Incarceration as Forced Migration: Effects on Selected Community Health Outcomes

James C. Thomas, PhD, MPH, and Elizabeth Torrone, MSPH

Objectives. We estimated the effects of high incarceration rates on rates of sexually transmitted infections and teenage pregnancies.

Methods. We calculated correlations between rates of incarceration in state prisons and county jails and rates of sexually transmitted infections and teenage pregnancies for each of the 100 counties in North Carolina during 1995 to 2002. We also estimated increases in negative health outcomes associated with increases in incarceration rates using negative binomial regression analyses.

Results. Rates of sexually transmitted infections and teenage pregnancies, adjusted for age, race, and poverty distributions by county, consistently increased with increasing incarceration rates. In the most extreme case, teenage pregnancies exhibited an increase of 71.61 per 100 000 population (95% confidence interval [CI] = 41.88, 101.35) in 1996 after an increase in the prison population rate from 223.31 to 468.58 per 100 000 population in 1995.

Conclusions. High rates of incarceration can have the unintended consequence of destabilizing communities and contributing to adverse health outcomes. (*Am J Public Health.* 2006;96:1762–1765. doi:10.2105/AJPH.2005.081760)

Community health pioneer Sidney Kark attributed high rates of syphilis in South Africa in the late 1930s to the socially destabilizing effects of migration related to the seeking of mining jobs.[1] Extreme gender ratio imbalances in the areas surrounding the mines led to sexual behaviors that facilitated the transmission of such diseases. Social epidemiologist Mark Lurie has documented similar effects associated with HIV/AIDS in present-day South Africa.[2]

Because incarceration leads to a select portion of a community's residents being removed from their families and neighborhoods, it is tantamount to "forced migration," contributing to imbalances in neighborhood gender ratios and resulting in the potential for community health effects similar to those just described for South Africa. Moreover, such disruptions of families and social networks can degrade social cohesion and the norms that might otherwise prevent sexually transmitted diseases and teenage pregnancies. Since the early 1980s, rates of incarceration in the United States have tripled and are now the highest of any country in the world. Men are 10 times more likely than women to be incarcerated. In addition, African Americans are 6 times more likely than Whites to face incarceration.[3]

Moreover, rates of several sexually transmitted infections (STIs), including HIV, are higher among African Americans than Whites, and this is especially the case among male African Americans. For example, in 2000 the gonorrhea rate among male non-Hispanic Blacks in the United States was 40 times greater than that among male non-Hispanic Whites.[4] Also, teenage pregnancies were 2.8 times more common among Blacks than among non-Hispanic Whites in 2000.[5] Finally, in a 1999 study of counties in North Carolina, Thomas and Sampson found bivariate correlations between rates of incarceration and rates of STIs.[6]

North Carolina has 76 state prisons and 97 jails, and its rate of incarceration ranks 31st among the 50 states.[7] We analyzed county-level data from the state in an attempt to determine (1) the incarceration variables that would have the strongest correlations with community health effects, (2) whether these correlations would remain stable over time, and (3) whether there would be a lag in time between incarceration and observable community health effects.

METHODS

Data Sources

We obtained 1995 through 2002 data on entries, releases, and state prison system populations from the North Carolina Department of Corrections. We did not analyze federal incarcerations (which represent approximately one tenth of the state's incarcerations) or juvenile incarcerations (which constitute less than 1% of incarcerations).[8,9] Data on numbers of individuals incarcerated were classified by year, county (of which there are 100 in North Carolina), race, and gender. Data for a given year were reported as number of individuals entering prison, number of individuals being released, or mean number of individuals incarcerated during the year. We also gathered information on county of conviction and county of residence at the time of arrest.

We obtained data on county jail entries, releases, and populations for the years 1995 through 2000 from the North Carolina County Court System. Information on numbers of individuals incarcerated was categorized by year and county of conviction.

The North Carolina Department of Health and Human Services provided data on STI counts according to type of infection (gonorrhea, chlamydia, HIV [new cases reported as either HIV or AIDS], and syphilis [primary or secondary]), race/ethnicity, gender, age, year, and county of residence for the years 1995 through 2002. We obtained data on numbers of pregnancies among young women aged 15 to 19 years by county and year (1995–2001) from the North Carolina Office of Vital Statistics.

Finally, population data, grouped according to county, age group, gender, and race/ethnicity, were derived from the US census Web site (http://www.cenus.gov). We used intercensal estimates for the years 1995 through 1999.

Data Analysis

We calculated a county-level Pearson correlation coefficient between each incarceration variable (rate of entry, rate of release, and population size by county of conviction and county of residence) and each health outcome (rates of gonorrhea, chlamydia, primary or secondary syphilis, HIV, and teenage pregnancies) for each year from 1995 to 2000. We calculated these same correlations for the incarceration rate in a given year and health outcomes 1 year and 2 years later to approximate a temporal causal sequence and to determine when effects were most evident. Because data on health outcomes beyond 2002 were not available, we were unable to conduct time-lagged incarceration analyses for 2001 and 2002.

Multivariate analyses were limited to state prison incarcerations grouped by county of residence, because we hypothesized that the county where one lives is affected by one's imprisonment more than the county in which one was arrested (if these counties are not the same). We did not conduct multivariate analyses of county jail incarcerations because bivariate correlations were less strong and stable than the corresponding prison correlations.

Variables included as potential confounders were the percentage of a county'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). Negative binomial regression models were used to calculate health outcome rate differences and their corresponding confidence intervals (CIs). These rate differences referred to increases in the number of individuals with a reported health outcome per 100 000 population in a given year, derived from comparisons between the 75th percentile and 25th percentile of the distribution of North Carolina county incarceration rates (either rates for the year in question or time-lagged rates). All analyses were conducted with Stata version 9 (Stata Corp, College Station, Tex).

TABLE 1—Pearson Correlations Between Incarceration Variables in 1995 and Health Outcomes in 1996: North Carolina

	State Prison								
	By County of Residence			By County of Conviction			Jail		
	Entry	Population	Exit	Entry	Population	Exit	Entry	Population	Exit
Chlamydia	0.538†	0.680†	0.538†	0.549†	0.654†	0.518†	0.331***	0.378†	0.304**
Gonorrhea	0.616†	0.741†	0.618†	0.617†	0.713†	0.588†	0.392†	0.461†	0.357***
Syphilis	0.267**	0.403†	0.292**	0.267**	0.382†	0.271**	0.302**	0.322**	0.258*
HIV	0.511†	0.625†	0.511†	0.486†	0.582†	0.475†	0.244	0.341***	0.214*
Teenage pregnancy	0.675†	0.702†	0.678†	0.667†	0.679†	0.637†	0.425†	0.462†	0.405†

*P < .05; **P < .01; ***P < .001; †P < .0001.

RESULTS

The state's mean yearly prison population increased slightly during the study period, from 29 495 in 1995 to 31 534 in 2000. However, as a result of the increase in the state population over the period, overall there was a slight decrease in the prison population rate (from 401.58 prisoners per 100 000 population in 1995 to 391.76 per 100 000 in 2000). The average daily jail population increased from 142.78 per 100 000 in 1995 to 163.45 per 100 000 in 2000.

During the same years, respective rates of reported STIs (per 100 000 population) for the state were as follows: 326.24 and 223.60 for gonorrhea, 214.85 and 275.58 for chlamydia, 15.41 and 6.01 for primary or secondary syphilis, and 30.61 and 18.04 for HIV. In 1995 and 2000, teenage pregnancy rates were 292.95 and 234.57 per 100 000, respectively.

Bivariate correlations calculated with a 1-year lag were consistently larger than correlations calculated with no lag. For example, correlations between prison populations grouped by county of residence in 1995 and gonorrhea rates in 1995 and 1996 were 0.71 and 0.74, respectively. A 2-year lag yielded stronger correlations than the 1-year lag in the case of some of the incarceration and health outcome variables and weaker correlations for other variables. In the following, we report results for 1-year lags only.

With a single exception (the correlation of jail entry with HIV), all of the correlations between the various incarceration variables and health outcomes were statistically significant (Table 1). The correlations between health outcomes and prison incarceration variables were greater (nearly double) than the corresponding correlations between health outcomes and jail incarceration variables except for the case of syphilis. The incarceration variable most strongly correlated with each of the health outcomes was prison population by county of residence. In all but a few instances, correlations were stronger by county of residence than by county of conviction. Correlations by entry and release were similar.

The correlations between particular incarceration variables and health outcomes varied little over the study period. For example, correlations between prison population sizes in 1995, 1997, and 1999 and gonorrhea rates a year later were 0.74, 0.67, and 0.68, respectively.

Adjustment for county age, race, and poverty distributions attenuated the strength of the relationships between incarceration variables and health outcomes, although many of the associations nonetheless remained large and statistically significant (Table 2). For example, after adjustment, a county with a prison population rate at the 25th percentile of the distribution in 1996 would have had a teenage pregnancy rate of 221.09 per 100 000 population in the same year, whereas a county at the 75th percentile would have had a teenage pregnancy rate of 293.56 per 100 000. Increasing the prison population rate from the 25th to the 75th percentile would thus result in an additional 71.61 (95% CI = 41.88, 101.35) teenage pregnancies per 100 000 population, or a 32% increase.

The 1996 health outcome rate differences associated with changes in prison population rates were nearly twice as high as the rate differences associated with changes in prison

TABLE 2—Rate Increases in Reported Health Outcomes (per 100 000 Population) by Year: North Carolina, 1996–2002

	Prison Population (95% CI)	Prison Entry (95% CI)	Prison Exit (95% CI)
	1996		
Chlamydia	51.50 (10.12, 92.88)	17.46 (3.45, 31.46)	22.86 (5.66, 40.06)
Gonorrhea	62.46 (17.57, 107.36)	19.22 (5.64, 32.81)	23.35 (7.06, 39.64)
Teenage pregnancy	71.61 (41.88, 101.35)	37.66 (23.61, 51.71)	47.31 (30.47, 64.14)
	1998		
Chlamydia	43.84 (–1.02, 88.71)	28.06 (1.33, 54.79)	31.56 (6.94, 56.19)
Gonorrhea	46.46 (–1.12, 94.05)	39.53 (9.19, 69.88)	35.08 (10.47, 59.69)
Teenage pregnancy	52.80 (23.44, 82.13)	42.18 (23.33, 61.02)	35.92 (19.89, 51.95)
	2000		
Chlamydia	29.11 (2.69, 55.53)	10.95 (–0.28, 22.18)	15.27 (1.81, 28.74)
Gonorrhea	22.65 (–5.86, 51.16)	13.09 (–0.50, 26.69)	21.47 (1.78, 41.15)
Teenage pregnancy	50.26 (22.34, 78.18)	28.91 (14.31, 43.51)	31.53 (16.91, 46.15)
	2002		
Chlamydia	30.26 (4.70, 55.83)	24.21 (8.41, 40.01)	24.20 (7.99, 40.41)
Gonorrhea	32.16 (–0.19, 64.51)	23.11 (4.95, 41.28)	22.78 (4.24, 41.32)
Teenage pregnancy	. . .	. . .	. . .

Note. CI = confidence interval. Values are the rate differences in the health outcome observed when the incarceration rate is increased from the 25th percentile to the 75th percentile, according to county of residence. Values were adjusted for county distributions of age, race, and percentage of residents living in poverty. To establish a temporal sequence and thus a stronger causal inference, we compared the values for health outcomes in each year (even years) with incarceration rates from the previous year (odd years).

entry and exit rates. Rate differences for health outcomes decreased in 1998 and 2000, as did the contrast between rate differences for given health outcomes according to the 3 incarceration variables. In 2002, rate differences increased again, as did the contrast in rate differences for given health outcomes between the incarceration variables.

DISCUSSION

Associations between incarceration rates and health outcomes were strong and consistent. Results were strongest for teenage pregnancies and the most common STIs. For the less frequent STIs (syphilis and HIV), several counties reported no cases. In such instances and instances in which there were low frequencies of reported STIs, counties were at increased susceptibility of extreme variation in rates with the addition or subtraction of a single reported case, resulting in wider confidence intervals. Associations of incarceration with teenage pregnancy were more consistent than associations with STIs. This finding may reflect, in part, more thorough reporting of teenage pregnancies than STIs and, thus, less statistical vulnerability to variations in underreporting between counties.

The stronger correlations between health outcomes and incarceration in prisons as opposed to jails probably reflect meaningful differences in the effects of these types of incarceration on the lives of a community's residents. Jail terms are briefer, on average, than prison terms. Individuals in jail are awaiting trial or serving time for a minor offense, whereas those in prison are serving time, often in years, for more serious offenses. They are absent from their families and communities for longer periods of time than are jail detainees.

The fact that stronger correlations were obtained with a 1-year lag than with no lag suggests that high incarceration rates lead to negative community health effects, strengthening the argument for a causal relationship. The incarceration variable most strongly related to health outcomes was number of prisoners per 100 000 population, the measure representing the closest proxy for absence of individuals from a community. The effects on health outcomes of prison entry and exit rates, which might be considered to represent community transitions, were not remarkably different from each other.

In contrast to rate ratios, rate differences indicate the number of new cases that can be expected with a change in the independent variable (in this case, incarceration), thus providing an indication of the public health importance of the issue in question.[10] For example, the number of excess gonorrhea cases generated by increases in incarceration rates was sizable, ranging from 22.65 (in 2000) to 62.46 (in 1996) per 100 000 population; similarly, the number of excess teenage pregnancies generated ranged from 50.26 (2000) to 71.61 (1996) per 100 000 population.

This study, conducted at the ecological level, was based on county rates of incarceration and sexually related health outcomes. The classic ecological fallacy would be to infer from our results that incarceration leads to higher STI and teenage pregnancy rates.[11,12] Although we are unaware of any data on rates of infection among ex-offenders, fewer than one half of 1% of reported gonorrhea and chlamydial infections in North Carolina in 2000 were reported from correctional facilities (either jails or prisons; L. Sampson, North Carolina Division of Public Health, written communication, February 2004). This small percentage suggests that incarceration's effects on STI incidence may be greatest outside prison walls.

Given that 10 times more men than women are imprisoned, incarceration lowers the community ratio of men to women; this is particularly the case for African Americans, among whom the incarceration rate is several times higher than that among individuals from other racial groups. Lower gender ratios have been shown to affect rates of teenage pregnancy, syphilis, and gonorrhea.[13–15] Small numbers of men relative to women can result in the men remaining in the community having more power in their relationships with women. For instance, if a woman insists that her male sexual partner be faithful, he can leave her for another partner who will be less demanding or who will turn a blind eye to his other sexual relationships.

At any given time, more than 12% of male African Americans aged 25 to 29 years are incarcerated.[16] The corresponding high rates

of removals from and releases to communities disrupt relationships and contribute to the inability of communities to maintain social norms, in that maintenance of these norms is based on long-term relationships. In communities where neighbors know one another, these individuals can be involved in each other's lives and in the lives of their children; they can observe each other's actions and offer encouragement or advice. Even people guilty of committing crimes can and do play such positive social roles, and their absence from a community may have intergenerational effects. More than half (56%) of state and federal prisoners in the United States in 1997 had children.[17] To the degree that parenting affects the sexual behaviors of adolescents, adolescents with a parent who is absent as a result of incarceration may be more at risk of behaviors that result in an STI or pregnancy.

The ex-offender population represents another means through which incarceration can affect community STI rates. One study showed that men with HIV who were released from prison had sexual intercourse within an average of 6 days of their release, and 31% of these men believed that it was likely they would infect their primary sexual partner.[18] Similarly, Kark noted that migrants themselves were principally responsible for the high rates of syphilis in South Africa in the 1940s.[1] As a result of laws prohibiting gold and diamond miners from migrating with their families, the gender ratios in the mining communities reached extreme levels, as high as 12:1. The men at the mines would have sexual intercourse with prostitutes and possibly carry an infection back to their wives.

As mentioned earlier, Lurie has described a similar phenomenon driving HIV transmission in South Africa in recent years.[2] Whereas the present-day high rates of HIV in South Africa (with rates of adult diagnoses ranging from 21% to 39%) might be explained in part by selective migration to cities, the relatively low infection rate in the Congo (approximately 4% of adults), where some of the first identified cases originated, might be attributable in part to the country's lack of an infrastructure that would facilitate migration.[16]

People generally prefer to stay in their home communities. Typically, only a complex mixture of market forces, politics, and cultural factors (e.g., racial attitudes) results in individuals leaving their communities en masse. The earlier-mentioned 3-time increase in incarceration rates in the United States since 1980 has been attributed principally to the "war on drugs."[3] Thus, present-day incarceration-based "migration" has been linked to factors such as poverty and the maelstrom of economic and political forces surrounding illicit drugs. However, because this form of "migration" does entail force, the American public can decide whether to exert more or less force, that is, whether to raise or lower incarceration rates and, thus, community turnover rates.

It is unlikely that the negative community health effects associated with incarceration will prove to be a sufficient motivation for determining alternative means of responding to the social ills addressed today via incarceration. It is more likely that economic factors, such as the expense of incarcerating large numbers of people and a political climate that allows elected officials the opportunity to develop creative alternatives to incarceration, will determine the rate at which people are moved into and out of prison and, thus, into and out of their communities. In any event, until changes in policy take place, high rates of incarceration will have the unintended consequences of destabilizing communities and generating worse social ills. ■

About the Authors

The authors are with the Department of Epidemiology, University of North Carolina, Chapel Hill.

Requests for reprints should be sent to James C. Thomas, PhD, MPH, Department of Epidemiology, CB# 7435, University of North Carolina, Chapel Hill, NC 27599-7435 (e-mail: jim.thomas@unc.edu).

This article was accepted March 25, 2006.

Contributors

J.C. Thomas originated the study, acquired the data, directed the analysis, interpreted the findings, and was the principal author of the article. E. Torrone conducted the data analysis and contributed to the interpretation of the findings and the writing of the article.

Acknowledgments

This study was supported by funds from the University of North Carolina Center for AIDS Research (National Institutes of Health grant P3 AI50410) and the Open Society Institute (grant 74411-00 01).

Human Participant Protection

This study was approved by the institutional review board of the University of North Carolina.

References

1. Kark SL. The social pathology of syphilis in Africans. *S Afr Med J.* 1949;23:77–84.

2. Lurie M, Harrison A, Wilkinson D, Abdool Karim SS. Circular migration and sexual networking in rural KwaZulu/Natal: implications for the spread of HIV and other sexually transmitted disease. *Health Transition Rev.* 1997;7(suppl 3):S15–S24.

3. Austin J, Irwin J. *It's About Time: America's Imprisonment Binge.* 3rd ed. Belmont, Calif: Wadsworth/Thompson Learning; 2001.

4. *Sexually Transmitted Disease Surveillance, 2000.* Atlanta, Ga: Centers for Disease Control and Prevention; 2001.

5. Alan Guttmacher Institute. US teenage pregnancy statistics: overall trends, trends by race and ethnicity, and state-by-state information, New York, 2004. Available at: http://www.guttmacher.org/pubs/state_pregnancy_trends.pdf. Accessed July 5, 2006.

6. Thomas JC, Sampson L. Incarceration as a social force affecting STD rates. *Rev Infect Dis.* 2005;191:S55–S60.

7. National Institute of Corrections. Corrections statistics for North Carolina. Available at: http://nicic.org/StateCorrectionsStatistics. Accessed July 5, 2006.

8. US Department of Justice. Correctional populations in the United States, 1995. Available at: http://www.ojp.usdoj.gov/bjs/pub/pdf/cpius95.pdf. Accessed July 27, 2006.

9. US Department of Justice. Profile of state prisoners under age 18, 1985–1997. Available at: http://www.ojp.usdoj.gov/bjs/pub/pdf/pspa1897.pdf. Accessed July 5, 2006.

10. Dombrowski J, Thomas JC, Kaufman J. A study in contrasts: measures of racial disparity in the occurrence of gonorrhea. *Sex Transm Dis.* 2004;31:149–153.

11. Hammett TM, Harmon MP, Rhodes W. The burden of infectious disease among inmates of and releasees from US correctional facilities, 1997. *Am J Public Health.* 2002;92:1789–1794.

12. Maruschak LM. *HIV in Prisons and Jails, 1999.* Washington, DC: US Dept of Justice; 2001.

13. Sampson RJ. Unemployment and imbalanced sex ratios: race-specific consequences for family structure and crime. In: Tucker MB, Mitchell-Kernan C, eds. *The Decline in Marriage Among African Americans: Causes, Consequences and Policy Implications.* New York, NY: Russell Sage Foundation; 1995:229–254.

14. Kilmarx PH, Zaidi AA, Thomas JC, et al. Ecologic analysis of socio-demographic factors and the variation in syphilis rates among counties in the United States, 1984–93. *Am J Public Health.* 1997;87:1937–1943.

15. Thomas JC, Gaffield ME. Social structure, race, and gonorrhea rates in the southeastern United States. *Ethn Dis.* 2003;13:362–368.

16. *The 2004 Report on the Global AIDS Epidemic.* Geneva, Switzerland: Joint United Nations Programme on HIV/AIDS; 2004.

17. Mumola CJ. Incarcerated parents and their children. Available at: http://www.ojp.usdoj.gov/bjs/pub/ascii/iptc.txt. Accessed July 27, 2006.

18. Stephenson BL, Wohl DA, McKaig R, et al. Sexual behaviours of HIV-seropositive men and women following release from prison. *Int J STD AIDS.* 2006;17:103–108.