

# Characteristics and Behaviors Associated with HIV Infection among Inmates in a Large Southern Prison System

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## Abstract

**Background:** The prevalence of HIV among correctional populations is many times that of the general US population. Twenty-seven state prison systems provide inmates with voluntary (i.e. consent-based) HIV testing. The purpose of this study was to characterize the population of HIV-positive prisoners in a state prison system with voluntary HIV testing and estimate the number of undetected HIV cases.

**Methods:** Using de-identified electronic records of adult prisoners entering the North Carolina Department of Corrections from January 2004 to May 2006, associations between HIV serostatus and conventional HIV-risk behaviors, mental health, confinement status, and socio-demographic characteristics were estimated using logistic regression. The range of undetected cases was estimated by multiplying the age-sex-race-specific number of untested prisoners by corresponding stratum-specific HIV prevalences from both tested prisoners and from data for the entire state.

**Results:** Approximately 40% (N=21419) of prisoners were tested for HIV, and nearly 3.4% (N=718) of these tested prisoners were HIV-positive. Among men, HIV infection was most strongly associated with MSM (OR=8.0), black race (OR=6.2), other non-white race (OR=7.4), and age group 35-44 years (OR=1.1). The strongest risk factor among women was black race (OR=3.8). Modest associations (i.e. ORs < 3.0) were observed for several other risk factors across employment, education, mental health, imprisonment, drug use, and co-infection domains. Sixty-three percent of HIV-positive prisoners were coinfected with HCV. Greater than 80% of HIV-positive prisoners had been initially diagnosed with HIV before entering prison, 30% had ever been told you have AIDS, and less than half reported a conventional HIV risk behavior. We estimated between 23% (217) and 67% (1478) of HIV cases remained undetected.

**Conclusions:** Modest to moderate associations and the large proportion of prisoners without reported risks highlight the potential limitations of risk factor based HIV testing in prison. Our most conservative estimate suggests that about one-fourth of all HIV cases in the NC DOC remained undetected.

## Objectives

- Examine associations between HIV-infection and inmate characteristics among a population of inmates voluntarily tested for HIV in a large southern prison system
- Estimate a plausible range of undetected HIV cases

## Background

- The prevalence of HIV among US prisoners is several times that of the general population;<sup>1-5</sup> HIV is predominantly acquired in the community
- Before arrest, prisoners have little access to routine healthcare; prisons are an important venue for HIV services<sup>6</sup>
- 27 state prison systems provided voluntary (i.e. consent-based) HIV testing; 7 (~25%) target "high risk" prisoners for testing;<sup>7</sup> The CDC recommends use of routine opt-out HIV testing<sup>8-9</sup>
- Greater understanding of the characteristics of the HIV-infected prison population would be useful in evaluating and improving prison HIV testing services

## Methods

### Study population, data sources, data linkage

- Adult prisoners entering the North Carolina Department of Correction (DOC) between Jan 2004 and May 2006, tested for HIV
- Data routinely collected by DOC staff describing inmate characteristics and behaviors
- HIV, HCV, syphilis test results
- Electronic prison and lab data linked via unique prison identification number (PIN); other identifiers removed

### Model-based analyses

- Multivariate associations of inmate characteristics and HIV-serostatus were estimated using gender-specific logistic regressions

### Estimating number of HIV cases among untested male prisoners

- Multiplied the number of untested male prisoners within each of 15 age-race stratum by corresponding stratum-specific prevalence estimates from the population of male prisoners tested for HIV; repeated approach using stratum-specific prevalence estimates for the general population of men in NC<sup>10,11</sup>

## Results

**Table 1. Characteristics of male and female prisoners tested for HIV following imprisonment in the NC DOC, January 2004-May 2006**

	Males (15,461)	Females (5,858)
<b>Age group (years)</b>		
45+	16.5 %	12.2 %
35-44	31.8	33.9
25-34	36.7	36.4
18-24	15.1	17.5
<b>Race</b>		
Black	49.7	42.8
Other	4.7	3.0
White	45.6	54.2
<b>Education</b>		
College	8.4	13.1
HS degree or GED	50.3	46.0
Less than high school	41.3	40.9
Unemployed	31.3	66.5
Married	15.5	15.1
<b>IQ test results</b>		
≤ 80	21.4	13.7
81 - 100	55.2	55.0
≥ 101	23.3	31.4
<b>Drug conviction ever</b>	35.6	41.8
<b>Sex conviction ever</b>	5.5	1.2
<b>Cocaine or crack ever</b>	38.4	64.9
<b>Heroin ever</b>	2.4	6.1
<b>MSM</b>	1.0	—
<b>Multiple sexual partners</b>	18.0	27.1
<b>Prostitution</b>	6.8	16.7
<b>Share Needles</b>	3.2	9.4
<b>Blood transfusion</b>	0.9	2.9
<b>Sex with Needle Sharer</b>	—	16.2
<b>Sex with MSM</b>	—	3.2
<b>Mental health</b>		
Axis I	3.0	6.4
Axis II	2.9	4.6
<b>Hepatitis C</b>		
Positive	7.5	9.4
Negative	3.1	2.7
No test	89.4	87.9
<b>Syphilis</b>		
Positive	5.3	5.9
Negative	89.4	93.5
No test	5.3	0.6
<b>Tuberculosis</b>	4.2	1.0

- Among men, the prevalence of HIV was high among inmates reporting MSM (30%), needle sharing (10%), sex w/ prostitutes (10%), and crack cocaine use (5%)
- Among women, the prevalence of HIV was high among inmates reporting sex with MSM (10%), blood transfusion (10%), multiple sexual partners (5%), and prostitution (5%)

### Coinfection

- HIV-infected prisoners were coinfected with TB disease (2.5%), syphilis (9.2%) and hepatitis C (67.8%)

### Prison population

- ~55,000 prisoners (12% women) entered the NC DOC during the study period

### Study Population

- 39% of inmates (83% of women; 33% of men) were tested for HIV during their incarceration

- Women tested were similar to those not tested; men were less likely to be tested if they were black; more likely to be tested if reporting heroin use, crack use, TB, or any conventional HIV risk behavior:
  - MSM, multiple partners, prostitution, needle sharing, blood transfusion 78-85, sex with needle sharer, and sex with MSM

### HIV serostatus

- 3.6% of men and 2.6% of women tested for HIV were infected
- 52% of infected males and 35% of infected females denied all conventional risk behaviors

**Table 2. Covariate-adjusted associations between inmate characteristics and HIV serostatus among prisoners tested for HIV following admission to the NC DOC, January 2004-May 2006**

	Males AOR (95% CI)	Females AOR (95% CI)
<b>Age (years)</b>		
35-44	3.9 (2.3, 6.5)	1.8 (0.4, 7.2)
25-34	4.1 (2.5, 6.7)	2.6 (0.7, 8.9)
18-24	2.6 (1.6, 4.4)	2.0 (0.6, 7.0)
<b>Race</b>		
Black	6.2 (4.8, 8.4)	3.8 (1.9, 6.7)
Other	2.4 (1.4, 12.4)	2.4 (0.5, 10.7)
White	1	1
<b>Education</b>		
College	1.4 (1.0, 2.1)	—
HS grad or GED	1.3 (1.0, 1.6)	—
Less than HS	1	—
Unemployed	1.7 (1.4, 2.1)	1.5 (0.8, 2.9)
Single/separated	1.2 (0.9, 1.5)	0.8 (0.4, 1.5)
<b>IQ score</b>		
≤ 80	1.8 (1.3, 2.6)	2.0 (0.9, 4.7)
81 - 100	1.2 (0.9, 1.6)	1.3 (0.6, 2.8)
≥ 101	1	1
<b>Sex crime</b>	0.9 (0.5, 1.4)	—
<b>Drug crime</b>	0.8 (0.6, 1.0)	2.1 (1.2, 3.9)
<b>Prostitution</b>	1.8 (1.1, 3.0)	0.5 (0.1, 2.1)
<b>Cocaine or crack</b>	1.3 (1.1, 1.6)	1.2 (0.6, 2.5)
<b>HIV Risk Behaviors</b>		
MSM	8.0 (5.1, 12.8)	—
Multiple sex partners	1.4 (1.0, 1.9)	2.2 (1.1, 4.1)
Prostitution	1.5 (1.2, 2.2)	0.9 (0.5, 1.9)
Share needles	2.1 (1.4, 3.3)	1.0 (0.4, 2.5)
Blood transfusion	0.4 (0.2, 1.1)	2.6 (1.0, 6.8)
Sex w/Needle sharer	—	1.4 (0.6, 3.0)
Sex with MSM	—	2.2 (0.9, 5.7)
<b>Mental health</b>		
Axis I	1.2 (0.7, 2.1)	1.8 (0.7, 4.7)
Axis II	1.6 (1.0, 2.7)	0.7 (0.1, 5.2)
Neither	1	1
Syphilis	1.5 (1.0, 2.1)	1.3 (0.6, 3.3)
Tuberculosis	0.4 (0.2, 0.8)	—

## Results (continued)

- Among males, majority of factors had modest associations (ORs <2); exceptions included MSM, share needles, Black and Other race, and, Age > 24 years (OR=2.6 - 4.0)
- Among females, race had largest effects; drug crime, multiple sexual partners (ORs~ 2)
- Between 23 and 67% of HIV-infected males may not have been tested for HIV
- Greater than 80% of prisoners had been diagnosed with HIV before their most recent prison admission

## Limitations

- HIV risk assessments were not documented for approximately half of women
- Lacks formal evaluation of trade-offs between sensitivity and specificity for different risk-factor based testing algorithms
- Serostatus results only available among prisoners voluntarily tested

## Discussion

- HIV prevalence among women similar to true prevalence, prevalence among men only applicable to tested population
- Estimate of HIV-infected males not tested for HIV was wide, but may be useful in considering changes to HIV testing and treatment services
- HCV-infection among HIV-positive was ~ 3 times that of national estimates of prisoners;<sup>1</sup> HCV/HIV coinfection can increase morbidity and mortality, and complicate HIV treatment<sup>12</sup>

- Among males and females, the majority of non-demographic associations were modest in magnitude
- Inmates reluctant to disclose risk-behaviors, indicating potential limitations of targeted testing

- Findings support CDC recommendations for routine testing<sup>8,9</sup>

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