDS cases is an important concept to consider for future research, as spending on one type of program is not likely to produce the same result, or lack thereof, as spending on another.

Similarly, for percent state population holding a bachelor's degree or higher, the results suggest that the lower combined state educational attainment, the more AIDS cases there are. This relationship comports with conventionally held beliefs that lower educational attainment leads to worse health outcomes, as the less educated partake in risky behaviors. Of note, the effect of education was only significant in the total AIDS and IV drug use AIDS models and not in the heterosexual AIDS models. For both incarceration rate and releases, a one percentage point increase in the percent of the state population holding at least a bachelor's degree decreases total AIDS cases by just over 3%, while a one percentage point increase in percent holding at

least a bachelor's degree decreases IV drug AIDS cases by roughly 4.5%. The education effects are the strongest in the models. Not surprisingly, education affected IV drug use AIDS cases more than total AIDS cases, as educational attainment is a risk factor for both AIDS and probability of using IV drugs. Additionally education is considered a social determinant of health, as it increases employment opportunities, increases capacity for decision making, and increases the ability to provide social and personal resources that reduce stress.[8] The results of this study confirm and lend additional affirmation of the importance of education in determining one's health, in this case, the likelihood of contracting AIDS.

The last covariates that reached statistical significance in some of the models were the rates of concurrent STDS, here gonorrhea and chlamydia. Higher rates of both STDS appear to decrease the number of AIDS cases exhibited by the negative coefficients. When considering incarceration rate, a one percentage point increase in the chlamydia rate decreases total AIDS cases by .07%, while decreasing IV drug AIDS cases by .21%. The results for heterosexual AIDS cases did not meet statistical significance. However, only heterosexual AIDS cases reached statistical significance with regard to incarceration rate and gonorrhea. A one percentage point increase in the state gonorrhea rate decreases heterosexual AIDS cases by .33%. Conversely, when considering incarceration measured as the number of releases, an increase in the chlamydia rate for all three AIDS categories decreases AIDS cases, while none of the gonorrhea results reached statistical significance. The incidence ratio rates show that a one percentage point increase in the state rate of chlamydia decreases total AIDS cases by .07%, IV AIDS cases by .21%, and heterosexual AIDS cases by .09%. These results are almost the same as those produced using incarceration rate, where significant. This similarity shows consistency in type and magnitude of effect.

It is important to note that these results are contrary to the expected relationship. It is well documented that having a concurrent STD, such as chlamydia or gonorrhea, increases the risk of contracting HIV.[9] This contradicting result can signal several different things. First, reduced chlamydia and gonorrhea rates could mean an absence of large scale testing. This can parlay into more AIDS cases, in particular, as reduced STD testing may correlate with reduced HIV testing, which may result in HIV diagnoses being made at a later disease stage, perhaps after advancement to AIDS. Secondly, these results may suggest increased chlamydia and gonorrhea testing, prevention, or treatment compared to a relative lack of testing, prevention, and treatment with regard to AIDS. As the former two STDs are more common, more strategies to address them may have been developed. Similarly, gonorrhea and chlamydia do not carry the same social stigma as AIDS. As mentioned in previous chapters individuals often hold false beliefs regarding who has or is likely to contract HIV/AIDS. Thus, some underestimate their own risk or refrain from medical treatment to avoid stigma. The other STDs do not come with the same beliefs—or at least not to the same degree. Therefore, the much larger societal acceptance of chlamydia and gonorrhea may lead to increased attention to risk or compliance with prevention and treatment. These explanations are only two of many possible explanations for these results, and it is beyond the scope of the current study to delve into the particulars of each explanation. This finding, however, should guide future research endeavors to more closely tease out the similarities and differences among individual STDs, rather than treating them holistically.

As mentioned before, infectious disease often shows a lagged impact, given that time is needed for disease to spread. To capture the possible impact of incubation time, the models in Tables 4.1 and 4.2 are rerun to include a one year lag in the AIDS variables. The results of the lagged models are displayed in Tables 4.3 and 4.4 below.

Table 4.3: Total State Population AIDS Negative Binomial Regression with Incarceration Rate and One Year Lag (Including Transmission Mechanisms)

Independent Variable	Total AIDS Cases	Total AIDS IV Drug	Total AIDS Heterosexual Contact
Incarceration Rate	-.00007	.00034	-.00010
	(.00007)	(.00013)	(.00007)
	-.00004	.00017*	-.00006
Male Incarceration	(.00004)	(.00007)	(.00004)
	-.00002	4.85e-06	-.00031
Female Incarceration	(.00036)	(.00106)	(.00037)
Unemployment	-.02629**	-.02579*	-.01339*
	(.00657)	(.01080)	(.00562)
	.00176	-.00360	-.00375
Poverty	(.00833)	(.01136)	(.00602)
	-.00302	-.01321**	-.00270
Marriage Rate	(.00295)	(.00504)	(.00272)
	-4.02e-08	-1.66e-06**	-7.28e-07**
State GDP	(2.66e-07)	(4.12e-07)	(2.24e-07)
	.45215	-8.405	5.299
Percent Black	(2.436)	(11.502)	(5.745)
	2.191	-33.476**	-7.317
Percent Hispanic	(2.315)	(7.859)	(4.400)
	6.95e-07	1.10e-06*	-2.39e-07
24 and Under	(3.31e-07)	(5.39e-07)	(3.00e-07)
	-8.99e-07	-4.20e-07	6.00e-07
25 to 44	(5.20e-07)	(7.27e-07	(4.09e-07)
	4.83e-08	4.54e-07**	-2.65e-09
45 and older	(6.28e-08)	(1.60e-07	(8.94e-08)
	-.00007	.00108	.00093
Spending on Health programs (per capita)	(.00039)	(.00060)	(.00034)
	-.00947	-.05570	.01278
Governor Party	(.02609)	(.05111)	(.02692)
	.01737	.00049	-.01672
Percent holding a Bachelors' or higher	(.01829)	(.03816)	(.01946)
	-.00005	-.00051	-.00025
Chlamydia Rate	(.00039)	(.00049)	(.00024)
	-.00026	.00291**	.00066
Gonorrhea Rate	(.00074)	(.00105)	(.00054)
		.03177	.07580**
Percent Drug Use (except Marijuana)	.00589	(.05025)	(.02750)
	(.03035)		
Number of Social Organizations	.00022	.00170**	.00030
	(.00023)	(.00054)	(.00029)

*Significant at the .05 level

** Significant at .01 level

Table 4.4: Total State Population AIDS Negative Binomial Regression with Incarceration Measured as Releases and One Year Lag (Including Transmission Mechanisms)

Independent Variable	Total AIDS Cases	Total AIDS IV Drug Use	Total AIDS Heterosexual Contact
Total Releases	1.20e-07	1.49e-06*	-6.71e-08
	(4.45e-07)	(7.07e-07)	(3.72e-07)
Male Releases	7.82e-08	1.65e-06*	-9.44e-08
	(4.98e-07)	(7.92e-07)	(4.16e-07)
Female Releases	1.70e-06	.00001*	-1.03e-06
	(4.03e-06)	(6.52e-06)	(3.45e-06)
Unemployment	-.02535**	-.03244**	-.01226*
	(.00651)	(.01090)	(.00565)
Poverty	-.00073	-.00175	-.00541
	(.00846)	(.01132)	(.00594)
Marriage Rate	-.00297	-.01313**	-.00266
	(.00305)	(.00503)	(.00272)
State GDP	-1.19e-07	-1.37e-06**	-8.25e-07**
	(2.58e-07)	(3.90e-07)	(2.15e-07)
Percent Black	.07517	-8.185	4.795
	(2.460)	(11.50154)	(5.737)
Percent Hispanic	1.246	-28.683**	-8.713*
	(2.185)	(7.612806)	(4.299)
24 and Under	5.99e-07	1.19e-06*	-2.92e-07
	(3.25e-07)	(5.37e-07)	(2.98e-07)
25 to 44	-7.15e-07	-7.74e-07	7.60e-07
	(4.98e-07	(7.06e-07)	(3.95e-07)
45 and older	5.17e-08	4.59e-07**	1.46e-09
	(6.45e-08)	(1.61e-07)	(8.99e-08)
Spending on Health programs (per capita)	-.00017	.00130*	.00088**
	(.00038)	(.00060)	(.00033)
Governor Party	-.00642	-.06119	.01546
	(.02539)	(.05118)	(.02686)
Percent holding a Bachelors' or higher	.01344	-.01363	-.01604
	(.01859)	(.03864)	(.01959)
Chlamydia Rate	.00003	-.00034	-.00024
	(.00042)	(.00050)	(.00025)
Gonorrhea Rate	-.00051	.00280**	.00056
	(.00080)	(.00106)	(.00054)
Percent Drug Use (except Marijuana)	.00805	.03176	.07741**
	(.03075)	(.05028)	(.02752)
Number of Social Organizations	.00021	.00189**	.00029
	(.00025)	(.00055)	(.00030)

*Significant at the .05 level
** Significant at .01 level

Overall the lagged models performed similarly to the models without lagged independent variables. There does not appear to be overwhelming evidence that a lagged structure is better at least not when considering total AIDS cases. As mentioned before since AIDS is advanced stage disease, a one year lag may not be enough to capture the time needed to uncover lagged effects. Any effects may only be visible in much larger lags such as five or ten years which are limited here due to data collection years. With only thirteen years of data, a five or more year lag would leave very few observations in the analysis possibly biasing results. Nevertheless, the lag structure was introduced in accordance to the existing literature. This point of distention regarding how much if any of a lag is needed is a good place for future research to explore. Analogous to the first set of models, only a single significant result was found pertaining to incarceration rate, but instead of total AIDS cases IV drug AIDS cases for male incarceration reached statistical significance. Using the incidence ratio rate a one percentage point increase in male incarceration rate decreases IV drug AIDS cases by .017%.

Looking at the models measuring incarceration as the number of releases, all three of the release types produced statistically significant results for IV drug AIDS cases. Unlike the previous models, in the lagged models incarceration only exhibits a significant relationship with IV drug AIDS cases. Total and male releases failed to exhibit a significant relationship with total AIDS cases as in the model without a one year lag. Interestingly, the coefficients for all three types of releases for the total AIDS cases models are all positive which is displays an opposite relationship than those in the model without a lag, although, none of these coefficients reached statistical significance. Similar to the results without the lag, these results are extremely small and marginal but statistically significant. Moreover, female releases have the largest magnitude effect of the three types on releases. If one were to consider the hypothesis that incarceration can

serve as an intervention point in infectious disease spread, intervening in female incarceration may make more impact than male incarceration. These results remain too small and isolated to make sweeping ascertains regarding a claim such as this, but serves as a starting point to steer the types of questions to be asked by future research.

Some of the other covariates similarly behaved in the models with and without the one year lag. All of the coefficients are in the same direction as the previous set of models. Unemployment reached significance when considering incarceration rates and releases for all three AIDS models showing lower unemployment increases AIDS cases. As for the age cohorts, the positive direction and significance on the youngest cohort groups in the IV drug AIDS models again show that the younger the population the more AIDS cases. This finding is strengthen by the negative and often significant coefficients on the oldest cohort suggesting that the older the population the fewer AIDS cases. Educational attainment and per capita state spending on health programs exhibited mixed relationships. For the total AIDS models, the coefficients were negative similar to the previous models, but in the IV drug and heterosexual AIDS models the coefficients were positive suggesting that an increase in spending increases AIDS cases. Lastly, in most of the models for both incarceration measures, the lower the state chlamydia rates the more AIDS cases present.

Gender Specific AIDS Models

Moving the analysis to a more fine grained level, the next set of models explores gender specific relationships between incarceration and AIDS. The AIDS profiles among men and women take on very different patterns. As of 2010, men contracted HIV at a rate 4.2 times that of women. Women, on the other hand, contracted HIV from heterosexual contact 84% of the time while men contracted it from male to male sexual contact 78% of the time.[10] Relatedly, only

6% of male HIV infections were attributed to IV drug use, while 14% of new female infections were attributed to the same cause. Building off these differing statistics, there is reason to believe that male and female AIDS cases arise from different circumstances and are likely to have different relationships with incarceration. To explore this supposition, gender specific AIDS models were run borrowing the variables and structure of the total AIDS models. The results of the female models are displayed in Tables 4.5 and lagged female models in Table 4.6.

Female AIDS Models

Starting with the female models and continuing throughout the rest of the chapter, shortened tables that display the coefficients and standard errors of the main independent variables of interest are displayed in the text of the chapter. Full models including all of the covariates can be found in the chapter's appendices. The longer tables are the same structure as the total AIDS tables found in the previous section on total state AIDS cases. Each column displays the coefficients for the total incarceration rate or total releases model, while the coefficients for the male- and female-specific variables are added in their respective columns. Each type of incarceration was run in a separate model to prevent problems surrounding colinearity. Given that the coefficients for the other covariates were relatively similar across all the models (total, male, and female), only the results for the total incarceration models were reported for the sake of concision.

Table 4.5: Female State Population AIDS Negative Binomial Regression with Incarceration Rate and Releases (Including Transmission Mechanisms)

Independent Variable	Female AIDS Cases	Female AIDS IV Transmission	Female AIDS Heterosexual Transmission
Incarceration Rate	.00002	-.00009	-.00007*
Male Incarceration	-.00004	-.00005	-.00003
Female Incarceration	-.00036	-.00052	-.00037

Total Releases	-1.51e-06*	-1.55e-06	-1.59e-06**
Male Releases	-1.68e-06*	-1.72e-06	-1.77e-06**
Female Releases	-.00002*	-.00002	-.00002**

*Significant at the .05 level
** Significant at .01 level

Table 4.6: Female State Population AIDS Negative Binomial Regression with Incarceration Rate and One Year Lag (Including Transmission Mechanisms)

Independent Variable	Female AIDS Cases	Female AIDS IV Transmission	Female AIDS Heterosexual Transmission
Incarceration Rate	-.00002	.00006	-.00005
	(.00003)	(.00008)	(.00003)
	-9.40e-06	.00012	-.00003
Male Incarceration Rate	(.00001)	(.00060)	(.00002)
	.00009	-.00002	-.00006
Female Incarceration Rate	(.00016)	(.00084)	(.00018)
	-1.66e-06*	-3.81e-07	-1.60e-06**
Total Releases	(6.86e-07)	(1.16e-06)	(4.48e-07)
	-1.84e-06*	-3.75e-07	-1.79e-06**
Male Releases	(7.71e-07)	(1.31e-06)	(5.04e-07)
	-.00001*	-2.86e-06	-.00001**
Female Releases	(6.01e-06)	(9.97e-06)	(3.90e-06)

*Significant at the .05 level
** Significant at .01 level

In the female models, the model using incarceration measured as releases performed better from the vantage point that more of the incarceration variables had statistically significant results. As seen in Table 4.5, the only significant incarceration association shows that a one percentage point increase in a state's incarceration rate decreases female heterosexual AIDS cases by .007%. Similar to the total AIDS models, when using number of releases as the measure of incarceration, there are negative and significant results for total female AIDS cases and female heterosexual AIDS cases across all three types of releases: total, male, and female. Based on the incidence ratio rates, a one percentage point increase in total releases decreases female AIDS cases by .0002%, a one percentage point increase in male releases decreases female AIDS cases by .0002%, and a one percentage point increase in female releases decreases female AIDS cases

by .001%. Looking at the results pertaining to female heterosexual AIDS cases, a one percentage point increase in total releases decreases female heterosexual AIDS by .0002%. A one percentage point increase in male releases decreases female heterosexual AIDS cases by .0002%. Lastly, a one percentage point increase in female releases decreases female heterosexual AIDS cases by .002%.

The negative direction of the coefficients further suggests that some characteristic of incarceration acts as an intervention with regards to infectious diseases. The current literature shows that entering a prison facility can be an inmate's first interaction with medical services, as prisons are required by law to provide humane and minimum medical services. While there is great variance in the level and quality of health services provide to inmates in different facilities, Supreme Court case law and other legislation mandate that facilities must have medical services. In terms of AIDS, this medical care often refers to testing as well as treatment, if found positive. In 2006 and 2007, the CDC released expanded HIV testing recommendations for healthcare settings, including prisons.[11] These reports were followed by specific guidance aimed directly at correctional settings released in 2009.[12] Taken together, these guidelines express a growing concern and desire to increase HIV testing as a part of a public health strategy to reduce the spread of the disease.

The female models exhibit marginally small magnitudes of significant results comparable to those in the total AIDS model. Additionally, the female incarceration measures display the strongest effect on the various categories of female AIDS cases. This result is not surprising when considering female AIDS. If incarceration does provide some type of intervention, i.e. increased HIV/AIDS testing, higher levels of incarceration would be expected to reduce the number of female AIDS cases, as more females who pass through prisons will be aware of their

disease status. Female incarceration, however, also had the strongest effect on total AIDS cases. While incarceration is largely thought of as a male issue, women are the largest growing segment among the newly incarcerated. These results suggest that the growth in female incarceration may be matched with greater effectiveness in intervening with female prisoners, as opposed to male prisoners. This trend is something to continue to look for in the male and racial models to see if a similar pattern is observed.

Based on the increased attention given to HIV testing, the most plausible manner for corrections systems to act as interventions is through increased HIV testing of inmates. If fewer individuals are entering prisons, and prisons are commonly testing for HIV, it can be presumed that fewer people in a given state will be tested for HIV. This could explain the increase of AIDS with a reduction in incarceration. Testing for HIV is also an opportunity to learn about the diseases itself, as well as one's status, which could reduce risk behaviors that could factor into transmitting the disease to others. The results with regard to this point are consistent for total and female AIDS cases, so it will be telling if the male and racial models exhibit the similar trends.

Lastly, for consistency with the total AIDS models, the female models with both measures of incarceration were rerun including a one year lag for each dependent variable. The results of the lagged models are in Table 4.6.

In comparing the two measures of incarceration, rates and releases, the lagged female models return results that are similar in direction, but the release models produced more significant results. The models without lags behaved similarly with the release models producing more significant results than the incarceration rate models. This may suggest that a measure of releases may be a better measure to uncover this relationship than those currently incarcerated. Also similar to the previous models without a lag, all three measures of releases produced

significant results for the total female and female heterosexual AIDS models while producing no significant results for the female IV drug AIDS cases. These results suggest that incarceration may have a differential impact on total female and female heterosexual AIDS than female IV drug AIDS spread. Yet again, almost all of the incarceration coefficients are negative suggesting that higher incarceration decreases females AIDS cases. Similar to the total AIDS models, the magnitudes are small which cautions over estimating the weight of these findings. Comparing the lagged results to the results without a lag, with regards to female AIDS cases, the lagged structure does not appear to contribute any significant additional explanatory power or at least not when considering a one year lag. As mentioned before in the discussion of the total AIDS sections, it is possible that AIDS, itself, does not follow the same single year lagged trajectory that has been attributed to other infectious diseases. As AIDS is advanced stage HIV, most people are first diagnosed with HIV and it is several years later before they have AIDS. A single year is presumably not long enough to capture this time gap. However, for consistency and test of previous literature a one year lagged structure was explored here. As the extent of lag contributed to the incarceration AIDS relationship is still in flux, it remains a key component of future research in this area.

Male AIDS Models

For comparison and to enhance the scope of this study, models that mimic the female models above were run for male AIDS cases in total and by the two different transmission mechanisms for both measures of incarceration. The results of the male models are displayed below in Table 4.7.

Table 4.7: Male State Population AIDS Negative Binomial Regressions (Including Transmission Mechanisms)

Independent Variable	Male AIDS Cases	Male AIDS IV Transmission	Male AIDS Heterosexual Transmission
Incarceration Rate	-.00008*	-.00004	-.00010*
Male Incarceration	-.00004*	-.00002	-.00005*
Female Incarceration	-.00065**	-.0004416	-.00068**
Total Releases	-1.40e-06	-1.26e-06	-1.70e-06
Male Releases	-1.51e-06	-1.30e-06	-1.87e-06
Female Releases	-.00002*	-.00002	-.00002*

*Significant at the .05 level
** Significant at .01 level

There are several similarities between the male and female AIDS model results. First, consistent with both the female and total AIDS models, all of the incarceration coefficients, regardless of significance, are in the negative direction. Yet again, the negative direction suggests that an increase in incarceration decreases male AIDS cases in general. Second, female incarceration, both rate and releases, had a more consistent and larger impact on male total AIDS cases and male heterosexual AIDS cases than the total and male incarceration measures. As postulated before, this result may be due to the growing levels of female incarceration and to interventions done with female inmates being more effective or widespread than those interventions done for male inmates. If female interventions are successful and more women know their status, they are likely to be more cautious in behaviors that could transmit the disease via heterosexual contact post release.

Thirdly, male IV drug AIDS cases were the least affected by incarceration of the three AIDS measures. In the male models, no measure of incarceration produced significant results for IV drug AIDS cases. There are several possible explanations for this outcome. The first possible explanation is that IV drug use is becoming a smaller and smaller cause of transmitting AIDS. If

fewer people are contracting AIDS through behaviors such as needle sharing, then interventions directed toward reducing transmission via needle sharing will be less effective due to decreased volume. Alternatively, the restraints of prison may reduce IV drug use or provide treatment for such behaviors that reduce IV drug use in the population in general. Both of these explanations point to the variance in AIDS cases transmitted through IV drug use and sexual contact, a point consistent with recent findings that show a relatively small percentage of new AIDS cases being attributed to IV drug use as opposed to some form of sexual contact.

Looking more concretely at the male models using incarceration rates, the incidence ratio rates show that a one percentage point increase in the overall incarceration rate decreases male AIDS cases by .008% and male heterosexual AIDS cases by .01%. A one percentage point increase in male incarceration decreases male AIDS cases by .004% and male heterosexual AIDS cases by .005%. A one percentage point increase in female incarceration decreases male AIDS cases by .07% and male heterosexual AIDS cases by .07%. In the models using releases, only female releases produced significant results for total male AIDS cases and male heterosexual AIDS cases. According to the incidence ratio rates, a one percentage point increase in female releases decreases male AIDS cases and male heterosexual AIDS cases by .002%.

Other than the incarceration variables, many of the covariates performed in a manner consistent with the covariates in the total and female AIDS models. First, male AIDS cases appear to be associated with a younger population, as evidenced by the positive coefficients on the 24 and under age cohort and the negative coefficients on the 45 and older cohorts. This finding is particularly consistent when considering heterosexually transmitted AIDS cases. Younger populations are assumed to have more sex partners, since they are less likely to be of marrying age. Second, educational attainment is among the most consistent and strongly

associated covariates on all three types of male AIDS cases. A one percentage point decrease in percent of the state population having at least a bachelor's degree increases all categories of male AIDS cases from 2.3% to 4.5%. Third, higher unemployment is shown to decrease male AIDS cases where it is significant. A one percentage point increase in unemployment decreases male AIDS cases between 1.3% and 3.2% across all three male AIDS categories. Fourth, state per capita spending on health programs performed in a similar manner to the previous models as reduced spending parlays into increased male AIDS cases. Lastly, the chlamydia rates similarly show that a reduction in chlamydia increases male AIDS cases.

One striking difference between the male models and the total and female models is the significant findings for the party of the governor covariate. The negative coefficients suggest that under republican governors (Republican coded as 0, Democrats coded as 1), states have increased male AIDS cases. Using incarceration rates, having a Republican governor increased total male and male heterosexual male AIDS cases by just over 5%. Considering releases, having a Republican governor increased male heterosexual AIDS cases by just over 8%. Surprisingly, the party of the governor did not have a significant relationship on male IV drug AIDS cases. Much of the tough on crime rhetoric was Republican, so it would be assumed that having a Republican governor would impact this transmission mechanism. However, it is also possible to find a lack of significance if Republican governors are stricter on drug use, which may result either in more people being locked up for longer sentences—and thus not being released in the time frame of the study—or in focusing interventions on drugs at the exclusion of other mechanisms, such as heterosexual contact. Accordingly, one might presume that Republicans control drug-related transmission at the expense of considering other avenues for transmission, resulting in a reduction of infection via drug use but an increase in sexually transmitted infection.

The lack of significant findings for party of governor in the female models combined with the significant findings in the male model is harder to square. For the most part, all of the coefficients across all three sets of models—total, female, and male—are negative signaling under Republican governors and more AIDS cases are present. As much of the existing political focus is on male incarceration, it is possible that less attention has been given to female incarceration. As female incarceration was on the rise toward the latter part of the time frame of study, perhaps political will and attention have yet to catch up with female incarceration trends in the same way they have with male incarceration. The differences by gender will be an important component to consider when moving forward with this type of research. As more data becomes available and a clearer and more sustained pattern of female incarceration emerges, a more in-depth investigation of any similarities or differences between male and female incarceration may be explored.

To end this section on male AIDS cases, models with one year lags were run to see if any differences arose. Although the lagged models for total AIDS and female AIDS did not perform better or provide more informative, the lagged male models were included for comprehensiveness. Table 4.8 displays the results of the lagged male AIDS models.

Table 4.8: Male State Population AIDS Negative Binomial Regression with One Year Lag (Including Transmission Mechanisms)

Independent Variable	Male AIDS Cases	Male AIDS IV Transmission	Male AIDS Heterosexual Transmission
Incarceration Rate	-9.91e-06	.00004	-.00008
	(.00003)	(.00007)	(.00004)
	-8.63e-06	.00002	-.000046*
Male Incarceration	(.00002)	(.00004)	(.00002)
	.00032	.000641	-7.76e-06
Female Incarceration	(.00018)	(.00043)	(.00025)
	-1.28e-06	-1.02e-06	-1.51e-06
Total Releases	(7.50e-07)	(1.12e-06)	(8.42e-07)
	-1.39e-06	-1.11e-06	-1.62e-06

Male Releases	(8.38e-07)	(1.26e-06)	(9.44e-07)
	-8.85e-06	-7.74e-06	-.00001
Female Releases	(6.55e-06)	(9.80e-06)	(7.35e-06)

*Significant at the .05 level
** Significant at .01 level

Looking at Table 4.8, the first thing that stands out is the lack of significant results for total male AIDS cases and male heterosexual AIDS cases. Only male incarceration rate produced a significant result for male heterosexual AIDS models unlike the significant results for all types of incarceration rates in the model without the lag. Also unlike the model without a lag, all of the coefficients in the male IV drug models for incarceration rates are positive in the lagged models displaying an opposite relationships. The coefficients remain negative for total male and male heterosexual AIDS cases regardless of significance.

When incarceration is measured as the number of releases, none of the coefficients reached statistical significance in the lagged models. Female releases were significant for both total male and heterosexual male cases in the models without a lag. The male results are similar to the female results in that incarceration mostly exhibits a negative relationship to AIDS cases, few coefficients are statistical significant, of those that are significant their magnitudes are very small, and IV drug AIDS cases are the most likely to lack reaching statistical significance.

In addition to mostly providing consistent results for the incarceration variables, the covariates also appear to behave in a similar manner in the models with and without a lag. A younger age structure, decreased per capita spending on health programs, republican governors, lower educational attainment, and reduced chlamydia rates all increase male AIDS cases. The failure of the lagged structure to provide substantially different or better results does not preclude such as a structure from applying to other infectious diseases, but for reasons mentioned in the previous section the lagged s structure either doesn't apply or is not large enough in these models to prove beneficial.

Racial AIDS Models

Black AIDS Models

As several commonalities were found among the relationship between female and male incarceration and AIDS, another cut at this relationship was undertaken, but with a focus on race. Although only slight differences were found in the gendered models, it is believed that starker differences will be found in racial models, Black and White, given the divergence in racial incarceration and AIDS statistics. To test the hypothesized differences between Blacks and Whites, the same models as in the previous sections were run with break downs into race specific variables. The initial results are shown in Table 4.9. As a reminder, the racial models only include incarceration measures as a rate due to data limitations and such data being unavailable in number of releases.

Table 4.9: Black State Population AIDS Negative Binomial Regression with Incarceration Rate (Including Transmission Mechanisms)

Independent Variable	Black AIDS Cases	Black AIDS IV Drug Use	Black AIDS Heterosexual Contact
Black Incarceration Rate	.0000212	.0000266	.0000246*
Black Male Incarceration Rate	.000022	.0000246	.0000257*
Black female Incarceration Rate	.0002184	.0004334	.0002632**
	One Year Lag		
Black Incarceration Rate	-1.86e-06 (6.44e-06)	9.49e-06 (.00001)	7.64e-07 (6.14e-06)
Black Male Incarceration Rate	-1.58e-06 (6.95e-06)	8.32e-06 (.00001)	1.58e-06 (6.65e-06)
Black female Incarceration Rate	-.00006 (.00007)	.00019 (.00011)	-.00006 (.00006)

*Significant at the .05 level
** Significant at .01 level

Looking at the racial models, one of the most significant findings of interest is that the coefficients for all the incarceration variables, regardless of significance, are positive. Unlike in the previous models, these positive coefficients suggest that an increase in Black incarceration

increases Black AIDS cases. This is the first of the models to behave in the hypothesized direction for the relationship between incarceration and AIDS. The next important, yet contrary, result in the Black models is that only Black heterosexual AIDS cases are affected by incarceration in a statistically significant manner. Using the incidence ratio rates, Black incarceration and Black male incarceration are expected to have a 1.00003 time greater impact on Black heterosexual AIDS cases holding all else constant. Black female incarceration is expected to have a 1.0003 times greater impact on Black heterosexual AIDS cases holding all else constant. These results, again, are of a very small magnitude but reach statistical significance. Further, these results combined with the results from the total, male, and female models suggest that Black AIDS cases are differentially impacted by incarceration compared to other races. Additional data is needed to confirm this supposition as it is based solely on the Black model results at this time. This question will be explored further in the next section, which estimates the incarceration-AIDS relationship for White AIDS cases.

The achievement of significant results for heterosexually transmitted AIDS cases among Blacks only is not altogether surprising. Heterosexual contact, especially for Black women, is a major mechanism for contracting AIDS. Although heterosexual contact falls behind homosexual contact for Black men, it surpasses IV drug use and most other methods of transmission.[13] Given the volume of AIDS cases transmitted through heterosexual contact, the stigma around admitting homosexuality, and the need to rekindle relationships disrupted by prison stays, it is very likely that heterosexual contact is becoming the most concerning transmission mechanism among Blacks, both men and women.

The covariates in the Black models did not display consistent findings across the AIDS categories as in the previous models. Although unemployment was in a negative direction, as it

was in the previous models, it only had an effect on total Black AIDS cases and heterosexual Black AIDS cases. The incidence ratio rate shows that a one percentage point decrease in the unemployment rate increases Black heterosexual AIDS cases by nearly 1.4 % and total Black AIDS cases by 1.1%. State GDP and governor party were only significant for Black IV drug AIDS cases, showing that lower GDP and a Republican governor increase this category of Black AIDs cases. Likewise, state spending on health programs was only significantly associated with total Black AIDS cases, showing that a decrease in spending increases Black AIDS cases.

Unlike in the previous models, both the number of social organizations and the percent of the population using illicit drugs other than marijuana in the last year produced some significant results in the Black models. The significant coefficients on these variables were both positive, suggesting that higher percentages of the population using illicit drugs increases Black heterosexual AIDS cases and that more social establishments in the state increases total Black AIDS cases. The former result is as hypothesized, but the latter signals an opposite relationship than what was expected. In general, more social organizations and involvement increases social capital, which in turn improves health and discourages behaviors that may be risk factors for AIDS. What this result may suggest is that more social interaction may introduce people to increased numbers of other people and/or to activities or behaviors that may be risky. An increased social circle may be detrimental to the spread of diseases, such as AIDS, if knowing more people increases the likelihood of having more sexual partners. On the other hand, more drug use can lead to increased AIDS cases through needle sharing or by defining the parameters of a relationship. It has been documented that Black women are often introduced to IV drugs by a male partner. If women are in relationships with men who partake in behaviors that increase their own risk, the risk profile of the women themselves is increased by that of their partner.

Being with partners who have increased risk can logically increase heterosexually transmitted AIDS, as sexual intimacy is an aspect of most relationships. It is beyond the scope of this study to tease apart each specific relationship, but this study does intend to offer insight based on its findings to steer the direction of much needed future research in this area.

To maintain consistent modeling, the Black AIDS models were run again including a one year lag for the dependent variables. Unlike in previous lagged studies, which failed to add substantial caveats to the models without lags, the Black lagged models display contrary findings compared to the Black models without a lag. The coefficients in the lagged model have switched from a positive to a negative direction. The new results suggest that increases in Black incarceration should be expected to decrease Black AIDS cases. The coefficients in the lagged model have switched from a positive to a negative direction for total Black AIDS cases. The new results suggest that increases in Black incarceration should be expected to decrease total Black AIDS cases; however, none of the results in the lagged models reached statistical significance. The coefficients on Black IV drug AIDS cases remained positive suggesting an increase in incarceration increases Black IV drug AIDS cases. For Black heterosexual AIDS cases, total Black and Black male incarceration exhibit a similar positive relationship while Black female incarceration switches from a positive to a negative relationship.

In addition to exhibiting some type of protective or interventionist effect of incarceration –as in the total, female, and male models—the lagged Black model also conveys relative consistency in magnitude of effect across incarceration measures and category of Black AIDS cases. The magnitude of Black incarceration on both total and IV drug AIDS cases is relatively stable, as is the effect of both Black male and female incarceration on both AIDS categories. Female incarceration, in this case Black female incarceration, once again showed the strongest

effect of the three types of incarceration further, suggesting a differential impact of intervention in female over male incarceration.

Most of the covariates performed similarly to the previous models with younger population, reduced health program spending, and lower unemployment showing increased AIDS cases in general. The poverty variable, however, reached significance in the lagged Black model, and its coefficient is in the opposite direction of the total, male, and female models. The positive poverty coefficient is this model is in the expected direction, as increased poverty is likely to coincide with increased joblessness, homelessness, lower education, and poorer living conditions—all of which are risk factors for contracting AIDS. Consequently, higher levels of poverty should reasonably coincide with higher levels of AIDS.

One of the most important findings of the Black models, both with and without a lag, is that many of the variables have switched to align with the expected directions. This switch signals that Black AIDS may be differentially affected by incarceration and that such differences are worth exploring for several reasons. First, these differences may signal a need for different responses based on subgroups. Not all groups of people are impacted by, nor are likely to respond the same to, all interventions. Therefore, different types of interventions may be needed to reach most effectively varying subgroups, especially based on race. Second, disease spread, impact, or trajectory may not be the same across all groups, and caution should be taken when looking at these concerns. The differences among groups are important to understand in order to devise best practices for addressing the same disease across different populations. Third, while differences may exist, there is substantial room for common ground. Such common ground is important when considering social institutions, such as prisons, that are not on the surface broken

down into racial groups. Understanding both the commonalties and the differences should inform the most cost effective and disease effective strategies for combatting the AIDS epidemic.

White AIDS Models

In order to further explore the racial differences displayed in the Black AIDS models compared to the total AIDS models, White AIDS models were run for a more accurate racial comparison. The initial White model results are displayed in Table 4.10.

Table 4.10: White State Population AIDS Negative Binomial Regression with Incarceration Rate (Including Transmission Mechanisms)

Independent Variable	White AIDS Cases	White AIDS IV Drug Use	White AIDS Heterosexual Contact
White Incarceration Rate	-.00001**	-.00009**	-6.71e-06
White Male Incarceration	.00003	-.00010**	-8.67e-06
White Female Incarceration	-.00007*	-.00038	.00015
	One Year Lag		
White Incarceration Rate	-1.21e-06 (5.24e-06)	4.14e-06 (9.51e-06)	4.33e-06 (7.97e-06)
White Male Incarceration	-1.60e-06 (5.81e-06)	4.37e-06 (.00001)	6.00e-06 (8.88e-06)
White Female Incarceration	-.00004 (.00011)	.00004 (.00008)	-.00003 (.00006)

*Significant at the .05 level
** Significant at .01 level

Looking at the coefficients for the incarceration variables, the first thing to notice is the negative direction, which suggests that an increase in White incarceration decreases White AIDS cases. These results are opposite the findings in the first Black AIDS model which had positive coefficients. The initial Black AIDS model also only displayed significant results in the Black heterosexual AIDS model, while the initial White model shows no significant results for White heterosexual AIDS cases. Interpreting at the incidence ratio rates for the significant incarceration coefficients, a one percentage point increase in total White incarceration is expected to decrease total White AIDS cases by .001% and White IV drug AIDS cases by .009%. A one percentage

point increase in White male incarceration is expected to decrease White IV drug AIDS cases by .01%, and a one percentage point increase in White Female incarceration is expected to decrease total White AIDS cases by .007%. Of particular interest here, in the White AIDS model, White female incarceration did not display the strongest nor the most consistent effect on White AIDS cases, as was seen in all of the previous models (total, female, male and Black models). Many of the other covariates behaved in a similar manner to the all combined and gendered previous models. Overall, lower unemployment rates, lower state GDP, a younger population, having a Republican governor, and lower chlamydia rates all suggest increased White AIDS cases. To advance the racial comparison, a set of models that includes lagged White AIDS dependent variables were run, and the results as listed in Table 4.10.

The first thing to notice about the lagged models is that none of the incarceration coefficients reached statistical significance. In the total White AIDS models all of the coefficients are negative similar to the models without the lag. Conversely, the coefficients for the White heterosexual AIDS models and most of the coefficients for the White IV drug AIDS model are positive in the lagged models while being negative in the models without the lag. This result suggests that over time the relationship between White IV drug and White heterosexual AIDS cases may switch from negative to positive suggesting that a lagged structure may introduce needed explanatory power to uncover the correct relationship between incarceration and White AIDS cases. While none of these results are significant meaning no definitive evidence was provided, these results are exhibiting some difference between the model with and without the lag. As mentioned previously, the models might have failed to reach statistical significance due to a one year lag being too short given the etiology of the AIDS virus.

Another finding of interest is the negative coefficient in the White heterosexual AIDS model for the social capital variable. The coefficient in this model is negative, suggesting the expected relationship that fewer social organizations increases AIDS cases, as fewer social organizations increase social isolation and reduce social capital. The fact that this relationship was only significant for heterosexually transmitted AIDS cases could suggest that being in a relationship is more socially isolating than not. Individuals may join social organization in order to meet other people, possible mates, or build friendships. If an individual is already in a relationship, there may be reduced need to connect with others or partners may experience relationship violence that often manifests in social isolation. The literature shows that women often have reduced interpersonal power in relationships and many suffer abuse. Such abuse is likely to encourage women to withdraw and make them less likely to push for safer sex practices, resulting in an increase of heterosexually transmitted AIDS cases. Regardless of the specific cause, social organizations appear to have opposite effects on Black and White AIDS cases. For Blacks, increased social organizations coincided with an increase in AIDS cases while for Whites, increased social organizations decreased AIDS cases. These results point to another example of differential impact of social factors on the spread of AIDS. This one study alone is not enough to confirm the magnitude or specificity of such relationships, but should serve as a starting point to further study of racial differences in the AIDS disease trajectory.

Race and Gender Combined AIDS Models

The last attempt to uncover the dynamics of the relationship between incarceration and AIDS explores race and gender combined models. Black and White females are the first explored, in Table 4.11. Similar to the individual race specific models, only one measure of incarceration, rates, was used, due to data limitations. The results for models with and without

the lags are all combined in Table 4.11. Although the incarceration variables in the left hand column are listed as incarceration rate, male incarceration, and female incarceration, they are changed to be race specific measures for each race and gender model. For example, in the Black female model the incarceration measures are Black incarceration, Black male incarceration, and Black female incarceration. In the White female models, the incarceration measures are White incarceration, White male incarceration, and White female incarceration. Using the same modeling structure and technique, models for Black males and White males with and without a one year lag follow in Table 4.12.

Table 4.11: Black and White Female State Population AIDS Negative Binomial Regression with Incarceration Rate and with and without One Year Lag

Independent Variable	Black female AIDS Cases	White Female AIDS Cases	Black female AIDS Cases (1 Year Lag)	White Female AIDS Cases (1 Year Lag)
Incarceration Rate	.0000124	-9.28e-06	7.97e-07	9.75e-06
			(7.15e-06)	(7.96e-06)
			1.28e-06	.00001
Male Incarceration	.0000135	-.0000618*	(7.69e-06)	(8.86e-06)
			-.00003	.00003
Female Incarceration	.0000747	-2.07e-06	(.00007)	(.00006)

*Significant at the .05 level
** Significant at .01 level

In the Black and White female models, only one incarceration coefficient produced significant results. The White female AIDS cases model without a lag suggests that an increase in White male incarceration decreases White female AIDS cases. Looking at the other incarceration coefficients, there is a switch in direction of the incarceration coefficients for both the Black and White female models when comparing the lag to no lag. The initial Black female model is consistent with the previous Black model with no lag. The positive coefficients suggest that an increase in Black incarceration increases Black AIDS cases. In the lagged model, conversely, these coefficients are negative, suggesting that an increase in Black incarceration

decreases Black female AIDS cases. The White female models show the exact opposite results. In the initial model, the coefficients are negative, suggesting that an increase in White incarceration decreases White female AIDS cases. In the lagged model, however, the coefficients are now positive, suggesting that an increase in White incarceration increases White female AIDS cases. The exception to this finding is White female incarceration, which had negative coefficients in both models with and without the one year lag. None of these results reached statistical significance, but their contrary nature deserves some consideration and grappling. In the previous White models, all of the incarceration coefficients were negative, so the positive direction is thus far unique to White female AIDS cases. These differing results could be interpreted as a suggestion that a lagged structure matters when considering the relationship between incarceration and AIDS; however, the length of the exact lag remains unclear at this time.

Moving on to explore some of the covariates, unemployment only reached significance in the Black female AIDS models. The negative coefficient suggests that an increase in unemployment decreases Black female AIDS cases. The age cohorts portrayed similar results as those in all of the previous models: the younger the population, the more AIDS cases for both Black and White females. The social capital variables were only significant for White females in these models, suggesting that an increase in social establishments decreases White female AIDS cases. Although this variable failed to reach statistical significance for Black females, it did exhibit an interesting trend that was picked up by the previous Black models. In the model without a lag, the coefficient is negative, suggesting that an increase in social organizations decreases Black female AIDS cases; however, the coefficient is positive in the lagged model, suggesting that an increase in social organizations actually increases Black female AIDS cases.

What these findings propose is that different factors influence the spread of AIDS among Blacks and Whites. These differences are worth exploring and may prove useful in devising prevention and treatment strategies.

Moving to an examination of Black and White male AIDS cases, Black male AIDS cases display a similar pattern to those of Black females in the models with and without the lag. The positive coefficients on the incarceration variables in the Black male model without a lag suggest that increases in Black incarceration increase Black male AIDS cases. In the lagged model, on the contrary, the coefficients are negative suggesting that increases in Black incarceration decrease Black male AIDS cases. The incarceration coefficients in both White Male models are negative suggesting that an increase in White incarceration decreases White male AIDS cases. As far as reaching statistical significance, incarceration appears to have a more significant effect on racial male AIDS cases than racial female AIDS cases. Interpreting the incidence ratio rates, for the White male model without a lag, a one percentage point increase in White incarceration decreases White male AIDS cases by .001%, while a one percentage point increase in White male incarceration decreases White male AIDS cases by .002%. In the lagged Black models, a one percentage point increase in Black incarceration decreases Black male AIDS cases by .002%, while a one percentage point in either Black male or Black female incarceration decreases Black male AIDS cases by .01%.

Table 4.12: Black and White Male State Population AIDS Negative Binomial Regression with Incarceration Rate and with and without One Year Lag

Independent Variable	Black Male AIDS Cases	White Male AIDS Cases	Black Male AIDS Cases (1 Year Lag)	White Male AIDS Cases (1 Year Lag)
Incarceration Rate	1.32e-06	-.00001**	-1.59e-06	-9.82e-06**
			(3.29e-06)	(2.84e-06)
			7.98e-06	-.00001*
Male Incarceration	1.82e-06	-.00002**	(5.51e-06)	(4.75e-06)
			-.00010*	-4.25e-06
Female Incarceration	-.00003	-.00006	(.00005)	(.00003)

*Significant at the .05 level

** Significant at .01 level

The Black Male lagged model shows a consistent finding for the effect of poverty, as in the previous Black models. The positive coefficient suggests that an increase in poverty is expected to increase Black male AIDS cases. This finding throughout the models appears applicable to Black AIDS cases, while for Whites, this variable's coefficients are consistently in the opposite direction. Along the same lines, in the Black male AIDS lagged model, the coefficient for social organizations is positive, suggesting that an increase in the number of social organizations increases Black male AIDS cases, similar to the finding for Black female AIDS cases. This finding is the only one to reach significance for racial male AIDS, but it is important to note that the coefficients for this variable are positive for both Black and White models, contrary to the previous White models. In lines with all the previous models, both Black and White models here suggest that reduced spending on health programs, younger populations, and lower chlamydia rates all indicate increased AIDS cases for both Black and White males.

Incarceration and Tuberculosis (TB)

Although the main focus on this investigation is HIV/AIDS, TB was examined for a couple of useful reasons. The first is to see if the relationship between HIV/AIDS and incarceration is similar to the relationship between TB and incarceration. It is possible that different infectious diseases may be tested at different rates or be differentially impacted by levels of incarceration or groups incarcerated. The second reason for the inclusion of TB is to further explore the conditional results found in Uggen et. al (2016), where incarceration decreases community levels of TB and syphilis but increases incidence of gonorrhea and chlamydia.[13] These scholars attribute the differential effect of incarceration to varying levels of disease testing for specific diseases in prisons. As Uggen's study is one of the first studies to find

such differential effects, the current study seeks to provide further evidence to confirm or challenge their assertion.

Data and Methods

While a full description of all variables may be found in Chapter 3, this section provides a brief overview of the variables pertinent to the subsequent models. The first set of TB models considers entire state population TB incidences in a year and entire state population TB incidences by gender. The dependent variable in the first model is the number of TB cases reported in a state in a given year. The dependent variable in the second model is the number of female TB cases in a state in a given year; in the third model, the dependent variable is the number of male TB cases in a state in a given year. The main independent variable, incarceration, is measured in two different ways. The first incarceration variable is a state's rate of incarceration in each year. This measure is considered for total incarceration rate, male incarceration rate, and female incarceration rate. The second measure of incarceration is the total number of releases from state prison in each year. Measure of total releases, male releases, and female releases are considered separately. The other covariates include state unemployment rate, state percent of population living in poverty, state marriage rate, state gross domestic product (GDP), percent of state population that is Black, percent of state population that is Hispanic, three age cohorts, state per capita spending on health programs, party of governor in each year, percent of state population holding a bachelor's degree or higher, percent of state population that used illicit drugs other than marijuana in the last year, and the number of social organizations recorded in a state under the county business patterns. Unlike in the earlier AIDS analysis, gonorrhea and chlamydia rate are excluded. While evidence exists that having a concurrent STD is a risk factor for contracting and transmitting HIV/AIDS, the same evidence does not

specifically behave as a risk factor for contracting TB. There is some evidence that having HIV itself may contribute to likelihood of contracting TB, but HIV is not necessarily a direct risk factor.

Negative binomial regression models are used to estimate the cases of TB on the set of independent variables. Since the dependent variables of interest are counts that require standardization across different size states, an exposure variable was added. In general, the exposure variable is the state population in each respective year. Where the dependent variable is female TB cases, the exposure variable is changed to state female population in a given year. Similarly, when the dependent variable is male TB cases, the exposure variable is state male population in the respective year. Models are estimated both with and without a one year lag of the dependent variable.

Results and Discussion

The results of the estimates of the negative binomial model without a lag and incarceration rates used as the measure of incarceration are displayed in Table 4.13, while the results using releases as the measure of incarceration are displayed in Table 4.14. In general, none of the incarceration variables reached statistical significance. However, all of coefficients are in the negative direction, suggesting that the lower incarceration level, the more cases of TB there are. Such results could be consistent with the previous conditional hypothesis that TB is more routinely tested for in prison settings, and therefore lower rates of TB could signal effective diagnosis and treatment within prisons.[2] While the direction of the coefficients is consistent with prior findings, these results cannot be used to as evidence to confirm those findings due to the lack of significant results. As this study uses a different and more recent time frame, there may be time elements that contribute to the varying results.

The only incarceration variable to reach statistical significance was female releases regressed on all TB and male TB cases. Converting the coefficients to incidence rate ratios, for each additional point increase in the number of female releases, there is an expected .01% decrease in the number of total TB cases and male TB cases (incidence rate ratio TB = exp(-.0000127)=.9999873; Male TB = exp(-.0000146)=.9999854). Although this is an extremely small effect, it is nonetheless significant and supports the previous evidence found by Uggen et. al (2016).[3] Importantly, this result explores the potential role of female incarceration in disease spread and/or intervention. While male incarceration still composes the lion share of the prison population, women are the fastest growing segment of the newly incarcerated population.[4] Most previous studies, with justification, have focused on the role of male incarceration. While men still make up the majority of all inmates, there is a growing need to consider the steady increase in female incarceration, especially as we seek to understand the role of incarceration in shaping disease profiles. These finding suggest that female incarceration may have a differential impact than male incarceration and deserves consideration when considering the detriments and the possible interventionist role of the prison system.

Table 4.13: Total State Population and Gendered TB Panel Negative Binomial Regression Coefficients with Incarceration Rates

Independent Variable	All TB Cases	Female TB Cases	Male TB Cases
Incarceration Rate	-5.23e-06	-.00002	-.00002
Male Incarceration Rate	3.41e-07	-7.00e-06	-7.75e-06
Female Incarceration Rate	-.00019	-.00019	-.00029
Total Releases	-1.03e-06	-7.80e-07	-1.28e-06
Male Releases	-1.10e-06	-7.81e-07	-1.40e-06
Female Releases	-.00001*	-.00001	-.00002*

*Significant at the .05 level
** Significant at .01 level

As for the other covariates, unemployment and percent of state population holding a bachelor's degree or higher are the most consistently significant across both measures of incarceration and all three TB measures. The coefficient on unemployment is opposite the intended direction of positive. The results show that the lower the unemployment rate, the more cases of TB across all measures. Unemployment is usually considered a risk factor for infectious disease, as lower socioeconomic status (SES) increases risk for TB, and unemployment is an indicator of lower SES.[5] Considering the incidence ratio rates, these findings contradict the conventional belief showing that a one percentage point increase in the unemployment rate results in nearly a 3.5% decrease in TB across total TB cases, female TB cases, and male TB cases. This result is relatively the same using both incarceration rate and number of releases as the measure of incarceration. One possible explanation of this is increased diagnosis of TB that coincides with higher insurance coverage or access to medical services. As employer-based insurance remains the top source of insurance on the United States, it is possible that the higher the level of employment, the greater the insurance coverage. Insurance coverage serves as a key access criterion for medical services, which are required for TB testing. If more people are going to the doctor, it is possible that more diagnoses are made strictly due to increased testing. In areas of lower employment, individuals may have contracted TB, but lack the means to be tested, resulting in fewer reported cases.

Percent of state population holding a bachelor's degree or higher, on the other hand, is in the hypothesized negative direction. The results indicate that lower educational attainment leads to increased cases of TB. Considering the incidence ratio rates, a one percent point increase in percent of population holding a bachelor's degree or higher decreases expected TB cases by 3.5% overall, 4.4% for females, and 3.3% for males. While all three of these percentages are

close, there is a slightly greater impact of educational attainment on female TB cases than male TB cases. These results are as expected given that higher educational attainment is correlated with decreased risk behaviors and increased medical access and compliance.

In a similar manner to the unemployment findings, the occasionally significant result for percent of state population living in poverty is negative and in the opposite direction as hypothesized. In general, the results indicate that the lower the percent of population living in poverty, the more TB cases are present. Previous research indicates that TB is often concentrated in poorer, lower SES areas. Some of the biggest impacts of poverty are crowded or close living quarters and homelessness, both of which increase one's likelihood of having TB.[6] Percent living in poverty was only significant for both measures of incarceration for female TB cases and for total TB cases when using incarceration rate as the measure of incarceration. Again, all three of these incidence ratio rates are extremely close, showing that a one percentage point increase in the percent of state population in poverty decreases intended TB cases around 2%.

Prior scholarship has drawn attention to the idea that infectious disease and incarceration may exhibit a lagged structure. The significance of the lagged structure makes sense as the assumption is that inmates must be released from a prison facility and reenter the community in order for diseases to spillover from inside prison to outside its walls. This spillover requires an incubation period, especially when using a measure such as incarceration rate. The incarceration rate measures the number of people currently in a correctional facility, ideally confining them from interaction with those outside of such facilities. Thus, lagging the infectious disease cases allows for the release of some individuals from prison, assuming some inmates are released every year, and for such infectious disease to permeate the larger community. While the number of releases more directly accounts for the mechanism of return to the community, there is still a

possible incubation period that needs to occur in order to give a disease time to spread. While this incubation period is not clearly defined in the current literature, there is some prior acknowledgement that this period is at least a year. To test this idea, the same TB models displayed in tables 4.13 and 4.6 were rerun to include a one year lag of the number of TB cases (dependent variable). The results of the lagged models are displayed in tables 4.14.

Table 4.14: Total State Population and Gendered TB Panel Negative Binomial Regression Coefficients with One Year Lag and Incarceration Rates and Releases

Independent Variable	All TB Cases (1 year lag)	Female TB Cases (1 year lag)	Male TB Cases (1 year lag)
	-1.90e-06	.00005	-.00005
Incarceration Rate	(.00002)	(.00004)	(.00003)
	2.44e-07	.0000663	-.00002
Male Incarceration Rate	(.00001)	(.0000303)	(.00001)
	-.00023	-.00053	-.00016
Female Incarceration Rate	(.00021)	(.00034)	(.00016)
	-2.79e-07	-6.79e-07	-4.98e-07
Total Releases	(3.30e-07)	(6.65e-07)	(4.14e-07)
	-2.47e-07	-7.46e-07	-4.93e-07
Male Releases	(3.70e-07)	(7.46e-07)	(4.65e-07)
	-5.66e-06*	-9.72e-06	-6.12e-06
Female Releases	(2.90e-06)	(5.87e-06)	(3.64e-06)

*Significant at the .05 level
** Significant at .01 level

One of the most interesting results of the models with lagged TB cases is the lack of significant results similar to the models without a lag. None of the results in the lagged model reached statistical significance for the incarceration rate or release coefficients. Female incarceration appears to have the largest effect of the three types of incarceration leading further credence to the need to increase focus and attention to the rise and impact of female incarceration. Also, similar to the no lagged results, the lagged findings have mostly negative coefficients. Such findings relay some evidence that incarceration itself may play an interventionist role in the public health strategy to handle diseases that can be easily and widely tested, such as TB. Given the extremely and marginally small impact these results show some

caution should be taken in wholesale jumping to the conclusion that incarceration reduces spread of disease. As with any public health strategy all cost and benefits need to be weighed such as effectiveness of testing versus cost of testing and treatment. Regardless, the results reaching statistical significance in the direction in which they did warrants further investigation and consideration.

While in general the results of the measuring incarceration as a rate or number of releases, produced similar results there were some differences. Interestingly, however, female incarceration appears to have a larger impact than both male and total incarceration again. Although the difference is small it exists. This provides additional evidence to consider female and male incarceration separately when considering impact on infectious disease spillover effects. Female releases also produced significant results for all three types of TB cases, total, male, and female, in the lagged models. This result is again very marginal although in line with some previous literature.

The covariates in the lagged model behaved similarly to how they behaved in the model without lagged dependent variables. Percent population living in poverty and percent holding a bachelor's degree or higher, and unemployment remained the consistently statistically significant across all three categories of TB and both measures of incarceration. They again were in the negative direction showing an increase in incarceration leads to a decrease educational attainment and poverty. The magnitude of these effects, however, was slightly different. With regards to percent holding a bachelor's degree or higher in the lagged models, a one percentage point increase in the percent holding at least a bachelor's degree decreases all three categories of TB cases by nearly 4%. This is overall a slightly higher magnitude of effect than in the models without the lags, but is less than half a percent different. As for poverty, a one percentage point

increase in poverty decreases all three categories of TB cases by around 2%. This is basically identical to the results found in the prior model without a lag. In the lagged models using both measures of incarceration, a one percentage point increase in the unemployment rate decreased total and male TB cases by around 1.8% which is smaller than the 3.5% decrease seen in the models without a lagged structure.

The lagged models, however, indicated some additional statistically significant results for state gross domestic product (GDP) and party of governor. With both measures of incarceration in the lagged models, a one percentage point increase in the state GDP decreased male and female TB cases by around .00006%. Only the lagged model using incarceration rate saw an increase in state GDP decrease all TB cases. This however was at a significantly small level. This effect is again only marginally, but nonetheless statistically significant. In the models without a lag, state GDP failed to reach statistical significance. As for party of the governor in the lagged models, the positive direction of the coefficients suggests that when significant, a democratic governor increases TB cases. Thus, having a democratic governor increased all TB cases by roughly 5% and female cases by roughly 10% for both measures of incarceration. In the models without a lag, having a democratic governor increased female TB cases by roughly 7%, but did not affect total or male TB cases. Overall, the lagged models did not perform any better or much different than the TB models without a lag.

The last set of TB models explores racial differences with and without a one year lag. In these models, several of the dependent variables are changed to race specific measures. First, total incarceration rate is changed to total Black incarceration in the Black TB models and total White incarceration in the White TB models. The gendered measures of incarceration are also divided into racial subgroups. In the Black models, male incarceration is the Black male

incarceration rate, while female incarceration is the Black female incarceration rate. The same concept applies to the White models. Similarly, the unemployment rate variable is broken down along racial lines. In the Black models, unemployment is measured as the state Black unemployment rate, while in the White models, unemployment is measured as state White unemployment rate. Lastly, the age cohorts are measured as race specific. In the Black models, each age cohort is the number of Black sin the population in that age cohort. The same is applicable for the White age cohorts; each group is measured as the number of White individuals in a state in that age group.

Results for these models are found in Table 4.15. The first two columns of coefficients are from models without a lagged dependent variable, and the last two columns show the racial models with a one year lagged dependent variable. The racial models are run using only incarceration rates, excluding the number of releases due to data limitations. The number of annual releases was only available in total and for gendered subgroups, not for racial subgroups.

Table 4.15: Racial Group State Population TB Panel Negative Binomial Regression Coefficients with and without One Year Lag and Incarceration Rates

Independent Variable	Black TB Cases	White TB Cases	Black TB Cases (1 year lag)	White TB Cases (1 year lag)
Incarceration Rate	6.96e-06	-4.53e-06	8.35e-06 (8.02e-06)	-.00001 (.00001)
Male Incarceration Rate	7.38e-06	-3.53e-06	8.53e-06 (8.69e-06)	-.00001 (.00001)
Female Incarceration Rate	.00006	-.00009	.00011 (.00008)	-.00022* (.00011)

*Significant at the .05 level
** Significant at .01 level

None of the measures of incarceration reached statistical significance for any of the three TB categories. Given these results, it does not appear that incarceration leads to racial differences in the disease spread of TB. Similar to the previous models, unemployment is the only covariate

that is consistently significant across all models. All four coefficients are again in the negative direction, suggesting that an increase in unemployment decreases Black and White TB cases. Using the incidence ratio rates, a one percentage point increase in Black unemployment decreases Black TB cases by 1.4%. A one percentage point increase in White unemployment decreases White TB cases by roughly 4% in both models with and without a one year lag. These results are similar to those in the total TB case models, where it was posited that lower unemployment could signal greater access to insurance coverage through employers and greater diagnoses.

Conclusion

The main purpose of this chapter was to contribute to the research on the relationship between incarceration and AIDS. In undertaking this endeavor, multiple cuts were used to investigate this relationship from a macro level to a more fine-grained racial and gender specific level. The general hypothesis was that higher levels of incarceration will increase the number of AIDS cases in the general population. For the most part, the results in this chapter disprove this hypothesis. Whether or not the results reached statistical significance, taking all the models together, the main finding was that the levels of incarceration seem to decrease AIDS cases in the general population. This conclusion needs to be carefully considered and cautiously generalized. There are many societal costs to our current system of mass incarceration. On the surface, these results can be interpreted to show that incarceration is a positive, especially in the etiology of disease spread. Without further thought, incarceration can appear to be a solution to reducing the AIDS epidemic, but before such as vast conclusion is considered, a deeper look into what is driving these results is needed.

As mentioned briefly in the Results and Discussion section, there are two possible reasons incarceration may be associated with fewer general AIDS cases. The reasons center on the confinement of persons versus the possible intervention that incarceration can provide. In terms of confinement, incarceration may lock up people who are most predisposed to partake in risky behaviors that lead to contracting AIDS. This line of thought assumes that such risky behaviors are prohibited or at least reduced within the prison setting. These behaviors include sexual practices, drug use, needle sharing, tattooing, and other involvement in activities that increase the risk of AIDS contraction or transmission. Pushing this argument a step further, if prison forces a break from such activities, it is likely that such a refrain from risky activity can be maintained upon release back into society. If fewer individuals are involved in risky behavior, there is a reduced risk of disease spread, and more often than not, reduced risk leads to fewer incidences of disease. According to safety protocols and practices in prisons, objects such as needles and drugs are considered contraband and counter to security and control efforts. Although prisons are viewed as highly authoritative and confining environments, many researchers have found that widespread risk behaviors, such as tattooing, drug use, and sexual activity, do occur within prison walls. Since needles are prohibited items in prisons, the needles that do exists are often shared for activities such as tattooing. Similarly, sexual activity is over prevalent in prison settings, due to the confinement from intimate partners left in the community, which gives rise to a need for a sexual outlet in a context that lacks sufficient supervision.[16] In other cases, prison serves as a place where some are introduced to deviant behavior, including drug use and other activities. For these reasons, it is unlikely that it is simply the confinement of prison itself that leads to a reduction of broader AIDS cases.

On the other hand, the alternative explanation is that prison, as an institution, is providing some type of intervention in the course of disease spread. It is well established that incarceration disproportionately burdens poorer, resource-deprived, minority communities. These communities are simultaneously at higher risk for contracting AIDS. This structure means that prisons can serve as a net that catches a substantial portion of the population most at risk for AIDS. While confined, inmates are entitled to some level of medical care, and prison often represents the first interaction with health services for many inmates. Growing attention to the AIDS epidemic has led to increased discussion and implementation of HIV testing. The possibilities of testing to prevent disease spread are many fold. First, through testing, individuals must acknowledge their diseases status. Knowing one's status can potentially guide an individual's decision-making process when it comes to sexual behaviors and other activities. Not knowing one's status increases the risk of spread, as it means that a person may be less likely to practice safe behaviors. Simple awareness has been shown to increase safer sex practices.

Secondly, testing itself does not need to be an isolated medical test. Many HIV recommendations propose the use of testing in conjunction with education and counseling services.[17] Education and counseling can teach positive individuals how to prevent transmission of their disease, help positive individuals approach their partners, allow for consultations with positive individuals on the importance of complying with medication regimes, and dispel common misconceptions that can increase risk, including how disease spreads and who contracts the disease. The structure of the prison setting also aids in the possibility for wide spread testing. Given the limited autonomy of inmates, it is reasonable to assume that prisons can require HIV testing for all inmates. That level of requirement is the most ideal condition for such an intervention. Regardless, given the population in prison, its strict structure, and its presumed

existing health apparatus, prisons serve as a promising site for intervention in the lives of those most likely to contract AIDS. Toward this last point, this study has only provided evidence that this possibility exists, but has not been able to test such a theory directly. The remainder of this study will seek to directly unpack the relationship between incarceration and HIV/AIDS further, as well as to land an empirical test with regard to the impact of testing within correctional facilities.

Even though most of this chapter and conclusion focuses on AIDS, it is possible that this concept may extend to other infectious diseases such as TB. The proposed relationship or interventionist role of incarceration is further given credence by the results of the TB empirical section. Those results also produced findings that show an increase in incarceration associated with a decrease in TB cases in the general population. Moreover, this finding provides increased reason to explore and identify the possible characteristics of prison that are directly driving this relationship. A first stab at such an understanding is undertaken in Chapter 6, as an exploration of various types of state HIV testing conditions. Before moving to the testing chapter, a final look at the incarceration-infectious disease link is investigated by moving the study to HIV data. This added investigation is needed for two main reasons. The first is due to the limitations of AIDS data; given the length of time it takes for the disease to seroconvert to AIDS, HIV allows for a more direct test of the proposed relationship. Most people when diagnosed are diagnosed with HIV, not AIDS, and there are several factors that alter the time it takes for the transition. Second, there are inconsistent findings with regard to using the one year lag. Considering the reasons just mentioned for AIDS, the lag structure is more likely to produce results for HIV, if they do exist. Lastly, although HIV testing is related to AIDS, it is preferable to segue into the testing chapter after an investigation and discussion of HIV data, specifically. Considering the

advancements in testing and antiretroviral medications, there are several confounding factors that would impact AIDS and testing more so that HIV testing. Due to this testing in this study is test with regards to HIV.

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Appendix A: Chapter 4 Appendices

Appendix A.1: Female State Population AIDS Negative Binomial Regression with Incarceration Rate (Including Transmission Mechanisms)

Independent Variable	Female AIDS Cases	Female AIDS IV Transmission	Female AIDS Heterosexual Transmission
Incarceration Rate	.0000215	-.0000906	-.0000661*
Male Incarceration	-.0000371	-.0000466	-.0000302
Female Incarceration	-.0003586	-.0005174	-.0003664
Unemployment	-.018789*	-.0202306	-.0136052**
Poverty	-.0104097	.0059726	-.0170452**
Marriage Rate	-.0018775	.0046929	-.0029091
State GDP	-4.02e-07	-4.63e-07	-2.20e-07
Percent Black	-.0505446	.0063569	-.0092021
Percent Hispanic	-.0027238	-.0214727	.0249988
24 and Under	9.65e-07**	2.86e-07	1.20e-06**
25 to 44	-6.39e-07*	1.68e-07	-8.14e-07**
45 and older	-2.30e-07**	-3.11e-07**	-3.30e-07
Spending on Health programs (per capita)	-.0009384**	-.0015031**	-.00101**
Governor Party	-.0168219	-.0220375	-.0234071
Percent holding a Bachelors' or higher	-.0271741**	-.054914**	-.0302535**
Chlamydia Rate	-.001052**	-.0018095**	-.0006649**

Gonorrhea Rate	-.0011484	-.0004053	-.0008282*
Percent Drug Use (except Marijuana)	.0201205	.0293192	.0106415
Number of Social Organizations	-.0007145**	-.0006369**	-.0005431

*Significant at the .05 level
** Significant at .01 level

Appendix A.2: Female State Population AIDS Negative Binomial Regression with Incarceration Measured as Releases (Including Transmission Mechanisms)

Independent Variable	Female AIDS Cases	Female AIDS IV Transmission	Female AIDS Heterosexual Transmission
Total Releases	-1.51e-06*	-1.55e-06	-1.59e-06**
Male Releases	-1.68e-06*	-1.72e-06	-1.77e-06**
Female Releases	-.0000149*	-.000019	-.0000148**
Unemployment	-.0174658*	-.0186479	-1.59e-06*
Poverty	-.0095816	.0074486	-.0159889
Marriage Rate	-.0025284	.0044278	-.0046858
State GDP	-4.00e-07	-4.60e-07	-2.59e-07
Percent Black	-.072632	.0113208	-.0829901
Percent Hispanic	.0278413	-.0620506	.0449954
24 and Under	9.96e-07**	1.56e-07	-8.79e-07**
25 to 44	-6.77e-07**	2.99e-07	1.14e-06**
45 and older	-2.52e-07**	-3.09e-07**	-2.55e-07**
Spending on Health programs (per capita)	-.0010873**	-.0014206**	-.0009176**
Governor Party	-.0184117	-.0262641	-.0155918
Percent holding a Bachelors' or higher	-.0206062*	-.0526223**	-.0107846

Chlamydia Rate	-.0012169**	-.0018428**	-.0009876**
Gonorrhea Rate	-.0010317	-.0004424	-.0011295
Percent Drug Use (except Marijuana)	.0040428	.0271909	-.0001118
Number of Social Organizations	-.0006357**	-.0006198**	-.0006362**

*Significant at the .05 level
** Significant at .01 level

Appendix A.3: Female State Population AIDS Negative Binomial Regression with Incarceration Rates and One Year Lag (Including Transmission Mechanisms)

Independent Variable	**Female AIDS Cases (1Year Lag)**	**Female AIDS IV Transmission (1 Year Lag)**	**Female AIDS Heterosexual Transmission (1 Year Lag)**
Incarceration Rate	-.00002	.00006	-.00005
	(.00003)	(.00008)	(.00003)
	-9.40e-06	.00012	-.00003
Male Incarceration Rate	(.00001)	(.00060)	(.00002)
	.00009	-.00002	-.00006
Female Incarceration Rate	(.00016)	(.00084)	(.00018)
	-.03715**	-.04372**	-.03216**
Unemployment	(.00458)	(.01329)	(.00516)
	.00722	.00251	.00656
Poverty	(.00484)	(.01265)	(.00544)
	-3.88e-06	.00022	.00027
Marriage Rate	(.00227)	(.00557)	(.00254)
	-2.65e-08	-3.16e-07	1.87e-07
State GDP	(1.49e-07)	(4.25e-07)	(1.68e-07)
	.09886*	.036918	.11669*
Percent Black	(.04619)	(.13952)	(.05202)
	.21011**	.27475	.22432**
Percent Hispanic	(.05164)	(.14648)	(.05963)
	9.68e-07**	4.31e-07	1.08e-06
24 and Under	(1.50e-07)	(3.82e-07)	(1.71e-07)
	-4.61e-07**	3.59e-08	-6.01e-07**
25 to 44	(1.66e-07)	(4.22e-07)	(1.89e-07)
	-2.74e-07**	-3.14e-07**	-3.27e-07**
45 and older	(4.34e-08)	(1.05e-07)	(4.86e-08)
Spending on Health programs (per capita)	-.00156**	-.00253**	-.00125**
	(.00023)	(.00058)	(.00026)
	-.02757*	.02098	-.02714

Governor Party	(.01406)	(.04093)	(.01619)
Percent holding a Bachelors' Degree or higher	-.04835** (.00573)	-.07391** (.01485)	-.04170 (.00657)
Chlamydia Rate	-.00042** (.00013)	-.00093* (.00038)	-.00029 (.00015)
Gonorrhea Rate	-.00054 (.00038)	-.00043 (.00120)	-.00042 (.00042)
Percent Drug Use (except Marijuana)	.00531 (.01755)	.04881 (.04905)	-.01376 (.01999)
Number of Social Organizations	.00003 (.00013)	-.00068** (.00026)	-9.86e-06 (.00014)

*Significant at the .05 level
** Significant at .01 level

Appendix A.4: Female State Population AIDS Negative Binomial Regression with Incarceration Rates and One Year Lag (Including Transmission Mechanisms)

Independent Variable	Female AIDS Cases (1 Year Lag)	Female AIDS IV Transmission (1 Year Lag)	Female AIDS Heterosexual Transmission (1 year Lag)
Total Releases	-1.66e-06* (6.86e-07)	-3.81e-07 (1.16e-06)	-1.60e-06** (4.48e-07)
Male Releases	-1.84e-06* (7.71e-07)	-3.75e-07 (1.31e-06)	-1.79e-06** (5.04e-07)
Female Releases	-.00001* (6.01e-06)	-2.86e-06 (9.97e-06)	-.00001** (3.90e-06)
Unemployment	-.03196** (.00827)	-.04155** (.01348)	-.02876** (.00527)
Poverty	.00990 (.00774)	.00390 (.01273)	.00907 (.00550)
Marriage Rate	-.00044 (.00325)	.00037 (.00557)	.00017 (.00254)
State GDP	6.82e-09 (2.44e-07)	-2.73e-07 (4.34e-07)	2.29e-07 (1.69e-07)
Percent Black	.05272 (.08164)	.03112 (.13877)	.11764* (.05202)
Percent Hispanic	.22137** (.08818)	.28880* (.14618)	.20270** (.05961)
24 and Under	9.03e-07** (2.30e-07)	3.90e-07 (3.81e-07)	1.06e-06** (1.69e-07)
25 to 44	-5.11e-07* (2.57e-07)	5.04e-08 (4.25e-07	-5.91e-07** (1.89e-07)

45 and older	-3.25e-07** (6.13e-08)	-3.16e-07** (1.07e-07)	-3.42e-07** (4.84e-08)
Spending on Health programs (per capita)	-.00150** (.00034)	-.00259** (.000587)	-.00121** (.00026)
Governor Party	-.01285 (.02424)	.01758 (.04102)	-.03267* (.01625)
Percent holding a Bachelors' or higher	-.05129** (.00926)	-.07420 (.01492)	-.03918** (.00662)
Chlamydia Rate	-.00055** (.00023)	-.00091* (.00038)	-.00033* (.00015)
Gonorrhea Rate	-.00046 (.00069)	-.00019 (.00117)	-.00026 (.00043)
Percent Drug Use (except Marijuana)	-.00942 (.02839)	.05098 (.04884)	-.01776 (.01988)
Number of Social Organizations	-.00042** (.00015)	-.00066** (.00026)	-.00005 (.00014)

*Significant at the .05 level
** Significant at .01 level

Appendix A.5: Male State Population AIDS Negative Binomial Regression with Incarceration Rate (Including Transmission Mechanisms)

Independent Variable	Male AIDS Cases	Male AIDS IV Transmission	Male AIDS Heterosexual Transmission
Incarceration Rate	-.0000786*	-.0000389	-.0000984*
Male Incarceration	-.0000374*	-.0000174	-.0000481*
Female Incarceration	-.0006522**	-.0004416	-.0006775**
Unemployment	-.0275972**	-.032273*	-.0126465*
Poverty	-.0076081	-.032273	-.0139741
Marriage Rate	.0011855	.0037421	-.0003564
State GDP	-1.04e-06**	-3.53e-07	-1.05e-06*
Percent Black	-.0115817	.0042226	.0514522
Percent Hispanic	-.0070101	-.0452373	.0884572
24 and Under	7.11e-07**	1.30e-07	1.08e-06**

25 to 44	-3.59e-07*	2.05e-07	-7.72e-07**
45 and older	-1.73e-07**	-2.00e-07*	-3.46e-07**
Spending on Health programs (per capita)	-.0009074**	-.0011924*	-.000459
Governor Party	-.0589086**	.0116127	-.0551469**
Percent holding a Bachelors' or higher	-.0386919**	-.0468862**	-.0232044**
Chlamydia Rate	-.0010765**	-.0023579**	-.0004753**
Gonorrhea Rate	-.0003544	-.0009227	-.0006595
Percent Drug Use (except Marijuana)	.010626	-.0381855	.0339653
Number of Social Organizations	-.0003612**	-.0003118	-.0008954**

*Significant at the .05 level
** Significant at .01 level

Appendix A.6: Male State Population AIDS Negative Binomial Regression with Incarceration Measured as Releases (Including Transmission Mechanisms)

Independent Variable	Male AIDS Cases	Male AIDS IV Transmission	Male AIDS Heterosexual Transmission
Total Releases	-1.40e-06	-1.26e-06	-1.70e-06
Male Releases	-1.51e-06	-1.30e-06	-1.87e-06
Female Releases	-.0000152*	-.0000172	-.0000163*
Unemployment	-.0157002	-.0311152*	-.0082414
Poverty	-.0098924	-.0044848	-.0101639
Marriage Rate	.0021196	.00356	-.000813
State GDP	-6.49e-07*	-3.36e-07	-6.52e-07
Percent Black	.0033482	.0077506	-.0139611
Percent Hispanic	.0006398		-.0087951

		-.0698856	
24 and Under	8.70e-07**	1.08e-07	9.88e-07**
25 to 44	-5.33e-07	2.16e-07	-6.24e-07
45 and older	-2.31e-07**	-2.00e-07 *	-2.78e-07**
Spending on Health programs (per capita)	-.0006954	-.0011587*	-.0000713
Governor Party	-.0423208	.0053257	-.085576**
Percent holding a Bachelors' or higher	-.0381091**	-.0455693**	-.0196916
Chlamydia Rate	-.0013793**	-.0023458*	-.0005434
Gonorrhea Rate	-.0010548	-.0008208	-.0012841
Percent Drug Use (except Marijuana)	-.0043903	-.0397485	.0510719
Number of Social Organizations	-.0002794	-.0002926	-.0002654

*Significant at the .05 level
** Significant at .01 level

Appendix A.7: Male State Population AIDS Negative Binomial Regression with Incarceration Rate and One Year Lag (Including Transmission Mechanisms)

Independent Variable	**Male AIDS Cases**	**Male AIDS IV Transmission**	**Male AIDS Heterosexual Transmission**
Incarceration Rate	-9.91e-06	.00004	-.00008
	(.00003)	(.00007)	(.00004)
	-8.63e-06	.00002	-.000046*
Male Incarceration	(.00002)	(.00004)	(.00002)
	.00032	.000641	-7.76e-06
Female Incarceration	(.00018)	(.00043)	(.00025)
	-.04309**	-.03386**	-.04299**
Unemployment	(.00535)	(.01303)	(.00690)
	.00120	-.00415	.00379
Poverty	(.00586)	(.01259)	(.00765)
	.00251	.00625	-.00056
Marriage Rate	(.00287)	(.00533)	(.00386)
	-8.89e-07	-3.22e-07	-8.26e-07**

State GDP	(1.73e-07)	(3.90e-07)	(2.26e-07)
	.06881	.05950	.07393
Percent Black	(.05415)	(.13239)	(.07005)
	-.06929	.26224	-.19788**
Percent Hispanic	(.06031)	(.1451725)	(.08412)
	5.17e-07**	4.68e-07	5.79e-07**
24 and Under	(1.74e-07)	(3.80e-07)	(2.30e-07)
	-7.45e-08	-7.93e-10	-2.75e-07
25 to 44	(1.91e-07	(4.09e-07)	(2.55e-07)
	-7.44e-09	-2.61e-07**	-4.94e-08
45 and older	(4.95e-08)	(8.85e-08)	(6.32e-08)
Spending on Health programs (per capita)	-.00055*	-.00081	-.00018
	(.00027)	(.00055)	(.00036)
Governor Party	-.06345**	.02216	-.08257**
	(.01617)	(.04165)	(.02219)
Percent holding a Bachelors' or higher	-.05025**	-.05762**	-.04178**
	(.00661)	(.01419)	(.00899)
Chlamydia Rate	-.00101**	-.00241**	-.00030
	(.00016)	(.00039)	(.00021)
Gonorrhea Rate	-.00004	.00034	-.00027
	(.00044)	(.00116)	(.00058)
Percent Drug Use (except Marijuana)	-.01867	-.04977	-.01129
	(.02056)	(.04438)	(.02783)
Number of Social Organizations	.00034*	-.00047*	.00019
	(.00014)	(.00023)	(.00018)

*Significant at the .05 level
** Significant at .01 level

Appendix A.8: Male State Population AIDS Negative Binomial Regression with Incarceration Measured as Releases and One Year Lag (Including Transmission Mechanisms)

Independent Variable	Male AIDS Cases	Male AIDS IV Transmission	Male AIDS Heterosexual Transmission
Total Releases	-1.28e-06	-1.02e-06	-1.51e-06
	(7.50e-07)	(1.12e-06)	(8.42e-07)
Male Releases	-1.39e-06	-1.11e-06	-1.62e-06
	(8.38e-07)	(1.26e-06)	(9.44e-07)
Female Releases	-8.85e-06	-7.74e-06	-.00001
	(6.55e-06)	(9.80e-06)	(7.35e-06)
	-.04134**	-.0314226*	-.043514**

Unemployment	(.00925)	(.0132729)	(.0106261)
	.00995	-.0021634	.012554
Poverty	(.00936)	(.0126807)	(.0112558)
	.00192	.0061525	-.0029189
Marriage Rate	(.00418)	(.0053178)	(.0053597)
	-6.87e-07**	-2.89e-07	-7.45e-07*
State GDP	(2.65e-07)	(4.01e-07)	(3.05e-07)
	.06796	.0485315	.0636067
Percent Black	(.09053)	(.1319485)	(.1038166)
	-.02797	.2645351	-.3291217**
Percent Hispanic	(.10238)	(.1461984)	(.123911)
	5.26e-07*	4.26e-07	3.68e-07
24 and Under	(2.46e-07)	(3.83e-07)	(2.96e-07)
	-2.05e-07	1.08e-08	-1.11e-07
25 to 44	(2.77e-07)	(4.15e-07)	(3.37e-07)
	-9.96e-08	-2.63e-07**	-3.55e-08
45 and older	(6.47e-08)	(9.00e-08)	(7.55e-08)
Spending on Health programs (per capita)	-.00021	-.0008401	.0003226
	(.00039)	(.0005521)	(.0004597)
Governor Party	-.05197	.0123739	-.1067296**
	(.02715)	(.0413891)	(.0317307)
Percent holding a Bachelors' or higher	-.05113**	-.0567347**	-.0444998**
	(.01044)	(.0142442)	(.0120399)
Chlamydia Rate	-.00119**	-.0023723**	-.0002984
	(.00027)	(.0003882)	(.0003126)
Gonorrhea Rate	-.00011	.0006267	-.0006332
	(.00081)	(.0011341)	(.0009096)
Percent Drug Use (except Marijuana)	-.03124	-.0466782	-.0061461
	(.03236)	(.0442843)	(.0396916)
Number of Social Organizations	1.50e-06	-.0004537*	.00025
	(.00020)	(.000232)	(.0002109)

*Significant at the .05 level
** Significant at .01 level

Appendix A.9: Black State Population AIDS Negative Binomial Regression with Incarceration Rate (Including Transmission Mechanisms)

Independent Variable	Black AIDS Cases	Black AIDS IV Drug Use	Black AIDS Heterosexual Contact
Black Incarceration Rate	.00002	.00003	.00003*

Black Male Incarceration Rate	.00002	.00003	.00003*
Black female Incarceration Rate	.00022	.00043	.00026**
Unemployment	-.01134*	-.01904	-.01448*
Poverty	.01030	-.00802	-.00859
Marriage Rate	.00962	.07408	-.00088
State GDP	-9.39e-08	-1.63e-06*	-4.63e-08
Percent Black	-.05991	-.21641	.05599
Percent Hispanic	-.03540	-.13736	-.08986
24 and Under	1.44e-07	-.00001	2.04e-07
25 to 44	-3.34e-06	8.54e-06	-1.03e-06
45 and older	5.86e-07	9.94e-07	3.85e-08
Spending on Health programs (per capita)	-.00147*	-.00141	-.00108
Governor Party	.02439	.17962*	-.01235
Percent holding a Bachelors' Degree or higher	-.00466	.00589	-.00452
Chlamydia Rate	-.00043	-.00156	-.00022
Gonorrhea Rate	-.00190	-.00383*	-.00268*
Percent Drug Use (except Marijuana)	.02774	-.01342	.08811*
Number of Social Organizations	.00065**	.00068	.00043

*Significant at the .05 level
** Significant at .01 level

Appendix A.10: Black State Population AIDS Negative Binomial Regression with Incarceration Rate and One Year Lag (Including Transmission Mechanisms)

Independent Variable	Black AIDS Cases	Black AIDS IV Drug Use	Black AIDS Heterosexual Contact
Black Incarceration Rate	-1.86e-06	9.49e-06	7.64e-07

	(6.44e-06)	(.00001)	(6.14e-06)
	-1.58e-06	8.32e-06	1.58e-06
Black Male Incarceration Rate	(6.95e-06)	(.00001)	(6.65e-06)
	-.00006	.00019	-.00006
Black Female Incarceration Rate	(.00007)	(.00011)	(.00006)
	-.0125937**	-.02129**	-.01824**
Unemployment	(.00421)	(.00722)	(.00459)
	.00697	.00002	.00222
Poverty	(.00754)	(.01327)	(.00829)
	.00286	.00814	-.01198
Marriage Rate	(.00477)	(.00907)	(.00642)
	1.27e-07	3.35e-09	1.82e-07
State GDP	(2.26e-07)	(3.59e-07)	(2.46e-07)
	-.01567	.01148	.08051
Percent Black	(.08203)	(.14196)	(.08362)
	.10390	.17869	.00003
Percent Hispanic	(.09671)	(.15313)	(.09672)
	2.19e-06	1.39e-06	2.23e-06
24 and Under	(1.25e-06)	(2.01e-06)	(1.16e-06)
	-2.56e-06	5.36e-07	-1.99e-06
25 to 44	(1.34e-06)	(2.15e-06)	(1.33e-06)
	-7.47e-07	-2.92e-06**	-7.05e-07
45 and older	(5.12e-07)	(8.82e-07)	(5.26e-07)
Spending on Health programs	-.00059	-.00185**	-.00041
(per capita)	(.00036)	(.00068)	(.00040)
	-.04707	-.01408	-.06981**
Governor Party	(.02528)	(.04835)	(.02772)
Percent holding a Bachelors'	-.02169*	-.04166**	-.02337*
Degree or higher	(.00949)	(.01636)	(.01060)
	-.00038	-.00077	-.00041
Chlamydia Rate	(.00024)	(.00043)	(.00027)
	-.00011	.00028	.00024
Gonorrhea Rate	(.00070)	(.00115)	(.00073)
Percent Drug Use (except	-.09964**	-.04633	-.09269**
Marijuana)	(.03024)	(.05429)	(.03371)
	.00011	-.00018	.00031
Number of Social Organizations	(.00017)	(.00031)	(.00021)

*Significant at the .05 level
** Significant at .01 level

Appendix A.11: White State Population AIDS Negative Binomial Regression with Incarceration Rate (Including Transmission Mechanisms)

Independent Variable	White AIDS Cases	White AIDS IV Drug Use	White AIDS Heterosexual Contact
White Incarceration Rate	-.0000127**	-.0000878**	-6.71e-06
White Male Incarceration	.0000315	-.0001016**	-8.67e-06
White Female Incarceration	-.0000716*	-.0003796	.0001463
Unemployment	-.0177065*	-.058655*	-.0183035
Poverty	.0007186	-.0091677	-.0311504*
Marriage Rate	.0044556	-.0136976	-.0016385
State GDP	-6.76e-07*	-1.43e-06	-1.41e-06*
Percent Black	-.1234156	-.2723961	-.1281165
Percent Hispanic	.0494894	-.260605	-.0432399
24 and Under	1.50e-06**	3.71e-06*	-.0432399*
25 to 44	-1.14e-06**	-1.86e-06	-1.34e-06
45 and older	-2.04e-07*	-6.03e-07	1.25e-07
Spending on Health programs (per capita)	-.0005274	-.0000635	-.0000505
Governor Party	-.0310787	-.1776254**	-.0916382
Percent holding a Bachelors' or higher	-.0081907	-.0195481	.0101603
Chlamydia Rate	-.0012506**	-.0012294	-.0013001**
Gonorrhea Rate	-.0001454	-.0018645	-.0001174
Percent Drug Use (except Marijuana)	-.0081907	-.0226029	.0128915
Number of Social Organizations	-.0000585	-.0010703	-.0005349

*Significant at the .05 level
** Significant at .01 level

Appendix A.12: White State Population AIDS Negative Binomial Regression with Incarceration Rate and One Year Lag (Including Transmission Mechanisms)

Independent Variable	White AIDS Cases	White AIDS IV Drug Use	White AIDS Heterosexual Contact
White Incarceration Rate	-1.21e-06	4.14e-06	4.33e-06
	(5.24e-06)	(9.51e-06)	(7.97e-06)
	-1.60e-06	4.37e-06	6.00e-06
White Male Incarceration	(5.81e-06)	(.00001)	(8.88e-06)
	-.00004	.00004	-.00003
White Female Incarceration	(.00011)	(.00008)	(.00006)
	-.02351	-.03584	-.03534*
Unemployment	(.00789)	(.01997)	(.01724)
	-.00663	.00298	.03111*
Poverty	(.00644)	(.01716)	(.01505)
	.00279	-.00248	-.00142
Marriage Rate	(.00288)	(.00772)	(.00771)
	-1.25e-07	-4.52e-07	3.52e-07
State GDP	(3.02e-07)	(6.82e-07)	(5.69e-07)
	-.07715	.00401	.09992
Percent Black	(.07094)	(.17316)	(.14671)
	.30851**	.3813*	.35730*
Percent Hispanic	(.07682)	(.19240)	(.17094)
	1.03e-06**	-9.19e-07	4.61e-07
24 and Under	(3.60e-07)	(8.95e-07)	(7.54e-07)
	-6.11e-07	1.41e-06	3.10e-07
25 to 44	(3.53e-07)	(8.51e-07)	(7.31e-07)
	-4.62e-07**	-2.15e-07	-2.80e-07
45 and older	(1.16e-07)	(2.05e-07)	(1.90e-07)
Spending on Health programs	-.00063*	-.00037	-.00017
(per capita)	(.00030)	(.00079)	(.00069)
	-.00334	-.03039	-.03902
Governor Party	(.02138)	(.05563)	(.04766)
Percent holding a Bachelors'	-.01952**	-.04361*	-.04664**
or higher	(.00791)	(.01878)	(.01769)
	-.00147**	-.00202**	-.00150**
Chlamydia Rate	(.00019)	(.00052)	(.00043)
	.00098	.00202	.00123
Gonorrhea Rate	(.00059)	(.00159)	(.00136)
Percent Drug Use (except	-.06914**	-.02673	.04504
Marijuana)	(.02194)	(.05347)	(.04880)
Number of Social	-.00066**	-.00119**	-.00107**

Organizations	(.00020)	(.00039)	(.00037)

*Significant at the .05 level
** Significant at .01 level

Appendix A.13: Black and White Female State Population AIDS Negative Binomial Regression with Incarceration Rate and with and without One Year Lag

Independent Variable	Black female AIDS Cases	White Female AIDS Cases	Black female AIDS Cases (1 Year Lag)	White Female AIDS Cases (1 Year Lag)
Incarceration Rate	.00001	-9.28e-06	7.97e-07	9.75e-06
			(7.15e-06)	(7.96e-06)
			1.28e-06	.00001
Male Incarceration	.00001	-.00006*	(7.69e-06)	(8.86e-06)
			-.00003	.00003
Female Incarceration	.00007	-2.07e-06	(.00007)	(.00006)
			-.01865**	-.01979
Unemployment	-.01022*	-.03273	(.00496)	(.01704)
			.00637	.01729
Poverty	-.00584	.00221	(.00891)	(.01463)
			-.00848	.001868
Marriage Rate	-.00291	.00657	(.00622)	(.00703)
			3.00e-07	5.63e-07
State GDP	-8.38e-08	-1.26e-06*	(2.75e-07)	(5.67e-07)
			.01986	.12960
Percent Black	.01538	-.11606	(.09358)	(.14673)
			.10860	.69091**
Percent Hispanic	-.05915	-.15548	(.10434)	(.16498)
			2.10e-06	-4.04e-07
24 and Under	2.46e-06	1.49e-06*	(1.32e-06)	(7.04e-07)
			-1.49e-06	1.01e-06
25 to 44	-1.67e-06	-9.71e-07	(1.46e-06)	(6.87e-07)
			-1.40e-06*	-3.85e-07*
45 and older	-1.63e-06**	-7.80e-08	(5.76e-07)	(1.77e-07)
Spending on Health programs (per capita)	-.00082	-.00083	-.00113**	-.00066
			(.00044)	(.00068)
			-.03863	-.03911
Governor Party	-.05081	-.09033	(.02990)	(.04818)
Percent holding a Bachelors' Degree or higher	-.01510	-.00025	-.02352*	-.05539**
			(.01167)	(.01747)
			-.00040	-.00143**
Chlamydia Rate	-.00061*	-.00156**	(.00029)	(.00042)
			.00008	.00211

Gonorrhea Rate	-.00094	-.00118	(.00079)	(.00133)
Percent Drug Use (except Marijuana)	-.05666	.02774	-.09147** (.03622)	.03672 (.04777)
Number of Social Organizations	-.00026	-.00071*	.00011 (.00026)	-.00128** (.00032)

*Significant at the .05 level
** Significant at .01 level

Appendix A.14: Black and White Male State Population AIDS Negative Binomial Regression with Incarceration Rate and with and without One Year Lag

Independent Variable	Black Male AIDS Cases	White Male AIDS Cases	Black Male AIDS Cases (1 Year Lag)	White Male AIDS Cases (1 Year Lag)
Incarceration Rate	1.32e-06	-.0000132**	-1.59e-06 (3.29e-06)	-9.82e-06** (2.84e-06)
Male Incarceration	1.82e-06	-.000015**	7.98e-06 (5.51e-06)	-.00001* (4.75e-06)
Female Incarceration	-.0000264	-.0000621	-.00010* (.00005)	-4.25e-06 (.00003)
Unemployment	-.0074599	-.0155775	-.01199** (.00246)	-.02980** (.00615)
Poverty	.0041872	.0003299	.00583 (.00443)	-.00321 (.00558)
Marriage Rate	.0061173	.0045373	.0085098** (.0032717)	.00398 (.00245)
State GDP	2.14e-07	-5.76e-07*	-4.81e-09 (1.47e-07)	-3.86e-07* (2.00e-07)
Percent Black	-.0955477	-.1181713	-.02611 (.04436)	-.01897 (.05259)
Percent Hispanic	-.049729	.078151	.11067* (.04896)	.21403** (.06021)
24 and Under	1.94e-06	1.65e-06**	2.96e-06** (6.13e-07)	1.54e-06** (2.65e-07)
25 to 44	-2.74e-06	-1.32e-06**	-2.24e-06** (7.40e-07)	-1.20e-06** (2.61e-07)
45 and older	-9.61e-07	-2.43e-07*	-8.66e-07** (2.77e-07)	-3.03e-07** (7.71e-08)
Spending on Health programs (per capita)	-.0011192**	-.00052	-.00027 (.00021)	-.00075** (.00025)
Governor Party	-.0459299	-.0203028	-.06365** (.01462)	.01639 (.01667)
Percent holding a Bachelors' Degree or	-.008509	-.0098544	-.0124078* (.0056807)	-.02197** (.00629)

higher				
Chlamydia Rate	-.0003819	-.0011909**	-.00032* (.00014)	-.00152** (.00016)
Gonorrhea Rate	-.0014569	-.0000796	-.00045 (.00038)	.00031 (.000515)
Percent Drug Use (except Marijuana)	-.0714664*	-.0252069	-.10636** (.01793)	-.07512** (.01691)
Number of Social Organizations	.0002709	.0000829	.00029** (.00011)	-.00016 (.00017)

*Significant at the .05 level
** Significant at .01 level

Appendix A.15: Total State Population and Gendered TB Panel Negative Binomial Regression Coefficients with Incarceration Rates

Independent Variable	All TB Cases	Female TB Cases	Male TB Cases
Incarceration Rate	-5.23e-06	-.0000173	-.0000216
Male Incarceration Rate	3.41e-07	-7.00e-06	-7.75e-06
Female Incarceration Rate	-.0001871	-.0001848	-.000293
Unemployment	-.0364314**	-.0333106**	-.0388627**
Poverty	-.0142645*	-.0189132**	-.0127966
Marriage Rate	.0007136	-.0032951	.0012339
State GDP	-3.97e-07	-4.99e-07	-5.38e-07
Percent Black	.0007331	.0782252	-.0284945
Percent Hispanic	-.0804029	.0630885	-.1533504
24 and Under	-3.52e-07	2.88e-07	-3.04e-07
25 to 44	4.27e-07	2.88e-07	4.12e-07
45 and older	-1.99e-08	-1.24e-08	-3.72e-08
Spending on Health programs (per capita)	-.0003759	-.0002952	-.0006638*

Governor Party	.0299974	.0787031**	.0244475
Percent holding a Bachelors' Degree or higher	-.0358659**	-.0453739**	-.0355638**
Percent Drug Use (except Marijuana)	.0210964	.0224112	.0287686
Number of Social Organizations	.0000405	-.0000733	-.00009

*Significant at the .05 level
** Significant at .01 level

Appendix A.16. : Total State Population and Gendered TB Panel Negative Binomial Regression Coefficients with Incarceration Measured as Number of Releases

Independent Variable	All TB Cases	Female TB Cases	Male TB Cases
Total Releases	-1.03e-06	-7.80e-07	-1.28e-06
Male Releases	-1.10e-06	-7.81e-07	-1.40e-06
Female Releases	-.0000127*	-.000011	-.0000146*
Unemployment	-.0360829**	-.0328142**	-.0383195**
Poverty	-.0120307	-.0176567*	-.0104117
Marriage Rate	.0005671	-.003451	.0010341
State GDP	-3.82e-07	-4.73e-07	-5.33e-07
Percent Black	-.0002328	.0768309	-.0291575
Percent Hispanic	-.0969204	.0505119	-.1760549
24 and Under	-3.61e-07	-1.40e-07	-3.01e-07
25 to 44	4.36e-07	2.88e-07	4.11e-07
45 and older	-3.42e-08	-2.32e-08	-5.08e-08
Spending on Health programs (per capita)	-.0003599	-.0002915	-.0006281

Governor Party	.0256112	.0742804**	.0202755
Percent holding a Bachelors' Degree or higher	-.0342192**	-.0445881**	-.0335774**
Percent Drug Use (except Marijuana)	.0200559	.0204588	.0277681
Number of Social Organizations	.0000135	-.0000921	-.0001185

*Significant at the .05 level
** Significant at .01 level

Appendix A.17: Total State Population and Gendered TB Panel Negative Binomial Regression Coefficients with One Year Lag and Incarceration Rates

Independent Variable	All TB Cases (1 year lag)	Female TB Cases (1 year lag)	Male TB Cases (1 year lag)
	-1.90e-06	.00005	-.00005
Incarceration Rate	(.00002)	(.00004)	(.00003)
	2.44e-07	.0000663	-.00002
Male Incarceration Rate	(.00001)	(.0000303)	(.00001)
	-.00023	-.00053	-.00016
Female Incarceration Rate	(.00021)	(.00034)	(.00016)
	-.00345	-.00592	-.02342**
Unemployment	(.00410)	(.00644)	(.00469)
	-.01422**	-.015925*	-.01597**
Poverty	(.00419)	(.00670)	(.00507)
	.00129	-.00453	.00436*
Marriage Rate	(.00172)	(.00257)	(.00215)
	1.39e-07	-3.77e-09	-1.81e-07
State GDP	(1.23e-07)	(1.94e-07)	(1.50e-07
	.02753	.01414	.08703
Percent Black	(.03930)	(.06146)	(.04854)
	-.02841	-.06479	-.05867
Percent Hispanic	(.04525)	(.07151)	(.05494)
	2.24e-07*	4.16e-07*	-3.85e-07**
24 and Under	(2.24e-07)	(1.71e-07)	(1.28e-07)
	-1.48e-07	-2.87e-07	4.94e-07**
25 to 44	(1.20e-07)	(1.89e-07)	(1.43e-07)
	-1.10e-07**	-8.11e-08	-3.80e-08
45 and older	(3.23e-08)	(5.09e-08)	(3.93e-08)
	2.70e-06	.00025	-.00092**
Spending on Health programs (per capita)	(.00018)	(.00028)	(.00022)
	.06376**	.076153**	.05377**

Governor Party	(.01188)	(.01843)	(.01486)
Percent holding a Bachelors' Degree or higher	-.01851** (.00464)	-.01457* (.00726)	-.04895** (.00551)
Percent Drug Use (except Marijuana)	-.02939* (.01379)	-.01504 (.0217643)	.02933 (.01629)
Number of Social Organizations	.00005 (.00010)	.00016 (.00017)	.00007 (.00013)

*Significant at the .05 level
** Significant at .01 level

Appendix A.18: Total State Population and Gendered TB Panel Negative Binomial Regression Coefficients with One Year Lag and Incarceration Measured as Releases

Independent Variable	All TB Cases (1 year lag)	Female TB Cases (1 year lag)	Male TB Cases (1 year lag)
Total Releases	-2.79e-07 (3.30e-07)	-6.79e-07 (6.65e-07)	-4.98e-07 (4.14e-07)
Male Releases	-2.47e-07 (3.70e-07)	-7.46e-07 (7.46e-07)	-4.93e-07 (4.65e-07)
Female Releases	-5.66e-06* (2.90e-06)	-9.72e-06 (5.87e-06)	-6.12e-06 (3.64e-06)
Unemployment	-.02346** (.00383)	-.00327 (.00803)	-.02293** (.00473)
Poverty	-.01587** (.00418)	-.013903 (.00827)	-.01572** (.00511)
Marriage Rate	.00326 (.00175)	-.00396 (.00324)	.00421 (.00215)
State GDP	-2.26e-07 (1.20e-07)	5.01e-08 (2.48e-07)	-1.91e-07 (1.49e-07)
Percent Black	.06421 (.03895)	.01181 (.07750)	.09021 (.04846)
Percent Hispanic	-.11365** (.04433)	-.08264 (.09542)	-.07426 (.05475)
24 and Under	-3.32e-07** (1.02e-07)	2.61e-07 (2.48e-07)	-3.60e-07** (1.27e-07)
25 to 44	4.45e-07** (1.14e-07)	-1.58e-07 (2.60e-07)	4.74e-07** (1.43e-07)
45 and older	-1.78e-08 (3.19e-08)	-1.07e-07 (6.43e-08)	-4.20e-08 (3.96e-08)
Spending on Health	-.00056**	.00026	-.00090**

programs (per capita)	(.00017)	(.00034)	(.00022)
Governor Party	.04970** (.01192)	.06855** (.02327)	.05297** (.01497)
Percent holding a Bachelors' or higher	-.04302** (.00441)	-.01623 (.00910)	-.04816** (.00551)
Percent Drug Use (except Marijuana)	.03301** (.01312)	-.01536 (.02688)	.02717 (.01622)
Number of Social Organizations	.00018 (.00011)	.00003 (.00019)	.00007 (.00013)

*Significant at the .05 level
** Significant at .01 level

Appendix A.19: Racial Group State Population TB Panel Negative Binomial Regression Coefficients with and without One Year Lag and Incarceration Rates

Independent Variable	Black TB Cases	White TB Cases	Black TB Cases (1 year lag)	White TB Cases (1 year lag)
Incarceration Rate	6.96e-06	-4.53e-06	8.35e-06 (8.02e-06)	-.00001 (.00001)
Male Incarceration Rate	7.38e-06	-3.53e-06	8.53e-06 (8.69e-06)	-.00001 (.00001)
Female Incarceration Rate	.00006	-.00009	.00011 (.00008)	-.00022* (.00011)
Unemployment	-.01447**	-.04598**	-.01457** (.00538)	-.04022** (.01332)
Poverty	-.00561	-.00070	-.00149 (.01049)	.00700 (.01311)
Marriage Rate	.00694	.01662**	.00762 (.00709)	.00804 (.00699)
State GDP	1.99e-07	-2.66e-07	3.91e-07 (3.22e-07)	-2.41e-07 (5.89e-07)
Percent Black	.15851	-.11638	.034784 (.10327)	-.10817 (.12448)
Percent Hispanic	-.02066	-.20803	-.19356 (.12044)	-.18418 (.14712)
24 and Under	-1.37e-06	-3.19e-07	-3.00e-06 (1.63e-06)	7.41e-07 (7.43e-07)
25 to 44	4.93e-06**	2.17e-07	4.44e-06** (1.77e-06)	-6.26e-07 (6.60e-07)
45 and older	-4.19e-06**	-1.99e-08	-2.53e-06** (6.30e-07)	-6.94e-08 (2.85e-07)

Spending on Health programs (per capita)	-.00043	-.00185**	.00041 (.00049)	-.00217** (.00056)
Governor Party	.09950**	-.00643	.04095 (.03440)	.03190 (.03894)
Percent holding a Bachelors' Degree or higher	-.03626**	-.01856	-.01037 (.01290)	-.00967 (.01628)
Percent Drug Use (except Marijuana)	.00353	.00678	-.07208 (.04067)	-.01961 (.04094)
Number of Social Organizations	-.00019	.00026	.00025 (.00027)	.00068 (.00036)

*Significant at the .05 level
** Significant at .01 level

Chapter 5: HIV and Incarceration

Introduction

Before moving into an analysis for HIV testing in state prisons as the source of interventions for reducing infectious disease in the community, the present analysis is extended from AIDS to HIV data. While testing can pick up both AIDS and HIV, most testing is directed at HIV. The majority of people are diagnosed at earlier stages of the disease, and given the age structure of large segments of inmates, it is likely that testing would intervene at the HIV stage as opposed to at the advanced stage of AIDS. Similarly, HIV data is likely more telling in the context of trying to identify a relatively short time frame of transmission. While most previous research has acknowledged that HIV is the preferred category for data, these studies do not use HIV data due to limitations in comprehensive and consistent data. In general, previous research has explored a timeframe ranging from the 1980s to the early 2000s. Using such a time frame precludes the inclusion of more recent HIV data collection efforts. However, since scholars have agreed that HIV is the preferable data set, and since more recent data collections have been able to gather HIV data at the state level, this study will attempt to test directly the infectious disease of interest—HIV—using a more contemporary time frame.

In order to test HIV, the time frame of interest is reduced to 2008 to 2013, since these are the years for which the NCHHSTP Atlas begins reporting HIV data at the state level. Extending this study to HIV greatly reduces observations, since the time frame is shortened by eight years. However, the insight gained from expanding this investigation to HIV is worth a try and serves as a starting point for future research as better HIV data collection is achieved. Another reason to

explore HIV, specifically, is the lack of findings or presence of contradictory findings discussed in the one year lag models in the AIDS chapter. As mentioned in Chapter 4, it is possible that a one year lag is not long enough to influence AIDS spread, given that AIDS is an advanced stage disease. If a one year lag is noteworthy for infectious disease spread, it is presumed that the incarceration-infectious disease relationship is more likely visible when considering HIV over AIDS. In addition, before introducing testing assumed to impact HIV, it is useful to do a baseline investigation of HIV. Lastly, using HIV advances the literature, as most previous studies are confined to use of AIDS cases or deaths due to data limitations.

Data and Methods

While an in depth discussion of the data and methods is found in Chapter 3, a brief review of the general concepts is repeated here. This empirical chapter will mirror the AIDS section in Chapter 4 with the exception that HIV, rather than AIDS, is the dependent variable of interest. Models run for the entire population are followed by race and gender specific models. The final set of models will be race and gender combined models. Similar to the previous chapter, after each set of models, a second set that contains a one year lag is included.

Results and Discussion

Total Population Models

The initial total population HIV models using both measures of incarceration, rates and releases, are seen in Tables 5.1 and 5.2. The same models with a one year lag follow in Tables 5.2 and 5.3.

Table 5.1: Total State Population HIV Negative Binomial Regression with Incarceration Rates (Including Transmission Mechanisms)

Independent Variable	HIV Cases	HIV IV Transmission	HIV Heterosexual Transmission

Incarceration Rate	-.0000527	-.0002778*	-.000161*
Male Incarceration	-.0000347	-.000159*	-.0000818
Female Incarceration	.000222	-.000339	-.000815
Unemployment	-.0033788	-.0128605	-.0136606
Poverty	-.0088958	.0020077	-.0118121
Marriage Rate	-.0016969	-.0049893	-.002325
State GDP	1.75e-07	2.38e-08	-6.76e-07**
Percent Black	-1.505862	-19.03291**	.4333636
Percent Hispanic	-.9892313	-10.59496**	-2.781973
24 and Under	4.81e-08	1.09e-06	-3.67e-07
25 to 44	6.20e-08	-4.80e-07	9.97e-07*
45 and older	-1.83e-07*	-2.79e-07	-1.59e-07
Spending on Health programs (per capita)	.0001243	-.0001367	.0012997**
Governor Party	6.11e-06	.0202523	.025559
Percent holding a Bachelors' Degree or higher	-.0243059	-.027981	-.0503723*
Chlamydia Rate	.0000729	-.0006408	.0003984
Gonorrhea Rate	6.11e-06	.0036151**	.0003879
Percent Drug Use (except Marijuana)	.0279564	-.0120891	.0495727
Number of Social Organizations	-.0004577	.0012627**	.0003992

*Significant at the .05 level
** Significant at .01 level

Table 5.2: Total State Population HIV Negative Binomial Regression with Incarceration measured as Releases (Including Transmission Mechanisms)

Independent Variable	HIV Cases	HIV IV Transmission	HIV Heterosexual Transmission
Total Releases	-3.09e-07	-1.09e-06	-5.34e-07
Male Releases	-3.82e-07	-1.16e-06	-6.03e-07
Female Releases	-2.02e-06	-1.00e-05	-5.25e-06
Unemployment	-.0026217	-.0009696	-.010619
Poverty	-.0088233	-.0060852	-.0132622
Marriage Rate	-.0016063	-.0011422	-.0021169
State GDP	1.75e-07	-2.39e-07	-7.88e-07**
Percent Black	-1.625851	-9.409157**	.1772023
Percent Hispanic	-1.17439	-3.287446	-3.608481
24 and Under	6.32e-08	5.73e-07	-4.09e-07
25 to 44	4.46e-08	3.67e-07	1.17e-06*
45 and older	-1.92e-07*	-5.89e-07**	-1.87e-07*
Spending on Health programs (per capita)	.0001334	-.0009738	.0011763**
Governor Party	.0055496	.0557445	.0335613
Percent holding a Bachelors' Degree or higher	-.0248433	-.0600729	-.0506693*
Chlamydia Rate	.0000297	-.0015005*	.0002932
Gonorrhea Rate	.0000251	.0041383**	.0003713
Percent Drug Use (except Marijuana)	.0255104	-.0417903	.0501059
Number of Social	-.0004918	-.0004273	.0002626

Organizations

*Significant at the .05 level
** Significant at .01 level

The first result that stands out when looking at the initial HIV models, is the negative coefficients on all of the incarceration variables across both measures of incarceration, rates and releases. This finding, consistent with most of the AIDS models, suggests that an increase in incarceration decreases HIV cases in general. None of the coefficients in the releases models reached statistical significance while only the total incarceration rate and male incarceration rate have a significant association with HIV cases. Interpreting the incidence ratio rates, a one percentage point increase in the total incarceration rate decreases total IV drug HIV cases by .028% and total heterosexual HIV cases by .016%, while a one percentage point increase in male incarceration decreases IV drug HIV cases by .016%. Similar to the AIDS models, these magnitudes are small but significant. For most of the AIDS models, female incarceration showed the strongest and most consistent association on AIDS cases; however, in the HIV models, there were no significant coefficients for the female incarceration rate.

Considering the covariates in the models, none seem to produce as consistent or consistently significant results as percent holding a bachelors' degree or as unemployment, as was the case in the AIDS models. Some of the inconsistencies may be due to the reduced time frame and reduced number of observations. Tables 5.3 and 5.4 show the results of the HIV models including the one year lags. These results in the lagged models again exhibit mostly negative coefficients on the incarceration variables in both sets of models, suggesting that the increased incarceration decreases HIV cases. The exceptions are the coefficients on the IV drug HIV cases on all three lagged releases variables, which are positive. As there were also some positive coefficients for IV drug AIDS cases in Chapter 4, it is possible that incarceration may

not influence IV transmission in the same manner that it influences total transmission or heterosexual transmission. In the previous chapter, it was posited that this lack of influence with regard to IV transmission may be due to the observation that incarceration increases and reinforces risky and deviant behaviors, such as drug use. The lack of influence with regard to IV transmission may also be due to an inadequate prison response to IV drug use among inmates. If a drug use problem is not addressed, then it still has the potential to serve as a mechanism for transmission of HIV through activities such as needle sharing. Along the same lines, if such behavior is reinforced or introduced in prisons, it is likely to continue upon release, thereby increasing the likelihood of serving as a possible transmission mechanism. These coefficients, however, did not reach statistical significance, so future research is needed to retest such a relationship.

The next results of interest are that the lagged models show more significant results across total, male, and female incarceration, as well as across all three HIV categories, than the models without lags. Interpreting the incidence ratio rates, a one percentage point increase in the total incarceration decreases HIV cases by .011% and heterosexual HIV cases by .029%. For male incarceration, a one percentage point increase in male incarceration rate decreases heterosexual HIV cases by .016%. Lastly, a one percentage point increase in the female incarceration rate decreases IV drug HIV cases by .23% and heterosexual HIV cases by .11%. In this lagged set of models, much like the many of AIDS models, female incarceration has the largest magnitude of effect in reducing HIV cases.

In the lagged release models, incarceration only produced a significant result on heterosexual AIDS cases. The incidence ratio rates indicate that a one percentage point increase in the incarceration rate decreases expected heterosexual HIV cases by .0001%, a one percentage

point increase in male incarceration decreases expected heterosexual HIV cases by .0002%, and a one percentage point increase in female incarceration decreases expected heterosexual HIV cases by .002%. Many of the covariates in the lagged HIV models performed in an expected manner given the results of the AIDS models in the previous chapter. Overall, a younger population increases the number of expected HIV cases, as do lower chlamydia rates. In contrast to the AIDS models, in the HIV models, the poverty variable shows the expected direction. As poverty levels increase, so do the number of HIV cases. More social establishments leads to more expected HIV cases. While this is contrary to most of the literature on social capital, where more social involvement usually improves health outcomes, these results suggest that maybe more social involvement expands social circles, thereby increasing risk by expanding the reach of disease. The last major result of interest is the positive coefficients on the spending variables. Higher state GDP and more per capita spending on health programs increase the expected number of HIV cases. While this finding is contrary to expectation, it is possible that increased spending results in increased testing, which in turn leads to more cases, due to volume of testing.

While the lagged results produced more significant findings, they did not perform in a conclusive manner that was better than the models without the one year lag. There are several reasons attributable to this. The first is the dwindling number of observations. HIV in general has an eight year shorter time frame than the AIDS study due to data limitations. Taking a shortened time frame and further reducing it by adding a lag could blur the effects of a one year lag. Secondly, as there is no current agreement on the length of lag that best fits HIV/AIDS cases, a one year lag many not be efficient to capture the effects of this relationship. Any further lag is prevented in this study due to the shirt time frame. As more data becomes available more testing of the appropriate lag for HIV can be undertaken.

Table 5.3: Total State Population HIV Negative Binomial Regression with Incarceration Rates and a One Year Lag (Including Transmission Mechanisms)

Independent Variable	HIV Cases	HIV IV Transmission	HIV Heterosexual Transmission
Incarceration Rate	-.00007	.00034**	-.00010
	(.00007)	(.00013)	(.00007)
	-.00004	.00017*	-.00006
Male Incarceration	(.00004)	(.00007)	(.00004)
	-.00002	.00194**	-.00031
Female Incarceration	(.00036)	(.00069)	(.00037)
	-.02629**	-.02579*	-.01339*
Unemployment	(.00657)	(.01080)	(.00562)
	.00176	-.00361	-.00375
Poverty	(.00833)	(.01136)	(.00602)
	-.00302	-.01321**	-.00270
Marriage Rate	(.00295)	(.00504)	(.00272)
	-4.02e-08	-1.66e-06**	-7.28e-07**
State GDP	(2.66e-07)	(4.12e-07)	(2.24e-07)
	.45215	-8.405	5.299
Percent Black	(2.436)	(11.502)	(5.745)
	2.191	-33.476**	-7.317
Percent Hispanic	(2.315)	(7.859)	(4.400)
	6.95e-07*	1.10e-06*	-2.39e-07
24 and Under	(3.31e-07)	(5.39e-07)	(3.00e-07)
	-8.99e-07	-4.20e-07	6.00e-07
25 to 44	(5.20e-07)	(7.27e-07)	(4.09e-07)
	4.83e-08	4.54e-07	-2.65e-09
45 and older	(6.28e-08)	(1.60e-07)	(8.94e-08)
Spending on Health programs (per capita)	-.00007	.00108	.00093**
	(.00039)	(.00060)	(.00034)
	-.00947	-.05570	.01278
Governor Party	(.02609)	(.05111)	(.02692)
Percent holding a Bachelors' Degree or higher	.01737	.00049	-.01672
	(.01829)	(.03816)	(.01946)
	-.00005	-.00051	-.00025
Chlamydia Rate	(.00039)	(.00049)	(.0002429)
	-.00026	.00291**	.00066
Gonorrhea Rate	(.00074)	(.00105)	(.00054)

Percent Drug Use (except Marijuana)	.00589 (.03035)	.03177 (.05025)	.07580** (.02750)
Number of Social Organizations	.00022 (.00023)	.00170** (.00054)	.00030 (.00029)

*Significant at the .05 level
** Significant at .01 level

Table 5.4: Total State Population HIV Negative Binomial Regression with Incarceration measured as Releases and One Year Lag (Including Transmission Mechanisms)

Independent Variable	HIV Cases	HIV IV Transmission	HIV Heterosexual Transmission
Total Releases	1.20e-07 (4.45e-07)	1.49e-06* (7.07e-07)	-6.71e-08 (3.72e-07)
Male Releases	7.82e-08 (4.98e-07)	1.65e-06* (7.92e-07)	-9.44e-08 (4.16e-07)
Female Releases	1.70e-06 (4.03e-06)	.00001* (6.52e-06)	-1.03e-06 (3.45e-06)
Unemployment	-.02535** (.00651)	-.03244** (.01090)	-.01226* (.00565)
Poverty	-.00073 (.00846)	-.00175 (.01132)	-.00541 (.00599)
Marriage Rate	-.00297 (.00305)	-.01313** (.00503)	-.00266 (.00272)
State GDP	-1.19e-07 (2.58e-07)	-1.37e-06** (3.90e-07)	-8.25e-07** (2.15e-07)
Percent Black	.07517 (2.460)	-8.1849 (11.502)	4.795 (5.737)
Percent Hispanic	1.246 (2.185)	-28.683** (7.613)	-8.713* (4.299)
24 and Under	5.99e-07 (3.25e-07)	1.19e-06* (5.37e-07)	-2.92e-07 (2.98e-07)
25 to 44	-7.15e-07 (4.98e-07)	-7.74e-07 (7.06e-07)	7.60e-07 (3.95e-07)
45 and older	5.17e-08 (6.45e-08)	4.59e-07** (1.61e-07)	1.46e-09 (8.99e-08)
Spending on Health programs (per capita)	-.00017 (.00038)	.00130* (.00060)	.00088** (.00033)
Governor Party	-.00642 (.02539)	-.06119 (.05118)	.01546 (.02686)
Percent holding a Bachelors' Degree or higher	.01343 (.01858)	-.01363 (.03864)	-.016038 (.01959)
Chlamydia Rate	.00002 (.00042) -.00051	-.00034 (.00050) .00280**	-.00024 (.00025) .00056

Gonorrhea Rate	(.00080)	(.00106)	(.00054)
Percent Drug Use (except Marijuana)	.00805 (.03075)	.03176 (.05028)	.07741** (.02752)
Number of Social Organizations	.00021 (.00025)	.00189** (.00055)	.00029 (.00030)

*Significant at the .05 level
** Significant at .01 level

Gendered Models

The female models exhibit many of the same main findings as the total HIV models. The negative coefficients on the majority of the incarceration variables suggest that an increase in incarceration decreases female HIV cases, as seen in Table 5.5. The exception to this pattern is again the coefficients on the IV drug female HIV cases. The positive coefficients suggest that an increase in incarceration increases female IV drug HIV cases. These coefficients failed to reach statistical significance, as in the prior models. Similar to the total HIV model, none of the incarceration coefficients in the release models achieved statistical significance. In the rate models, the incidence ratio rates suggest that a one percentage point increase in the incarceration rate decreases female HIV cases by .025% and female heterosexual HIV cases by .016%, while a one percentage point increase in male incarceration decreases female heterosexual HIV cases by .009%.

Analogous to the total HIV models, the lagged female models exhibit the same patterns as the models without a lag. The coefficients for the most part are in the same direction, and the lagged models produced more significant results. The incidence ratio rates for the first set of lagged models show that a one percentage point increase in the incarceration rate decreases female HIV cases by .017% and female heterosexual HIV cases by .021%, while a one percentage point increase in male incarceration decreases female HIV cases by .0095 and female heterosexual HIV cases by .011%. In the releases models, a one percentage point increase in total

releases or male releases decreases female HIV and female heterosexual cases by an expected .0001%; a one percentage point increase in female releases decreases female HIV and female heterosexual cases by .001%.

To prevent overwhelming the reader with the length and vastness of data tables, beginning with the female HIV models, a summarized table with all the incarceration results is included in the text of the chapter, while the full data tables with all of the covariates can be found in the Appendices section at the end of the chapter. A brief discussion of relevant covariates is added to the body of the text. Also similar to the total HIV cases, the results in Table 5.5 show that increases in poverty level and in both per capita spending and State GDP also increases expected female HIV cases. Overall, the female models performed very similar to the total HIV models with no major surprises. In the next section, Male HIV models are analyzed to see if they follow a similar pattern.

Table 5.5: Female State Population HIV Negative Binomial Regression with Incarceration Rate and Releases and Lag Results (Including Transmission Mechanisms)

Independent Variable	Female HIV Cases	Female HIV IV Drug Transmission	Female HIV Heterosexual Transmission
Incarceration Rate	-.00025**	.00010	-.00016*
Male Incarceration Rate	-.00006	.00004	-.00009*
Female Incarceration Rate	-.00031	.00104	-.00072
Total Releases	-6.50e-08	1.11e-06	-2.99e-07
Male Releases	-9.10e-08	1.18e-06	-3.47e-07
Female Releases	-3.40e-07	.00001	-2.78e-06
	One Year Lag		
Incarceration Rate	-.00004 (.00009)	.00033 (.00020)	-.00010 (.000086)
Male Incarceration Rate	-.00002 (.00005)	.00017 (.00011)	-.00006 (.00004)

Female Incarceration Rate	-.00005 (.00049)	.00206* (.00107)	-.00028 (.00044)
Total Releases	-6.46e-07 (5.34e-07)	5.74e-07 (1.12e-06)	-6.72e-07 (4.59e-07)
Male Releases	-7.42e-07 (6.00e-07)	6.27e-07 (1.25e-06)	-7.62e-07 (5.13e-07)
Female Releases	-6.05e-06 (4.92e-06)	6.88e-06 (.0000104)	-6.26e-06 (4.25e-06)

*Significant at the .05 level
** Significant at .01 level

The initial male models without lagged dependent variables present comparable results to both the total and female HIV models above. The negative incarceration coefficients suggest that increases in incarceration decrease HIV cases. Exhibiting the same results as the prior models, incarceration measured as the number of releases failed to produce any statistically significant results. The incidence ratio rates in the models measuring incarceration as rates suggest that a one percentage point increase in the total incarceration rate decreases Male IV drug HIV cases by .044% while a one percentage point increase in the male incarceration rate decreases male HIV cases by .005% and male IV drug HIV cases by .025%.

The male lagged models continued the pattern of producing more statistically significant results than the models without a lag. In the lagged models some of the incarceration coefficients in the release set of models achieved statistical significance as well as some significant findings for measures of female incarceration, rates and releases.

The lagged release models also show positive coefficients on the male IV drug cases. These results further suggest that there may be a differential effect of incarceration based on transmission mechanism. While incarceration may decrease heterosexual HIV cases is may actually increase IV drug use cases which was consistent across total, female, and male IV drug use HIV cases. The last three sets of models, total, female, and male, produced fairly consistently providing further reason to believe that incarceration may be acting as some type of intervention

in the spread of HIV in the general community. Most of this is based on the negative direction of the incarceration coefficients regardless of statistical significance. The relative consistency in this finding raises cause to explore what mechanism of incarceration may be acting as an intervention if any. This idea will be explicitly explored in Chapter 6 after the racial and race and gendered combined HIV models are analyzed to see if they also exhibit similar trends to the AIDS racial and combined models.

Table 5.6: Male State Population HIV Negative Binomial Regression with Incarceration Rate and Releases and Lag Results (Including Transmission Mechanisms)

Independent Variable	Male HIV Cases	Male HIV IV Drug Transmission	Male HIV Heterosexual Transmission
Incarceration Rate	-.00008	-.00044**	-.00009
Male Incarceration Rate	-.000056*	-.00025**	-.00003
Female Incarceration Rate	-.00007	-.000875	-.00113
Total Releases	-4.22e-07	-6.16e-07	-5.99e-07
Male Releases	-5.02e-07	-6.72e-07	-6.99e-07
Female Releases	-3.08e-06	-3.62e-06	-5.46e-06
	One Year Lag		
Incarceration Rate	-.00011** (.00004)	.00035* (.00017)	-.00010 (.00012)
Male Incarceration Rate	-.00006** (.00002)	.00185* (.00091)	-.00005 (.00006)
Female Incarceration Rate	-.00049* (.00020)	.00185* (.00091)	-.00039 (.00066)
Total Releases	-8.58e-08 (3.43e-07)	2.21e-06* (9.13e-07)	1.05e-06 (6.37e-07)

Male Releases	-3.14e-07 (3.99e-07)	2.46e-06* (1.02e-06)	1.15e-06 (7.13e-07)
Female Releases	-7.63e-07 (2.03e-06)	.00002* (8.40e-06)	8.63e-06 (5.91e-06)

*Significant at the .05 level
** Significant at .01 level

Racial HIV Models

The results of the initial Black HIV model, displayed in Table 5.7 without lagged dependent variables, shows similar trends to the previous models in this chapter. All of the Black incarceration variables have negative coefficients, suggesting that increased Black incarceration decreases Black HIV cases. The incidence ratio rates indicate that a one percentage point increase in the Black incarceration rate decreases Black IV drug HIV cases by .0005%, a one percentage point increase in the Black male incarceration rate decreases Black HIV cases by .002%, and a one percentage point increase in the Black female incarceration rate decreases Black HIV cases by .012%.

The lagged Black models, which results are displayed in Table 5.7, show inconsistent directions on the Black incarceration coefficients for the Black IV drug and Black heterosexual HIV models. The coefficients for all of the incarceration measures in the total Black HIV case models are positive which is opposite the posited relationship in the models without a lag which are positive. Only the coefficient for Black female incarceration in the total Black HIV model reached statistical significance. Analogous to all of the previous significant results, its magnitude is very small and no definitive conclusions regarding the exact relationship between incarceration and HIV can be drawn.

While some of the patterns in the Black models mimic the patterns seen in the previous total and gendered HIV models, the lagged model did exhibit some differences worth

considering although lacking statistical significance. The additional positive incarceration coefficients suggest that there may be racial differences in how incarceration influences the spread of HIV in the general community. To further explore this posited racial difference, white HIV models are analyzed in the next section.

Table 5.7: Black State Population HIV Negative Binomial Regression with Incarceration Rate (Including Transmission Mechanisms)

Independent Variable	Black HIV Cases	Black HIV IV Transmission	Black HIV Heterosexual Transmission
Black Incarceration Rate	-9.66e-07	-4.87e-06**	-7.77e-07
Black Male Incarceration Rate	-.000016*	-.00002	-.00001
Black Female Incarceration Rate	-.00011*	-.00011	-.00007
	One Year Lag		
Black Incarceration Rate	3.09e-07 (5.97e-07)	-1.19e-06 (2.29e-06)	-4.17e-08 (8.84e-07)
Black Male Incarceration Rate	3.21e-06 (4.66e-06)	-.00003 (.00002)	4.31e-06 (8.82e-06)
Black Female Incarceration Rate	.00010* (.00005)	-.00010 (.00015)	-8.14e-06 (.00006)

*Significant at the .05 level
** Significant at .01 level

The White HIV models add additional caveats to the relationship of interest between incarceration and HIV. For White HIV cases, positive coefficients are seen in both the set of models with and without lagged dependent variables. For all three measures, White incarceration appears to increase the White heterosexual HIV cases, given the positive coefficients. However, these coefficients are switched to a negative direction in the lagged White HIV models. Both white HIV and White IV drug HIV cases mimic the previously undiscovered relationship, where incarceration appears to decrease such categories of HIV cases. The initial White model measuring incarceration as rates returned no statistically significant results.

As for the lagged White HIV models, they produced more significant results that the models without a lag. White female and male incarceration displayed statistically significant associations with total White and White heterosexual HIV cases. Similar to the model without the lag, all of the incarceration coefficients in the total and IV drug White HIV cases are negative suggesting an increase in White incarceration decreases White HIV cases. Conversely, while all of the incarceration coefficients for the three incarceration variables in the White heterosexual models without the lag are positive, two of three turn negative in the lagged models. The White HIV models produced more significant results suggesting that incarceration may have larger or broader impact on White HIV cases than Black HIV cases. Similarly differences in the direction of specific incarceration coefficients suggest some differences in need of further research for more clarification.

Table 5.8: White State Population HIV Negative Binomial Regression with Incarceration Rate (Including Transmission Mechanisms)

Independent Variable	White HIV Cases	White HIV IV Transmission	White HIV Heterosexual Transmission
White Incarceration Rate	-3.97e-07	-1.56e-06	2.85e-07
White Male Incarceration Rate	-5.17e-06	-3.34e-06	.0000141
White Female Incarceration Rate	5.64e-06	-.0000177	.0000973
	One Year Lag		
White Incarceration Rate	-3.83e-06	5.98e-07	-3.83e-06
	(3.02e-06)	(2.08e-06)	(3.02e-06)
White Male Incarceration Rate	-.00005	-.00005**	-.00005
	(.00003)	(.00002)	(.00003)
White Female Incarceration Rate	-.00023	-.00025**	-.00023
	(.00013)	(.00009)	(.00013)

*Significant at the .05 level
** Significant at .01 level

Race and Gender Combined HIV Models

One of the first observations that stands out in looking at the results of the Black and White female HIV model results in Table 5.9 is the flip in incarceration coefficient for each race and gender model with and without the one year lag. In the Black Female HIV model without the one year lag, all of the incarceration coefficients are negative, but in the Black female models with a one year lag, all of the incarceration coefficients are positive. One the other hand, the White female models without a lag have all positive coefficients on the incarceration variables, while the lagged model has all negative coefficients on the incarceration variables. Only total Black incarceration rate in the Black female HIV model without a lag reached statistical significance. The incidence ratio rate interpretation suggests that a one percentage point increase in Black incarceration decreases Black female HIV cases by an expected .0002%.

Table 5.9: Black and White Female State Population HIV Negative Binomial Regression with Incarceration Rate and with and without One Year Lag

Independent Variable	Black Female HIV Cases	White Female HIV Cases	Black Male HIV Cases	White Male HIV Cases
Incarceration Rate	-2.48e-06**	2.99e-06	-8.02e-07	-1.30e-06
Male Incarceration	-.0000166	7.82e-06	-.0000104	-2.20e-06
Female Incarceration	-.0000614	.0000387	-.0000816	.0000187
		One Year Lag		
Incarceration Rate	-2.05e-06* (9.82e-07)	3.46e-07 (2.10e-06)	-1.45e-06* (6.56e-07)	2.07e-07 (9.75e-07)
Male Incarceration Rate	9.15e-06 (9.93e-06)	-.00004* (.00002)	1.44e-06 (6.41e-06)	-.00001 (8.19e-06)
Female Incarceration Rate	.00004 (.00007)	-.00024* (.00009)	-.00004 (.00005)	-.00005 (.00004)

*Significant at the .05 level
** Significant at .01 level

The analysis next turns to a consideration of Black and White male HIV cases to see the trends they exhibit with regard to incarceration and further explore whether any detectable racial

differences exist. While the racial female models only produced a single significant result, none of the incarceration variables in the racial male models achieved statistical significance. For the Black male HIV models, the coefficients showed the same pattern as for the Black female HIV models; whereas in the model without a lag, the incarceration coefficients were all negative, but in the model with a lag, the coefficients switch to a positive direction. The White male HIV models did not show the same clear pattern.

Conclusion

Many of the findings with regard to HIV mirror those of AIDS in chapter 4. The main finding is that incarceration appears to decrease the number of community HIV cases. As posited in the previous chapter, there are many possible explanations for such a relationship, but two of the most plausible are the fact of prison confinement or the idea that intervention serves to reduce HIV. The confinement argument suggests that either prisons are locking up high numbers of HIV positive people or those at risk for being HIV positive, thus keeping them out of the larger community or that the confinement of prison itself reduces the risk factors associated with HIV spread and thus aids reducing disease incidence. While there is no evidence yet to prove or disprove this notion, there is evidence that risk behaviors such as unsafe sexual behavior and IV drug use do occur in prison.[1] In some cases, the culture of prison itself may first introduce some inmates to such behaviors that are then likely to continue upon releases. Considering this evidence, it is believed that confinement is not the likely source for the decrease in HIV cases, but future studies that look directly at the implications of confinement are needed to confirm or deny this assertion.

An alternative to the confinement theory is one that considers incarceration as an intervention. As prisons are legally required to provide inmates healthcare, and given the

demographics of many who enter prison facilities, prisons are often the first place of interaction with medical services. Simultaneously, given the authoritative structure of prisons, prison officials have leeway in requiring certain medical testing or interventions. One of the possible required tests is an HIV test. Testing inmates, or a substantial portion of inmates within prison, could serve as a possible intervention for the larger community in several ways. First, testing forces individuals to know their HIV status. Knowledge in this case can be power. If a people know they are HIV positive, they may be more likely to take precautions when engaging in sexual behaviors, as well as to reduce risk behaviors overall. Second, finding out about a positive status in prison requires the prison system to provide HIV treatment. Studies show that individuals with high viral loads, who take antiviral drugs, are less likely to transmit the disease to someone else. This lowered likelihood for transmission to someone else requires taking the correct and recommended dosage of antiviral drugs, which is required within prisons. Lastly, regardless of whether inmates test positive or negative, general testing—or bringing the risk of HIV to the attention of the prison population—may reduce risk behavior or encourage safe behaviors upon release. Many testing recommendations suggest that testing should coincide with educational counseling, which could be required in an environment such as prisons.

While both of the aforementioned explanations for the main findings in this study so far remain theory, the next chapter seeks to test the latter of two possibilities: HIV testing. Although state prison systems are autonomous and are thus able to determine when or if they test for HIV, resulting in great variance in policies, it is possible to begin exploring the impact of HIV testing by grouping states with similar testing policies. It is an interesting leap—and a dangerous leap—to call incarceration a positive intervention, given the many societal harms prison creates. Thus, understanding exactly which characteristics of incarceration may have led to decreases in HIV

must be explored further. Chapter 6 begins this exploration by comparing states with different HIV testing policies and analyzing their impact on statewide HIV cases.

Appendix B: Chapter 5 Appendices

Appendix B.1: Female State Population HIV Negative Binomial Regression with Incarceration Rate and Releases and Lag Results (Including Transmission Mechanisms)

Independent Variable	Female HIV Cases	Female HIV IV Drug Transmission	Female HIV Heterosexual Transmission
Incarceration Rate	-.0001712*	8.42e-06	-.0002111*
Male Incarceration Rate	-.000089*	7.04e-06	-.0001106*
Female Incarceration Rate	-.0007016	-.0004403	-.0007903
Unemployment	-.0035817	-.0329733	-.0001142
Poverty	.0256615**	.0294498	.0257916**
Marriage Rate	-.004246	-.005521	-.0039487
State GDP	1.03e-06*	1.43e-06	1.16e-06**
Percent Black	-18.27742	-19.95623	-20.14005
Percent Hispanic	-31.78437**	-24.37277	-31.38016**
24 and Under	2.08e-06**	2.27e-06	2.04e-06**
25 to 44	-2.14e-06**	-2.07e-06	-2.28e-06**
45 and older	4.29e-08	9.03e-09	2.59e-08
Spending on Health programs (per capita)	.0019255**	.0026927	.0018262**
Governor Party	.0578729	.0115986	.071244
Percent holding a Bachelors' Degree or	.0774797*	-.0436379	.0956959*

higher			
Chlamydia Rate	-.0013304**	-.0024604**	-.0011269**
Gonorrhea Rate	.0025835**	.0052489*	.0021892*
Percent Drug Use (except Marijuana)	-.0336798	.0007752	-.0377197
Number of Social Organizations	.0012461**	.0033174**	.0010238*

*Significant at the .05 level
** Significant at .01 level

Appendix B.2: Female State Population HIV Negative Binomial Regression with Incarceration Rate and Releases and Lag Results (Including Transmission Mechanisms)

Independent Variable	Female HIV Cases	Female HIV IV Drug Transmission	Female HIV Heterosexual Transmission
Total Releases	-1.07e-06*	1.17e-06	-1.44e-06**
Male Releases	-1.20e-06*	1.36e-06	-1.63e-06**
Female Releases	-9.76e-06*	7.23e-06	-.00001**
Unemployment	.00013	-.04041	.00502
Poverty	.02661*	.02576	.02734**
Marriage Rate	-.00440	-.00489	-.00408
State GDP	1.13e-06**	1.15e-06	1.31e-06**
Percent Black	-15.930	-20.925	-17.369
Percent Hispanic	-33.779**	-22.776	-33.826**
24 and Under	2.09e-06**	2.08e-06	2.07e-06**
25 to 44	-2.09e-06**	-1.71e-06	-2.25e-06**
45 and older	-3.22e-08	6.64e-08	-7.55e-08

Spending on Health programs (per capita)	.00190**	.00254	.00180**
Governor Party	.06954	.00861	.08521*
Percent holding a Bachelors' Degree or higher	.08941*	-.07203	.11261*
Chlamydia Rate	-.00146**	-.00215*	-.00132**
Gonorrhea Rate	.00252**	.00482*	.00216*
Percent Drug Use (except Marijuana)	-.03601	.01323	-.04257
Number of Social Organizations	.00117**	.00346**	.00091*

*Significant at the .05 level
** Significant at .01 level

Appendix B.3: Female State Population HIV Negative Binomial Regression with Incarceration Rate and One Year Lag (Including Transmission Mechanisms)

Independent Variable	Female HIV Cases	Female HIV IV Drug Transmission	Female HIV Heterosexual Transmission
Incarceration Rate	-.00004	.00033	-.00010
	(.00009)	(.00020)	(.000086)
	-.00002	.00017	-.00006
Male Incarceration Rate	(.00005)	(.00011)	(.00004)
	-.00005	.00206*	-.00028
Female Incarceration Rate	(.00049)	(.00107)	(.00044)
	-.02074**	-.03689*	-.01381*
Unemployment	(.00797)	(.01660)	(.00683)
	.00028	.01139	.00091
Poverty	(.01023)	(.01758)	(.00724)
	-.00690	-.01897*	-.00353
Marriage Rate	(.00440)	(.00841)	(.00316)
	-9.74e-07**	-1.77e-06**	-7.67e-07**
State GDP	(3.03e-07)	(6.42e-07)	(2.72e-07)
	-2.630	-3.303	-4.656762
Percent Black	(3.044)	(17.800)	(6.922)
	-4.096	-26.994*	-4.536

Percent Hispanic	(2.905)	(12.242)	(5.308)
24 and Under	-2.34e-07 (4.08e-07)	5.60e-07 (8.63e-07)	-1.55e-07 (3.62e-07)
25 to 44	8.64e-07 (5.84e-07)	1.16e-07 (1.16e-06)	5.89e-07 (4.95e-07)
45 and older	-3.10e-08 (9.28e-08)	3.25e-07 (2.50e-07)	9.72e-09 (1.07e-07)
Spending on Health programs (per capita)	.00045 (.00045)	.00093 (.00095)	.00075 (.00040)
Governor Party	.00333 (.03400)	-.047114 (.07866)	-.00065 (.03228)
Percent holding a Bachelors' Degree or higher	-.02691 (.02391)	-.04666 (.05914)	-.02127 (.02362)
Chlamydia Rate	-.00006 (.00041)	-.00027 (.00074)	-.00033 (.00029)
Gonorrhea Rate	.00038 (.00082)	.00125 (.00161)	.00109 (.00066)
Percent Drug Use (except Marijuana)	.08416* (.03760)	.05222 (.07843)	.08365** (.03303)
Number of Social Organizations	.00032 (.00037)	.00128 (.00085)	.00019 (.00035)

*Significant at the .05 level
** Significant at .01 level

Appendix B.4: Female State Population HIV Negative Binomial Regression with Incarceration measured as Releases and One Year Lag (Including Transmission Mechanisms)

Independent Variable	Female HIV Cases	Female HIV IV Drug Transmission	Female HIV Heterosexual Transmission
Total Releases	-6.46e-07 (5.34e-07)	5.74e-07 (1.12e-06)	-6.72e-07 (4.59e-07)
Male Releases	-7.42e-07 (6.00e-07)	6.27e-07 (1.25e-06)	-7.62e-07 (5.13e-07)
Female Releases	-6.05e-06 (4.92e-06)	6.88e-06 (.0000104)	-6.26e-06 (4.25e-06)
Unemployment	-.01916* (.00788) .00262	-.040851* (.0167465) .0151043	-.0112262 (.0068682) .0009351

Poverty	(.01026)	(.0175379)	(.0072099)
	-.00689	-.0188108	-.0034455
Marriage Rate	(.00440)	(.008397)	(.0031584)
	-9.75e-07**	-1.46e-06*	-8.24e-07**
State GDP	(2.94e-07)	(6.11e-07)	(2.62e-07)
	-2.654	-1.83536	-4.845949
Percent Black	(3.000)	(17.79233)	(6.913641)
	-4.431	-22.30184	-5.742651
Percent Hispanic	(2.746)	(11.91288)	(5.197849)
	-1.98e-07	6.95e-07	-1.77e-07
24 and Under	(4.06e-07)	(8.58e-07)	(3.60e-07)
	8.39e-07	-3.05e-07	6.87e-07
25 to 44	(5.67e-07)	(1.12e-06)	(4.79e-07)
	-4.03e-08	2.97e-07	-3.61e-09
45 and older	(9.01e-08)	(2.51e-07)	(1.08e-07)
Spending on Health programs (per capita)	.00044 (.00045)	.0010746 (.0009462)	.0006731 (.0004032)
	.00128	-.0539741	.0001357
Governor Party	(.03364)	(.0787382)	(.0322102)
Percent holding a Bachelors' Degree or higher	-.02342 (.02407)	-.0501307 (.0597817)	-.0173867 (.0237809)
	-.00017	-.0003001	-.0004116
Chlamydia Rate	(.00042)	(.0007575)	(.0003006)
	.00057	.00152	.0011665
Gonorrhea Rate	(.00082)	(.0016224)	(.0006635)
Percent Drug Use (except Marijuana)	.08229* (.03753)	.045207 (.0784386)	.0824326** (.0330799)
Number of Social Organizations	.00027 (.00036)	.0013098 (.0008638)	.0000941 (.0003587)

*Significant at the .05 level
** Significant at .01 level

Appendix B.5: Male State Population HIV Negative Binomial Regression with Incarceration Rate (Including Transmission Mechanisms)

Independent Variable	Male HIV Cases	Male HIV IV Drug Transmission	Male HIV Heterosexual Transmission
Incarceration Rate	-.0000813	-.0004403**	-.0000879
Male Incarceration Rate	-.0000506*	-.0002506**	-.0000347

Female Incarceration Rate	-.0000733	-.000875	-.0011278
Unemployment	-.0033175	-.0130228	-.0199224*
Poverty	-.0061292	-.0002573	-.0140213
Marriage Rate	-.0011985	-.0013332	-.0016308
State GDP	-1.04e-07	7.80e-07	-1.09e-06**
Percent Black	-5.476414	-26.21842**	24.01429*
Percent Hispanic	-1.861974	-14.27318*	-6.723544
24 and Under	-2.23e-07	1.08e-06	-1.65e-06**
25 to 44	6.29e-07	-1.15e-06	2.11e-06**
45 and older	-1.39e-07*	-8.63e-08	-1.61e-07
Spending on Health programs (per capita)	-.0000993	-.0004233	.002416**
Governor Party	-.0010823	-.0307258	.0694411
Percent holding a Bachelors' Degree or higher	-.0253618	-.0473989	-.0722522*
Chlamydia Rate	.0003348	-.0000936	.001229**
Gonorrhea Rate	-.0004429	.0030835*	-.0023697*
Percent Drug Use (except Marijuana)	.0211999	-.0093971	.1053369*
Number of Social Organizations	-.0005436*	.0019137**	.0006652

*Significant at the .05 level
** Significant at .01 level

Appendix B.6: Male State Population HIV Negative Binomial Regression with Incarceration measured as Releases (Including Transmission Mechanisms)

Independent Variable	**Male HIV Cases**	**Male HIV IV Drug**	**Male HIV Heterosexual**

		Transmission	Transmission
Total Releases	-4.22e-07	-6.16e-07	-5.99e-07
Male Releases	-5.02e-07	-6.72e-07	-6.99e-07
Female Releases	-3.08e-06	-3.62e-06	-5.46e-06
Unemployment	-.0017034	-.0074558	-.0170482
Poverty	-.0064754	-.0083932	-.0135023
Marriage Rate	-.0009832	-.0005032	.0004398
State GDP	-1.53e-07	3.73e-07	-1.20e-06**
Percent Black	-6.018847*	-29.4244**	23.82948**
Percent Hispanic	-2.244128	-17.51071**	3.839797
24 and Under	-1.93e-07	9.49e-07	-1.57e-06**
25 to 44	6.39e-07	-6.58e-07	2.49e-06**
45 and older	-1.49e-07*	-9.07e-08	-4.34e-07**
Spending on Health programs (per capita)	-.0001584	-.0006219	.0023712**
Governor Party	.0001309	-.0099727	.1009282*
Percent holding a Bachelors' Degree or higher	-.0245965	-.0493073	-.0967128*
Chlamydia Rate	.0002391	-.0000903	.0009808*
Gonorrhea Rate	-.0003374	.0027292	-.0018128
Percent Drug Use (except Marijuana)	.0171007	-.0057055	.1091304*
Number of Social Organizations	-.0006429*	.0018292**	.000259

*Significant at the .05 level
** Significant at .01 level

Appendix B.7: Male State Population HIV Negative Binomial Regression with Incarceration Rate and One Year Lag (Including Transmission Mechanisms)

Independent Variable	Male HIV Cases	Male HIV IV Drug Transmission	Male HIV Heterosexual Transmission
Incarceration Rate	-.0001058**	.0003482*	-.0000955
	(.000038)	(.0001718)	(.0001204)
	-.0000556**	.0018495*	-.0000544
Male Incarceration Rate	(.0000203)	(.0009079)	(.000064)
	-.0004846*	.0018495*	-.0003948
Female Incarceration Rate	(.0001985)	(.0009079)	(.0006646)
	-.0164818**	-.0201054	-.0135431
Unemployment	(.0032354)	(.0142981)	(.009953)
	.0001761	-.0141327	-.0129323
Poverty	(.0036629)	(.0149433)	(.0108465)
	-.0036944**	-.0105282	.0007605
Marriage Rate	(.0013737)	(.0063404)	(.0053775)
	-7.94e-10	-1.58e-06	-7.33e-07
State GDP	(1.29e-07)	(5.40e-07)	(3.97e-07)
	-8.242804**	-12.49564	25.7981**
Percent Black	(3.330021)	(15.12484)	(10.39761)
	.4642605	-39.14673**	-13.58145
Percent Hispanic	(2.513415)	(10.27322)	(7.907126)
	6.33e-07**	1.67e-06*	-3.85e-07
24 and Under	(1.62e-07)	(6.94e-07)	(5.42e-07)
	-6.63e-07**	-9.92e-07	5.74e-07
25 to 44	(2.29e-07)	(9.39e-07)	(7.32e-07)
	2.50e-09	5.64e-07	-4.08e-08
45 and older	(4.69e-08)	(2.09e-07)	(1.63e-07)
Spending on Health programs (per capita)	.000274	.0011344	.0013273*
	(.0001893)	(.0007792)	(.0006007)
	-.0168524	-.0586198	.0480482
Governor Party	(.0145972)	(.0675544)	(.0491404)
Percent holding a Bachelors' Degree or higher	-.0039824	.037941	-.001366
	(.0114225)	(.0500053)	(.0345226)
	-.0000196	-.0007035	-.000094
Chlamydia Rate	(.0001508)	(.0006482)	(.0004398)
	-.0000771	.0043249**	-.0001373
Gonorrhea Rate	(.0003156)	(.0013992)	(.0009518)

Percent Drug Use (except Marijuana)	-.0177372 (.0155194)	.0224056 (.0655487)	.0632028 (.0498106)
Number of Social Organizations	.0001026 (.0001645)	.0020118** (.0006987)	.0004548 (.0005202)

*Significant at the .05 level
** Significant at .01 level

Appendix B.8: Male State Population HIV Negative Binomial Regression with Incarceration measured as Releases and One Year Lag (Including Transmission Mechanisms)

Independent Variable	Male HIV Cases	Male HIV IV Drug Transmission	Male HIV Heterosexual Transmission
Total Releases	-8.58e-08 (3.43e-07)	2.21e-06* (9.13e-07)	1.05e-06 (6.37e-07)
Male Releases	-3.14e-07 (3.99e-07)	2.46e-06* (1.02e-06)	1.15e-06 (7.13e-07)
Female Releases	-7.63e-07 (2.03e-06)	.0000192* (8.40e-06)	8.63e-06 (5.91e-06)
Unemployment	-.01431** (.00471)	-.029231* (.0144257)	-.0154906 (.0100129)
Poverty	-.00347 (.00613)	-.0134826 (.0148657)	-.0186936 (.0108146)
Marriage Rate	-.00345 (.00219)	-.0104962 (.006333)	.0006684 (.0053802)
State GDP	-5.23e-08 (1.90e-07)	-1.28e-06** (5.08e-07)	-8.81e-07* (3.80e-07)
Percent Black	-3.445 (2.777)	-13.28896 (15.12823)	24.78901* (10.38534)
Percent Hispanic	-2.159 (2.329)	-34.14605** (9.918218)	-15.32648* (7.687619)
24 and Under	5.61e-07* (2.49e-07)	1.73e-06** (6.91e-07)	-4.55e-07 (5.39e-07)
25 to 44	-5.39e-07 (3.51e-07)	5.61e-07 (7.32e-07)	8.01e-07 (7.09e-07)
45 and older	1.85e-08 (5.86e-08)	5.98e-07 (2.10e-07)	-2.98e-09 (1.64e-07)
Spending on Health programs (per capita)	.00016 (.00028)	.0014276 (.0007783)	.0012716* (.0005971)
Governor Party	-.01168 (.01931)	-.0643495 (.0676296)	.0536027 (.0489878)

Percent holding a Bachelors' Degree or higher	.01931 (.01445)	.0150959 (.0506927)	-.0062364 (.0347279)
Chlamydia Rate	-.00003 (.00029)	-.0003751 (.0006671)	.0000738 (.0004497)
Gonorrhea Rate	-.00035 (.00055)	.003936** (.0014196)	-.0005742 (.0009614
Percent Drug Use (except Marijuana)	-.02492 (.02350)	.0269481 (.0655649)	.0678679 (.0497931)
Number of Social Organizations	-.00012 (.00023)	.0023573** (.0007211)	.000616 (.0005282)

*Significant at the .05 level
** Significant at .01 level

Appendix B.9: Black State Population HIV Negative Binomial Regression with Incarceration Rate (Including Transmission Mechanisms)

Independent Variable	Black HIV Cases	Black HIV IV Transmission	Black HIV Heterosexual Transmission
Black Incarceration Rate	-9.66e-07	-4.87e-06**	-7.77e-07
Black Male Incarceration Rate	-.000016*	-.0000165	-.0000126
Black Female Incarceration Rate	-.0001086*	-.0001054	-.0000668
Unemployment	-.004227	.0044543	-.0089258****
Poverty	-.0034388	-.0299078	-.0014304
Marriage Rate	.001438	-.011095	.0014685
State GDP	-2.56e-07	5.17e-07	-3.14e-07
Percent Black	-15.44632**	-30.896**	-9.243696
Percent Hispanic	-4.659726	-25.07984**	-8.144
24 and Under	2.18e-06*	5.62e-06*	7.42e-07
25 to 44	4.68e-08	-3.78e-06	1.63e-06
45 and older	-2.24e-06**	2.21e-07	-2.16e-06

Spending on Health programs (per capita)	.0002699	.0005867	.0014394**
Governor Party	.0426753	-.0777073	.0716675*
Percent holding a Bachelors' Degree or higher	-.0197318	-.1496842**	-.0704698**
Chlamydia Rate	.0007608**	.0003853	.0007076**
Gonorrhea Rate	-.0004575	.0018909	.0004644
Percent Drug Use (except Marijuana)	.0294239	-.0015665	.0366609
Number of Social Organizations	-.0001236	.0025029**	.0002133

*Significant at the .05 level
** Significant at .01 level

Appendix B.10: Black State Population HIV Negative Binomial Regression with Incarceration Rate and One Year Lag (Including Transmission Mechanisms)

Independent Variable	**Black HIV Cases**	**Black HIV IV Transmission**	**Black HIV Heterosexual Transmission**
Black Incarceration Rate	3.09e-07	-1.19e-06	-4.17e-08
	(5.97e-07)	(2.29e-06)	(8.84e-07)
Black Male Incarceration Rate	3.21e-06	-.0000299	4.31e-06
	(4.66e-06)	(.0000196)	(8.82e-06)
Black Female Incarceration Rate	.00010*	-.0001042	-8.14e-06
	(.00005)	(.000148)	(.0000634)
Unemployment	-.00434	-.0106466	-.0151692**
	(.00289)	(.0094004)	(.0037961)
Poverty	-.00669	.0163249	-.0035828
	(.00564)	(.0162182)	(.0068871)
Marriage Rate	.00433	-.0091421	-.0030276
	(.00286)	(.0094001)	(.0036885)
State GDP	-1.07e-07	-4.69e-07	-5.80e-07
	(1.40e-07)	(5.73e-07)	(2.58e-07)
Percent Black	1.230*	-14.21908	4.453815
	(.63604)	(7.775352)	(8.675312)
Percent Hispanic	-.54171	-12.50778	3.851234
	(.43904)	(8.462751)	(4.978269)
	2.16e-06	8.37e-06**	2.40e-06

24 and Under	(7.61e-07)	(2.70e-06)	(1.14e-06)
	1.69e-07	-5.90e-06	-1.98e-06
25 to 44	(9.79e-07)	(3.45e-06)	(1.36e-06)
	-2.27e-06**	-7.58e-07	-1.29e-06
45 and older	(4.42e-07)	(1.59e-06)	(7.25e-07)
Spending on Health programs	.00019	.0013011	.0010803**
(per capita)	(.00028)	(.0009992)	(.0004272)
	.00151	.1111012	.0648418
Governor Party	(.02211)	(.0748191)	(.0310859)
Percent holding a Bachelors'	.01211	-.1671047**	-.0714536**
Degree or higher	(.00655)	(.0562085)	(.0283168)
	-.00015	-.0000942	.000132
Chlamydia Rate	(.00023)	(.0006989)	(.0002909)
	-.00031	.0018529	.0004998
Gonorrhea Rate	(.00050)	(.0016441)	(.0006415)
Percent Drug Use (except	.01099	.0533844	.1080097**
Marijuana)	(.02776)	(.0885663)	(.0361597)
	.00007	.0006041	-.0003485
Number of Social Organizations	(.00009)	(.0006305)	(.000363)

*Significant at the .05 level
** Significant at .01 level

Appendix B.11: White State Population HIV Negative Binomial Regression with Incarceration Rate (Including Transmission Mechanisms)

Independent Variable	**White HIV Cases**	**White HIV IV Transmission**	**White HIV Heterosexual Transmission**
White Incarceration Rate	-3.97e-07	-1.56e-06	2.85e-07
White Male Incarceration Rate	-5.17e-06	-3.34e-06	.0000141
White Female Incarceration Rate	5.64e-06	-.0000177	.0000973
Unemployment	-.0017661	-.0248238	-.0231842
Poverty	-.0106997	.0144956	-.0345295*****
Marriage Rate	-.0011852	-.0005686	-.0125299*
State GDP	4.47e-08	-5.56e-07	3.52e-07
Percent Black	-17.55218**	-16.79109	.9956635

Percent Hispanic	-.3684931	-15.29234	-22.10696*
24 and Under	-2.23e-07	1.72e-06	-5.39e-07
25 to 44	4.33e-07	-1.39e-06	-6.95e-08
45 and older	-2.91e-07	6.75e-08	6.73e-07
Spending on Health programs (per capita)	.0001243	-.0011818	.0015319
Governor Party	-.0361252	-.0113719	-.1339669*
Percent holding a Bachelors' Degree or higher	-.0105042	.008814	.0561999
Chlamydia Rate	-.0004057	-.0003694	.0000423
Gonorrhea Rate	.0000123	.0035751	-.0024408
Percent Drug Use (except Marijuana)	.0010481	-.0806614	.0730224
Number of Social Organizations	-.0004768	.000965	.0025573*

*Significant at the .05 level
** Significant at .01 level

Appendix B.12: White State Population HIV Negative Binomial Regression with Incarceration Rate and One Year Lag (Including Transmission Mechanisms)

Independent Variable	**White HIV Cases**	**White HIV IV Transmission**	**White HIV Heterosexual Transmission**
White Incarceration Rate	1.11e-07 (7.71e-07)	-3.83e-06 (3.02e-06)	5.98e-07 (2.08e-06)
White Male Incarceration Rate	-.00002** (7.09e-06)	-.00005 (.00003)	-.00005** (.00002)
White Female Incarceration Rate	-.00009** (.00003)	-.00023 (.00013)	-.00025** (.00009)
Unemployment	-.0208925** (.0052222)	-.04903* (.02033)	-.02289 (.01424)
Poverty	.0044969 (.006158)	.00764 (.02301)	.00623 (.01627)
Marriage Rate	-.0043262* (.0021424)	-.01467 (.00775)	-.00028 (.00611)

State GDP	2.07e-07 (2.23e-07)	-1.29e-06 (-1.29e-06)	-6.75e-07 (6.27e-07)
Percent Black	-15.22902* (6.412776)	-17.006 (25.428)	-8.825 (17.158)
Percent Hispanic	5.295359 (4.220204)	-30.353* (15.677)	2.967 (11.549)
24 and Under	1.09e-06** (4.11e-07)	1.50e-06 (1.54e-06)	11.549 (1.10e-06)
25 to 44	-9.80e-07 (5.35e-07)	-2.78e-06 (2.03e-06)	5.36e-07 (1.41e-06)
45 and older	3.76e-08 (1.53e-07)	1.17e-06 (5.81e-07)	-2.63e-08 (4.17e-07)
Spending on Health programs (per capita)	-.0000493 (.0002969)	.00235* (.00116)	.00025 (.00084)
Governor Party	-.0541682** (.0217087)	-.08294 (.08669)	-.08913 (.06174)
Percent holding a Bachelors' Degree or higher	-.0033187 (.0196892)	.05052 (.07544)	.02518 (.06720)
Chlamydia Rate	-.0004602 (.0002747)	.00080 (.00107)	-.00153* (.00071)
Gonorrhea Rate	.0000244 (.0000244)	.00057 (.00218)	-.00060 (.00147)
Percent Drug Use (except Marijuana)	-.0218517 (.0235733)	.03959 (.09036)	-.02172 (.06720)
Number of Social Organizations	.0004567 (.0003155)	.00130 (.00120)	.00015 (.00085)

*Significant at the .05 level
** Significant at .01 level

Appendix B.13: Black and White Female State Population HIV Negative Binomial Regression with Incarceration Rate and with and without One Year Lag

Independent Variable	Black Female HIV Cases	White Female HIV Cases	Black Female HIV Cases (1 Year Lag)	White Female HIV Cases (1 Year Lag)
Incarceration Rate	-2.48e-06**	2.99e-06	-2.05e-06* (9.82e-07)	3.46e-07 (2.10e-06)
Male Incarceration	-.0000166	7.82e-06	9.15e-06 (9.93e-06)	-.00004* (.00002)
Female Incarceration	-.0000614	.0000387	.00004 (.00007)	-.00024* (.00009)
			-.01311**	-.02178

Unemployment	-.0097935*	-.0189083	(.00427)	(.01446)
Poverty	-.0145294*	-.0158222	-.00411 (.00769)	.01421 (.01638)
Marriage Rate	.0015605	-.0113942	-.00246 (.00400)	-.00533 (.00625)
State GDP	-1.48e-07	1.23e-07	-6.93e-07* (2.87e-07)	-9.08e-07 (6.50e-07)
Percent Black	-15.83422	.1869386	-3.728 (9.735)	-6.440 (12.340)
Percent Hispanic	6.709937	-26.65441*	16.315** (5.346)	-18.390 (8.234)
24 and Under	4.80e-06**	-3.90e-07	3.97e-06 (1.26e-06)	5.78e-07 (1.11e-06)
25 to 44	-2.24e-06	8.57e-07	-2.76e-06 (1.55e-06)	-7.27e-07 (1.46e-06)
45 and older	-2.60e-06**	3.27e-07	-1.60e-06* (8.08e-07)	6.42e-07 (3.95e-07)
Spending on Health programs (per capita)	.000433	.0007301	-.00012 (.00048)	.00086 (.00086)
Governor Party	.0597151	-.1457523*	.07288* (.03440)	-.17371** (.06256)
Percent holding a Bachelors' Degree or higher	-.0865914**	.0529834	-.04956 (.03146)	.06897 (.05203)
Chlamydia Rate	.0004694	-.0002505	.00016 (.00032)	-.00173* (.00071)
Gonorrhea Rate	.0011424	-.0008677	.001301 (.00072)	.00163 (.00152)
Percent Drug Use (except Marijuana)	.005083	.0411932	.13379** (.04026)	-.02003 (.06682)
Number of Social Organizations	.000254	.0009382	.00030 (.000404)	.00044 (.00086)

*Significant at the .05 level
** Significant at .01 level

Appendix B.14: Black and White Male State Population HIV Negative Binomial Regression with Incarceration Rate and with and without One Year Lag

Independent Variable	Black Male HIV Cases	White Male HIV Cases	Black Male HIV Cases (1 Year Lag)	White HIV AIDS Cases (1 Year Lag)
Incarceration Rate	-8.02e-07	-1.30e-06	-1.45e-06* (6.56e-07) 1.44e-06	2.07e-07 (9.75e-07) -.00001

Male Incarceration	-.0000104	-2.20e-06	(6.41e-06)	(8.19e-06)
Female Incarceration	-.0000816	.0000187	-.00004 (.00005)	-.00005 (.00004)
Unemployment	-.0018246	.0007729	-.00279 (.00277)	-.01711** (.00667)
Poverty	.0014005	-.0091646	-.00451 (.00493)	.00468 (.00883)
Marriage Rate	.0041588	.0002346	.00304 (.00253)	-.00476 (.00311)
State GDP	-2.47e-07	-1.42e-07	-2.74e-07 (1.88e-07)	3.36e-07 (2.70e-07)
Percent Black	-2.802834	-20.99388**	4.924 (6.334)	-1.809 (3.236)
Percent Hispanic	-7.87612*	3.111103	1.748 (3.668)	.10088 (3.202)
24 and Under	1.19e-06	-2.80e-07	2.71e-06** (8.38e-07)	1.02e-06* (4.98e-07)
25 to 44	1.08e-06	5.59e-07	-1.35e-06 (1.05e-06)	-8.26e-07 (6.68e-07)
45 and older	-2.55e-06**	-4.49e-07**	-2.29e-06 (5.39e-07)	3.91e-08 (1.53e-07)
Spending on Health programs (per capita)	-.000111	.0000775	.00059* (.00030)	-.00020 (.00038)
Governor Party	.0477689	-.0248688	-.01893 (.02170)	-.03872 (.02779)
Percent holding a Bachelors' Degree or higher	-.0220924	-.0295941	-.02035 (.02086)	-.01614 (.02172)
Chlamydia Rate	.0011682**	-.0002279	.00033 (.00021)	-.00036 (.00039)
Gonorrhea Rate	-.0016343**	-.0001492	-.00042 (.00045)	-.00052 (.00075)
Percent Drug Use (except Marijuana)	.0666961**	.0065196	-.01505 (.02596)	-.00490 (.03256)
Number of Social Organizations	-.0004119	-.000768*	-.00023 (.00026)	.00039 (.00034)

*Significant at the .05 level
** Significant at .01 level

Chapter 6: HIV Testing as an Intervention in Disease Spread

Introduction

As mentioned in the previous chapter, the results in this study so far overwhelmingly point toward higher levels of incarceration decreasing community levels of HIV/AIDS. While this is contrary to the expected relationship, it is not out of the realm of plausible possibility. What these results may represent is that prisons, or some characteristic thereof, act as a form of intervention in the course of larger communal disease spread. Similarly, any disease gains made within prison walls may spillover to serve as disease gains in the wider community. The presumed or hypothesized mechanism of intervention within prisons is the implementation of HIV testing. This chapter seeks to provide one of the first direct state level empirical tests of the impact of prison HIV testing on disease spread.

The first HIV testing was licensed in 1985.[1] Over the next two decades, further advancements were made in terms of better testing mechanisms and more widespread availability. In 2006, the CDC released recommendations for HIV testing in healthcare settings, followed by guidance specifically for correctional settings in 2009. Although the CDC recommends testing in prisons, states have the ability to choose under what circumstances and which prisoners to test. This autonomy creates a wide variance in the number of prisoners, if any, are actually tested within state prisons.

Testing is a vital part of combating the HIV epidemic, as it is the only mechanism that informs individuals of their disease status. By knowing their status, individuals can modify their

behaviors, which could result in reducing or eliminating spread to others. Existing research finds that knowing one's diseases status is linked to a lower likelihood of acquiring and transmitting HIV.[2] Even if a person tests negative, the experience and built-up knowledge of the disease may shape their opinions regarding high risk behaviors. In addition, having higher antiretroviral loads in one's system reduces the likelihood of transmitting the disease to others. The only way to receive antiretroviral treatment is to be tested and receive a prescription from a doctor. The bottom line is that testing is an important and presumably effective component of decreasing the HIV/AIDS epidemic in the United States.

While HIV testing can be implemented at any health facility, prison presents a unique and interesting opportunity to increase the effectiveness of HIV testing. First, the prison population is likely to capture a sample of the population at highest risk for HIV contraction. Prisons are known to house high levels of drug users, sex workers, poorer, and lower SES populations. People who fit into these categories are at higher risk for HIV contraction. This is combined with prison populations being three to five times more likely to have HIV.[3] Second, the authoritative structure of the prison system lends itself to easier testing implementation than in other settings. Most healthcare settings rely on voluntary visitation by individuals. Prisons, on the other hand, leave few decisions to the individual and forcibly require numerous behaviors as conditions of confinement. Testing could be one such required behavior added to the terms of a prison stay. Third, prisons are by law required to provide health services to inmates. Given this fact, it can be presumed that prisons already have the infrastructure in place to implement a practice such as HIV testing. Lastly, if prisons identify HIV positive individuals, they can work with outside organizations and medical facilities through re-reentry programs in order to continue antiretroviral treatment after releases. Continued antiretroviral treatment helps combat

disease spread, since higher viral loads reduce the likelihood of spread to others. Combining all of these factors, prisons, on their surface, represent a key opportunity to reach some of the highest risk populations.

Data and Methods

Following the structure of the two other empirical chapters, a full description of the data and methods undertaken in this section are laid out in chapter 3. A brief review is provided here as a refresher. This section seeks to test whether states that more widely or under a greater number of conditions test for HIV have a different impact on disease spread than those states that test under fewer conditions. It is assumed that the more conditions under which a state prison system tests for HIV, the more prisoners would be tested. The opposite—the fewer the testing conditions, the fewer prisoners tested—is assumed for states with fewer testing circumstances. HIV testing in state prisons had two levels. First, testing can be mandatory or voluntary. If testing is mandatory, it is likely that a larger number of inmates will be tested than would be tested under voluntary circumstances. Second, states have a variety of circumstances under which they can decide to test inmates. These circumstances are on entry, during incarceration, upon exit, random, high risk, inmate request, court order, clinical indication, involvement in an incident, or other. The first four circumstances, upon entry, in custody, upon exit, or random can be applied in a mandatory sense. The rest of the circumstances are dependent on certain situational factors or are voluntary.

In order to divide states into two groups for testing—less strict and stricter testing states—a numerical ranking was provided by the researcher. The full rankings can be seen in the tables in chapter 3, but the basic breakdown is that each circumstance that a state tested for was assigned a point, while the testing circumstances that could fall under the mandatory umbrella

were assigned two points each. A composite score was tallied for all states, and then they were split into two groups at a natural breaking point (between 5 and 6). This split leaves 21 states in the less strict group, including West Virginia, Colorado, Massachusetts, New Mexico, Kentucky, Maine, North Carolina, Arizona, California, Louisiana, Montana, New Jersey, Pennsylvania, Wyoming, Georgia, Michigan, South Dakota, Tennessee, Utah, Virginia, and Wisconsin. The stricter testing group has 22 states, including Florida, Illinois, Kansas, Maryland, Minnesota, Nebraska, Ohio, Indiana, Mississippi, New York, Oklahoma, South Carolina, Washington, Idaho, Iowa, North Dakota, Texas, Missouri, Nevada, Alabama, and Arkansas.

The same models as in chapter 5 were run separately for each of the two groups of states and then compared. Much like chapter 5, the main results of interest, the incarceration variables, are displayed in the body of the chapter text. Full tables including the covariates are included in the chapter's appendices at the end.

Results and Discussion

Total Population Models

The coefficients on the incarceration variables in this first group of states—those less strict with regard to HIV testing—are all in the negative direction, again suggesting that higher levels of incarceration decrease HIV cases in general. These results are consistent with the all-inclusive state studies in the previous two chapters. In the models without a lag, significant results were produced for both the total HIV cases and the heterosexual HIV cases. This finding, as in the previous sections, suggests that incarceration may influence heterosexually transmitted HIV cases more so than IV drug transmission cases. The release models did not return any significant results. In the lagged models, significant results were produced for the incarceration rate coefficients for total and heterosexual HIV cases, but also for the release lagged models for

heterosexually transmitted cases. These findings provide further evidence that methods of HIV transmission are differentially impacted by incarceration, with incarceration having a larger impact on heterosexually transmitted HIV cases. Similar to the previous empirical sections, the magnitudes on the significant variables are relatively small. Most importantly, these first results are confirming and mimicking the results found in the all-state models above, pointing toward some characteristic of prisons acting as an intervention or protectionist.

Table 6.1: Total State HIV Negative Binomial Regression using Incarceration Rate and Releases for States with Less Strict Testing Circumstances (Including One Year Lag)

Independent Variable	HIV Cases	HIV IV Drug Transmission	HIV Heterosexual Transmission
Incarceration Rate	-.00018**	-.00027	-.00027**
Male Incarceration Rate	-.00010**	-.00106	-.00014**
Female Incarceration Rate	-.00060*	-.00106	-.00147**
Total Releases	5.70e-09	-2.97e-07	-8.92e-07
Male Releases	-1.38e-09	-3.40e-07	-9.90e-07
Female Releases	5.74e-07	-2.19e-06	-8.81e-06
	One Year Lag		
Incarceration Rate	.00015	-7.55e-06	-.00020
	(.00030)	(.00022)	(.00012)
Male Incarceration Rate	.00011	-.00016	.00003
	(.00008)	(.00021)	(.00010)
Female Incarceration Rate	-.00173*	.00163	-.00172
	(.00089)	(.00189)	(.00102)
Total Releases	-4.59e-07	6.11e-07	-4.59e-07
	(6.69e-07)	(1.34e-06)	(6.69e-07)
Male Releases	6.26e-06	1.50e-06	9.05e-06
	(4.10e-06)	(9.08e-06)	(4.81e-06)
Female Releases	-.00005	-6.79e-06	-.00008*
	(.00003)	(.00008)	(.00004)

*Significant at the .05 level
** Significant at .01 level

The next set of models looks at total HIV cases in the states with stricter HIV testing. The first result that sticks out is the positive coefficients on many of the incarceration variables. In the model without a lag, all of the incarceration rate variables have positive coefficients for total HIV, IV drug HIV cases, and almost all heterosexual HIV cases, suggesting that an increase in incarceration increases HIV cases. The release incarceration variables also produced positive coefficients in the total HIV model. Negative coefficients were produced in the IV drug and heterosexual HIV cases for the release variables. These initial results show a pattern that differs from the results in Table 6.1 for the less strict states. In the less strict states, incarceration appears to decrease HIV cases, while in the more strict states incarceration appears to increase HIV cases. While these are only initial results, they display a diverging pattern between the groups of states. This pattern, however, is contradictory to the hypothesized relationship. The hypothesis was that in states that perform more testing for HIV, there would be fewer general HIV cases. What the results thus far display is the opposite: in states where there is more testing there are more HIV cases and where there is less testing there are fewer cases. Most importantly, though, are the emerging differences between the two groups of states, suggesting that something must be driving the opposite coefficient directions.

Looking at the lagged results for the stricter state models, some of the coefficients switch direction, particularly in the models using incarceration as the rate. All of the incarceration rate coefficients are negative which is opposite to the direction in the models without a lag; however, all of the coefficients in the release lagged models are positive, which is similar to the models without a lag. The contradictory coefficients in the rate models do not necessarily refute the prior findings, but they do display an interesting caveat. Given that the release models still have positive coefficients, and that release is presumed to be a better measure, since releases are

needed in order for gains in prisons to spread to the larger community, the notion that more incarceration appears to increase HIV cases in the stricter testing states still holds.

Table 6.2: Total State HIV Negative Binomial Regression using Incarceration Rate and Releases for States with Stricter Testing Circumstances (including One Year Lag)

Independent Variable	HIV Cases	HIV IV Drug Transmission	HIV Heterosexual Transmission
Incarceration Rate	.00013**	.00012	-5.11e-06
Male Incarceration Rate	.00006*	.00006	3.41e-06
Female Incarceration Rate	.00104**	.00062	3.41e-06
Total Releases	3.84e-07	-3.84e-07	-2.57e-07
Male Releases	4.20e-07	-3.39e-07	-3.67e-07
Female Releases	4.03e-06	-3.72e-06	-2.98e-06
	One Year Lag		
Incarceration Rate	-.00007 (.00005)	.00081** (.00033)	.00017 (.00011)
Male Incarceration Rate	-.00009* (.00005)	.00032 (.00027)	.00003 (.00009)
Female Incarceration Rate	.00072 (.0005)	.00146 (.00301)	.00083 (.00103)
Total Releases	6.94e-08 (2.84e-07)	1.56e-06 (1.17e-06)	5.47e-07 (5.77e-07)
Male Releases	6.96e-07 (1.59e-06)	.00001 (6.24e-06)	6.17e-08 (3.16e-06)
Female Releases	-5.42e-06 (.00001)	-.00008 (.00005)	3.79e-06 (.00003)

*Significant at the .05 level
** Significant at .01 level

Gendered Models

The next set of models explores differences in the effect on gendered HIV cases for each group of states. In the less strict states, the incarceration coefficients for both rates and releases

are again all in the negative direction, suggesting that more incarceration decreases female HIV cases. Significance is achieved in a manner similar to the above total HIV model for both total female HIV cases and female heterosexual HIV cases, in the models for the incarceration rate variables. The models measuring incarceration as releases only produced a single significant variable across the models with and without a lag: for female incarceration in the female heterosexual HIV cases model. The significant results for the models with and without a lag still consistently show very small magnitudes of effect. These results for the less strict states are displayed in Table 6.3.

Table 6.3: Female State HIV Negative Binomial Regression using Incarceration Rate and Releases for States with Less Strict Testing Circumstances (Including One Year Lag)

Independent Variable	Female HIV Cases	Female HIV IV Drug Transmission	Female HIV Heterosexual Transmission
Incarceration Rate	-.00035**	-.00014	-.00035**
Male Incarceration Rate	-.00018**	-.00008	-.00018**
Female Incarceration Rate	-.00140*	-.00035	-.00168*
Total Releases	-6.87e-07	-2.26e-07	-6.97e-07
Male Releases	-7.63e-07	-2.64e-07	-7.68e-07
Female Releases	-6.74e-06	-1.37e-06	-7.22e-06
	One Year Lag		
Incarceration Rate	-.00028*	-.00047	-.00017
	(.00014)	(.00033)	(.00013)
Male Incarceration Rate	-.00015	.00012	.00016
	(.00028)	(.00011)	(.00012)
Female Incarceration Rate	-.00006	-.00273*	-.00297**
	(.00272)	(.00111)	(.00117)
Total Releases	-1.15e-06	-2.87e-06	-6.97e-07
	(7.36e-07)	(2.17e-06)	(8.11e-07)
Male Releases	.00001	6.17e-06	.00001**
	(5.45e-06)	(.00001)	(4.94e-06)

Female Releases	-.00009* (.00004)	-.00008 (.00012)	-.00013** (.00004)

*Significant at the .05 level
** Significant at .01 level

Turning to the stricter testing states, whose results are displayed in Table 6.4, a mix of coefficient directions can be seen. The total and male incarceration rate variables have positive coefficients in the models without a lag, while female incarceration has negative coefficients across all three female HIV categories. Male and total incarceration also has negative coefficients for female heterosexual HIV cases. None of these results achieved statistical significance. All of the release variables in the models without a one year lag have negative coefficients. Looking at the lagged models, the incarceration rate coefficients are again mixed, while all of the release coefficients are positive. Only the total release coefficient reached statistical significance in the female IV drug HIV cases model. While these results are by no means definitive or straightforward, they do exhibit some differences from the results found in the less strict state analyses. These models appear to be uncovering something that is causing the positive coefficients in the stricter state models, since the positive coefficients are absent from the less strict state models. To further probe at this relationship, male HIV models for both groups of state are the focus of the next set of models.

Table 6.4: Female State HIV Negative Binomial Regression using Incarceration Rates and Releases for States with Stricter Testing Circumstances (Including a One Year Lag)

Independent Variable	Female HIV Cases	Female HIV IV Drug Transmission	Female HIV Heterosexual Transmission
Incarceration Rate	.00003	.00008	-.00002
Male Incarceration Rate	9.92e-06	.00006	-4.83e-06
Female Incarceration Rate	-.00048	-.00005	-.00066
Total Releases	-3.51e-07	-9.57e-07	-3.77e-07

Male Releases	-4.45e-07	-1.18e-06	-4.71e-07
Female Releases	-4.22e-06	-.00001	-4.28e-06
	One Year Lag		
Incarceration Rate	.00021 (.00012)	.00081** (.00033)	.00012 (.00013)
Male Incarceration Rate	.00005 (.00010)	.00032 (.00029)	.00001 (.00011)
Female Incarceration Rate	.00078 (.00113)	.00149 (.00301)	.00071 (.00122)
Total Releases	-2.64e-07 (6.46e-07)	1.41e-06 (1.78e-06)	-5.39e-07 (6.96e-07)
Male Releases	-1.23e-06 (3.52e-06)	-4.37e-06 (9.47e-06)	-5.94e-07 (3.81e-06)
Female Releases	7.72e-06 (.00003)	.00005 (.00008)	-4.78e-07 (.00003)

*Significant at the .05 level
** Significant at .01 level

For the less strict testing states, the male HIV models' results mirrored the pattern of the less strict states total and female results. In general, the direction of the coefficients on all of the incarceration measures, rates and releases and with and without a lag, seems to suggest that an increase in incarceration decreases male HIV cases. In the models without a lag, the total and male incarceration showed a significant association with total male HIV cases. In the lagged models, total, male, and female releases produced a significant association with male heterosexual HIV cases. While there is a general lack of significant findings or clear associated relationships, the consistently negative direction of the coefficients for the less strict state models is worth noting, especially it has differed from the findings in the stricter testing state models up to this point.

Table 6.5: Male State HIV Negative Binomial Regression using Incarceration Rates and Releases for States with Less Strict Testing Circumstances (Including One Year Lag)

Independent Variable	Male HIV Cases	Male HIV IV Drug Transmission	Male HIV Heterosexual Transmission
Incarceration Rate	-.00017**	-.00035	-.00012
Male Incarceration Rate	-.00009**	-.00019	-.00005
Female Incarceration Rate	-.00058	-.00147	-.00090
Total Releases	-5.67e-07	-2.24e-07	-1.05e-06
Male Releases	-6.41e-07	-2.56e-07	-1.17e-06
Female Releases	-4.77e-06	-1.74e-06	-9.56e-06
	One Year Lag		
Incarceration Rate	-.00010	.00053*	-.00025
	(.00006)	(.00026)	(.00020)
Male Incarceration Rate	.00006	.00014	-.00026
	(.00005)	(.00022)	(.00017)
Female Incarceration Rate	-.00136**	.00159	.00115
	(.00048)	(.00209)	(.00174)
Total Releases	-3.11e-07	3.03e-06*	-2.71e-07
	(4.26e-07)	(1.47e-06)	(1.11e-06)
Male Releases	6.01e-07	1.04e-06	-2.79e-07
	(2.69e-06)	(.00001)	(8.80e-06)
Female Releases	-8.88e-06	.00002	-1.97e-07
	(.00002)	(.00009)	(.00007)

*Significant at the .05 level
** Significant at .01 level

The male HIV models without a lag produced results in a manner consistent with those for the total and female HIV models focusing on the stricter testing states. The positive coefficients across both rates and releases suggest an increase in incarceration increases male HIV cases in general. Although the incarceration coefficients in the male models without a lag are positive, all of the incarceration coefficients in the lagged model returned a negative direction, suggesting an opposite relationship to that of the model without a lag. The lagged results are more consistent with the prior results in the less strict testing states, while the results

without the lag are more consistent with the prior results from the stricter states models. While these results are relatively inconclusive and ambiguous, they do differ on some level from those found overall in the less strict state model. This difference suggests at some level that some characteristics of the stricter states are creating a different relationship between incarceration and HIV than in the less strict states. To further try to unpack and clarify these differences, the same models are rerun for both groups of states with regard to race.

Table 6.6: Male State HIV Negative Binomial Regression using Incarceration Rates and Releases for States with Stricter Testing Circumstances (Including a One Year Lag)

Independent Variable	Male HIV Cases	Male HIV IV Drug Transmission	Male HIV Heterosexual Transmission
Incarceration Rate	.00008	.00015	.00003
Male Incarceration Rate	.00004	.00008	.00002
Female Incarceration Rate	.00056	.00108	-.00061
Total Releases	3.97e-07	-1.36e-07	3.32e-07
Male Releases	4.30e-07	2.31e-07	-4.66e-08
Female Releases	4.20e-06	1.37e-06	1.01e-06
	One Year Lag		
Incarceration Rate	-.00006 (.00006)	.00041 (.00029)	.00027 (.00020)
Male Incarceration Rate	-8.81e-06 (.00005)	.00058 (.00024)	.00007 (.00018)
Female Incarceration Rate	-.00031 (.00058)	-.00488 (.00272)	.00080 (.00191)
Total Releases	2.84e-07 (3.75e-07)	1.85e-06 (1.57e-06)	2.91e-06** (1.05e-06)
Male Releases	-8.46e-08 (2.06e-06)	.00002** (8.54e-06)	1.99e-06 (5.74e-06)
Female Releases	3.18e-06 (.00002)	-.00018** (.00007)	8.73e-06 (.00005)

*Significant at the .05 level
** Significant at .01 level

Racial HIV Models

The majority of the Black incarceration variables have negative coefficients, thus supporting the previous results in the less strict states: that incarceration decreases Black HIV cases. Black male and Black female incarceration produced positive coefficients for the Black IV drug HIV cases. This finding is similar to the differing coefficient in the previous total and female IV drug HIV cases. When the lagged Black negative binomial models were run, results could not be computed due to the necessity of dropping groups for only having a single observation. The dropping of those groups could be a result of small Black or Black female populations in this group of states. None of the coefficients reached statistical significance, but they resembled patterns similar to those of previous results in the less strict state models.

Table 6.7: Black State HIV Negative Binomial Regression using Incarceration Rates for States with Less Strict Testing Circumstances (Including One Year Lag)

Independent Variable	Black HIV Cases	Black HIV IV Transmission	Black HIV Heterosexual Transmission
Black Incarceration Rate	-1.37e-06	-3.60e-06	3.64e-06
Black Male Incarceration Rate	-.0000392	.0001315	-.0000843
Black Female Incarceration Rate	-.0001465	.0017223	-.000564
	One Year Lag		
Black Incarceration Rate	5.13e-06**	3.40e-06	8.61e-06**
	(1.70e-06)	(6.06e-06)	(2.98e-06)
Black Male Incarceration Rate	-.00001	.00005	.000138
	(.00002)	(.00014)	(.00006)
Black Female Incarceration Rate	.00025	-.00074	-.00094
	(.00045)	(.00114)	(.00056)

*Significant at the .05 level
** Significant at .01 level

In general, the Black model results for the stricter testing states resemble those found in all three of the previous sets of models—total, female, and male—for the stricter states. The mostly positive incarceration coefficients suggest that increases in incarceration increase Black

HIV cases. The Black male incarceration coefficients were the only negative coefficients, both with and without the releases. Coefficients for Black male incarceration are the only coefficients to be negative, while only total Black incarceration in the lagged model reached statistical significance. The Black HIV models did not return as consistent or straightforward results, given the mix of coefficient directions. Overall, however, the mostly positive coefficients continue the pattern seen in the previous stricter state models, where incarceration increases HIV cases—in this instance, Black HIV cases. Some of the inconsistencies and lack of significance in the data could be due to the relatively small number of observations available. Dividing the states into two groups, as well as reducing the timeframe for available HIV data may limit the reach of such a study. Nonetheless, enough similarities between models in each a state group can be considered to be contributing to a different pattern for each group.

Table 6.8: Black State HIV Negative Binomial Regression using Incarceration Rates for States with Stricter Testing Circumstances (Including One Year Lag)

Independent Variable	Black HIV Cases	Black HIV IV Transmission	Black HIV Heterosexual Transmission
Black Incarceration Rate	1.01e-07	9.42e-08	2.46e-07
Black Male Incarceration Rate	-5.38e-06	-3.47e-06	.00001
Black Female Incarceration Rate	-.00002	.00008	.00008
	One Year Lag		
Black Incarceration Rate	6.24e-09 (8.10e-07)	3.15e-06 (3.15e-06)	6.78e-07 (1.17e-06)
Black Male Incarceration Rate	-5.60e-07 (.00003)	-.00018 (.00013)	-.00008 (.00006)
Black Female Incarceration Rate	-.00003 (.00027)	.00164 (.00103)	.00057 (.00045)

*Significant at the .05 level
** Significant at .01 level

Similar to the Black HIV models, the White HIV models display inconsistent and insignificant results for both the less strict and stricter testing state models. None of the incarceration variables in either group models reached statistical significance. One thing to notice is that although the coefficients are not in a consistent pattern, many appear to switch direction from the less strict state models to the stricter state models. For example, in the less strict state models, the coefficient for total White incarceration in the total White HIV model is negative, while in the stricter state model, it is positive. This pattern is repeated in for the White male and female coefficients in the White heterosexual HIV cases models. The coefficients are negative in the less strict state group, while they are positive in the stricter state group. Several other coefficients follow a similar pattern through the White HIV models in both groups of states. Again, these results suggest that there is something different between the states that drives the differences in the coefficient directions although fail to reach statistical significance. As with the Black models, the lack of statistical significance may again be due to the reduced number of observations in the models as they are spilt into specific and smaller populations.

Table 6.9: White State HIV Negative Binomial Regression using Incarceration Rates for States with Less Strict Testing Circumstances

Independent Variable	White HIV Cases	White HIV IV Transmission	White HIV Heterosexual Transmission
White Incarceration Rate	-4.77e-07	5.89e-06	3.87e-06
White Male Incarceration Rate	.00002	.00004	-.00011
White Female Incarceration Rate	.00039	.00011	-.00092
	One Year Lag		
White Incarceration Rate	3.22e-06 (2.06e-06)	-4.14e-06 (6.77e-06)	-1.07e-06 (5.19e-06)
White Male Incarceration Rate	2.08e-07 (.00003)	-.00007 (.00011)	.00002 (.00008)

	.00029	.00097	-.00045
White Female Incarceration Rate	(.00028)	(.00108)	(.00077)

*Significant at the .05 level
** Significant at .01 level

Table 6.10: White State HIV Negative Binomial Regression using Incarceration Rates for States with Stricter Testing Circumstances and One Year Lag

Independent Variable	**White HIV Cases**	**White HIV IV Transmission**	**White HIV Heterosexual Transmission**
White Incarceration Rate	1.08e-06	2.37e-06	2.01e-06
White Male Incarceration Rate	-4.92e-07	.00011	.00002
White Female Incarceration Rate	-.00003	.00029	.00002
	One Year Lag		
White Incarceration Rate	1.97e-06	3.04e-06	5.31e-06
	(1.24e-06)	(4.33e-06)	(2.87e-06)
	-.00002	-.00032	.00012
White Male Incarceration Rate	(.00007)	(.00028)	(.00020)
	-.00003	.00130	-.00059
White Female Incarceration Rate	(.00028)	(.00107)	(.00078)

*Significant at the .05 level
** Significant at .01 level

The last set of models for each group of states is specific to Black and White female and male HIV cases. In the results for Black females, no coefficients for the Black male and female incarceration variables could be computed because several groups were dropped due to having only a single observation. This dearth of observations may be due to the limitations of the small time frame and the specificity of the group being tested. Similarly, given the divide in the states, it is possible that many of the less strict states have a smaller Black female population or general Black population that further reduces the possible number of observations included. Much like the total Black and White HIV models, both the race specific female and male models do not exhibit the clear patterns seen in the total, female, and male HIV models for either group of states. Each group has a mix of positive and negative coefficients, suggesting that in some cases,

increases in incarceration increase HIV cases, while in other cases, increases in incarceration decrease HIV cases. These results do not appear to add any additional credence or evidence to any of the previous findings. Instead what these results more likely signal is that more data is needed to be able to effectively test the relationship at a group level this specific.

Table 6.11: Black and White Female and Male State Population HIV Negative Binomial Regression with Incarceration Rate in Less Strict Testing States (Including One) Year Lag

Independent Variable	Black female HIV Cases	White Female HIV Cases	Black female HIV Cases (1 Year Lag)	White Female HIV Cases (1 Year Lag)
Incarceration Rate	-7.92e-07	6.77e-06	5.79e-06	-5.19e-07
			(3.22e-06)	(5.36e-06)
Male Incarceration	-.00003	.00002	.00019**	.00002
			(.00007)	(.00008)
Female Incarceration	.00021	-.00018	-.00156**	-.00020
			(.00063)	(.00079)
Independent Variable	**Black Male AIDS Cases**	**White Male AIDS Cases**	**Black Male AIDS Cases (1 Year Lag)**	**White Male AIDS Cases (1 Year Lag)**
Incarceration Rate	2.53e-06	-4.29e-06*	3.06e-06	2.61e-06
			(1.97e-06)	(2.11e-06)
Male Incarceration	-.00003	.00002	-.00003	3.38e-06
			(.00005)	(.00003)
Female Incarceration	-.00023	.00049	.00042	.00039
			(.00040)	(.00030)

*Significant at the .05 level
** Significant at .01 level

Table 6.12: Black and White Female and Male State Population HIV Negative Binomial Regression with Incarceration Rate Stricter Testing States (Including One Year Lag)

Independent Variable	Black female HIV Cases	White Female HIV Cases	Black Female HIV Cases (1 Year Lag)	White Female HIV Cases (1 Year Lag)
Incarceration Rate	-8.74e-07	5.77e-06*	-9.40e-07	4.75e-06
			(1.40e-06)	(3.04e-06)
Male Incarceration	2.94e-06	.0000166	-.00011	.00005
			(.00006)	(.00020)
Female Incarceration	-5.74e-06	.0000193	.00098*	-.00038
			(.00050)	(.00078)

Independent Variable	Black Male AIDS Cases	White Male AIDS Cases	Black Male AIDS Cases (1 Year Lag)	White Male AIDS Cases (1 Year Lag)
Incarceration Rate	-4.41e-07	-4.65e-08	-8.16e-08 (9.07e-07)	5.46e-07 (1.15e-06)
Male Incarceration	-4.41e-06	-7.77e-06	.00004 (.00004)	-.00004 (.00008)
Female Incarceration	-6.73e-06	-.0000479	-.00031 (.00031)	.00005 (.00031)

*Significant at the .05 level
** Significant at .01 level

Conclusion

The main motivation for this chapter was to attempt to test the previous findings, consistent with incarceration decreasing HIV cases, by examining HIV testing as the possible intervention leading to the reduction in disease. This examination was accomplished by dividing states into two groups based on the number and type of circumstances under which they test inmates for HIV. While there was an overall lack of results that achieved statistical significance, an interesting pattern emerged among the relationships suggested by the coefficients on the incarceration variables in each group of states. In general, the coefficients in the less strict testing states signaled that increases in incarceration decreased HIV cases while the stricter state coefficients signaled that an increase in incarceration is associated with an increase in HIV cases.

Taking these results at face value, they are contrary to the hypothesis that states that perform more testing in prisons will experience reductions in HIV cases. There are several possible explanations for these reverse results. First, if a state performs more testing, they may be more likely to identify positive cases leading to more diagnosis due to increased testing volumes. Conversely, states that perform less testing may have more undiagnosed HIV cases resulting in artificially low case counts. Second, the short time frame of study may not be long enough to pick up on the complete picture of how increased testing impacts general HIV cases. There may be an initial increase in HIV cases as more people are tested and become aware of their positive

status, but this increase may slow or reverse over time as the testing has longer to act as an intervention. In the long run, the knowledge and behavior modifications sparked by increased testing may act as the intended intervention and erasing any short term increases. This possibility is something that only future data, as more data is collected, will be able to investigate.

Third, the manner in which states were split may contribute to the patterns found. The number of circumstances under which testing occurs may not be the same as overall pervasiveness of testing. The original assumption is that if a state tests under more circumstances, then more inmates will be tested. This assumption may need modification. This data only allows weighting for the mandatory categories, assigning them a weight double to the other categories, but there may be variance in these mandatory categories. For instance, testing inmates at random will not yield the same number of inmates tested as testing all inmates upon entry or release. Similarly, testing inmates upon release may not result in the prison providing any intervention other than acknowledging status. Release testing limits the opportunity to combine testing with medication regimes or counseling activities, as well as limiting the time dedicated to connection with reentry services. Prison health systems do not have the same obligation to an inmate at release as they do upon entry. Perhaps a more detailed type of weighting to divide the states could further help unpack this relationship.

Similarly, there is likely to be variance in the number of inmates tested under the same inmate circumstances, as well. What one prison system determines clinical indication may not meet the threshold for clinical indication in another system. The types of incidents that would result in required testing are likely to differ across prison systems, as well as across prisons within a single system. What one judicial system holds as their standard for court-ordered testing is likely to vary from other jurisdictions. Most importantly, factors such as degree of privacy will

impact the number of inmates voluntarily requesting an HIV test. All of these factors can alter the number or percentage of inmates actually receiving tests. This complicates using just the given circumstances as the breakdown for the groups, as it is not a measure of the extent of testing within state prison systems. Future studies may need to resort to interview or case study data in an effort to gauge the amount and extent of testing that exists within each state prisons system and even within individual prisons themselves.

While this empirical section does not leave us with any definitive answers regarding the power of HIV testing, there appears to be at least at some level an indication that differences exist between states that are more likely to test inmates for HIV than those that are not. Given the differences in directions of coefficients, this section did uncover something related to prison testing that is important to HIV spread and has spillover effects on the larger community. The exact specifics and magnitudes of such relationships are still yet to be uncovered. This is a needed and important place for future research, as the current system of incarceration is likely going to take years to change, but in the meantime, new research may provide an opportunity to simultaneously influence other public health concerns.

References

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Appendix C: Chapter 6 Appendices

Appendix C.1: Total State HIV Negative Binomial Regression using Incarceration Rate for States with Less Strict Testing Circumstances

Independent Variable	HIV Cases	HIV IV Drug Transmission	HIV Heterosexual Transmission
Incarceration Rate	-.00018**	-.00027	-.00027**
Male Incarceration Rate	-.00010**	-.00106	-.00014**
Female Incarceration Rate	-.00060*	-.00106	-.00147**
Unemployment	-.01324**	-.00157	-.01976*
Poverty	-.01090	-.01070	-.00677
Marriage Rate	.00612*	-.00234	-.00117
State GDP	-5.99e-07	-5.81e-07	-2.12e-06**
Percent Black	8.333	-7.859	30.848**
Percent Hispanic	10.781**	-15.074	-9.315
24 and Under	-2.35e-06**	-2.09e-06	-2.83e-06**
25 to 44	1.92e-07	-8.47e-07	1.67e-06**
45 and older	1.39e-08	3.63e-08	2.09e-07
Spending on Health programs (per capita)	-.00033	.00003	.00138*
Governor Party	.11886**	.19613**	.09032*
Percent holding a Bachelors' degree or higher	.03263	.07545	.03532

Chlamydia Rate	.00023	.00046	.00061
Gonorrhea Rate	-.00082	.00109	-.00053
Percent Drug Use (except Marijuana)	.08360*	.03302	.11786*
Number of Social Organizations	.00127**	.00290**	.00178**

*Significant at the .05 level
** Significant at .01 level

Appendix C.2: Total State HIV Negative Binomial Regression using Incarceration as Releases for States with Less Strict Testing Circumstances

Independent Variable	**HIV Cases**	**HIV IV Drug Transmission**	**HIV Heterosexual Transmission**
Total Releases	5.70e-09	-2.97e-07	-8.92e-07
Male Releases	-1.38e-09	-3.40e-07	-9.90e-07
Female Releases	5.74e-07	-2.19e-06	-8.81e-06
Unemployment	-.01356**	-.00258	-.00973
Poverty	-.01193**	-.01188	-.02379*
Marriage Rate	.00807**	-.00113	-.00963**
State GDP	-9.52e-07**	-1.15e-06	-9.13e-07*
Percent Black	5.065	-8.605	29.140**
Percent Hispanic	10.020**	-16.069	-8.442
24 and Under	-2.74e-06**	-2.68e-06*	-3.27e-06**
25 to 44	4.32e-07	-5.45e-07	1.96e-06**
45 and older	8.47e-08	1.56e-07	2.56e-07
Spending on Health programs (per capita)	-.00042	.00003	.00138*

Governor Party	.11159**	.19388*	.10297*
Percent holding a Bachelors' or higher	.02136	.06042	.03051
Chlamydia Rate	.00026	.00044	.00052
Gonorrhea Rate	-.00114**	.00064	-.00086
Percent Drug Use (except Marijuana)	.06113**	.00466	.09099*
Number of Social Organizations	.00141*	.00316**	.00167**

*Significant at the .05 level
** Significant at .01 level

Appendix C.3: Total State HIV Negative Binomial Regression using Incarceration Rate for States with Less Strict Testing Circumstances and One Year Lag

Independent Variable	**HIV Cases**	**HIV IV Drug Transmission**	**HIV Heterosexual Transmission**
Incarceration Rate	.00015	-7.55e-06	-.00020
	(.00030)	(.00022)	(.00012)
Male Incarceration Rate	.00011	-.00016	.00003
	(.00008)	(.00021)	(.00010)
Female Incarceration Rate	-.00173*	.00163	-.00172
	(.00089)	(.00189)	(.00102)
Unemployment	.02461	-.02090	-.02616*
	(.02172)	(.02199)	(.01089)
Poverty	-.02147	-.01242	-.01945*
	(.01687)	(.01675)	(.00929)
Marriage Rate	-.00959	-.01896	-.00443
	(.01241)	(.01103)	(.00588)
State GDP	.00001	-1.49e-06	-1.20e-06
	(5.89e-06)	(1.26e-06)	(7.50e-07)
Percent Black	9.284	15.439	39.584**
	(5.364)	(20.607)	(11.200)
Percent Hispanic	3.637	8.447	13.460
	(3.172)	(12.747)	(9.386)
24 and Under	-1.51e-06	1.17e-06	-1.03e-06
	(1.71e-06)	(1.07e-06)	(6.38e-07)
25 to 44	-5.87e-07	-3.36e-07	8.01e-07
	(1.79e-06)	(1.32e-06)	(6.97e-07)

	-2.18e-07	-5.50e-07*	1.90e-07
45 and older	(1.08e-06)	(2.25e-07)	(1.69e-07)
Spending on Health programs (per capita)	.00083	.00324**	.00221**
	(.00101)	(.00109)	(.00063)
	.17462**	.25022**	-.00992
Governor Party	(.06800)	(.07968)	(.04449)
Percent holding a Bachelors' degree or higher	-.07265	-.01629	-.12441**
	(.04700)	(.07479)	(.04523)
	-.00045	-.00121	-.00113**
Chlamydia Rate	(.00046)	(.00070)	(.00034)
	.0002986	.00414	-.00009
Gonorrhea Rate	(.00204)	(.00220)	(.00089)
Percent Drug Use (except Marijuana)	.39196	.12180	.01950
	(.42164)	(.09399)	(.05757)
Number of Social Organizations	-.00038	-.00293	.00086
	(.00093)	(.00157)	(.00061)

*Significant at the .05 level
** Significant at .01 level

Appendix C.4: Total State HIV Negative Binomial Regression using Incarceration as Releases for States with Less Strict Testing Circumstances and One Year Lag

Independent Variable	**HIV Cases**	**HIV IV Drug Transmission**	**HIV Heterosexual Transmission**
Total Releases	-4.59e-07	6.11e-07	-4.59e-07
	(6.69e-07)	(1.34e-06)	(6.69e-07)
	6.26e-06	1.50e-06	9.05e-06
Male Releases	(4.10e-06)	(9.08e-06)	(4.81e-06)
	-.00005	-6.79e-06	-.00008*
Female Releases	(.00003)	(.00008)	(.00004)
	-.02922**	-.01927	-.02922**
Unemployment	(.01091)	(.02220)	(.01091)
	-.01959*	-.01281	-.01959*
Poverty	(.00939)	(.01658)	(.00939)
	-.00289	-.017737	-.00289
Marriage Rate	(.00605)	(.01131)	(.00605)
	-1.72e-06*	-1.48e-06	-1.72e-06*
State GDP	(7.04e-07)	(1.19e-06)	(7.04e-07)
	37.135**	15.899	37.135**

Percent Black	(11.244)	(20.508)	(11.244)
	15.580	7.777	15.580
Percent Hispanic	(9.273)	(12.869)	(9.273)
	-1.27e-06*	1.05e-06	-1.27e-06*
24 and Under	(6.26e-07)	(1.04e-06)	(6.26e-07)
	1.10e-06	-1.18e-07	1.10e-06
25 to 44	(6.77e-07)	(1.28e-06)	(6.77e-07)
	2.24e-07	-5.66e-07**	2.24e-07
45 and older	(1.67e-07)	(2.21e-07)	(1.67e-07)
Spending on Health programs (per capita)	.00232**	.00329**	.00232**
	(.00063)	(.00109)	(.00063)
	-.01144	.24474**	-.01144
Governor Party	(.04786)	(.07933)	(.04786)
Percent holding a Bachelors' degree or higher	-.14131	-.02785	-.14131**
	(.04641)	(.07513)	(.04641)
	-.00121**	-.00116	-.00121**
Chlamydia Rate	(.00035)	(.00071)	(.00035)
	-.00040	.00432*	-.00040
Gonorrhea Rate	(.00089)	(.00222)	(.00089)
Percent Drug Use (except Marijuana)	-.01115	.11991	-.01115
	(.05598)	(.09208)	(.05598)
Number of Social Organizations	.00082	-.00313*	.00082
	(.00065)	(.00155)	(.00065)

*Significant at the .05 level
** Significant at .01 level

Appendix C.5: Total State HIV Negative Binomial Regression using Incarceration Rate for States with Stricter Testing Circumstances

Independent Variable	**HIV Cases**	**HIV IV Drug Transmission**	**HIV Heterosexual Transmission**
Incarceration Rate	.00013**	.00012	-5.11e-06
Male Incarceration Rate	.00006*	.00007	3.41e-06
Female Incarceration Rate	.00104**	.00062	3.41e-06
Unemployment	.00026	-.02055	-.01000
Poverty	-.02046**	.03092	-.02335*

Marriage Rate	-.00558**	-.01534*	-.0096**
State GDP	-4.55e-07*	-5.47e-07	-8.95e-07*
Percent Black	-20.047**	13.281	-16.565
Percent Hispanic	-3.770	-39.545	-25.962**
24 and Under	-5.37e-07	-1.81e-07	-6.22e-07
25 to 44	1.77e-06 **	1.91e-06	1.15e-06
45 and older	-4.68e-07**	-3.95e-07	2.06e-07
Spending on Health programs (per capita)	.00063*	.00267**	.00196**
Governor Party	-.08207**	-.11379	-.02953
Percent holding a Bachelors' or higher	-.02457	-.18208**	-.05719
Chlamydia Rate	.00099**	-.00162	.00101
Gonorrhea Rate	-.00211**	.00387*	-.00116
Percent Drug Use (except Marijuana)	.00503	.15833	-.03122
Number of Social Organizations	-.00108**	-.00214	-.00021

*Significant at the .05 level
** Significant at .01 level

Appendix C.6: Total State HIV Negative Binomial Regression using Incarceration as Releases for States with Stricter Testing Circumstances

Independent Variable	**HIV Cases**	**HIV IV Drug Transmission**	**HIV Heterosexual Transmission**
Total Releases	3.84e-07	-3.84e-07	-2.57e-07
Male Releases	4.20e-07	-3.39e-07	-3.67e-07
Female Releases	4.03e-06	-3.72e-06	-2.98e-06

Unemployment	-.0035063	-.0221626	-.009399
Poverty	-.0189169**	.0382646	-.0216981*
Marriage Rate	-.0055402**	-.0146353*	-.0093825**
State GDP	-3.24e-07	-3.48e-07	-8.59e-07*
Percent Black	-19.90613**	13.38092	-16.73911
Percent Hispanic	-1.915441	-36.61936	-25.40145*
24 and Under	-2.64e-07	-3.77e-08	-6.22e-07
25 to 44	1.32e-06**	1.62e-06	1.14e-06
45 and older	-4.74e-07 **	-4.29e-07	1.93e-07
Spending on Health programs (per capita)	.0006935*	.0025886*	.0019119**
Governor Party	-.0881022**	-.1274031	-.0306289
Percent holding a Bachelors' or higher	.0006935*	-.1856687**	-.0583123
Chlamydia Rate	.0009545**	-.0019264	.0009178
Gonorrhea Rate	-.0020628**	.0041978*	-.0010808
Percent Drug Use (except Marijuana)	-.0027649	.1489962	-.0303278
Number of Social Organizations	-.0010698**	-.0022263	-.0002409

*Significant at the .05 level
** Significant at .01 level

Appendix C.7: Total State HIV Negative Binomial Regression using Incarceration Rate for States with Stricter Testing Circumstances and One Year Lag

Independent Variable	**HIV Cases**	**HIV IV Drug Transmission**	**HIV Heterosexual Transmission**
Incarceration Rate	-.00007	.00081**	.00017
	(.00005)	(.00033)	(.000110

	-.00009*	.00032	.00003
Male Incarceration Rate	(.00005)	(.00027)	(.00009)
	.00072	.00146	.00083
Female Incarceration Rate	(.0005)	(.00301)	(.00103)
	-.01572	-.01773	-.01858
Unemployment	(.00508)	(.03093)	(.00971)
	.00256	.03893	.00457
Poverty	(.00574)	(.03642)	(.01163)
	-.00653**	-.01978	-.00750*
Marriage Rate	(.00161)	(.01103)	(.00352)
	-4.40e-07*	-2.80e-06*	-6.79e-07
State GDP	(2.22e-07)	(1.36e-06)	(4.34e-07)
	-7.073	7.263	8.044
Percent Black	(4.951)	(31.822)	(10.031)
	-10.892*	-74.381	-10.471
Percent Hispanic	(5.411)	(33.885)	(10.748)
	-6.95e-07	-1.59e-06	-4.31e-07
24 and Under	(4.74e-07)	(2.85e-06)	(9.03e-07)
	1.12e-06*	3.41e-06	1.45e-06
25 to 44	(5.73e-07)	(3.40e-06)	(1.10e-06)
	8.00e-09	7.13e-07	-3.52e-07
45 and older	(1.38e-07)	(8.77e-07)	(2.72e-07)
Spending on Health programs (per capita)	.00051	.00067	.00126*
	(.00030)	(.00171)	(.00058)
	-.14278**	-.19068	.07256
Governor Party	(.02616)	(.16089)	(.05513)
Percent holding a Bachelors' or higher	.07241**	-.02850	-.05815
	(.01856)	(.11743)	(.03695)
	.00049	-5.56e-06	-.00010
Chlamydia Rate	(.00034)	(.00202)	(.00065)
	-.00305**	-.00119	-.00205*
Gonorrhea Rate	(.00051)	(.00308)	(.00102)
Percent Drug Use (except Marijuana)	-.05788**	.00002	.08590
	(.02193)	(.13203)	(.04599)
Number of Social Organizations	-5.45e-06	.00004	-.00066
	(.00030)	(.00183)	(.00060)

*Significant at the .05 level
** Significant at .01 level

Appendix C.8: Total State HIV Negative Binomial Regression using Incarceration as Releases for States with Stricter Testing Circumstances and One Year Lag

Independent Variable	HIV Cases	HIV IV Drug Transmission	HIV Heterosexual Transmission
Total Releases	6.94e-08	1.56e-06	5.47e-07
	(2.84e-07)	(1.17e-06)	(5.77e-07)
	6.96e-07	.00001	6.17e-08
Male Releases	(1.59e-06)	(6.24e-06)	(3.16e-06)
	-5.42e-06	-.00008	3.79e-06
Female Releases	(.00001)	(.00005)	(.00003)
	-.01378**	-.03057	-.02378**
Unemployment	(.00485)	(.01967)	(.00936)
	-.00035	.03793	.00738
Poverty	(.00590)	(.02550)	(.01166)
	-.00680**	-.01380*	-.00740*
Marriage Rate	(.00162)	(.00667)	(.00353)
	-5.63e-07**	-8.71e-07	-4.94e-07
State GDP	(2.13e-07)	(8.50e-07)	(4.11e-07)
	-7.155	44.250*	8.488
Percent Black	(4.948)	(21.502)	(10.039)
	-12.662*	-66.910**	-7.990
Percent Hispanic	(5.3450)	(21.932)	(10.585)
	-8.82e-07*	2.06e-06	-7.71e-08
24 and Under	(4.56e-07)	(1.82e-06)	(8.71e-07)
	1.41e-06**	-1.12e-06	8.66e-07
25 to 44	(5.34e-07)	(2.10e-06)	(1.02e-06)
	3.20e-08	-3.38e-08	-3.64e-07
45 and older	(1.39e-07)	(5.74e-07)	(2.72e-07)
Spending on Health programs (per capita)	.00052	.00193	.00134*
	(.00030)	(.00114)	(.00059)
	-.13906**	-.14929	.06473
Governor Party	(.02602)	(.10870)	(.05486)
Percent holding a Bachelors' degree or higher	.07330**	-.08922	-.06028
	(.01859)	(.07702)	(.03689)
	.00063	-.00071	-.00015
Chlamydia Rate	(.00035)	(.00140)	(.00067)
	-.00318**	-.00014	-.00202*
Gonorrhea Rate	(.00052)	(.00208)	(.00103)

Percent Drug Use (except Marijuana)	-.05386** (.02172)	-.06188 (.12897)	.07522 (.04558)
Number of Social Organizations	.00003 (.00031)	-.00014 (.00184)	-.00066 (.00060)

*Significant at the .05 level
** Significant at .01 level

Appendix C.9: Female State HIV Negative Binomial Regression using Incarceration Rate for States with Less Strict Testing Circumstances

Independent Variable	Female HIV Cases	Female HIV IV Drug Transmission	Female HIV Heterosexual Transmission
Incarceration Rate	-.0003481**	-.0001401	-.0003458**
Male Incarceration Rate	-.0001833**	-.0000753	-.0001813**
Female Incarceration Rate	-.0014048*	-.000352	-.0016833*
Unemployment	-.0171904	-.0107189	-.0199909
Poverty	-.0021281	-.0352952	.0033266
Marriage Rate	-.0095922	-.0033963	-.0049373
State GDP	-1.15e-06	-2.41e-06	-1.54e-06
Percent Black	22.74183	-9.308951	20.21983
Percent Hispanic	-14.19431	15.4193	-11.30935
24 and Under	-5.54e-07	-2.75e-06	-1.91e-06*
25 to 44	3.83e-07	7.58e-07	4.17e-07
45 and older	4.13e-08	-7.60e-07	2.23e-07
Spending on Health programs (per capita)	.0017361**	-.0004501	.0014806*
Governor Party	.145277**	.4160204*	.1393575**

Percent holding a Bachelors' or higher	.1083761**	.075557	.0994808*
Chlamydia Rate	-.000085	.0000697	.0001624
Gonorrhea Rate	.0012238	.0014894	.0006229
Percent Drug Use (except Marijuana)	.1288088**	-.0128269	.1143832*
Number of Social Organizations	.0015389*	-.0005865	.0019416**

*Significant at the .05 level
** Significant at .01 level

Appendix C.10: Female State HIV Negative Binomial Regression using Incarceration as Releases for States with Less Strict Testing Circumstances

Independent Variable	Female HIV Cases	Female HIV IV Drug Transmission	Female HIV Heterosexual Transmission
Total Releases	-6.87e-07	-2.26e-07	-6.97e-07
Male Releases	-7.63e-07	-2.64e-07	-7.68e-07
Female Releases	-6.74e-06	-1.37e-06	-7.22e-06
Unemployment	-.0213424*	-.0115096	-.0227769
Poverty	-.0035016	-.0357686	.0031
Marriage Rate	-.003796	-.0028651	-.0026555
State GDP	-2.26e-06**	-2.72e-06	-2.34e-06**
Percent Black	14.19379	-9.816247	16.02113
Percent Hispanic	-7.722216	15.23839	-10.51719
24 and Under	-2.40e-06**	-3.04e-06	-2.54e-06**
25 to 44	8.04e-07	9.28e-07	8.46e-07
45 and older	1.19e-07	-7.06e-07	3.11e-07

Spending on Health programs (per capita)	.0010573	-.000445	.0014359
Governor Party	.186172**	.4147787**	.1405764**
Percent holding a Bachelors' or higher	.0854306	.0672863	.0823298
Chlamydia Rate	.0001071	.0000596	.000126
Gonorrhea Rate	.0001553	.0012688	.0000917
Percent Drug Use (except Marijuana)	.0677259	-.0270194	.0745309
Number of Social Organizations	.0014454*	-.0005001	.001963**

*Significant at the .05 level
** Significant at .01 level

Appendix C.11: Female State HIV Negative Binomial Regression using Incarceration Rate for States with Less Strict Testing Circumstances and One Year Lag

Independent Variable	**Female HIV Cases**	**Female HIV IV Drug Transmission**	**Female HIV Heterosexual Transmission**
Incarceration Rate	-.00028*	-.00047	-.00017
	(.00014)	(.00033)	(.00013)
Male Incarceration Rate	-.00015	.00012	.00016
	(.00028)	(.00011)	(.00012)
Female Incarceration Rate	-.00006	-.00273*	-.00297**
	(.00272)	(.00111)	(.00117)
Unemployment	-.02148	-.02008	-.01753
	(.01354)	(.03000)	(.01242)
Poverty	-.01243	.01199	-.01010
	(.01025)	(.02517)	(.01096)
Marriage Rate	-.00866	-.03282*	-.00741
	(.00596)	(.01648)	(.00682)
State GDP	-5.85e-07	3.62e-07	-8.40e-07
	(9.01e-07)	(1.91e-06)	(8.57e-07)
Percent Black	16.861	10.347	22.443
	(9.297)	(20.731)	(13.620)
Percent Hispanic	24.400**	2.632	16.023
	(8.407)	(16.325)	(9.283)

	-2.08e-07	2.68e-06	-1.37e-06
24 and Under	(7.49e-07)	(1.57e-06)	(9.44e-07)
	1.71e-08	-2.06e-06	3.54e-07
25 to 44	(8.34e-07)	(1.89e-06)	(8.20e-07)
	-2.88e-07	-8.85e-07**	1.54e-07
45 and older	(1.72e-07)	(3.14e-07)	(1.93e-07)
Spending on Health	.00151*	.00307	.00148
programs (per capita)	(.00067)	(.00170)	(.00081)
	.09613	.38006**	.00253
Governor Party	(.05759)	(.12839)	(.05441)
Percent holding a	-.09126	.06829	-.09473*
Bachelors' or higher	(.05165)	(.10937)	(.04922)
	-.00116**	-.00083	-.00107**
Chlamydia Rate	(.00040)	(.00100)	(.00043)
	.00098	.00468	.00051
Gonorrhea Rate	(.00118)	(.00304)	(.00105)
Percent Drug Use (except	.00822	.23907	.01545
Marijuana)	(.06002)	(.13619)	(.05924)
Number of Social	-.00005	-.00267	.00165**
Organizations	(.00069)	(.00164)	(.00072)

*Significant at the .05 level
** Significant at .01 level

Appendix C.12: Female State HIV Negative Binomial Regression using Incarceration as Releases for States with Less Strict Testing Circumstances and One Year Lag

Independent Variable	**Female HIV Cases**	**Female HIV IV Drug Transmission**	**Female HIV Heterosexual Transmission**
Total Releases	-1.15e-06	-2.87e-06	-6.97e-07
	(7.36e-07)	(2.17e-06)	(8.11e-07)
	.00001	6.17e-06	.00001**
Male Releases	(5.45e-06)	(.00001)	(4.94e-06)
	-.00009*	-.00008	-.00013**
Female Releases	(.00004)	(.00012)	(.00004)
	-.02416*	-.02911	-.02218
Unemployment	(.01125)	(.03142)	(.01430)
	-.00585	.00893	-.01092
Poverty	(.01007)	(.02471)	(.01133)
	-.01288*	-.03584*	-.00800

Marriage Rate	(.00646)	(.01693)	(.00698)
State GDP	-1.25e-06	-7.97e-07	-1.29e-06
	(7.33e-07)	(1.83e-06)	(8.60e-07)
Percent Black	24.168*	10.417	23.687
	(12.514)	(19.994)	(13.504)
Percent Hispanic	11.226	4.209	19.391
	(8.404)	(16.976)	(12.125)
24 and Under	-9.06e-07	2.38e-06	-1.20e-06
	(8.42e-07)	(1.57e-06)	(7.66e-07)
25 to 44	1.28e-07	-1.80e-06	6.59e-07
	(7.34e-07)	(1.83e-06)	(8.33e-07)
45 and older	1.40e-07	-7.02e-07*	1.39e-07
	(1.78e-07)	(3.30e-07)	(2.11e-07)
Spending on Health programs (per capita)	.00173*	.00285	.00174*
	(.00074)	(.00174)	(.00075)
Governor Party	.04870	.36553**	.00150
	(.05292)	(.12868)	(.05745)
Percent holding a Bachelors' degree or higher	-.06731	.06327	-.11167*
	(.04631)	(.11330)	(.05801)
Chlamydia Rate	-.00109**	-.00104	-.00123**
	(.00041)	(.00103)	(.00043)
Gonorrhea Rate	.00049	.00348	.00035
	(.00095)	(.00310)	(.00107)
Percent Drug Use (except Marijuana)	.03924	.20142	-.00052
	(.05240)	(.13206)	(.06263)
Number of Social Organizations	.00138	-.00217	.00147
	(.00072)	(.00182)	(.00083)

*Significant at the .05 level
** Significant at .01 level

Appendix C.13: Female State HIV Negative Binomial Regression using Incarceration Rate for States with Stricter Testing Circumstances

Independent Variable	Female HIV Cases	Female HIV IV Drug Transmission	Female HIV Heterosexual Transmission
Incarceration Rate	.0000339	.0000819	-.0000201
Male Incarceration Rate	9.92e-06	.0000564	-4.83e-06

Female Incarceration Rate	-.0004774	-.0000487	-.0006621
Unemployment	-.0101063	-.0558955*	-.0038512
Poverty	-.0206072	.0460432	-.0302035*
Marriage Rate	-.0104423**	-.0191343	-.0089834*
State GDP	-6.44e-07	9.84e-07	-8.08e-07
Percent Black	-23.57517**	8.540076	-28.34673*
Percent Hispanic	-18.65642	21.53711	-24.93899*
24 and Under	9.98e-07	5.70e-06*	2.62e-07
25 to 44	-1.35e-07	-3.93e-06	3.84e-07
45 and older	-1.40e-07	-1.94e-06*	1.20e-07
Spending on Health programs (per capita)	.00131	.0011098	.0015381*
Governor Party	-.093492	-.0320832	-.0988575
Percent holding a Bachelors' or higher	-.070862	-.2949547**	-.0574362
Chlamydia Rate	-.000153	-.0048398**	.0006765
Gonorrhea Rate	.001256	.0047728	.0008709
Percent Drug Use (except Marijuana)	-.0360791	.1012315	-.0486376
Number of Social Organizations	-.0010019	-.0042054*	-.0008258

*Significant at the .05 level
** Significant at .01 level

Appendix C.14: Female State HIV Negative Binomial Regression using Incarceration as Releases for States with Stricter Testing Circumstances

Independent Variable	**Female HIV Cases**	**Female HIV IV Drug Transmission**	**Female HIV Heterosexual Transmission**

Total Releases	-3.51e-07	-9.57e-07	-3.77e-07
Male Releases	-4.45e-07	-1.18e-06	-4.71e-07
Female Releases	-4.22e-06	-.0000114	-4.28e-06
Unemployment	-.0097463	-.0565119*	-.0027048
Poverty	-.0172868	.0570164	-.0282649*
Marriage Rate	-.0107705**	-.018031	-.0087101*
State GDP	-6.11e-07	1.22e-06	-7.78e-07
Percent Black	-21.22624*	8.596778	-28.55929*
Percent Hispanic	-21.54262	25.06331	-24.46347*
24 and Under	8.69e-07	5.81e-06*	2.34e-07
25 to 44	-7.44e-08	-4.16e-06	4.26e-07
45 and older	-8.60e-08	-2.00e-06*	1.06e-07
Spending on Health programs (per capita)	.0013808*	.0009533	.0014707*
Governor Party	-.1014955	-.0466377	-.0994565
Percent holding a Bachelors' or higher	-.0847784*	-.2987562**	-.0583608
Chlamydia Rate	-.0000964	-.0053271**	.0005612
Gonorrhea Rate	.0013306	.0052449	.0009799
Percent Drug Use (except Marijuana)	-.0351061	.095564	-.0469025
Number of Social Organizations	-.0011757	-.0043615**	-.000867

*Significant at the .05 level
** Significant at .01 level

Appendix C.15: Female State HIV Negative Binomial Regression using Incarceration Rate for States with Stricter Testing Circumstances and One Year Lag

Independent Variable	Female HIV Cases	Female HIV IV Drug Transmission	Female HIV Heterosexual Transmission
Incarceration Rate	.00021	.00081**	.00012
	(.00012)	(.00033)	(.00013)
Male Incarceration Rate	.00005	.00032	.00001
	(.00010)	(.00029)	(.00011)
Female Incarceration Rate	.00078	.00149	.00071
	(.00113)	(.00301)	(.00122)
Unemployment	-.007855	-.01766	-.00598
	(.0109343)	(.03093)	(.01174)
Poverty	.00772	.03902	.00502
	(.01291)	(.03642)	(.01387)
Marriage Rate	-.00986**	-.01951	-.00796*
	(.00380)	(.01103)	(.00408)
State GDP	-1.75e-06**	-2.81e-06*	-1.56e-06**
	(4.83e-07)	(1.36e-06)	(5.20e-07)
Percent Black	-3.686	7.187	-7.300
	(11.086)	(31.822)	(11.905)
Percent Hispanic	-36.23729**	-74.375*	-28.011*
	(11.920)	(33.880)	(12.821)
24 and Under	-2.27e-06*	-1.59e-06	-2.34e-06*
	(1.01e-06)	(2.85e-06)	(1.09e-06)
25 to 44	3.48e-06**	3.40e-06	3.50e-06
	(1.22e-06)	(3.40e-06)	(1.32e-06)
45 and older	3.45e-07	7.01e-07	2.39e-07
	(3.03e-07)	(8.77e-07)	(3.26e-07)
Spending on Health programs (per capita)	.00178**	.00072	.00200**
	(.00065)	(.00171)	(.00070)
Governor Party	-.05735	-.19341	-.02833
	(.05972)	(.16090)	(.06476)
Percent holding a Bachelors' degree or higher	-.01334	-.02773	-.01502
	(.04127)	(.11742)	(.04435)
Chlamydia Rate	.00036	-.00002	.00042
	(.00072)	(.00202)	(.00077)
Gonorrhea Rate	-.00153	-.00109	-.00138
	(.00113)	(.00308)	(.00122)
Percent Drug Use (except Marijuana)	.07655	.00104	.09316
	(.05006)	(.13200)	(.05437)

Number of Social Organizations	-.00043 (.00066)	6.34e-06 (.00183)	-.00048 (.00072)

*Significant at the .05 level
** Significant at .01 level

Appendix C.16: Female State HIV Negative Binomial Regression using Incarceration as Releases for States with Stricter Testing Circumstances and One Year Lag

Independent Variable	Female HIV Cases	Female HIV IV Drug Transmission	Female HIV Heterosexual Transmission
Total Releases	-2.64e-07	1.41e-06	-5.39e-07
	(6.46e-07)	(1.78e-06)	(6.96e-07)
Male Releases	-1.23e-06	-4.37e-06	-5.94e-07
	(3.52e-06)	(9.47e-06)	(3.81e-06)
Female Releases	7.72e-06	.00005	-4.78e-07
	(.00003)	(.00008)	(.00003)
Unemployment	-.01303	-.04051	-.00852
	(.01052)	(.02973)	(.01130)
Poverty	.0174	.05547	.01350
	(.01300)	(.03789)	(.01390)
Marriage Rate	-.00899*	-.01781	-.00714
	(.00381)	(.01103)	(.00410)
State GDP	-1.36e-06	-1.73e-06	-1.27e-06**
	(4.58e-07)	(1.28e-06)	(4.93e-07)
Percent Black	-3.537	9.169	-7.456
	(11.116)	(31.885)	(11.940)
Percent Hispanic	-30.908**	-59.589	-23.879
	(11.741)	(33.269)	(12.634)
24 and Under	-1.77e-06	1.80e-07	-2.01e-06
	(9.75e-07)	(2.76e-06)	(1.05e-06)
25 to 44	2.66e-06*	5.42e-07	2.95e-06*
	(1.14e-06)	(3.20e-06)	(1.23e-06)
45 and older	2.77e-07	5.59e-07	1.78e-07
	(3.04e-07)	(8.76e-07)	(3.27e-07)
Spending on Health programs (per capita)	.00172**	.00087	.00190**
	(.00066)	(.00172)	(.00071)
Governor Party	-.07041	-.23881	-.03693
	(.05937)	(.16025)	(.06439)
Percent holding a Bachelors' degree or higher	-.01876	-.04033	-.01951
	(.04118)	(.11659)	(.04428)

Chlamydia Rate	-.00006 (.00074)	-.00073 (.00207)	.00003 (.0008)
Gonorrhea Rate	-.00117 (.00114)	-.00060 (.00310)	-.00103 (.00123)
Percent Drug Use (except Marijuana)	.06479 (.04946)	-.06033 (.12896)	.08724 (.05387)
Number of Social Organizations	-.00055 (.00067)	-.00017 (.00184)	-.00061 (.00072)

*Significant at the .05 level
** Significant at .01 level

Appendix C.17: Male State HIV Negative Binomial Regression using Incarceration Rate for States with Less Strict Testing Circumstances

Independent Variable	Male HIV Cases	Male HIV IV Drug Transmission	Male HIV Heterosexual Transmission
Incarceration Rate	-.0001671**	-.0003532	-.0001161
Male Incarceration Rate	-.0000901**	-.0001909	-.000054
Female Incarceration Rate	-.0005768	-.0014864	-.0008958
Unemployment	-.0086666	-.0039934	-.0179298
Poverty	-.0048551	.006972	-.0257481
Marriage Rate	.003337	-.0022511	.0087876
State GDP	-8.25e-07*	3.48e-07	-3.56e-06**
Percent Black	5.686523	-10.54253	49.68933**
Percent Hispanic	3.372185	-31.71695*	-5.22224
24 and Under	-2.49e-06**	-1.85e-06	-5.01e-06**
25 to 44	7.17e-07	-2.08e-06	4.43e-06**
45 and older	6.86e-08	6.37e-07	1.48e-07
Spending on Health programs (per capita)	-.0003614	.0005476	.0011594
Governor Party	.0682973**	.0448828	-.0095001

Percent holding a Bachelors' or higher	-.0038497	.052588	-.0921917
Chlamydia Rate	.0005967**	.0008629	.0016847**
Gonorrhea Rate	-.0012237*	.0001031	-.0031741*
Percent Drug Use (except Marijuana)	.0533776*	.0437742	.1235945
Number of Social Organizations	.0007345*	.0052711**	.0015841

*Significant at the .05 level
** Significant at .01 level

Appendix C.18: Male State HIV Negative Binomial Regression using Incarceration as Releases for States with Less Strict Testing Circumstances

Independent Variable	Male HIV Cases	Male HIV IV Drug Transmission	Male HIV Heterosexual Transmission
Total Releases	-5.67e-07	-2.24e-07	-1.05e-06
Male Releases	-6.41e-07	-2.56e-07	-1.17e-06
Female Releases	-4.77e-06	-1.74e-06	-9.56e-06
Unemployment	-.0092028	-.0047664	-.0196562
Poverty	-.0050264	.0050704	-.0241139
Marriage Rate	.0038023	-.0004327	.007253
State GDP	-1.20e-06**	-3.58e-07	-3.96e-06**
Percent Black	4.618895	-11.22399	51.63018**
Percent Hispanic	3.055194	-33.56972*	-4.730703
24 and Under	-2.74e-06**	-2.65e-06	-5.11e-06**
25 to 44	8.74e-07*	-1.71e-06	4.47e-06
45 and older	1.02e-07	8.07e-07*	1.24e-07

Spending on Health programs (per capita)	-.0004489	.0005545	.0011464
Governor Party	.073135**	.04171	.0197622
Percent holding a Bachelors' or higher	-.0043239	.0332592	-.0742278
Chlamydia Rate	.00054*	.00083	.00156*
Gonorrhea Rate	-.00138**	-.00049	-.00314*
Percent Drug Use (except Marijuana)	.03940	.00649	.12409
Number of Social Organizations	.00066	.00569**	.00126

*Significant at the .05 level
** Significant at .01 level

Appendix C.19: Male State HIV Negative Binomial Regression using Incarceration Rate for States with Less Strict Testing Circumstances and One Year Lag

Independent Variable	**Male HIV Cases**	**Male HIV IV Drug Transmission**	**Male HIV Heterosexual Transmission**
Incarceration Rate	-.00010	.00053*	-.00025
	(.00006)	(.00026)	(.00020)
Male Incarceration Rate	.00006	.00014	-.00026
	(.00005)	(.00022)	(.00017)
Female Incarceration Rate	-.00136**	.00159	.00115
	(.00048)	(.00209)	(.00174)
Unemployment	-.03104**	-.06515**	-.04064*
	(.00576)	(.02386)	(.01666)
Poverty	.00323	-.00039	-.03226*
	(.00538)	(.02169)	(.01617)
Marriage Rate	-.00355	-.00618	.00772
	(.00328)	(.01485)	(.00958)
State GDP	-7.78e-07*	-4.65e-06**	-2.19e-06
	(3.62e-07)	(1.48e-06)	(1.23e-06)
Percent Black	7.220	1.935	61.871**
	(6.612)	(26.030)	(17.997)
Percent Hispanic	12.229**	-7.926	2.2131
	(4.330)	(17.097)	(5.465)

	-4.20e-07	-3.05e-06	-1.22e-06
24 and Under	(4.67e-07)	(2.05e-06)	(9.63e-07)
	-6.30e-07	-5.29e-07	1.28e-06
25 to 44	(3.86e-07)	(1.61e-06)	(1.19e-06)
	9.43e-08	1.22e-06*	4.55e-07
45 and older	(8.37e-08)	(4.12e-07)	(2.74e-07)
Spending on Health programs (per capita)	.00068*	.00289	.00317**
	(.00035)	(.00158)	(.00115)
	.05307*	.09906	-.02641
Governor Party	(.02401)	(.10217)	(.07694)
Percent holding a Bachelors' or higher	-.00572	.00289	-.15250**
	(.02272)	(.00158)	(.05900)
	-.00039	-.00032	-.00093
Chlamydia Rate	(.00023)	(.00094)	(.00063)
	-.00023	-.00055	-.00159
Gonorrhea Rate	(.00050)	(.00217)	(.00142)
Percent Drug Use (except Marijuana)	-.01852	.05379	.03354
	(.02682)	(.11493)	(.08686)
Number of Social Organizations	.00085**	.00519**	-.000057
	(.00033)	(.00150)	(.0009949)

*Significant at the .05 level
** Significant at .01 level

Appendix C.20: Male State HIV Negative Binomial Regression using Incarceration as Releases for States with Less Strict Testing Circumstances and One Year Lag

Independent Variable	Male HIV Cases	Male HIV IV Drug Transmission	Male HIV Heterosexual Transmission
Total Releases	-3.11e-07	3.03e-06*	-2.71e-07
	(4.26e-07)	(1.47e-06)	(1.11e-06)
	6.01e-07	1.04e-06	-2.79e-07
Male Releases	(2.69e-06)	(.00001)	(8.80e-06)
	-8.88e-06	.00002	-1.97e-07
Female Releases	(.00002)	(.00009)	(.00007)
	-.02717**	-.06504**	-.04267**
Unemployment	(.00663)	(.02392)	(.01656)
	.000907	.00167	-.03255*
Poverty	(.00714)	(.02170)	(.01630)
	.00465	-.00268	.00966

Marriage Rate	(.00588)	(.01510)	(.00989)
State GDP	-5.86e-07	-3.44e-06**	-2.74e-06*
	(4.39e-07)	(1.38e-06)	(1.16e-06)
Percent Black	-12.261	-2.222	59.235**
	(7.011)	(26.202)	(18.087)
Percent Hispanic	12.298**	-7.308	2.905
	(4.960)	(17.017)	(5.658)
24 and Under	3.27e-07	-2.47e-06	-1.52e-06
	(5.21e-07)	(1.97e-06)	(9.60e-07)
25 to 44	-9.55e-07	-8.51e-07	1.65e-06
	(5.03e-07)	(1.58e-06)	(1.14e-06)
45 and older	1.65e-08	1.19e-06**	5.28e-07*
	(1.00e-07)	(4.07e-07)	(2.74e-07)
Spending on Health programs (per capita)	.00078*	.00308*	.00338**
	(.00037)	(.00158)	(.00114)
Governor Party	.04318	.05198	-.03323
	(.02639)	(.10688)	(.08179)
Percent holding a Bachelors' degree or higher	-.00741	-.01226	-.17072**
	(.02514)	(.09740)	(.06348)
Chlamydia Rate	-.00051	.00020	-.00102
	(.00034)	(.00095)	(.00064)
Gonorrhea Rate	.00012	-.00046	-.00201
	(.00064)	(.00216)	(.00142)
Percent Drug Use (except Marijuana)	-.04821	.08102	.00024
	(.02912)	(.11189)	(.08425)
Number of Social Organizations	.00038	.00582**	.00009
	(.00043)	(.00160)	(.00109)

*Significant at the .05 level
** Significant at .01 level

Appendix C.21: Male State HIV Negative Binomial Regression using Incarceration Rate for States with Stricter Testing Circumstances

Independent Variable	Male HIV Cases	Male HIV IV Drug Transmission	Male HIV Heterosexual Transmission
Incarceration Rate	.0000803	.0001501	.000029
Male Incarceration Rate	.0000391	.0000761	.0000208
Female Incarceration Rate	.000557	.0010779	-.0006132

Unemployment	.0066881	.0077518	-.0228915
Poverty	-.0138553*	.0138416	-.0067401
Marriage Rate	-.0061727**	-.0178813*	-.0113889
State GDP	-7.61e-07**	-1.75e-06	-1.00e-06
Percent Black	-15.17**	23.2972	13.90463
Percent Hispanic	-17.23279**	-88.52709**	-29.34434
24 and Under	-1.36e-06*	-4.75e-06*	-2.44e-06
25 to 44	2.44e-06**	6.52e-06*	2.83e-06
45 and older	-8.88e-08	7.45e-07	1.79e-07
Spending on Health programs (per capita)	.0007733*	.0040151**	.0033445**
Governor Party	-.0922095**	-.1583067	.2051025
Percent holding a Bachelors' or higher	-.0144836	-.098936	-.0515708
Chlamydia Rate	.001515**	.0012705	.0019102
Gonorrhea Rate	-.0021759**	.002637	-.0058816**
Percent Drug Use (except Marijuana)	.0016896	.206977	.0161823
Number of Social Organizations	-.0009181**	-.0006585	.0006967

*Significant at the .05 level
** Significant at .01 level

Appendix C.22: Male State HIV Negative Binomial Regression using Incarceration as Releases for States with Stricter Testing Circumstances

Independent Variable	Male HIV Cases	Male HIV IV Drug Transmission	Male HIV Heterosexual Transmission
Total Releases	3.97e-07	-1.36e-07	3.32e-07

Male Releases	4.30e-07	2.31e-07	-4.66e-08
Female Releases	4.20e-06	1.37e-06	1.01e-06
Unemployment	.0042489	.0052986	.0030978
Poverty	-.0140948*	.0201816	-.0136687
Marriage Rate	-.0063046**	-.0172738*	-.0049561**
State GDP	-7.08e-07**	-1.54e-06	-5.71e-07*
Percent Black	-15.1439**	23.52204	-17.04822**
Percent Hispanic	-16.49678**	-85.326**	-9.856291
24 and Under	-1.20e-06*	-4.56e-06	-7.52e-07
25 to 44	2.18e-06**	6.14e-06*	1.72e-06**
45 and older	-8.04e-08	7.12e-07	-2.23e-07
Spending on Health programs (per capita)	.000833*	.0039669**	.0005054
Governor Party	-.0955463**	-.1725933	-.0858681**
Percent holding a Bachelors' or higher	-.0138407	-.1036545	-.0162374
Chlamydia Rate	.0015556**	.001024	.0012652**
Gonorrhea Rate	-.0021966**	.0029291	-.0018628**
Percent Drug Use (except Marijuana)	-.002779	.1947555	-.0092743
Number of Social Organizations	-.0008824*	-.0007368	-.0009608**

*Significant at the .05 level
** Significant at .01 level

Appendix C.23: Male State HIV Negative Binomial Regression using Incarceration Rate for States with Stricter Testing Circumstances and One Year Lag

Independent Variable	Male HIV Cases	Male HIV IV Drug Transmission	Male HIV Heterosexual Transmission
Incarceration Rate	-.00006	.00041	.00027
	(.00006)	(.00029)	(.00020)
	-8.81e-06	.00058	.00007
Male Incarceration Rate	(.00005)	(.00024)	(.00018)
	-.00031	-.00488	.00080
Female Incarceration Rate	(.00058)	(.00272)	(.00191)
	-.01086	-.01188	-.04957**
Unemployment	(.00579)	(.02708)	(.01740)
	-.00431	.02705	.00887
Poverty	(.00660)	(.03319)	(.02149)
	-.00692**	-.01119	-.01127
Marriage Rate	(.00180)	(.00838)	(.00735)
	2.95e-08	-6.87e-07	1.23e-06
State GDP	(2.56e-07)	(1.21e-06)	(7.93e-07)
	-3.050	72.053**	48.760**
Percent Black	(5.675)	(29.403)	(18.849)
	-8.191	-77.178**	27.060
Percent Hispanic	(6.202)	(29.958)	(19.974)
	2.53e-07	2.61e-06	3.84e-06*
24 and Under	(5.47e-07)	(2.50e-06)	(1.64e-06)
	2.24e-08	-8.79e-07	-3.07e-06
25 to 44	(6.61e-07)	(2.95e-06)	(1.98e-06)
	-1.40e-07	-5.02e-07	-1.74e-06**
45 and older	(1.60e-07)	(7.66e-07)	(5.03e-07)
Spending on Health programs (per capita)	.00088**	.00247	-.00014
	(.00035)	(.00153)	(.00105)
	-.09471**	-.06808	.35021**
Governor Party	(.02958)	(.14876)	(.10720)
Percent holding a Bachelors' degree or higher	-.03575	-.12746	-.15527*
	(.02169)	(.10350)	(.06777)
	.00056	-.00067	-.00134
Chlamydia Rate	(.00039)	(.00187)	(.00119)
	-.00219**	.0007	-.00348
Gonorrhea Rate	(.00059)	(.00282)	(.00187)
Percent Drug Use (except Marijuana)	-.04806*	-.07628	.07321
	(.02472)	(.11578)	(.08699)

Number of Social Organizations	-.00073* (.00035)	-.00310 (.00166)	-.00143 (.00111)

*Significant at the .05 level
** Significant at .01 level

Appendix C.24: Male State HIV Negative Binomial Regression using Incarceration as Releases for States with Stricter Testing Circumstances and One Year Lag

Independent Variable	**Male HIV Cases**	**Male HIV IV Drug Transmission**	**Male HIV Heterosexual Transmission**
Total Releases	2.84e-07 (3.75e-07)	1.85e-06 (1.57e-06)	2.91e-06** (1.05e-06)
Male Releases	-8.46e-08 (2.06e-06)	.00002** (8.54e-06)	1.99e-06 (5.74e-06)
Female Releases	3.18e-06 (.00002)	-.00018** (.00007)	8.73e-06 (.0000475)
Unemployment	-.01011 (.00710)	-.0246016 (.0263849)	-.06339** (.01781)
Poverty	-.00846 (.00798)	.0251067 (.0347406)	.00110 (.02243)
Marriage Rate	-.00735** (.00204)	-.0114074 (.0084278)	-.01227 (.00749)
State GDP	-1.60e-07 (3.08e-07)	-2.82e-07 (1.14e-06)	1.28e-06 (8.33e-07)
Percent Black	-9.408 (5.295)	72.75785** (29.3666)	57.747* (24.362)
Percent Hispanic	-8.709 (7.321)	-70.62407* (29.32507)	28.401 (19.401)
24 and Under	7.50e-08 (5.59e-07)	3.60e-06 (2.45e-06)	4.61e-06** (1.84e-06)
25 to 44	2.92e-07 (6.83e-07)	-2.41e-06 (2.82e-06)	-4.08e-06* (2.09e-06)
45 and older	-6.50e-08 (1.75e-07)	-5.47e-07 (7.63e-07)	-1.82e-06** (6.25e-07)
Spending on Health programs (per capita)	.00070 (.00043)	.0026284 (.0015381)	.00028 (.00110)
Governor Party	-.09482** (.03184)	-.0815283 (.1482512)	.40632** (.16501)
Percent holding a Bachelors' degree or higher	-.03157 (.02722)	-.1362127 (.1029789)	-.16732* (.07768)

Chlamydia Rate	.00090* (.00043)	-.0005853 (.0019094)	-.00083 (.00127)
Gonorrhea Rate	-.00236** (.00067)	.0006641 (.0028353)	-.00403* (.00186)
Percent Drug Use (except Marijuana)	-.04512 (.02939)	-.1076417 (.1135895)	.06669 (.09390)
Number of Social Organizations	-.00048 (.00037)	-.0030938 (.0016537)	-.00169 (.00154)

*Significant at the .05 level
** Significant at .01 level

Appendix C.25: Black State HIV Negative Binomial Regression using Incarceration as Releases for States with Less Strict Testing Circumstances

Independent Variable	Black HIV Cases	Black HIV IV Transmission	Black HIV Heterosexual Transmission
Black Incarceration Rate	-1.37e-06	-3.60e-06	3.64e-06
Black Male Incarceration Rate	-.00004	.00013	-.00008
Black Female Incarceration Rate	-.00015	.00172	-.00056
Unemployment	-.00633	.01021	-.01298*
Poverty	.00812	-.01399	.01095
Marriage Rate	.01790	-.00953	.01585
State GDP	-9.51e-07	-5.46e-07	-3.29e-07
Percent Black	-22.308*	13.475	62.79473**
Percent Hispanic	-3.766	-35.508	-27.115**
24 and Under	-4.30e-06	-9.28e-06	-.00001**
25 to 44	-7.14e-07	-8.51e-06	-4.49e-06
45 and older	-3.87e-06	6.09e-06	7.22e-07
Spending on Health programs (per capita)	-.00024	.00286	.00058

Governor Party	.11897**	.06582	.25433**
Percent holding a Bachelors' Degree or higher	.05973	-.01446	.10595
Chlamydia Rate	.00193**	.00053	.00098
Gonorrhea Rate	-.00012	.0012948	.0009432
Percent Drug Use (except Marijuana)	.04485	.07702	.17490**
Number of Social Organizations	-.00038	.00357*	-.00094

*Significant at the .05 level
** Significant at .01 level

Appendix C.26: Black State HIV Negative Binomial Regression using Incarceration as Releases for States with Less Strict Testing Circumstances and One Year Lag

Independent Variable	**Black HIV Cases**	**Black HIV IV Transmission**	**Black HIV Heterosexual Transmission**
Black Incarceration Rate	5.13e-06**	3.40e-06	8.61e-06**
	(1.70e-06)	(6.06e-06)	(2.98e-06)
Black Male Incarceration Rate	-.00001	.00005	.000138
	(.00002)	(.00014)	(.00006)
Black Female Incarceration Rate	.00025	-.00074	-.00094
	(.00045)	(.00114)	(.00056)
Unemployment	-.00727*	-.01018	-.02124**
	(.00368)	(.01321)	(.00593)
Poverty	.00083	.01283	-.01381
	(.00706)	(.02337)	(.01180)
Marriage Rate	-.00358	-.01541	-.00040
	(.00476)	(.01789)	(.00810)
State GDP	-1.37e-06**	-1.53e-06	-1.22e-06
	(4.84e-07)	(1.61e-06)	(8.96e-07)
Percent Black	3.831	4.287	24.902
	(9.094)	(18.145)	(17.862)
Percent Hispanic	-9.676*	-9.533	1.928
	(4.104)	(15.670)	(7.517)
24 and Under	-8.90e-06**	-7.24e-06	-.00001**
	(2.37e-06)	(8.24e-06)	(3.91e-06)
25 to 44	7.99e-06**	1.45e-06	.00001*
	(2.96e-06)	(9.00e-06)	(4.95e-06)
45 and older	3.90e-06**	5.32e-06	3.22e-06*
	(1.01e-06)	(3.45e-06)	(1.59e-06)

Spending on Health programs (per capita)	.00336** (.00056)	.00488* (.00221)	.00351** (.00096)
Governor Party	-.01488 (.03247)	.18093 (.11275)	.03964 (.05317)
Percent holding a Bachelors' Degree or higher	.03645 (.03688)	.16156 (.13597)	-.07874 (.06312)
Chlamydia Rate	-.00191** (.00037)	-.00140 (.00124)	-.00212** (.00061)
Gonorrhea Rate	.00295** (.00067)	.00277 (.00251)	.00284** (00105)
Percent Drug Use (except Marijuana)	-.05300 (.03999)	.16156 (.13597)	.00216 (.06880)
Number of Social Organizations	.00126** (.00037)	.00297** (.00118)	.00014 (.00062)

*Significant at the .05 level
** Significant at .01 level

Appendix C.27: Black State HIV Negative Binomial Regression using Incarceration as Releases for States with Stricter Testing Circumstances

Independent Variable	Black HIV Cases	Black HIV IV Transmission	Black HIV Heterosexual Transmission
Black Incarceration Rate	1.01e-07	9.42e-08	2.46e-07
Black Male Incarceration Rate	-5.38e-06	-3.47e-06	.00001
Black Female Incarceration Rate	-.00002	.00008	.00008
Unemployment	.002105	.00343	-.00300
Poverty	-.01015	-.01584	-.02047
Marriage Rate	-.00416	-.02122	-.01169*
State GDP	-3.07e-07	5.39e-07	-4.05e-07
Percent Black	-33.739**	-13.585	-43.883**
Percent Hispanic	-13.708*	-41.242	-7.1775
24 and Under	9.93e-07	2.71e-06	8.71e-07

25 to 44	3.78e-06**	3.96e-06	2.78e-06
45 and older	-3.64e-06**	-2.85e-06	-2.64e-06
Spending on Health programs (per capita)	.00106**	.00163	.00173**
Governor Party	-.06768	-.04324	-.00439
Percent holding a Bachelors' Degree or higher	-.00079	-.19977*	-.05544
Chlamydia Rate	.00086*	-.00118	.00020
Gonorrhea Rate	-.00125	.00497	.00057
Percent Drug Use (except Marijuana)	-.04011	.13915	-.06517
Number of Social Organizations	-.00075*	-.00076	-.00061

*Significant at the .05 level
** Significant at .01 level

Appendix C.28: Black State HIV Negative Binomial Regression using Incarceration as Releases for States with Stricter Testing Circumstances and One Year Lag

Independent Variable	**Black HIV Cases**	**Black HIV IV Transmission**	**Black HIV Heterosexual Transmission**
Black Incarceration Rate	6.24e-09	3.15e-06	6.78e-07
	(8.10e-07)	(3.15e-06)	(1.17e-06)
	-5.60e-07	-.00018	-.00008
Black Male Incarceration Rate	(.00003)	(.00013)	(.00006)
	-.00003	.00164	.00057
Black Female Incarceration Rate	(.00027)	(.00103)	(.00045)
	-.00423	.00926	-.01126
Unemployment	(.00445)	(.01693)	(.00653)
	-.00440	.03289	-.00400
Poverty	(.00885)	(.03107)	(.01232)
	-.00203	-.00928	-.00697
Marriage Rate	(.00323)	(.01245)	(.00510)
	-4.32e-07	-8.25e-07	-5.72e-07
State GDP	(2.26e-07)	(8.75e-07)	(3.49e-07)
	-18.135**	12.010	-16.321
Percent Black			

	(6.562)	(34.054)	(12.655)
	-2.08517	-70.586**	.79568
Percent Hispanic	(6.167)	(27.494)	(10.752)
	1.74e-08	.00001**	3.77e-07
24 and Under	(1.19e-06)	(3.85e-06)	(1.60e-06)
	3.93e-06*	-1.15e-06	2.30e-06
25 to 44	(1.87e-06)	(6.13e-06)	(2.40e-06)
	-3.84e-06**	-2.20e-06	-2.80e-06
45 and older	(1.05e-06)	(3.74e-06)	(1.57e-06)
Spending on Health programs	.00126**	.00188	.00162*
(per capita)	(.00048)	(.0014507)	(.00068)
	-.05751	-.13517	.02834
Governor Party	(.03758)	(.16500)	(.06284)
Percent holding a Bachelors'	-.02353	-.06592	-.01010
Degree or higher	(.02604)	(.09974)	(.03786)
	.00098	-.00028	.00030
Chlamydia Rate	(.00053)	(.00169)	(.00070)
	-.00158	.00274	-.00091
Gonorrhea Rate	(.00096)	(.00347)	(.00141)
Percent Drug Use (except	.04308	-.15143	.10333
Marijuana)	(.03829)	(.13260)	(.05421)
	-.00035	-.00175	.00014
Number of Social Organizations	(.00037)	(.00135)	(.00057)

*Significant at the .05 level
** Significant at .01 level

Appendix C.29: White State HIV Negative Binomial Regression using Incarceration Rates for States with Less Strict Testing Circumstances

Independent Variable	White HIV Cases	White HIV IV Transmission	White HIV Heterosexual Transmission
White Incarceration Rate	-4.77e-07	5.89e-06	3.87e-06
White Male Incarceration Rate	.00002	.00004	-.00011
White Female Incarceration Rate	.00039	.00011	-.00092
Unemployment	-.01562	-.04820	-.03465
Poverty	.00170	-.02945	-.00904

Marriage Rate	-.01451	.02843	-.00202
State GDP	8.93e-07	-2.64e-06	-5.09e-07
Percent Black	-28.167*	13.760	-11.721
Percent Hispanic	6.440	8.260	-15.905
24 and Under	1.26e-06	-6.64e-06	-1.53e-06
25 to 44	-2.42e-06	3.55e-06	9.94e-07
45 and older	7.91e-08	-8.25e-07	5.24e-07
Spending on Health programs (per capita)	.00067	-.00251	-.03465
Governor Party	.04473	.06107	-.07956
Percent holding a Bachelors' Degree or higher	.02617	.06103	.18394
Chlamydia Rate	-.00159*	7.30e-06	-.00005
Gonorrhea Rate	.00108	-.00319	-.00137
Percent Drug Use (except Marijuana)	.01708	-.1317778	.15858
Number of Social Organizations	.00024	.00198	.00396**

*Significant at the .05 level
** Significant at .01 level

Appendix C.30: White State HIV Negative Binomial Regression using Incarceration Rates for States with Less Strict Testing Circumstances and One Year Lag

Independent Variable	**White HIV Cases**	**White HIV IV Transmission**	**White HIV Heterosexual Transmission**
White Incarceration Rate	3.22e-06	-4.14e-06	-1.07e-06
	(2.06e-06)	(6.77e-06)	(5.19e-06)
White Male Incarceration Rate	2.08e-07	-.00007	.00002
	(.00003)	(.00011)	(.00008)
White Female Incarceration Rate	.00029	.00097	-.00045
	(.00028)	(.00108)	(.00077)

	-.02852**	-.08864**	-.04429
Unemployment	(.01152)	(.03371)	(.02470)
	.01269	-.01159	-.01089
Poverty	(.01150)	(.03199)	(.02336)
	-.00120	-.04990*	.011903
Marriage Rate	(.00803)	(.02351)	(.01570)
	1.20e-06	-1.91e-06	-2.10e-06
State GDP	(8.13e-07)	(2.13e-06)	(1.67e-06)
	-2.567	28.782	7.952
Percent Black	(5.524)	(44.137)	(32.962)
	8.817	-17.32022	43.283*
Percent Hispanic	(12.043)	(25.6448)	(19.920)
	2.41e-06	5.82e-06	-2.79e-06
24 and Under	(1.41e-06)	(4.17e-06)	(2.77e-06)
	-3.20e-06*	-3.42e-06	1.25e-06
25 to 44	(1.43e-06)	(3.65e-06)	(2.52e-06)
	5.88e-07	2.02e-06*	-2.79e-07
45 and older	(3.86e-07)	(1.04e-06)	(7.57e-07)
Spending on Health programs	.00103	.00462*	.00080
(per capita)	(.00059)	(.00194)	(.00146)
	.00347	-.07557	-.04935
Governor Party	(.04369)	(.14151)	(.10399)
Percent holding a Bachelors'	.00228	.02577	-.05509
Degree or higher	(.04909)	(.13121)	(.09916)
	-.00206**	.00105	-.00190
Chlamydia Rate	(.00066)	(.00161)	(.00112)
	.00123	-.00134	-.00414
Gonorrhea Rate	(.00119)	(.00323)	(.00225)
Percent Drug Use (except	.00228	.30698*	.04875
Marijuana)	(.04909)	(.14640)	(.10961)
	.00116	.00248	.00124
Number of Social Organizations	(.00068)	(.00233)	(.00159)

*Significant at the .05 level
** Significant at .01 level

Appendix C.31: White State HIV Negative Binomial Regression using Incarceration Rates for States Stricter Testing Circumstances

Independent Variable	**White HIV Cases**	**White HIV IV Transmission**	**White HIV Heterosexual Transmission**

White Incarceration Rate	1.08e-06	2.37e-06	2.01e-06
White Male Incarceration Rate	-4.92e-07	.00011	.00002
White Female Incarceration Rate	-.00003	.00029	.00002
Unemployment	.02311*	.00830	.01033
Poverty	-.02797**	.09122*	-.05744*
Marriage Rate	-.00430	-.00658	-.01604*
State GDP	-1.16e-06**	-2.94e-06	3.1723
Percent Black	-23.736*	-11.119	-71.208
Percent Hispanic	-22.260**	-53.324	-71.208**
24 and Under	-4.46e-06**	-8.19e-06	-6.35e-06
25 to 44	4.82e-06**	9.06e-06	5.18e-06
45 and older	1.24e-07	6.10e-07	1.75e-06*
Spending on Health programs (per capita)	.00091	.00127	.00225
Governor Party	-.12844**	.01416	-.18756
Percent holding a Bachelors' Degree or higher	.03401	-.00612	.08692
Chlamydia Rate	.00106	-.00169	.00265
Gonorrhea Rate	-.00068	.00737	-.00611*
Percent Drug Use (except Marijuana)	-.06207	.04947	-.09012
Number of Social Organizations	-.00020	-.00073	.002957

*Significant at the .05 level
** Significant at .01 level

Appendix C.32: White State HIV Negative Binomial Regression using Incarceration Rates for States with Stricter Testing Circumstances and One Year Lag

Independent Variable	White HIV Cases	White HIV IV Transmission	White HIV Heterosexual Transmission
White Incarceration Rate	1.97e-06	3.04e-06	5.31e-06
	(1.24e-06)	(4.33e-06)	(2.87e-06)
	-.00002	-.00032	.00012
White Male Incarceration Rate	(.00007)	(.00028)	(.00020)
	-.00003	.00130	-.00059
White Female Incarceration Rate	(.00028)	(.00107)	(.00078)
	-.01226	-.04413	-.03736
Unemployment	(.01050)	(.04308)	(.02998)
	-.00007	.09921*	.03535
Poverty	(.01136)	(.04612)	(.02988)
	-.00786*	-.01023	-.00871
Marriage Rate	(.00355)	(.00945)	(.00738)
	-3.23e-07	-1.68e-06	-7.94e-07
State GDP	(4.96e-07)	(1.85e-06)	(1.30e-06)
	-10.871	38.582	12.754
Percent Black	(8.981529)	(45.58855)	(28.60129)
	-24.081**	-62.275	-38.442
Percent Hispanic	(8.686)	(33.762)	(23.693)
	-1.36e-06	-2.56e-06	-2.80e-06
24 and Under	(1.50e-06)	(5.88e-06)	(4.18e-06)
	1.59e-06	3.08e-06	4.01e-06
25 to 44	(1.54e-06)	(6.12e-06)	(4.34e-06)
	4.35e-07	1.35e-07	9.15e-08
45 and older	(3.39e-07)	(1.12e-06)	(7.93e-07)
Spending on Health programs (per capita)	.00102	.00379	.00164
	(.00057)	(.00221)	(.00154)
	-.12173**	-.05764	.01127
Governor Party	(.03717)	(.14943)	(.10669)
Percent holding a Bachelors' Degree or higher	.03175	-.03097	.01666
	(.04021)	(.14151)	(.10102)
	.00043	-.00235	-.00141
Chlamydia Rate	(.00061)	(.00235)	(.00154)
	-.00234*	-.00096	-.00467
Gonorrhea Rate	(.00101)	(.00412)	(.00265)
Percent Drug Use (except Marijuana)	-.10291**	-.02563	-.22686**
	(.03978)	(.14803)	(.11095)

Number of Social Organizations	.00012 (.00066)	-.00411 (.00240)	-.00158 (.00171)

*Significant at the .05 level
** Significant at .01 level

Appendix C.33: Black and White Female State Population HIV Negative Binomial Regression with Incarceration Rate in Less Strict Testing States (Including One) Year Lag

Independent Variable	Black female HIV Cases	White Female HIV Cases	Black female HIV Cases (1 Year Lag)	White Female HIV Cases (1 Year Lag)
Incarceration Rate	-7.92e-07	6.77e-06	5.79e-06 (3.22e-06)	-5.19e-07 (5.36e-06)
Male Incarceration	-.00003	.00002	.00019** (.00007)	.00002 (.00008)
Female Incarceration	.00021	-.00018	-.00156** (.00063)	-.00020 (.00079)
Unemployment	-.00932	-.05381*	-.01660* (.00716)	-.04160 (.02495)
Poverty	.00132	-.00618	.00302 (.01287)	-.00629 (.02365)
Marriage Rate	.01607	-.01085	.00847 (.00910)	.00028 (.01585)
State GDP	8.14e-08	3.34e-07	4.78e-07 (9.67e-07)	-1.66e-06 (1.70e-06)
Percent Black	77.581**	-3.693	22.306 (15.086)	-10.684 (33.025)
Percent Hispanic	-18.487	-16.112	6.437 (7.742)	32.280 (19.816)
24 and Under	-7.46e-06	7.35e-07	-3.90e-06 (4.58e-06)	-2.35e-06 (2.80e-06)
25 to 44	-.00001*	-1.22e-06	-2.77e-06 (5.30e-06)	1.73e-07 (2.58e-06)
45 and older	1.02e-06	3.61e-07	3.22e-06 (1.76e-06)	1.75e-07 (7.69e-07)
Spending on Health programs (per capita)	-.00056	.00213	.00208* (.00107)	.00083 (.00150)
Governor Party	.27529**	.12741	.06323 (.06282)	-.16876 (.10740)
Percent holding a Bachelors' Degree or higher	.13520	.22760*	-.00047 (.06384)	-.08229 (.09837)
Chlamydia Rate	.00087	-.00057	-.00139*	-.00090

			(.00068)	(.00111)
Gonorrhea Rate	.00180	-.00146	.00400** (.00115)	-.00213 (.00229)
Percent Drug Use (except Marijuana)	.13021	.19187	.04176 (.07838)	.03679 (.11079)
Number of Social Organizations	-.00075	.00093	.00113 (.00067)	.00195 (.00169)

*Significant at the .05 level
** Significant at .01 level

Appendix C.34: Black and White Male State Population HIV Negative Binomial Regression with Incarceration Rate in Less Strict Testing States (Including One Year Lag)

Independent Variable	Black Male AIDS Cases	White Male AIDS Cases	Black Male AIDS Cases (1 Year Lag)	White Male AIDS Cases (1 Year Lag)
Incarceration Rate	2.53e-06	-4.29e-06*	3.06e-06 (1.97e-06)	2.61e-06 (2.11e-06)
Male Incarceration	-.00003	.00002	-.00003 (.00005)	3.38e-06 (.00003)
Female Incarceration	-.00023	.00049	.00042 (.00040)	.00039 (.00030)
Unemployment	-.00965*	.00075	-.00486 (.00426)	-.02665* (.01159)
Poverty	.00927	-.00160	.00103 (.00861)	.02084 (.01279)
Marriage Rate	.00861	.00264	-.00493 (.00552)	-.00320 (.00917)
State GDP	-5.24e-07	-5.41e-07	-1.77e-06 (5.18e-07)	1.75e-06 (7.84e-07)
Percent Black	45.460**	-38.396**	1.520 (12.018)	-6.274 (4.785)
Percent Hispanic	-20.712**	14.529*	-8.507 (5.466)	6.642 (8.818)
24 and Under	-9.64e-06**	-3.90e-06**	-7.96e-06** (2.79e-06)	3.81e-06** (1.42e-06)
25 to 44	-3.40e-06	6.18e-07	8.39e-06* (3.70e-06)	-4.38e-06** (1.44e-06)
45 and older	1.73e-06	-9.24e-07**	3.18e-06** (1.26e-06)	6.62e-07* (3.41e-07)
Spending on Health programs (per capita)	-.00024	-.00104*	.00335** (.00065)	.00112 (.00061)
			-.04735	.02831

Governor Party	.15483**	.04234	(.03873)	(.04752)
Percent holding a Bachelors' Degree or higher	.07027	-.03025	.04603 (.04673)	.00805 (.04444)
Chlamydia Rate	.00107*	.00025	-.00169** (.00044)	-.00248** (.00074)
Gonorrhea Rate	-.00004	-.00118	.00275** (.00080)	.00213 (.00124)
Percent Drug Use (except Marijuana)	.13506**	-.02424	-.09251* (.04661)	-.01393 (.04916)
Number of Social Organizations	-.00104*	.00059	.00136** (.00046)	.00089 (.00073)

*Significant at the .05 level
** Significant at .01 level

Appendix C.35: Black and White Female State Population HIV Negative Binomial Regression with Incarceration Rate Stricter Testing States (Including One) Year Lag

Independent Variable	Black female HIV Cases	White Female HIV Cases	Black Female HIV Cases (1 Year Lag)	White Female HIV Cases (1 Year Lag)
Incarceration Rate	-8.74e-07	5.77e-06*	-9.40e-07 (1.40e-06)	4.75e-06 (3.04e-06)
Male Incarceration	2.94e-06	.00002	-.00011 (.00006)	.00005 (.00020)
Female Incarceration	-5.74e-06	.00002	.00098* (.00050)	-.00038 (.00078)
Unemployment	-.01084	.02692	-.01492 (.00809)	-.02082 (.02966)
Poverty	-.03084*	-.01286	-.00172 (.01989)	.04397 (.02997)
Marriage Rate	-.01471**	-.01339	-.01167 (.00612)	-.00917 (.00724)
State GDP	-2.77e-07	-1.28e-06	-6.97e-07 (4.16e-07)	-1.59e-06 (1.31e-06)
Percent Black	-52.963**	-7.027	-28.054** (9.064)	5.685 (29.093)
Percent Hispanic	5.331	-53.407*	-11.007 (9.398)	-58.619** (23.439)
24 and Under	5.75e-06**	-5.96e-06	6.45e-08 (2.11e-06) 2.79e-06	-3.38e-06 (4.21e-06) 3.98e-06

25 to 44	-3.04e-06	7.00e-06	(3.26e-06)	(4.39e-06)
45 and older	-1.45e-06	7.39e-07	-1.05e-06 (1.84e-06)	6.76e-07 (7.90e-07)
Spending on Health programs (per capita)	.00056	-.00069	.00061 (.00087)	.00311* (.00154)
Governor Party	-.03233	-.28544**	-.00430 (.07047)	-.09085 (.10546)
Percent holding a Bachelors' Degree or higher	-.10082*	.03957	.03854 (.04376)	.12185 (.09968)
Chlamydia Rate	-5.97e-06	.00018	.00158 (.00099)	-.00313* (.00155)
Gonorrhea Rate	.00081	-.00072	-.00399* (.00191)	-.00130 (.00268)
Percent Drug Use (except Marijuana)	-.06455	-.074844	.13101 (.07572)	-.21085* (.10880)
Number of Social Organizations	-.00103	.00018	.00094 (.00069)	-.00181 (.00169)

*Significant at the .05 level
** Significant at .01 level

Appendix C.36: Black and White Male State Population HIV Negative Binomial Regression with Incarceration Rate in Stricter Testing States (Including One Year Lag)

Independent Variable	Black Male AIDS Cases	White Male AIDS Cases	Black Male AIDS Cases (1 Year Lag)	White Male AIDS Cases (1 Year Lag)
Incarceration Rate	-4.41e-07	-4.65e-08	-8.16e-08 (9.07e-07)	5.46e-07 (1.15e-06)
Male Incarceration	-4.41e-06	-7.77e-06	.00004 (.00004)	-.00004 (.00008)
Female Incarceration	-6.73e-06	-.0000479	-.00031 (.00031)	.00005 (.00031)
Unemployment	.0060847	.0230548*	-.00031 (.00474)	-.01302 (.01134)
Poverty	-.0053298	-.0300326**	-.00571 (.00847)	-.00332 (.01194)
Marriage Rate	.000498	-.0027629	.00219 (.00368)	-.00848** (.00281)
State GDP	-3.02e-07	-1.23e-06**	-1.01e-07 (2.56e-07) 5.791	-1.05e-07 (5.04e-07) -10.962

Percent Black	-18.68479*	-25.87714*	(9.073)	(10.987)
Percent Hispanic	-15.72449*	-19.34393*	-2.700 (7.952)	-13.063 (9.196)
24 and Under	7.19e-07	-4.06e-06**	1.81e-06 (1.20e-06)	-6.17e-07 (1.61e-06)
25 to 44	3.72e-06*	4.32e-06**	1.13e-06 (1.85e-06)	8.83e-07 (1.67e-06)
45 and older	-3.73e-06**	1.08e-07	-3.67e-06** (1.15e-06)	1.99e-07 (3.20e-07)
Spending on Health programs (per capita)	.0004326	.0010009	.00086 (.00050)	.00044 (.00061)
Governor Party	-.0471578	-.1136001**	-.05521 (.04378)	-.11423** (.03865)
Percent holding a Bachelors' Degree or higher	.0286557	.0390551	-.01234 (.02822)	-.00591 (.03959)
Chlamydia Rate	.0012094*	.0012697*	.00046 (.00050)	.00109 (.00065)
Gonorrhea Rate	-.0023655*	-.0008745	-.00165 (.00098)	-.00268** (.00108)
Percent Drug Use (except Marijuana)	-.018612	-.0633324	-.01127 (.03875)	-.06923 (.03988)
Number of Social Organizations	-.0005019	.0000439	-.00065 (.00041)	.00049 (.00068)

*Significant at the .05 level
** Significant at .01 level

Chapter 7: Conclusion

Concluding Thoughts

The purpose of this study was to explore the role of incarceration with regard to infectious diseases spread. The main infectious disease of interest was HIV, but the relationship between incarceration and AIDS and TB, respectively, were investigated, as well. The hypothesis was that prisons have spillover effects to the larger outside community, and thus states with more inmates will have higher levels of infectious diseases, as incarceration serves to help facilitate disease spread. Overall, the data in this study did not support this hypothesis, but showed instead an inverse relationship. For the most part, the current study found that increases in incarceration appear to decrease community infectious diseases prevalence.

With respects to specific subgroups, these results point toward differences that may exist with regard to the relationship between incarceration and community HIV prevalence. First, Blacks and Whites to some degree appear differentially impacted by incarceration with respect to HIV spread. While White HIV cases appear to be consistently negatively associated with incarceration, some of the Black results show a positive relationship with incarceration. Looking at gender differences, female incarceration results suggest that female incarceration may have a larger impact on HIV spread than male incarceration. Given the current and continual rise in female incarceration, gendered incarceration data will grow and become more available, making it possible to further tease apart whether and to what extent female incarceration differentially impacts HIV spread. While none of these results can be considered definitive at this point, their power comes in laying a foundation and guiding future research, as well as in demanding

consideration from policy makers in debating the costs and benefits of our current system of mass incarceration.

On the surface, these results can be interpreted to suggest that incarceration is a good thing or a needed policy intervention, especially with regard to infectious disease. Such an interpretation must be made with great caution and is not necessarily how this evidence should be interpreted. This study by no means advocates for continuing the unsustainable system of mass incarceration that the nation faces, nor does it believe that locking up more individuals will solve the problem. Incarceration breaks families, destroys neighborhoods, begins or continues a cycle of disadvantage, and alienates individuals and communities from larger segments of American society, among other negative consequences. Incarceration, itself poses much societal harm. Consequently, treating one evil with another evil is not necessarily a viable solution. This message of caution is critical for moving forward with the research, as well as for considering any other possible policy prescriptions that may be designed from these results. This study should be taken as a first inquiry into the incarceration HIV connection and viewed as a starter for further conversation and research agendas.

The results from this study can be attributed to some aspect of incarceration facilitating the reduction of disease as opposed to incarceration in its totality facilitating disease reduction. Two possible explanations were posed in the precious chapters, confinement or HIV testing. Confinement presumes that prisons either lock up more of the population of those most at risk for HIV contraction—thereby reducing the ability for those individuals to contract HIV in the larger community—or it locks away the at-risk and HIV positive for long periods of time, thereby deflating the numbers of HIV positive individuals in the community itself. Alternatively, confinement and the restrictions within prison may force inmates to abstain from risk behaviors,

such as drug use, unsafe sexual practices, or tattooing; as a result of the forced abstinence, the newly reformed behavior is then kept up on release. This reformed behavior thus decreases the risk behavior that may spread disease outside of prison. HIV testing, on the other hand, may act as an intervention, intervening before the disease is able to spread to a larger population.

The confinement notion was largely dismissed because most prisoners are released, keeping the inflows and outflows open. Risk behavior, such as drug use and tattooing, still take place frequently within prisons, and prisons also serve as a place to pick up additional behaviors due to the climate and survival inside. For these reasons, it seems unlikely that simple confinement within prison is likely to constrain behaviors to the extent that it reforms or reshapes behavior in a manner consistent with reducing disease spread.

Alternatively, HIV testing seems like a much more plausible explanation for the perceived reductions. Almost all public health strategies aimed at targeting HIV contain some role for testing per CDC recommendations. Testing has many advantages that could be parlayed into effective HIV reduction. First, testing makes individuals aware of their status and builds knowledge. When people are aware of their HIV status, they can alter behaviors such as reducing risk behaviors, practicing safer sex, dialoguing with partners, and complying with medication. The last modification is crucial. Medication compliance can reduce the likelihood of transmission to an uninfected individual, but the only way to receive the needed prescription is to be tested first. Having higher viral loads of medication in one's system is one of the best ways to reduce transmission to others. Second, testing breads awareness. Even if a person tests negative, becoming aware of HIV can provide information that induces behavior modification. Third, testing can be combined with educational counseling or information dissemination that raises awareness and draws attention to prevention. Given the authoritative structure of prison, prisons

pose the opportunity to require testing or counseling as conditions of confinement. This requirement would extend the reach of interventions, and since prison is likely to house large portions of the at-risk population—people who are poorer, minorities, less educated, or increased participants in risk behaviors—testing in prison is likely to reach a large segment of the most at risk population. Lastly, prisons already have a health infrastructure that could implement testing without requiring many added resources.

As HIV testing was presumed to be the more plausible mechanism, the empirical analysis in Chapter 6 attempts to explore if this assertion is correct and tests whether different levels of testing can explain why incarceration appears to reduce HIV prevalence. States were divided into two groups based on the number of circumstances under which they tested for HIV in prisons. The results for the group of states that tested under fewer circumstances—less strict states—mirrored those of the prior two empirical sections. They signaled that incarceration decreases HIV prevalence. On the contrary, the results on the group of states that tested under more circumstances—stricter states—signaled that incarceration appears to increase HIV prevalence. While there was not an overwhelming degree of significant variables, the consistently different coefficients across several models in each group show some type of notable difference. These differences are counter to the hypothesized relationship, but this may be due to the short time frame of analysis.

A possible explanation for the increased HIV cases found in the stricter testing states is that testing under more conditions leads to more tests being performed resulting in more positive diagnoses. As more tests are performed more individuals have the chance to test positive and have their status medically recorded. For states that perform fewer tests, fewer individuals have the ability to test positive. This does not mean that fewer people are HIV positive, but rather less

people know their status and more cases being undiagnosed. What the stricter states results may be signaling is an artificial increase in the number of HIV cases simply because more tests are performed in prison settings. Over time this number is likely to decrease as testing as an intervention has a larger timeframe to even out or produce health gains. People can only receive treatment once they test positive and testing may raise awareness and/or increase knowledge unavailable elsewhere. As this study was restricted to no lag and a only a one year lagged structure of the independent variables, the long term impacts of divergent testing strategies was not empirically tested. The speculation that the short term gains displayed in this study will dissipate over time is a key area for future research to impart.

Research on the opportunities or limitations of HIV testing in prison systems as an entire population intervention needs further study especially given the possible benefits enumerated in chapter 6. These benefits include but are not limited to a pre-existing authoritative environment, pre-existing medical infrastructure, and capturing a large portion of the highest risk population. On the surface, prison settings appear to present several opportunities for implementing effective testing interventions. As with all public health strategies, there are also drawbacks. Some of these drawbacks include cost, public and state political leader uptake of the intervention, and privacy concerns; however, as with all policies the costs must be weighed against the benefits. While this study is only preliminary, the benefits may outweigh the costs; although, extensive additional analysis is needed before such conclusions can be considered definitive.

Limitations

The first limitation of this study is the narrow timeframe for which HIV data is currently available. For reasons listed throughout this study, HIV is the preferable dependent variable to AIDS. HIV data, however, is only available comprehensively from 2008 to 2014. This limited

timeframe reduces the number of observations, especially if lags are included. This limited number of observations can increase the error or weaken the generalizability of the study. As more HIV data becomes available, additional studies like this one need to be undertaken to get a better and more reliable sense of this relationship. This limitation also plays a role in the testing chapter that was limited to the same timeframe. Additionally, as more data is collected and more information regarding HIV testing practices in prison is uncovered, a more in-depth look at the differential impact of different testing policies can be undertaken. A longer time frame will also allow for longer lags, given the relative lack of results for the single year lag.

The second major limitation deals with the limited nature of the race and gender specific data by transmission mechanism. One of the main motivations for this study was to explore possible causes of the disproportionate HIV/AIDS burden carried by Black women. While data was available for Black females regardless of transmission mechanism, the data did not allow for an analysis by transmission mechanism as did the total Black models. Ideal data would include Black female heterosexually transmitted HIV cases and Black female IV drug HIV cases. The most desired dependent variable is Black female heterosexual transmission HIV cases, given that heterosexual contact is the main method of contraction for Black females. Similarly, incarceration data measured by race and in rates and releases is desired. The differences exhibited between rates and releases in the total HIV models points to there being some benefit to measuring incarceration as releases, which could not be done for the racial models due to data limitations. For these models incarceration was restrained to rates. The race models results may have been weakened by not having racial prison release data.

The third limitation is the preliminary look at HIV testing. As this is one of the first studies to consider a nationwide investigation of HIV testing, it is likely to include many pitfalls,

the first of which may be the breakdown of the states. This investigation breaks states down based on the number of testing circumstances, not the extent of testing circumstances. Using this data, there is no way to gauge the extent of testing. Simply testing under a greater number of conditions increases the presumed likelihood of performing more HIV tests, but does not directly measure how many tests states actually perform.

Future Studies

The first obvious place for future studies to explore is with regard to the use of enhanced HIV data collection. It is hoped that, moving forward, better and extended HIV data will be collected, allowing for a longer time period of investigation. Due to data limitations, this study was limited to only six years. This timeframe may not be enough time to uncover the relationship between incarceration and HIV, especially given the uncertainty surrounding the correct lag length.

Another important aspect of similar studies for future research to carry forward is a better and clearer investigation of the effect of HIV testing within prison settings. This study attempted to break states into two groups based on the rigor of testing using a weighting system to adjust for mandatory versus voluntary testing conditions. While this study does make a logical computation for grouping state testing conditions, one of the elements this study cannot control for is the actual number of tests performed in prisons. Just because a state tests under more circumstances does not mean that it actually performs more tests. To truly measure the effect of testing, the extent of testing is a critical component. At an aggregated level, using data such as that used in this study, the extent of testing is not measurable. Perhaps more concentrated studies, such as case studies of specific prisons or prisons systems or interviews, would provide a better measure of the pervasiveness of testing that actually occurs. Similarly, a more refined measure of

the difference between testing some versus all inmates is needed. Testing all inmates should increase the number of inmates who actually receive testing, rather than prisons that only test some inmates. Further, prison systems that test all inmates randomly may not catch as many inmates as prisons that test all inmates at entry. There may be additional differences in disease spread, as well, for prisons that test all inmates at entry rather than at exit. If prisoners are tested at exit, they are provided knowledge of their status, but are not likely to benefit from any interventions prison can provide. Prisoners tested at entry, on the other hand, are likely to benefit from prison interventions. This provides a rationale for further exploring the exact structure and extent of prison testing with regard to HIV spread or prevention.

Lastly, the structure of this macro level study limits the ability to draw definitive conclusions. It is possible that any intricacies of the incarceration and infectious disease relationship are likely to be seen at the county rather than the state level. This study cannot speak to the effect at either of these levels. The expanse of this study to consider all fifty states was the tradeoff with attempting to uncover a more refined relationship. As with most research, generalizability is gained from larger macro level studies, but micro level differences remain unknown. Thus, future studies are encouraged to study this relationship from the ground up rather than from the top down. This approach requires more in-depth, smaller study designs whose methods are more likely to utilize case studies, interviews, surveys, or focus groups. This observation does not render the current study useless, but rather positions the current study as providing evidence for the usefulness of studying this relationship through alternative methods.

Future Implications

Great caution should be exercised before making broad policy prescriptions based on this study. While some of the findings suggest that incarceration may play a role in reducing

community HIV/AIDS cases and HIV testing within state prisons systems may be a mechanism to reduce such disease spread, the miniscule magnitudes of effect should slow any inclination to direct policy solely based on this study. More than anything this study should serve as a conversation starter or as a strong basis for a future research agenda. As mentioned in the introduction, the spillover health effects of incarceration have failed to garner the attention that the political, financial, and psychological consequences have received. This lack of attention to health effects in no way means that they are not as significant nor that they are unrelated, but rather that research has yet to be directed at these important issues. While lacking overwhelming significance, the results of this study do lay a foundation for the importance of similar research and give credence to the need for additional carceral health consequence research.

In addition, this study exposes the need to study incarceration in subcomponents rather than as one single entity. Differences appear to exist in how incarceration impacts Blacks and Whites and males and females. In research, care must be taken not to aggregate to such a level that we lose explanatory power. This kind of over aggregation can be occur if incarceration is treated as a whole, without consideration of subgroups such as race and gender. Similarly, aggregation at the state level may wash away more refined community, neighborhood, and county level effects. Although this study found only a few significant results, that does not mean there is no or only a weaker association between incarceration and HIV. What it may signal, instead, is that the relationship is more defined at a smaller unit of analysis than the state. This is a critical area for future research to expand.

Appendix D

For several reasons, it is believed that a lagged structure is best when analyzing the relationship between incarceration and infectious diseases. The main reason for this belief is that time is needed for an inmate to be released from prison, have time to spread the disease to others, and for those infected to be positively diagnosed. While there is a general consensus that some type of lag of the disease is needed, there is no relative consensus on the length of this lag, especially for HIV/AIDS. Previous studies have used anywhere from a one year lag to a thirteen year lag with regard to HIV/AIDS. For more common diseases such as gonorrhea, chlamydia, and tuberculosis, a one year lag is considered to show the most consistent results. For HIV, however, the best lag is unknown, although it is likely to be longer than a single year. When using AIDS as the dependent variable the appropriate lag is likely to be even longer as AIDS is advanced stage HIV taking several years to seroconvert given medical advancements. The purpose of this appendix is to test the appropriateness of different lags in regards to the HIV and incarceration. This study provides models for no lag as well as a one year lag since a single year lag as it is the most widely used when studying infectious disease. The above results did not show overwhelming advantage to using a one year lag. Given these findings, this appendix will present a preliminary exploration of more advanced lags.

Given the vastness of the data models and tables in this study, this section will only use a single set of models to test different length of lags. This attempt should serve to steer future research in not lumping all infectious disease in the same group and analyzing them in the same

manner. Like much of the prior data analysis, this section is exploratory rather than definitive. As such, readers should seek to use these results as a starting point for further exploration in other related research rather than assuming the results exhibit a certainty. Much like the previous analytical sections, the incarceration variables are the specific independent variables of interest. Accordingly, only the results for these variables are reported in the table below. This section will test the total state HIV model which spans data from 2008 to 2013. Since this data covers six years lags will be tested up to 4 years. The results of these analyses are found below in Appendix 1 Table.

Appendix Table 1: Total State Population HIV Negative Binomial Regression with Incarceration Rates (Including Transmission Mechanisms) and Lag Test

Independent Variable	HIV Cases	HIV IV Transmission	HIV Heterosexual Transmission
One Year Lag			
Incarceration Rate	-.00007	.00034**	-.00010
	(.00007)	(.00013)	(.00007)
Male Incarceration Rate	-.00004	.00017*	-.00006
	(.00004)	(.00007)	(.00004)
Female Incarceration Rate	-.00002	.00194**	-.00031
	(.00036)	(.00069)	(.00037)
Two Year Lag			
Incarceration Rate	-.00013**	-.00009	-.00015
	(.00005)	(.00020)	(.00010)
Male Incarceration Rate	-.00007**	-.00008	-.00008
	(.00003)	(.00010)	(.00005)
Female Incarceration Rate	-.00021	.00228	-.00098
	(.00031)	(.00122)	(.00066)
Three Year Lag			
Incarceration Rate	7.98e-06	-.00004	-.00023
	(.00014)	(.00053)	(.00029)
Male Incarceration Rate	.00003	6.37e-06	-.00010
	(.00007)	(.00027)	(.00015)
Female Incarceration Rate	-.00272**	-.00190	-.00300
	(.00102)	(.00388)	(.00213)
Four Year Lag			

	.00006	-.00046	-.00025
Incarceration Rate	(.00014)	(.00056)	(.00029)
	.00002	-.00024	-.00014
Male Incarceration Rate	(.00007)	(.00028)	(.00015)
	.00139	-.00076	-.00045
Female Incarceration Rate	(.00098)	(.00405)	(.00215)

*Significant at the .05 level
** Significant at .01 level

Looking in the table above, there does not appear to be any clear overwhelming patterns or additional evidence gained by adding in the additional lags. The magnitudes are still relatively small and there are few statistically significant results. The most important conclusion to make from this analysis is that there is still an uncertainty regarding the appropriate lag for testing incarceration and HIV. This may signal that the appropriate lag is longer than the four years tested in this section. This study was limited to testing only a four year lagged structure due to current data limitations for reliable HIV data. Further uncovering the correct lagged structure is a critical place for future research to explore to assist in better understanding the relationship between HIV and incarceration; however, there are a few important results to point out.

In the total HIV model (column one), in the year three and four lag of the independent variables, the coefficients for the incarceration switch to a positive direction from a negative direction in years one and two. None of these results reached statistical significance, but the switch in direction may be something to pay attention to in future research. Over time, incarceration appears to increase HIV cases rather than reduce cases as seen in earlier years. This is opposite the pattern displayed in the total IV drug HIV case model. While the coefficients are positive with a one year lag, they turn negative in years two through four. This may signal that a one year lag of the independent variables does not exhibit the correct relationship between IV drug transmitted HIV cases and incarceration. Similarly, the incarceration may differential

impact total HIV cases and IV drug HIV cases. Heterosexually transmitted HIV cases on the other hand exhibit the same type of relationship, negative coefficients suggesting an increase in incarceration decreases heterosexual HIV cases, throughout all of the various year lags. While these results did not reach statistical significance, they do signal that difference exist between how incarceration is related to HIV dependent on transmission mechanism. Incarceration may have the highest effect in reducing heterosexually transmitted HIV cases compared to total and IV drug HIV cases.

As mentioned previously this section is purely exploratory is leaves many more questions than answers. This analysis cannot provide definitive evidence regarding the correct length of lag to best understand the relationship between HIV and incarceration. More importantly these results appear to be suggesting that the correct lag maybe longer than the four years examined by the current data. Like most of this study, this section was designed to direct future research and provides introductory investigation into ways to better unpack the impact of incarceration on community HIV/AIDS spread.