

Incarceration and Sexually Transmitted Infections: A Neighborhood Perspective

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ABSTRACT *The social dynamics of some communities are affected by the loss of significant numbers of people to prison and by the release of others who encounter the challenge of coping with the negative effects of the incarceration experience. The effects on communities are evident, in part, in the high rates of sexually transmitted infections (STIs) in North Carolina (NC) counties that have a high rate of incarceration. In the present study, we examined whether the same associations can be observed at the census tract level in one urban city of NC. To identify the mechanisms by which incarceration can affect the transmission of STIs, we conducted ethnographic interviews with ex-offenders and people who lost a sexual partner to prison. We found that census tract rates of incarceration were consistently associated with gonorrhea rates in the subsequent year. An increase of the percentage of census tract person-time spent in prison from 2.0% to 2.5% corresponded to a gonorrhea rate increase of 7.1 cases per 100,000 person-years. The people interviewed spoke of sexual partnership changes including those left behind finding new partners, in part for help in making financial ends meet; men having sex with men for the first time in prison; and having multiple new partners upon reentry to the community. The statistical associations and stories of the effects of incarceration on sexual relationships provide additional evidence of unintended community health consequences of high rates of incarceration.*

KEYWORDS *Epidemiology, Geography, Prisons, Sexually transmitted diseases*

INTRODUCTION

High rates of sexually transmitted infections (STIs) occur in counties where rates of incarceration are also high.^{1,2} The studies have shown that: the relationship is strongest when correlating STIs occurring in the year after the incarcerations (approximating a causal sequence); the relationship is stronger with prison than with jail incarceration; the relationship is stronger when using the measure of incarceration most closely approximating the absence of individuals from the community, i.e., average prison census; and another sex-related outcome, teen pregnancy, is also directly correlated with incarceration rates.

County-level correlations, however, do not elucidate the mechanisms by which incarceration leads to individual behaviors and community dynamics favoring STI

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transmission. For example, an incarceration rate that is six times higher for men than for women changes the community sex ratio. Such an imbalance can affect the power dynamics in sexual relationships. With male partners being rare, women may turn a blind eye to a partner's other sexual relationships. And when she loses a partner to prison, she may find another in the community, in part to help with her financial needs. Those needs would be particularly acute for mothers of young children. Another potential limitation of county-level correlations is that counties may not be the best representation of the population groups most affected by incarceration and STIs; smaller Census-based aggregations may be more meaningful and informative.³

We conducted a study of the relation between incarceration and STIs at the census tract level in Durham County, North Carolina. We selected Durham County because of its proximity to the University of North Carolina (the neighboring county) and its moderately high rates of incarceration and STIs. We hypothesized that a high rate of incarceration in one year would be associated with a high rate of STIs the following year. To more closely approximate the effect of the absence of people from the community, we calculated the aggregate person-time in prison for each census tract. To test the concept validity of our hypotheses for mechanisms by which incarceration affects STI transmission, we conducted ethnographic interviews with ex-offenders and sexual partners of ex-offenders.

Durham County had a 2000 population of 223,314, of which 51% were white and 40% were African American (the state of North Carolina was 12% African American). The percent living below the poverty level was slightly above the state average (9.8% for Durham and 9.0% for NC).⁴ In 2001 and 2002, 367 and 411 Durham residents, respectively, entered prison for county rates of 164 and 184 per 100,000 population. The overall state rates of prison entry in 2001 and 2002 were 291 and 294 cases per 100,000 population, respectively.⁵ The 2002 annual state rates of gonorrhea and Chlamydia were 184.3 and 437.3 cases per 100,000 population, respectively.⁶ The county is composed of 53 census tracts.

METHODS

Data on all reported gonorrhea and Chlamydia infections in 2002 and 2003 were received from the Durham County Health Department aggregated at the level of census tract. Census tract populations were obtained from the U.S. Census from the U.S. Census tract website.⁷ STI rates were calculated by dividing the number of cases of a given STI in a census tract by the population of the census tract, multiplied by 100,000.

Data on incarcerations were obtained from the North Carolina Department of Corrections. We received all entries and releases for Durham County for the years 1995 to 2003. Information on each included the name, street address at the time of incarceration, age, sex, race/ethnicity, date of entry, date of release, and reason for incarceration. Repeat entries per person were identified by identical demographic information and a unique chronological number given to each person. Addresses in the database are the last address for each person before they were incarcerated or the address they expect to reside at upon release. This address can be changed in the DOC database at any time during the person's stay, replacing any previous address recorded. Each address, signifying an entry or release, was assigned to a census tract by identifying a longitude and latitude for the home address using ArcGIS software (version 9.0).

Person-time spent in prison for a given year was calculated as the first day of the calendar year in prison (January 1 for all in prison at midnight on December 31st) subtracted from the last day of the year in prison (December 31 for those in prison at midnight on the 31st). The number of days between two consecutive incarcerations was also subtracted for anyone released and reimprisoned within the same calendar year. If a person only had information on their exit from prison, it was assumed that they were in prison on the first day of the year (January 1st). If a person only had information on being in the prison population on December 31st, we assumed they had spent the entire year in prison. Thus, for a given person within a given year, the total number of days ranged from 1 to 365. The number of person-days was then summed for all those of a given census tract. The yearly proportion of a census tract's person-days in prison was calculated as the sum of person-days in prison divided by the total number of person-days possible for the census tract (the census tract population times 365).

With ArcGIS mapping capabilities we created census tract maps of person time proportions and rates of STIs; both were categorized into quartiles of equal-sized ranges. We estimated the effect of the proportion of census tract person-time spent in prison on STI rates with a negative binomial regression. Our analyses at the county level have shown that incarceration rates are associated most strongly with STI rates in the subsequent year. Therefore, in the present study incarceration measures in 2001 were regressed against STIs in 2002, and similarly for incarcerations in 2002 and STIs in 2003. Variables included as confounders were the percentage of a census tract's population that was African American, the percentage of residents living below the poverty line, and age (categorized as younger than 24 years, 24–44 years, and 44 years or older). We also modeled the effects of the percent of census tract entering prison and the percent reentering the census tract because of release from prison. Census tract rates of entering or being released were calculated by dividing the number of entries (or exits) in that census tract by the total population of the census tract. All analyses were conducted with Stata (Stata Corp, College Station, TX).

Ethnographic Interviews

To better understand the ways in which incarceration affects people's lives in ways that could facilitate transmission of STIs, we conducted ethnographic interviews with ex-offenders and sexual partners of prisoners or ex-offenders. We identified potential respondents through the Durham Criminal Justice Resource Center (DCJRC) and the Triangle Resident Options for Substance Abusers (TROSA). We posted notices of the study at each location and the staff of each organization asked their clients if they were interested in participating in the study.

Confidential interviews lasting approximately 90 min were conducted in rooms at DCJRC and TROSA that ensured the participants confidentiality. After reviewing and signing a consent form, each interview was audio-recorded and transcribed for further evaluation. The interviews were semistructured, exploring themes of drug use, sexual partnerships during incarceration, the effects of separation caused by incarceration on relations with sexual partners in the community, changes in social status upon release, employment, and residential mobility. Respondents were compensated with \$20 for their participation in the study.

The study interviewer used a constant comparison method in which information obtained in one interview was explored in subsequent interviews with other respondents. Thematic analyses of the interview responses was conducted with NUD*IST Vivo (version 1.1) text analysis software.

The study was approved by the University of North Carolina Public Health Institutional Review Board (IRB).

RESULTS

Census Tract Level Analysis

We received 22,834 addresses from the North Carolina State Department of Corrections (DOC) for Durham County for the years 1995 to 2003. Using ArcGIS, these addresses were compared for accuracy against street geocodes in Durham County. Eighty-four percent ($n=19,090$ addresses) were matched with 80–100% accuracy. Four percent ($n=913$) of addresses were mapped with less than 80% accuracy. About 12% ($n=2,831$) remained unmatched whereas 1% ($n=176$) were tied for matching for more than one location. Of the addresses received, 4,487 were from the years 2001 and 2002, the years used in the analyses reported here. In 2001 and 2002, respectively, 6.0% and 4.8% of the prison entries were reentries within the same year. Reentries were included in the analysis because we were interested in the number of departures from the community, not just the number of people. The same approach was taken for multiple releases in a year.

The census tract in which the stadium for the AAA league baseball team, the Durham Bulls, was located had a population of only 211 residents and unstable rates. It was therefore excluded from the regression analyses and the following statistics. For the year 2001, two-thirds (68.5%) of those sentenced to prison had sentences greater than or equal to 6 months or 183 days, and half (49.6%) stayed in prison for the entire year. In 2002, 80.5% of the incarcerated had sentences greater than or equal to 6 months and two-thirds (66.8%) were in prison the entire year. The proportion of incarceration person-days per census tract ranged from zero to 0.025 (9.1 of 365 days) in 2001 and zero to 0.023 (8.4 of 365 days) in 2002. The geographical distribution of person-time proportions in 2001 is presented in Figure 1.

The number of gonorrhea cases reported in Durham County was 527 in 2002 and 526 in 2003, for a county rate of 217 cases per 100,000 population each year. We were unable to geocode 21.1% and 16.3% of the reported gonorrhea cases, respectively. The numbers for Chlamydia were 912 in 2002 and 1,104 in 2003; of these 22.6% and 18.2%, respectively, could not be geocoded. The rates of reported gonorrhea per census tract ranged from zero to 993 per 100,000 in 2002 and zero to 638 per 100,000 in 2003. The respective ranges for Chlamydia were zero to 1,414 cases per 100,000 in 2002 and zero to 1,631 cases per 100,000 in 2003. The geographical distribution of gonorrhea rates in 2002 is presented in Figure 2.

Every measure of incarceration was strongly associated with each STI in each year (Table 1). The association with census tract person-time in prison consistently demonstrated the strongest association. Adjusting for census tract distributions of age, race, and poverty attenuated the effects, although census tract person-time in prison remained the strongest predictor among the three incarceration measures (Table 2). While remaining significant in most instances for gonorrhea, none of the associations for Chlamydia were statistically significant in the adjusted model.

Ethnographic Interviews

We conducted a total of 24 ethnographic interviews, 14 with ex-offenders (13 male, 1 female) and 10 with partners of ex-offenders (all female). Ex-offenders had been out of prison for an average of 4 months (range 2 weeks to 18 months).

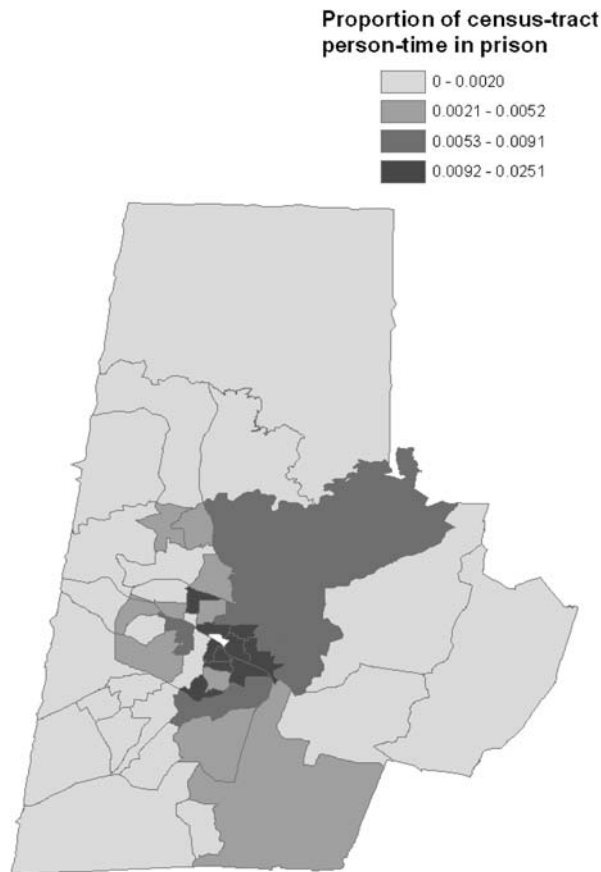


FIGURE 1. Geographical distribution of the proportion of the census tract person-time in prison, divided into four quartiles for Durham County, North Carolina, 2001. The uncolored census tract in the middle was excluded from the analysis because of a small population.

All of the partners and all but one of the ex-offenders were involved in a sexual relationship at the time of incarceration. Fourteen stated that their sexual partnerships ended as a direct result of the incarceration. Said one male respondent:

I told her go on about her life. I, we was 15 years old. I got eight to ten years. I ain't gin' to hold no woman down like that.

Another male reported:

I was in a relationship with this one girl, but you know, she went on about her business. I had eight years over my head. She went on with her life. So, I was basically stuck in a garden by myself.

The formation of new partnerships in the community was fueled in part by the need for financial security. Most of the respondents had children who were affected by the imprisonment. One female partner of an ex-offender described how it was common for women to seek substitute partners to meet financial needs while a main partner was in prison.

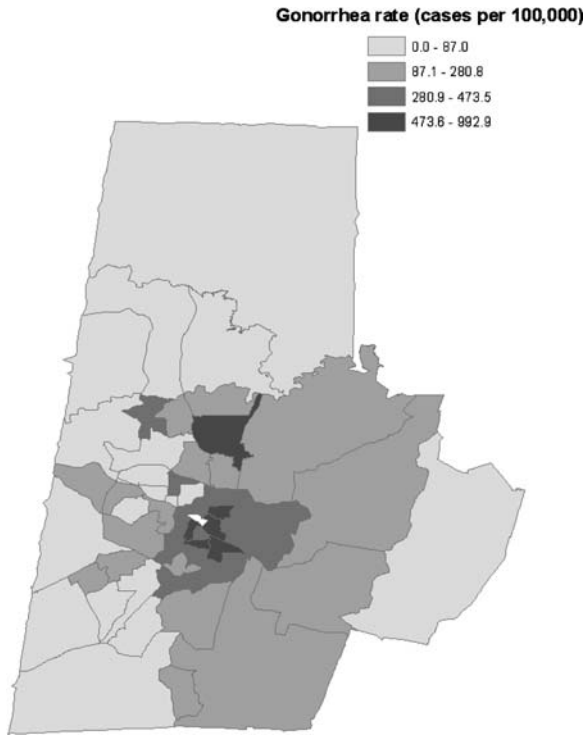


FIGURE 2. Geographical distribution of gonorrhea rates, divided into four quartiles for Durham County, North Carolina, 2002. The uncolored census tract in the middle was excluded from the analysis because of a small population.

They were doing that all the time. Keep money going while he was out.

A male ex-offender described a similar situation from his perspective:

So I got four years, got four kids. You got to make it some kind of way. That’s what she did, found somebody else.

TABLE 1 Unadjusted regression coefficients (β) for the association between incarceration rates on sexually transmitted infection rate in 52 census tracts of Durham County, NC in 2002 and 2003

Health outcome	Census tract person-time in prison		Percent of census tract entering prison		Percent of census tract exiting prison	
	β	<i>p</i> value	β	<i>p</i> value	β	<i>p</i> value
2002						
Gonorrhea	15.28	<.001	2.72	<.001	2.79	<.001
Chlamydia	14.82	<.001	2.51	<.001	2.63	<.001
2003						
Gonorrhea	14.17	<.001	2.95	<.001	2.88	<.001
Chlamydia	12.42	<.001	2.53	<.001	2.52	<.001

TABLE 2 Regression coefficients (β) for the association between incarceration rates on sexually transmitted infection rates, adjusted for age distribution, percent African American, and percent living below the poverty level in 52 census tracts of Durham County, NC in 2002 and 2003

Health outcome	Census tract person-time in prison		Percent of census tract entering prison		Percent of census tract exiting prison	
	β	<i>p</i> value	β	<i>p</i> value	β	<i>p</i> value
2002						
Gonorrhea	5.40	.02	.85	.02	.58	.23
Chlamydia	.16	.95	.09	.82	.32	.48
2003						
Gonorrhea	3.83	.19	1.40	.01	.98	.03
Chlamydia	1.03	.71	.32	.54	.37	.40

After release from prison, 10 of the 14 ex-offenders continued partnerships they had before incarceration and nine reported starting new partnerships. Seven admitted to multiple partnerships after release from prison. Because of the absence of female companionship during incarceration, several men said they needed to have sex with more than one woman upon release to satisfy their pent-up desires. One ex-offender who had been out for less than 1 month said he'd had sex with three or four women. Regarding the quality of the relationships, he said:

They trying to get serious, but I tell them all before I do anything, before I touch them in any kind of way. When I first talk to them, I just got out of prison and I ain't looking for no girlfriend, ain't looking for no wife, ain't looking for no baby mamma. I would like, you can keep all your drama, I would like, cause if we do anything, as two consenting adults and if you agree to this, you agree to it, so don't look for me to hold your hand the next morning and tell you I love you and nothing like that. And you got one or two that just won't listen.

A few of the ex-offenders described men having sex with other prisoners and then returning to heterosexual activity upon release. The reasons given for having sex with other men were coping with sexual tension and seeking protection from violence (having a male partner as a protector). Some mentioned the link between these behaviors and HIV, particularly when they are not disclosed to female partners upon release. Commenting on these sexual double lives, one ex-offender said:

You know what, I'm going to tell you what shocked me to see some of the guys I knew here from years, knowing them years, and they're on state [in state prison] now and they're messing with, you know, gays. And I'm looking at them like, you know, ain't no way and sleep with that man and then you going to come out here and you got kids and you got your wife or your girlfriend comes to see you and you're doing it. Can't, you can't do that. But that's, you know, it's goin' all come to the light someday.

DISCUSSION

The census tract incarceration rate was associated with the gonorrhea rate, independently of the effects of age, race, and poverty. The strongest association

was for incarceration measured as the percent of the census tract person-time spent in prison. A percent of census-tract person time in prison of 0.020 corresponds with a gonorrhea rate of 26.7 per 100,000; a census-tract person time in prison of 0.025 corresponds with a gonorrhea rate of 33.8 per 100,000, for a rate difference of 7.1 cases per 100,000.

These associations do not take into account the potential confounding effects of community levels of drug or condom use. And the precision of the estimates was likely hampered by a relatively small sample size ($n=52$). The smaller adjusted associations for Chlamydia relative to gonorrhea were likely to be due, in part, to less detection and greater underreporting of Chlamydia.⁸

Our analysis was based on the most recent address given to the DOC by the inmate. However, this address may not be where the offender actually lived; in some instances it could be the address of a friend or relative, or at worst, a false address given by the prisoner. We would expect more misclassification of residence in a census-tract-level analysis than in a county-level analysis because a street address of residence reported by an inmate (placing a person within a particular census tract) is more likely to be incorrect than a county of residence. To underscore this point, an individual who moves among various residences all over the county will always remain in the same county. We have no reason to suspect that misspecification of the census tract would be a nonrandom error, and thus we believe that the misclassification would bias our estimates toward a null association. STIs that were unreported or incorrectly assigned to a census tract would have the same effect on the analysis.

Some of the mechanisms by which a high incarceration rate could lead to a high STI rate were evident in our interviews with ex-offenders and people who had lost a partner to prison. Imprisonment often led both members of a former sexual partnership into relations with new partners. The person left behind in the community would often form a new relationship to simply move on in life or to find financial help, having lost a breadwinner to prison. With men being 10 times more likely to go to prison than are women, it can be hard to find a man to have a relationship with. Rather, it can be hard to find a man who isn't having sex with other women. Where men are rare, they have few incentives to adhere to demands for sexual faithfulness. Multiple and concurrent partnerships facilitate the transmission of STIs through sexual networks.⁹⁻¹⁴ Thus, without requiring the contribution of anyone who has been to prison, the transmission of infections in a community is affected by a high incarceration rate.

New sexual partnerships are also formed in prison. In some cases, men who only had female partners before prison engage in sex with men while in prison, including nonconsensual partnerships.¹⁵⁻¹⁸ The likelihood of sex resulting in transmission of HIV depends on the prevalence of HIV in the prison population and the frequency of sex and injection drug use.¹⁹⁻²²

An infection acquired or maintained during incarceration is likely to be infused into a community upon release from prison. HIV-infected men released from prison are unlikely to tell new sexual partners of their infection or to use a condom.²³ A number of our respondents spoke of a heightened desire for sex upon returning to the community and a resistance to committed relationships. Moreover, the gender of partners and the type of sex that men have upon release from prison may be influenced by the prison experience. Men who have both male and female partners, but who keep their male sexual partnerships secret are often referred to as men "on the down-low."²⁴ A man on the down-low can play a disproportionate role in the transmission of disease in a community because of the combined effects of the

relative ease of transmission through anal sex and concurrent sexual relationships. Although our respondents did not mention being on the down-low, it is clear through their descriptions that prison provides an ideal setting for men who initially only had sex with women to begin having sex with men, either by choice or circumstance. Post-release, men may continue to have same-gender sexual relations, along with preincarceration heterosexual behaviors. Moreover, injection drug use after release can also contribute to HIV transmission. Ex-offenders who used drugs before or during incarceration face strong temptations to return to drug use, caused in part by addiction and having little else to do as jobs are harder to obtain with a prison record.²⁵

This study in one county of NC has strengthened arguments for a connection between incarceration and STIs that was first inferred from county-level comparisons in NC. The magnitudes of the effects at the census-tract-level were consistent with those seen at the county-level. Moreover, a measure of the absence of people from the community that was more accurate than earlier measures showed a strong relationship with STI rates. The ethnographic interviews provided evidence of mechanisms explaining the means by which incarceration could affect transmission rates in the community. The next step in elucidating the link between incarceration and community STI rates is a cohort study of individuals affected by incarceration, including ex-offenders reentering society and individuals who have lost a loved one to prison. Such a study will allow us to estimate the relative importance of the various mechanisms furthering transmission.

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