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Association of HIV diagnosis rates and laws criminalizing HIV exposure in the United States

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Abstract

Objective: To assess whether state criminal exposure laws are associated with HIV and stage 3 (AIDS) diagnosis rates in the United States.

Design: We assessed the relationship between HIV and stage 3 (AIDS) diagnosis data from the National HIV Surveillance System and the presence of a state criminal exposure law as identified through WestlawNext by using generalized estimating equations.

Methods: We limited analysis to persons aged at least 13 years with diagnosed HIV infection or AIDS reported to the National HIV Surveillance System of the Centers for Disease Control and Prevention. The primary outcome measures were rates of diagnosis of HIV (2001–2010 in 33 states) and AIDS (1994–2010 in 50 states) per 100 000 individuals per year. In addition to criminal exposure laws, state-level factors evaluated for inclusion in models included income, unemployment, poverty, education, urbanicity, and race/ethnicity.

Results: At the end of the study period, 30 states had laws criminalizing HIV exposure. In bivariate models ($P < 0.05$), unemployment, poverty, education, urbanicity, and race/ethnicity were associated with HIV and AIDS diagnoses. In final models, proportion of adults with less than a high school education and percentage of the population living in urban areas were significantly associated with HIV and AIDS diagnoses over time; criminal exposure laws were not associated with diagnosis rates.

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Conflicts of interest

All authors declare no conflicts of interest. All co-authors were employees of the U.S. Centers for Disease Control and Prevention (CDC), contractors of CDC, or Orise Fellows while contributing to this manuscript.

Disclaimer: The findings and conclusions in this study are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

Conclusion: We found no association between HIV or AIDS diagnosis rates and criminal exposure laws across states over time, suggesting that these laws have had no detectable HIV prevention effect.

Keywords

HIV criminal exposure laws; HIV exposure laws; HIV policy; HIV prevention; HIV-specific criminal laws

Introduction

Preventing HIV infection continues to present a substantial public health challenge in the United States. Since 2010, HIV infection has been diagnosed for approximately 40 000 persons each year [1]. Large disparities persist with blacks or African Americans (hereafter referred to as blacks), Hispanic/Latinos, MSM, and persons who inject drugs most severely affected [2]. The National HIV/AIDS Strategy (NHAS), released in 2010 and updated in 2015, calls for renewed and coordinated efforts to reduce the number of new HIV infections and decrease HIV-related health disparities [3,4]. The NHAS also calls for re-examination of HIV-specific laws and policies, including review of the broad range of criminal statutes to ensure their consistency with current science and public health approaches to HIV prevention and treatment.

Although several studies have investigated the relationship between specific public policies and sexually transmitted diseases [5–7], few studies have explored the relationship between legislated policies and HIV or focused on criminal exposure laws and HIV diagnosis rates [8,9]. In general, criminal exposure laws impose criminal penalties on persons who know they have HIV and subsequently engage in certain behaviors, such as sexual activity without disclosing their infection status. States have implemented these laws at various times, and key characteristics of the laws, such as the extent they require documentation of transmission and whether the behaviors pose high or very minimal risk of transmission, vary [10]. Few take into account whether measures such as condom use or use of antiretroviral medications were taken to reduce the risk of transmission [10]. Whether these laws may influence risk behaviors that could lead to transmission and whether they ultimately serve to advance or undermine prevention goals has been debated [11–14]. We assessed whether criminal exposure laws were associated with HIV and AIDS diagnoses rates by state.

Methods

We conducted a longitudinal analysis, using annual state-level data on criminal exposure laws, HIV and AIDS diagnoses, and social and economic data from the US Census Bureau.

Law database

We used WestlawNext to identify states with criminal exposure laws. Applying primary legal research methods [15–17], we used broad search terms (‘HIV,’ ‘human immunodeficiency virus,’ ‘AIDS,’ ‘acquired immunodeficiency syndrome,’ ‘sexual! transmit! disease!,’ ‘sexual! transmit! infection!’ ‘communicable disease!’, and ‘venereal

disease!') to locate applicable laws. We collected information about laws that criminalize behaviors that could expose another person to HIV (e.g. through oral, anal, or vaginal sex; donation of blood or tissue; biting or spitting). For each year from 1994 to 2010, each state was coded as having a criminal exposure law or not; states with such laws were also coded for the year the law was enacted. Key characteristics of the laws have been described previously [10]. Categorization of laws for this analysis included information updated in August 2014 (see website for additional information https://www.cdc.gov/hiv/policies/law/states/exposure.html).

HIV surveillance data

The main outcome variables, HIV infection and AIDS diagnosis rates, were obtained from the Centers for Disease Control and Prevention's (CDC's) National HIV Surveillance System. For analysis of HIV diagnosis rates, we included persons with diagnosed HIV (regardless of stage of diagnosis) during 2001–2010, reported to CDC through June 2012, in 33 states that had confidential HIV infection reporting from 2001 to 2010: Alabama, Alaska, Arizona, Arkansas, Colorado, Florida, Idaho, Indiana, Iowa, Kansas, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, Nevada, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, West Virginia, Wisconsin, and Wyoming. For analysis of diagnosis rates of HIV infection classified as AIDS, we included persons whose infections were classified as AIDS during 1994–2010 in all 50 states.

We restricted this analysis to the population aged at least 13 years reported to CDC through June 2012. Rates per 100 000 population were calculated in each state per year by using population denominators from the US Census Bureau. Data were statistically adjusted for reporting delays [1,18].

Social and economic data

We obtained state-level data for each year from 1994 to 2010, which are listed as follows:

1. Poverty: percentage of state population with income in the past 12 months below poverty level [19]
2. Median income: household median income [20]
3. Unemployment: state unemployment rates [21]
4. Education: percentage of persons aged at least 25 years, with less than high school education 1994–2006 [22] and 2007–2010 [23]
5. Race/ethnicity: percentage of non-Hispanic blacks, Hispanics, and non-Hispanic whites [24,25]
6. Urban residence: percentage of the state population residing in urban areas. Because annual state-specific estimates were not available, we used the 1990 state estimates for each year during 1994–1995 [26], the 2000 state estimates for each year during 1996–2005 [27], and the 2010 state estimates for each year during 2006–2010 [28]

Data analysis

We use generalized estimating equations to evaluate the association of HIV criminalization laws with HIV and AIDS diagnosis rates over time. We treated log-transformed HIV and AIDS rates as separate outcomes [29] and evaluated the association of each state-level factor, and also having a criminal exposure law against each outcome. A multivariable linear regression model examined the association between criminal exposure laws and each outcome. We associated diagnosis data (time = t) with law data from the previous year (time = $t - 1$) to evaluate whether a law (in effect for at least 1 year) would alter the association. The best subset selection method was used to determine the variables included in the final adjusted model with criteria based on the smallest Akaike's information criteria (AIC). Analyses were performed using SAS, version 9.3 (SAS Institute, Cary, North Carolina, USA).

Results

By the end of 2010, 30 states had criminal exposure laws. During the study period, the distribution of AIDS diagnosis rates and HIV diagnoses varied across states. Income and unemployment increased between 2000 and 2010 for all states; trends in summary statistics for state-level factors at three time periods were similar for both states with and without criminalization laws (Table 1). There was little change in the number of states with laws over the whole study period. Urbanicity, unemployment, low education, poverty, and minority populations were positive and significantly associated with HIV and AIDS diagnoses rates ($P < 0.05$; Table 2). In both adjusted bivariable models, low education and urbanicity were significantly associated with HIV and AIDS diagnoses rates; having a criminal exposure law was not (Table 2). Models incorporating a 5-year lag for implementation showed similar results (not shown).

Discussion

In this ecologic analysis, we found no association between diagnosis rates and state criminal exposure laws. Although other analyses have examined the relationship of structural interventions and HIV, none have focused on laws that criminalize behaviors that could expose others to HIV infection and HIV diagnoses. Since the 1980s and early 1990s, when most states implemented these laws, there has been an ongoing discussion about whether these laws affect behavior or transmission [10–14,30–33]. Criminal exposure laws could potentially reduce transmission by encouraging disclosure of HIV status to comply with the law or by deterring HIV-positive persons from engaging in behaviors that could expose others. On the contrary, these laws could increase transmission by discouraging testing or disclosure because of perceived stigma or by discouraging HIV-positive persons from learning their HIV status (to avoid satisfying the 'knowing' element of the crime) [11,12,14,30]. In the end, these laws may have no effect on transmission because limited knowledge of such laws results in no impact on behaviors [12,32]. Finding no association between HIV or AIDS diagnoses rates and laws that criminalize HIV exposure supports the hypothesis that these laws have not affected HIV behaviors or transmission.

Our findings that low education and urbanicity were associated with HIV diagnosis rates are consistent with other analyses of national surveillance data in which high rates of HIV diagnoses in areas (census tracts) were associated with a higher percentage of residents with less than high school education [34] and high rates of HIV diagnoses occurring in large metropolitan area [35,36]. These results complement other work underscoring the benefits of multifactorial HIV prevention approaches that include considerations of social determinants and the communities most affected by HIV [2,3]. Finally, whereas HIV diagnosis data do not directly represent incidence because persons may not be diagnosed and reported for several years after infection, long-term temporal trends in HIV diagnoses, such as those in this analysis, likely reflect changes in incidence over time, especially with stable or increasing rates of HIV testing over the same time period, and evidence that 87% of persons with HIV have been diagnosed in recent years [37–39]. Although the period between infection and diagnosis with AIDS may be many years, AIDS diagnoses data were available for all states and provided more years of data. In addition, HIV criminal exposure laws could influence care seeking behavior, therefore demonstrating an association with AIDS diagnoses. The finding that the results were consistent for analyses of HIV in 33 states and AIDS diagnoses in all states is a strength of this study.

Our analysis has several limitations. First, ecologic analyses such as this one are intended to reveal associations between policies and health outcomes not causation. Additionally, we only classified states as either having HIV-specific criminal exposure law during each year of the analysis period or not, and we did not include more detailed categorization of laws. State laws vary (e.g. which acts are criminalized, whether the crime is a misdemeanor or a felony, which defenses are available), which could affect their impact on diagnoses [10]. Also, because states can use (and have used) general criminal laws, such as assault and battery or attempted murder, or communicable disease laws to prosecute persons accused of exposing others to HIV, the absence of a criminal exposure law does not mean that exposure incidents were not prosecuted in that state. Prosecution data or other factors to measure enforcement of these laws were unavailable. Additionally, HIV prevalence in a jurisdiction may also influence new diagnoses, and we did not adjust for HIV prevalence in our analysis. Finally, because this was a national analysis of state-level data, local factors were not considered. Other factors related to the implementation of these types of laws may also affect this type of ecologic analysis.

Reducing misperceptions, stigma, and discrimination to break down barriers to HIV prevention is an explicit goal of the NHAS. To that end, state governments have been encouraged to review criminal laws to ensure they reflect current science on transmission risk, and also further public interest and public health [4,40]. Because at least some of the rationale for implementing criminal exposure laws was to reduce HIV transmission, our findings may provide useful scientific information for policy discussions. Our finding of no association between HIV diagnosis rates and state criminal exposure laws suggests these laws have had no detectable HIV prevention effect in the United States.

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Table 1.

Description of state-level factors at three time periods for states with or without criminal exposure laws.

	2000		2005		2010	
	States with laws (*n* = 27)	**States without laws (*n* = 23)**	**States with laws (*n* = 29)**	**States without laws (*n* = 21)**	**States with laws (n = 30)**	**States without laws (n = 20)**
Median household Income (mean in dollars)	41355.30	42264.43	45321.14	47495.19	48748.54	51577.40
Unemployment rate (mean %)	3.7	4.0	5.1	4.6	9.2	8.1
Percentage of population						
Below poverty level (mean %)	10.8	10.7	12.3	11.8	14.7	13.4
Less than HS education (mean %)	14.8	14.2	13.9	12.6	13.3	12.2
Residing in urban areas (mean %)	72.6	68.2	71.5	69.3	72.8	70.6
Hispanic (mean %)	7.1	8.7	8.2	10.5	9.4	12.0
Non-Hispanic white (mean %)	76.4	77.0	74.3	75.5	72.3	74.2
Non-Hispanic black (mean %)	12.5	7.3	13.2	6.4	13.2	6.8

Table 2.

Crude and adjusted model results with 1-year lag for HIV diagnoses and AIDS diagnoses by HIV criminal exposure law and selected demographic state-level characteristics, United States.

	Models			
	Crude		Adjusted	
	β (95% CI)	*P*	β (95% CI)	*P*
HIV diagnoses, states, 2001–2010 (*n* = 33)				
HIV criminal exposure law	0.09 (−0.34, 0.52)	0.69	0.08 (−0.18, 0.34)	0.55
Median household income	0	0.63		
Unemployment rate	0.08 (0.03, 0.14)	0.005		
Percentage of population				
Hispanic	0.02 (0.0004, 0.04)	0.05		
Non-Hispanic black	0.06 (0.04, 0.07)	<0.0001		
Non-Hispanic white	−0.04 (−0.05, −0.02)	<0.0001		
Below poverty level	0.08 (0.03, 0.12)	0.001		
Less than high school education	0.11 (0.08, 0.15)	<0.0001	0.12 (0.09, 0.15)	<0.0001
Residing in urban areas	0.03 (0.01, 0.04)	<0.0001	0.03 (0.02, 0.04)	<0.0001
AIDS diagnoses, states, 1994–2010 (*n* = 50)				
HIV criminal exposure law	−0.15 (−0.57, 0.28)	0.30	−0.01 (−0.27, 0.26)	0.95
Median household income	0	0.39		
Unemployment rate	0.08 (0.004, 0.15)	0.04		
Percentage of population				
Hispanic	0.02 (0.003, 0.04)	0.03		
Non-Hispanic black	0.06 (0.04, 0.07)	<0.0001		
Non-Hispanic white	−0.03 (−0.05, −0.02)	0.0001		
Below poverty level	0.05 (−0.002, 0.09)	0.06		
Less than high school education	0.10 (0.06, 0.13)	<0.0001	0.10 (0.08, 0.12)	<0.0001
Residing in urban areas	0.03 (0.02, 0.04)	<0.0001	0.03 (0.02, 0.04)	<0.0001

CI, confidence interval.