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Prevalence Of HIV, Syphilis, Hepatitis B, and Hepatitis C Among Entrants to Maryland Correctional Facilities

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ABSTRACT *Although high prevalence of hepatitis C virus (HCV) in correctional institutions has been established, data are sparse regarding the comorbidities of hepatitis B virus (HBV), HCV, and human immunodeficiency virus (HIV), all of which may complicate the management of HCV. This study sought to estimate the prevalence and correlates associated with HCV prevalence among entrants into the Maryland Division of Correction and the Baltimore City Detention Center. Participants included all newly incarcerated entrants between January 28 and March 28, 2002. Excess sera with identifiers removed from samples drawn for routine syphilis testing were assayed for antibodies to HIV and HCV and for HBV surface antigen and surface and total core antibodies. Separately, all HIV-positive specimens were tested using the serological testing algorithm for recent HIV seroconversion. Of the 1,081 inmates and 2,833 detainees, reactive syphilis serology was noted in 0.6% of the combined population; HIV seroprevalence was 6.6%; HCV prevalence was 29.7%; and 25.2% of detainees and prisoners had antigen or core or surface antibodies to HBV. A multivariate analysis of predictors of HCV positivity indicated that detainees, women, whites, older age groups, those who were HIV seropositive, and individuals with past or present infection with HBV were significantly more likely to be positive for HCV. These data indicate that hepatitis C remains an important public health concern among entrants to jail and prison and is complicated with coinfections that need to be addressed for effective treatment.*

KEYWORDS *Hepatitis B virus, Hepatitis C virus, Human immunodeficiency virus, Jail, Prison, Seroprevalence, Syphilis.*

INTRODUCTION

More than 1.7 million individuals are incarcerated in US prisons or detention centers at any time, and more than 7 million individuals are released from prison or jails per year.[1] Because the behaviors associated with acquisition of these infectious diseases also place individuals at risk for incarceration, prison populations are at increased risk for hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV). Systematic surveillance of these infectious diseases in the incarcerated population is lacking, but population estimates suggest an HIV prevalence between 1.45% and 2.03%, an HCV prevalence between 17% and 25%, and an HBV prevalence between 20% and 80% among US inmates.[1] In spite of the high prevalence,

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few prisons have programs for routine HBV testing, few offer HBV immunization to the general prison population, and fewer still offer routine HCV testing or treatment.[2,3] Given the high prevalence of these diseases within the prison population, the lack of appropriate testing and treatment represents a missed public health opportunity to address the health care needs of the incarcerated population and to prevent the spread of infection to the communities into which they are released.

In addition to providing important data on the health care needs of incarcerated persons, examination of the prevalence of HBV, HCV, and HIV among entrants into prison and detention also provides an efficient means to estimate prevalence in a circumscribed but high-risk community. Because prisoners and detainees move from incarceration to community settings, information on disease prevalence, although imprecise, may help guide the development of community health care services.

This study sought to update estimates of the prevalence of HIV, HBV, and HCV among new entrants into the Maryland Department of Public Safety and Correctional Services Division of Correction (DOC), estimate the incidence of HIV among new entrants into prison or detention, and describe factors associated with HCV infection.

METHODS

Setting and Participants

Participants included inmates entering the Maryland DOC during the study period at the Maryland Reception, Diagnostic, and Classification Center and the Maryland Correction Institution—Women, which are the designated intake facilities for male and female inmates, respectively following their conviction and sentencing. These DOC facilities receive all entrants to the prison system, including transfers from detention facilities. Persons entering Maryland's Baltimore City intake facilities for detained persons during the study period, including the Central Booking and Intake Facility and the Women's Detention Center, were also included for the reasons described below.

Between January 28 and March 28, 2002, correctional medical personnel collected the excess sera from the routinely collected blood samples drawn for syphilis testing. Entrants into the DOC and the Baltimore City detention facilities were notified of the study and received educational information on hepatitis and ways to prevent infection. Newly incarcerated inmates or detainees (new entrants) without a syphilis blood draw during the study period were excluded. Such persons could include those who had a recent syphilis test result in their record, such as recently released persons charged with another crime or transfers from other facilities with similar routine syphilis testing. Testing for syphilis occurred during the first day at the detention facilities and within the first several days at the correctional facilities. The Baltimore detention facilities were included in this study because they contribute a large share of the Maryland inmates, and they perform routine syphilis screening; therefore, inclusion of the detention facilities was needed to represent the prison population accurately. Inmates or detainees younger than 18 years and federal inmates were excluded. This study was reviewed and approved by the Institutional Review Board of the Maryland Department of Health and Mental Hygiene.

Correctional personnel provided the demographics of the participants, including gender, race, age, offense category, sentence, and county of residence. Information on

HIV risk factors was obtained from inmates who requested nonblinded voluntary HIV counseling and testing and who consented in writing to provide their risk information to the study. The Maryland DOC offers a voluntary HIV testing program to inmates only after sentencing to a correctional facility; routine testing was not available in the detention center.

Specimen Collection, Unlinking, and Laboratory Testing

The collected excess sera were labeled with the prison identification number to permit linkage to demographic and syphilis results. Syphilis testing was conducted using standard routine correctional procedures. Syphilis serology (rapid plasma reagin) testing and confirmatory testing with the fluorescent treponemal antibody absorption test were performed by the Department of Health and Mental Hygiene Laboratories Administration. On completion of syphilis testing, specimens were maintained at –20°C. Additional laboratory tests (HBV, HCV, and HIV) were performed within 5 to 11 months. Syphilis test results were reported to the correctional facilities, and individuals testing positive for syphilis were treated at the medical clinics of the facilities. Correctional personnel provided the results of the routine syphilis testing to the participants.

Prior to additional serological testing, the demographics, risk information, and syphilis test results were linked to the specimens by prison identification number, and the identifying number was replaced with a random, unique study number on both the sera samples and data files, resulting in an unlinked serosurvey. Aliquots were sent to the Retrovirology Laboratory from the Syphilis Serology Laboratory and stored at –80°C. The samples were moved to storage at –20°C in batches and then thawed for HIV antibody testing. Each sample was tested by two different enzyme-linked immunosorbent assays (EIAs): Vironostika HIV-1 Antibody Microelisa (Biomerieux, Durham, NC) and HIV-1/2 Peptide EIA (BioRad Laboratories, Redmond, WA). Specimens that tested nonreactive in both assays were reported as negative for HIV antibody. Specimens that tested reactive in either assay were confirmed by Western blot assay (Genetic Systems, Redmond, WA). Specimens nonreactive by Western blot were then reported as negative for antibodies to the HIV. Specimens reactive by EIA and giving an indeterminate interpretation on the Western blot assay were reported as indeterminate. Specimens that were reactive by Western blot were reported as positive for HIV antibody.

To estimate incidence prior to jail or prison entry, HIV-positive specimens were immediately aliquoted twice for serologic testing algorithm for recent HIV seroconversion (STARHS) (Biomerieux-manual method). The STARHS screening assay was performed on one of the two aliquots after thawing in batches of 25–30 specimens. Specimens with standardized optical density (SOD) values of 2.0 or higher were reported as STARHS reactive; confirmatory testing was performed on samples with SOD values below 2.0. For this test, the second aliquot was thawed, and three different (1:20,000) dilutions were made for each specimen. A median SOD value less than 1.0 was nonreactive, indicative of a recent HIV infection (<170 days) by STARHS. The incidence point estimates and confidence intervals (CIs) were calculated using the method put forth by Janssen et al.[4]

Aliquots were then sent sequentially to the Hepatitis Laboratory from the Retrovirology Laboratory and stored at –80°C. Hepatitis C antibody tests were performed using the EIA from Ortho Diagnostic (BioRad Laboratories). For HBV surface antigen/antibody and total core antibody tests, kits from Abbott Laboratories (North Chicago, IL) and DiaSorin Inc. (Stillwater, MN) were used. Antibody

reactivity was expressed by the ratio of optical density of individual tests to the cutoff value (signal/co), and results were interpreted as described in the manufacturers' instructions.

The order of testing was syphilis, HIV antibody, HIV STARHS, HCV antibody, HBV surface antigen, HBV surface antibody, and HBV total core antibody. The quantity of excess sera from the blood drawn for the syphilis test was sometimes insufficient to allow testing for all infections.

Statistical Analyses

Frequency distributions of demographic variables, including serostatus variables, were examined, and statistical significance was calculated using chi-square distribution. Contingency tables with odds ratios (ORs) and 95% CIs were used to study the unadjusted association between demographic and risk factors and HCV infection. Stepwise regression (SAS Software, Cary, NC) was used to facilitate selecting the best fit among many possible models. The procedure included successive entry of each predictor that most improved the model fit, given that each additional effect entered into the model met the .05 significance level.

RESULTS

Table 1 summarizes the demographic characteristics of the entire prison population during the study period (regardless of study participation) and the demographic characteristics of the newly incarcerated and detained persons included in the serosurvey. County of residence was investigated and completed by correctional staff for the serosurvey participants.

Males and African Americans comprised the majority of the total incoming population (92.9% male, 77.2% African American) and of the serosurvey participants (85.4% male, 80.4% African American). Participants included a higher percentage of females (14.6% vs. 7.1% female) than the total inmates entering Maryland DOC. The age distribution of participants was similar to that of the total incoming population. Detainees were more likely to report residency in Baltimore City than the incoming prison inmates, 87.2% versus 39.8%, respectively. This was expected because the detainees are from the Baltimore City intake centers designated for those arrested and formally charged in Baltimore City.

Excluding the "other crime" category, drug offenses were the most common charge, followed by assault, for all newly incarcerated Maryland DOC inmates and the overall serosurvey population. Among the detainees, a higher percentage was charged with a drug offense (46.1%) than among the inmates (28.9%) included in the serosurvey. Parole violation represented the second most common charge (14.0%) for detainees. The average length of sentence for the inmates participating in the study was 6.9 years (median 4.5 years) compared to 5.7 years for the total inmate population (data not presented).

Table 2 presents the prevalence of infections among the inmates and detainees included in the serostudy. Prevalence of HIV antibodies, HCV antibodies, and history of ever being infected with HBV was lower in inmates than detainees. Of the study sample, 6.6% were infected with HIV (4.6% of inmates and 7.4% of detainees). Overall, 29.7% were infected with HCV (26.4% of inmates and 31.1% of detainees). There were 25.2% ever infected by hepatitis B (surface antigen or core and surface antibody), including 16.4% of inmates and 29.9% of detainees.

TABLE 1. Demographic characteristics of inmates and detainees included in serosurvey compared to all inmates admitted

			Serosurvey population					
	All inmates admitted		Total		Inmates		Detainees	
	No.	%	No.	%	No.	%	No.	%
Total	2,223	100.0	3,914	100.0	1,081	100.0	2,833	100.0
Gender								
Male	2,063	92.9	3343	85.4	976	90.3	2,367	83.6
Female	157	7.1	571	14.6	105	9.7	466	16.4%
Missing*	3							
Race								
White	491	22.5	738	18.9	343	31.8	395	13.9
African American	1,683	77.2	3,146	80.4	734	68.0	2412	85.2
Other	7	0.3	27	0.7	2	0.2	25	0.9
Missing*	42		3		2		1	
Age, years								
<18	15	0.7						
18–25	589	26.5	1,043	26.6	303	28.0	740	26.1
26–30	322	14.5	529	13.5	169	15.6	360	12.7
31–35	393	17.7	750	19.2	204	18.9	546	19.3
36–40	394	17.7	672	17.2	172	15.9	500	17.6
41–50	429	19.3	772	19.7	196	18.1	576	20.3
51–60	72	3.2	128	3.3	33	3.1	95	3.4
60+	8	0.4	20	0.5	4	0.4	16	0.6
Missing*	1							
County of residence†								
Baltimore City			2,433	73.3	389	39.8	2,044	87.2
Suburban Baltimore			469	14.1	214	21.9	255	10.9
Suburban Washington			98	3.0	94	9.6	4	0.2
Western			67	2.0	64	6.6	3	0.1
Eastern			106	3.2	101	10.3	5	0.2
Southern			50	1.5	49	5.0	1	0.0
Nonresident			98	3.0	66	6.8	32	1.4
Missing*			593		104		489	
Crime								
Arson	6	0.3	5	0.2	3	0.3	2	0.1
Assault	350	17.0	362	12.0	176	16.3	186	9.6
Burglary	132	6.4	142	4.7	85	7.9	57	2.9
Domestic violence	25	1.2	23	0.8	17	1.6	6	0.3
Drug offense	718	34.9	1203	39.9	312	28.9	891	46.1
Homicide	85	4.1	100	3.3	51	4.7	49	2.5
Parole violator	1	0.0	272	9.0	2	0.2	270	14.0
Prostitution	5	0.3	4	0.1	4	0.4	0	0.0
Sexual assault	61	3.0	51	1.7	40	3.7	11	0.6
Other	673	32.7	852	28.3	390	36.1	462	23.9
Missing*	167		900		1		899	

*Missing gender, race, age, county, and crime are excluded from percentage distributions.
†Data unreliable for incoming DOC.

TABLE 2. Prevalence rates for infections among inmates and detainees included in serosurvey*

	Inmates		Detainees		Total	
	No.	%	No.	%	No.	%
Total	1,081	100.0	2,833	100.0	3,914	100.0
Syphilis						
Reactive	19	1.8	4	0.1	23	0.6
Nonreactive	1,062	98.2	2,829	99.9	3,891	99.4
HIV antibodies						
Yes	49	4.6	202	7.4	251	6.6
No	1,022	95.3	2,516	92.3	3,538	93.2
Indeterminate	1	0.1	8	0.3	9	0.2
QNS	9		107		116	
Hepatitis C antibodies						
Yes	283	26.4	806	31.1	1,089	29.7
No	788	73.6	1,784	68.9	2,572	70.3
QNS	10		243		253	
Hepatitis B						
Surface antigen						
Yes	30	2.9	256	11.4	286	8.7
No	1,020	97.1	1,980	88.6	3,000	91.3
QNS	31		597		628	
Core and surface antibodies						
Yes	137	13.5	323	17.1	460	15.8
No	881	86.5	1,569	82.9	2,450	84.2
QNS	63		941		1,004	
Ever infected						
Yes	167	16.4	579	29.9	746	25.2
No	853	83.6	1,357	70.1	2,210	74.8
QNS	61		897		958	

QNS, sample quantity not sufficient for testing.
*Percentage calculations exclude specimens for which quantity was not sufficient for testing.

HIV incidence based on STARHS testing is presented in Table 3. Of the 251 inmates and detainees with antibody to HIV, 8 (3.4%) were nonreactive on the STARHS test, producing a seroincidence estimate of 0.52% per year (95% CI 0.17%–1.08%).

Table 4 presents prevalence of HCV cross-tabulated by participant demographic characteristics and infection with other pathogens for inmates and detainees combined. Hepatitis C prevalence was higher in detainees (OR 1.26, 95% CI 1.07–1.48), women (OR 1.55, 95% CI 1.28–1.87), and whites (OR 2.86, 95% CI 2.41–3.40). The risk for HCV increased with increasing age, with the highest risk for HCV infection among those older than 45 years (OR 16.32, 95% CI 11.96–22.27). No difference was detected in the overall prevalence of HCV infection among inmates and detainees convicted of a drug offense compared to other offenses. Hepatitis C was more common in those with HIV (OR 5.01, 95% CI 3.75–6.68), HBV core and surface antibodies (OR 4.70, 95% CI 3.81–5.78), and any evidence of prior HBV infection (OR 3.51, 95% CI 2.94–4.19). Individuals with no evidence of exposure to HBV were significantly less likely to have evidence of HCV (OR

TABLE 3. Prevalence of HIV and STARHS results for HIV-positive individuals among inmates and detainees included in serosurvey*

	Inmates		Detainees		Total	
	No.	%	No.	%	No.	%
HIV antibodies						
Yes	49	4.6	202	7.4	251	6.6
No	1,022	95.3	2,516	92.3	3,538	93.2
Indeterminate	1	0.1	8	0.3	9	0.2
QNS	9		107		116	
Total	1,081	100.0	2,833	100.0	3,914	100.0
STARHS						
Nonreactive	4	8.3	4	2.1	8	3.4
Reactive	44	91.7	184	97.9	228	96.6
QNS	1		14		15	
Total	49	100.0	202	100.0	251	100.0

QNS, sample quantity not sufficient for testing.
*Percentage calculations exclude specimens for which quantity was not sufficient for testing.

0.17, 95% CI 0.14–0.20). The prevalence of syphilis was low among this prison population and was not associated with HCV infection.

To ascertain the most important predictors for HCV seropositivity in this population after accounting for putative confounding variables, a stepwise multiple logistic regression analysis was performed (Table 5). Hepatitis C was more common in detainees than prison inmates (OR 1.49, 95% CI 1.21–1.85), in women more than in men (OR 1.32, 95% CI 1.04–1.67), in whites (OR 4.48, 95% CI 3.56–5.63), in those with HIV (OR 4.09, 95% CI 2.80–5.98), and in those with HBV markers (OR 2.69, 95% CI 2.20–3.28). No other variables significant in univariate analyses improved model fit.

Because of the unexpected and strong association of HCV and white race, we examined the relationship between mode of exposure and race for the 382 inmates that participated in the voluntary counseling and testing programs and who provided risk information (Table 6). Whites were significantly more likely to report injection drug use as a risk factor than non-whites ($P < .0001$). In a multivariate analysis that included the 382 individuals with risk information, race was no longer associated with HCV positivity (data not included).

DISCUSSION

Our study found a high prevalence of hepatitis C, hepatitis B, and HIV among a population of entrants into the Maryland DOC and the Baltimore City detention centers, with rates exceeding those reported in many local and national surveys. Antibody to HCV was noted in almost 30% of this study population, compared to national data[5] that suggest HCV seroprevalence in incarcerated populations of 16%–41%, varying by region.

Maryland's high HCV prevalence is plausibly related to drug use and more specifically to injection drug use. Higher rates of HCV were also seen among women in this study, a finding consistent with other studies of prison populations,[6,7] reflecting the higher rates of female incarceration for drug-related offenses. Not

TABLE 4. Prevalence of HCV by selected characteristics among inmates and detainees included in serosurvey with hepatitis C results (N = 3,661)

Variable	N	HCV+	%HCV+	Odds ratio	CI	*P*
Total	3,661	1089	29.7			
Population						
Inmate	1,071	283	26.4	1.00		
Detainee	2,590	806	31.1	1.26	1.07–1.48	<.005
Gender						
Male	3,123	885	28.3	1.00		
Female	538	204	37.9	1.55	1.28–1.87	<.0001
Race (excludes 3 unknown)						
Non-white	2,975	752	25.3	1.00		
White	683	336	49.2	2.86	2.41–3.40	<.0001
Age, years						
<25	894	71	7.9	1.00		
25–29	498	95	19.1	2.73	1.97–3.80	<.0001
30–34	657	162	24.7	3.79	2.81–5.12	<.0001
35–39	677	259	38.3	7.18	5.39–9.58	<.0001
40–44	516	257	49.8	11.50	8.54–15.49	<.0001
45+	419	245	58.5	16.32	11.96–22.27	<.0001
Drug offense (excludes 835 missing)						
Yes	1,296	386	29.8	1.10	0.94–1.30	.24
No	1,530	425	27.8	1.00		
HIV antibodies (excludes 1 QNS, 9 indeterminate)						
Yes	220	144	65.5	5.01	3.75–6.68	<.0001
No	3,431	942	27.5	1.00		
Syphilis						
Reactive	23	9	39.1	1.52	0.66–3.53	.33
Nonreactive	3,638	1,080	29.7	1.00		
Hepatitis B surface antigen (excludes 376 QNS)						
Yes	286	93	32.5	1.27	0.98–1.65	.07
No	2,999	824	27.5	1.00		
Hepatitis B core and surface antibodies (excludes 751 QNS)						
Yes	460	258	56.1	4.70	3.81–5.78	<.0001
No	2,450	524	21.4	1.00		
Ever hepatitis B (excludes 705 QNS)*						
Yes	746	351	47.1	3.51	2.94–4.19	<.0001
No	2,210	447	20.2	1.00		
Hepatitis B Susceptible† (excludes 751 QNS)†						
Yes	1,715	221	12.9	0.17	0.14–0.20	<.0001
No	1,195	561	47.0	1.00		

*Surface antigen or core and surface antibodies.

†Absence of surface antigen, core and surface antibodies

TABLE 5. Multivariate analysis of HCV positivity among inmates and detainees included in serosurvey (N = 2,948)

Variable	Regression coefficient	Odds ratio	CI	*P*
Intercept	–3.52			
Population (inmate)*				
Detainee	0.40	1.49	1.21–1.85	<.0005
Gender (male)*				
Female	0.27	1.32	1.04–1.67	<.05
Race (non-white)*				
White	1.50	4.48	3.56–5.63	<.0001
Age, years (<25 years)*				
25–29	0.99	2.69	1.82–3.98	<.0001
30–34	1.15	3.15	2.18–4.53	<.0001
35–39	1.81	6.11	4.30–8.68	<.0001
40–44	2.30	9.99	6.94–14.37	<.0001
45+	2.60	13.51	9.23–19.76	<.0001
HIV antibodies (no)*				
Yes	1.41	4.09	2.80–5.98	<.0001
Ever hepatitis B (no)*				
Yes	0.99	2.69	2.20–3.28	<.0001

Analysis restricted to N = 2,948 with complete data for all variables.
*Referent

surprisingly, inmates with HIV were significantly more likely to be infected with HCV because of the similar modes of transmission of HCV and HIV. Fully 65% of HIV-infected inmates in this study were also positive for HCV. This is likely because of the high proportion of inmates (25% to 40%) with a prior history of injection drug use.[8]

Hepatitis C was also associated with increased age, with those individuals 45 years of age or older more than 13 times more likely to have evidence of infection. The relationship between increased age and increase in HCV prevalence has been noted in other studies[9,10] and is thought to be a consequence of cumulative exposure to HCV predominantly because of ongoing injection drug use.

Whites were significantly more likely to be positive for HCV in this study population. Although this finding differs from other studies of HCV prevalence,

TABLE 6. Exposure risk category stratified by race for voluntary HIV testers among inmates

	White		Non-white		Total	
	No.	%	No.	%	No.	%
Total	120	100.0	262	100.0	382	100.0
Risk category						
IDU	45	37.5	37	14.1	82	21.5
Non-IDU	75	62.5	225	85.9	300	78.5

IDU, injecting drug user; non-IDU, noninjecting drug user.
Chi square $P < .0001$.

those studies included injection drug users recruited from street outreach.[10–12] This study population included all individuals who had been arrested or detained, not merely injection drug users. In a multivariate model, which included race and HIV risk behavior, race was no longer significantly associated with HCV seropositivity; suggesting that the association of white race and HCV positivity is caused by injection drug use among this population.

Our study found that, overall, 25% of inmates and detainees displayed evidence of past or current infection with HBV compared to national estimates, which suggested a range of HBV prevalence among incarcerated populations of 13% to 47%.[5] Given the high prevalence of HBV, evidence documenting in-prison seroconversion to HBV[6] and the potential to prevent further cases of HBV within the prison, it is striking that few state prison systems offer routine screening or vaccination for HBV. A study of state correctional policies reported that only 2 states routinely vaccinate for HBV, 9 states offer no HBV vaccine, and 26 states and the Federal Bureau of Prisons provide HBV vaccine to some inmates.[2] Recommendations from the Centers for Disease Control and Prevention are that all individuals should be administered HBV vaccine unless they have proof of completion of the vaccine series or serologic evidence of immunity to infection.[5]

The difficulties of tracking prisoners and administering the entire three-dose HBV vaccine regimen in a mobile and decentralized environment are significant. However, 30%–50% of healthy adults develop protective levels of antibody after a single dose of HBV vaccine, and 75% of healthy young adults develop antibody after two doses.[5] Although the full three-shot immunization schedule is the goal of HBV immunization programs, even limited success in delivering the entire three-dose HBV vaccine regimen would realize significant reduction in morbidity among incarcerated populations. With the availability of combination hepatitis A virus (HAV) vaccine and HBV immunization, there is an additional opportunity to prevent further liver damage. It is important to note that the benefits of HAV and HBV vaccination of prisoners would extend beyond diminishing HBV prevalence in this high-risk population. Because both HAV and HBV can exacerbate liver damage in HCV-infected patients, HAV and HBV vaccination could also decrease the morbidity and mortality associated with HCV infection.[5]

The high rates of HCV pose an enormous challenge for public health systems given the underfunding of many prison and detention centers and the frequent movement of prisoners within the prison system. Rationales for the failure to test and treat inmates for HCV include concerns that prisoners may not accept voluntary testing, treatment may not be well tolerated, toxicities are considerable, treatment would be too expensive, and the benefits of treatment may be lost once individuals are released and return to drug use. However, because of the magnitude of the problem and despite the significant obstacles that must be overcome, our experience with policies and programs addressing HIV disease within the prison system provides models for successful public health interventions.

Beginning in the 1990s, many states were faced with an emerging HIV prison population. Prison case rates for acquired immunodeficiency syndrome (AIDS) in 1993 were 50 per 10,000, more than 10 times greater than seen in the general population.[13] In 1991 in Maryland, voluntary HIV counseling and testing programs were just beginning, and a comparison of HIV seroprevalence obtained from voluntary counseling and testing and seroprevalence rates obtained from serosurveys revealed that only one third of all HIV-positive inmates accepted voluntary HIV testing.[14]

Ten years later, well-established HIV educational programs exist, with counseling and testing services routinely offered to all prison entrants. Data from this study, as well as findings from Maryland's 2002 HIV voluntary counseling and testing program, reveal significant declines from earlier levels. HIV seroprevalences of 7.1%, 7.7%, and 7% from blinded serosurveys in Maryland prisons in 1985–1987 were reported by Vlahov and colleagues.[15] In 1991, an HIV seroprevalence of 8.5% was noted in prison entrants in Maryland.[14] Data from our study revealed an HIV seroprevalence of 6.6%. Similar declines in HIV rates were seen in those accepting voluntary HIV testing, with 3.6% of individuals HIV seropositive among DOC entrants in the current study (Maryland AIDS Administration Counseling and Testing Data 2002) compared with 5.4% reported in 1991. Although it is plausible that the reduction in prevalence may be because of mortality among HIV-positive drug users, it might be conjectured that 10 years of HIV prevention education, widespread availability of HIV counseling and testing programs, and the availability of HIV treatment has contributed to these positive trends. The experience with HIV programs suggests that similar approaches for hepatitis C may be successful in ultimately reducing the burden of hepatitis C disease.

Other arguments for not providing HCV treatment include the significant costs associated with providing care. Costs for HIV treatment average $25,000 (Maryland Medicaid combined HIV/AIDS capitated rate); this cost is similar to the estimated $12,000 to $25,000 cost for treating HCV.[16] With substantial resources used to provide HIV care to incarcerated populations, it appears counterproductive to treat HIV while ignoring the problems associated with HCV-related morbidity. Patients coinfected with HIV and HCV appear to have a 12- to 300-fold higher risk of developing hepatocellular carcinoma than noncarriers.[16] In addition, studies have documented the increased mortality caused by liver failure in HIV coinfected patients, with one hospital report indicating that end-stage liver disease is now the leading cause of death among hospitalized patients with AIDS.[17]

Although the sequelae of chronic HCV suggests the importance of initiating treatment, the issue of providing treatment in the prison setting is complicated by the known toxicities of current HCV treatment, the difficulties of accurately predicting who will develop end-stage liver disease, the previously mentioned high costs of HCV treatment, and the possibility of reinfection with HCV if individuals resume illicit drug use. In spite of these difficulties, clinical decisions based on individual patient assessments may provide the best guidance for prison health care systems. The Rhode Island Department of Corrections found that only a small percentage of inmates with HCV were appropriate candidates for HCV treatment, but that therapeutic benefit could be achieved within the prison setting.[18]

Before firm conclusions are drawn, several limitations of this study should be noted. For ease of interpretation, data from the detainees and the prisoners were combined in several analyses. However, less than half of detainees are sentenced to the DOC; thus, the use of combined data may have overestimated the disease prevalence in the DOC. We tried to address this by noting when separated or aggregated data were used.

An additional limitation of this study was the insufficient quantity of serum to measure indicators for all diseases for all study subjects. One quarter of the subjects were not tested for HBV antibodies. Although special populations such as injection drug users may be more likely to have difficulty with phlebotomy or to have insufficient volume for testing, an analysis of demographic characteristics of those who did and did not have sufficient sera for testing did not reveal any differences.

Another limitation was the small number of inmates for whom risk factor data were available and the possible bias of this self-reported risk information. Additional risk information on more of the subjects would have been desirable; unfortunately, this was available only from prisoners who consented to voluntary HIV testing after entry in the DOC and not from detainees. However, a comparison of voluntary testers and the DOC study population revealed no differences in age, race, sex, and crime committed.

In spite of these limitations this study provides important data on the prevalence of HIV, HBV, and HCV among incarcerated and detained persons and may contribute to efforts to respond to the important health care needs of this vulnerable population.

Current correctional policies in Maryland as well as most state prison systems provide for routine testing and treatment of syphilis, In addition, voluntary screening for HIV is offered to all entrants. However, of all the infectious diseases observed in this study, syphilis has the lowest prevalence. Screening for HBV is not routinely performed, and immunization for HBV is offered only to prisoners who work in specific prison jobs. Hepatitis C screening is not offered, and HCV treatment is not available. Both HBV and HCV are far more prevalent, yet there is no systematic screening for either, no routine vaccination is given for HBV, and no screening or treatment for HCV is currently offered. This approach seems at odds with the available data and the sequelae of untreated HCV and the missed opportunity of preventing HBV. The impact of emerging infectious diseases requires that public health programs adjust to newer threats and provide appropriate screening and treatment for diseases with significant public health impact.

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