Published in final edited form as:

J Correct Health Care. 2015 April ; 21(2): 112–124. doi:10.1177/1078345815572596.

HIV Knowledge among a Longitudinal Cohort of Juvenile Detainees in an Urban Setting

Charbel El Bcheraoui, PhD, MSc^{1,2}, Xinjian Zhang, PhD², Leah J. Welty, PhD^{3,4}, Karen M. Abram, PhD³, Linda A. Teplin, PhD³, and Madeline Y. Sutton, MD, MPH²

¹Epidemic Intelligence Service Program, Centers for Disease Control and Prevention

²Division of HIV/AIDS Prevention, Centers for Disease Control and Prevention

³The Feinberg School of Medicine, Department of Psychiatry and Behavioral Sciences, Northwestern University

⁴The Feinberg School of Medicine, Department of Preventive Medicine, Northwestern University

Abstract

We investigated HIV knowledge change among a cohort of juvenile detainees. Participants completed an HIV knowledge survey at baseline and up to four more times over six years. We calculated knowledge scores; the time serial trend of scores was modeled using generalized estimating equations. Seven hundred ninety-eight participants, ages 14–18 years, completed a baseline survey; mean HIV knowledge scores ranged from 11.4 to 14.1 (maximum score = 18). Males had significantly lower HIV knowledge scores than females at baseline only. Over time, Hispanic participants had significantly lower scores than non-Hispanic black and non-Hispanic white participants. Overall, HIV knowledge increased but was still suboptimal five years after baseline. These findings suggest the need for developing and strengthening HIV prevention education programs in youth detention settings.

Keywords

HIV; AIDS; knowledge; detainees; youth; urban

INTRODUCTION

Over 1.6 million adolescents interact with the United States' (U.S.) juvenile detention system annually; an estimated 5% of all U.S. adolescents (Puzzanchera, Adams & Hockenberry 2012). Persons in, and released from, correctional facilities comprise an estimated 14% to 25% of Americans living with human immunodeficiency virus (HIV) (Hammett, Harmon & Rhodes 2002, Spaulding et al. 2006). Adolescents ages 13–24 years

Correspondence: Madeline Y. Sutton, MD, MPH, msutton@cdc.gov, DHAP/NCHHSTP/CDC, 1600 Clifton Rd NE MS E-45, Atlanta, GA 30333, Office: 404-639-1814, Fax: 404-639-6127.

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

The authors of this manuscript have no conflict of interest to disclose.

account for 25% of new HIV infections in the U.S., and detained and minority youth are disproportionately at risk (CDC 2012). Non-Hispanic black and Hispanic males are disproportionately represented among both incarcerated persons and persons living with HIV infection (Maruschak & Beavers 2009, CDC 2013).

Youth aged 13 to 29 years who have been detained within the US juvenile justice system have been reported to disproportionately engage in behaviors that may place them at risk for HIV infection (Abiona, Adefuye, Balogun & Sloan 2009, Gillmore, Morrison, Lowery & Baker 1994, Robertson & Levin 1999, Teplin, Mericle, McLelland & Abram 2003). Of the approximately 50,000 new HIV infections in the United States from 2007–2010, the Centers for Disease Control and Prevention (CDC) estimate that more than one-third (39%) were in persons aged 13 to 29 years old, meaning this age group had the highest proportion of new infections—and was the only age subgroup with a significant increase in incident infections—during this time period (CDC 2010). The number of previously detained youth with HIV infection in this age group is unknown but may be substantial. In addition, many juvenile detainees lack access to routine health care prevention and treatment services and may be at continued risk of HIV exposure when they return to their communities (English 2007).

Although most detainees return to their communities within two weeks of initial arrest, they are often unable to benefit from community-based and school-based HIV education programs because of the lack of long-term stability in their social settings and frequent recidivism (Hammett et al. 2002). Detention centers have a unique opportunity to provide HIV and sexual health education to youth in custody. Yet, despite evidence that detained adolescents may engage in behaviors that put them at increased risk of HIV (Abiona et al. 2009, Gillmore et al. 1994, Robertson et al. 1999, Teplin et al. 2003), have high rates of some sexually transmitted infections (STIs) and HIV (Hammett et al. 2002, Spaulding et al. 2006, Romero et al. 2007, Hammett 2009), and are less aware of HIV risk reduction strategies compared with same-age peers in public school (DiClemente, Lanier, Horan & Lodico 1991), available data suggest that over 40% of youth detention facilities do not provide any type of HIV education (CDC 1996).

To develop effective preventive interventions for detained adolescents, we first need information about their level of HIV/AIDS knowledge. Knowledge about health-related topics has been shown to be an important component of health preventive behaviors in the general population. Specifically for HIV, greater knowledge has been associated with fewer risk-taking behaviors for adolescents surveyed in community settings (Grunbaum et al. 2004, CDC 1990). In the United States in 2011, almost 50% of teenagers had engaged in sexual intercourse (CDC 2011); lack of HIV knowledge among this age group decreases prevention opportunities and increases risk of HIV infection for those teenagers exposed.

Previous studies have shown that detained youth in the U.S. receive little or no exposure to HIV prevention education and have less knowledge about HIV/AIDS than adolescents from the general population (DiClemente 1991, Nader, Wexler, Patterson, McKusick & Coates 1989, Loecker, Smith, Smith & Bunker 1992, Harwell, Trino, Rudy, Yorkman & Gollub 1999, The Center for HIV Law and Policy, 2010). These studies, however, have been cross-sectional. To date, no large-scale, longitudinal study has examined HIV knowledge after

youth leave detention and return to their communities (Nader et. al 1989, Harwell et al. 1999). Information on the level of HIV knowledge as youth age is critical and will help guide the public health community regarding whether HIV education programs need to be developed or augmented to accommodate this population's diverse needs (Tolou-Shams, Stewart, Fasciano & Brown 2010).

In this study, we describe HIV knowledge among youth who have participated in the Northwestern Juvenile Project, a large-scale, longitudinal study of youth in detention. The sample was large, racially and ethnically diverse, and included males and females. We investigated HIV knowledge over time, examining: (1) HIV knowledge at detention (baseline); (2) changes in HIV knowledge over time; and (3) associations between sociodemographic factors, such as age, sex, race/ethnicity, age at time of detention, and legal status at detention (processed in juvenile or adult court), with changes in HIV knowledge over time.

METHODS

Study setting

This study is a secondary analysis of data collected in the Northwestern Juvenile Project (NJP). NJP is a longitudinal cohort study of detainees from the Cook County Juvenile Temporary Detention Center (CCJTDC), who have been followed from original time of detention in 1995–1998 to the present. The CCJTDC has been previously described (Anonymous, 1993); briefly it receives approximately 8500 admissions every year and is used solely for pretrial detention and for offenders sentenced for fewer than 30 days (Anonymous, 1993). All detainees younger than 17 years are held at the CCJTDC, including youth processed as adults and automatically transferred to adult courts. Youth up to 21 years may be detained in the CCJTDC if they are being processed for an arrest that occurred when they were younger than 17 years. Like juvenile detainees nationwide, approximately 90% of the CCJTDC detainees are male. The age and offense distributions of the CCJTDC detainees are also similar to detained juveniles nationwide; most are racial/ethnic minorities. The CCJTDC's population is 77.9% African-American, 5.6% non-Hispanic white, 16.0% Hispanic, and 0.5% other racial or ethnic groups. More information about the CCJTDC has been previously published (Washburn et al. 2008, Abram, Teplin, McLelland & Dulcan 2003).

Participants, sampling procedures, and interviewing process

Baseline sample—Participants were randomly sampled during intake at the CCJTDC in Chicago from November 1995 through June 1998. The sample was stratified by sex, race/ethnicity, age (10–13 years or 14 years), and legal status (processed in juvenile or adult court) to obtain enough participants to compare key subgroups (e.g., females, Hispanics, younger children). Detained adolescents were eligible to participate after receiving information about the study and providing informed consent. Sampling fractions ranged from 2% to 69%. The final baseline sample included 1,829 participants: 370 (20.2%) were 10–13 years old, 657 (35.9%) were females, 1,005 (54.9%) were non-Hispanic blacks, 296 (16.2%) were non-Hispanic whites, 524 (28.6%) were Hispanic, and 4 (0.2%) self-identified

as “other.” At baseline, 1,554 participants (84.9%) were processed as juveniles and 275 (15.1%) as adults.

Follow-up interviews—The NJP design included follow-up interviews at three and at four and a half years after baseline for the entire sample, and for a random subsample of 997 participants (600 males and 397 females) two additional interviews at three and a half and at four years after baseline. For each follow-up interview, participants were re-interviewed regardless of where they were living: in the community (approximately two-thirds of interviews); at correctional facilities (nearly 30% of interviews); or by telephone if they lived more than 2 hours away (< 5% of interviews).

Procedures to obtain assent and consent at baseline and follow-up—For all interviews, participants provided assent (if they were < 18 years of age) or consent (if they were aged ≥ 18 years) for participation. The Northwestern University Institutional Review Board, and the Centers for Disease Control and Prevention Institutional Review Board approved a waiver of parental permission, consistent with federal regulations for minimal risk survey questionnaires. The study team engaged an independent participant advocate to represent the interests of minors. Parents and legal guardians were provided information about the study upon request.

HIV knowledge: questionnaire and measure

HIV knowledge was assessed by the total number of questions correct on an 18-item questionnaire administered during each interview; scoring < 16 of 18 items correctly was considered suboptimal. The questionnaire was adapted from the Street Youth at Risk for AIDS report and includes questions regarding routes of HIV transmission, condoms, HIV vaccine, and illicit drugs (Figure 1) (Watters & Beschner 1994). HIV knowledge measurements were reviewed by subject matter experts at baseline and the survey was pilot tested with 58 adolescent participants (Romero et al. 2007). The internal consistency (Cronbach’s $\alpha = 0.86$) (Cronbach 1951) of the scale was adequate for use with this population. The HIV knowledge questionnaire was added to the baseline interview during the last year of baseline data collection (1997–1998); therefore, only 798 participants received the HIV knowledge questionnaire at baseline. All participants were administered the HIV knowledge questionnaire at follow-up except those interviewed by telephone.

Statistical analysis

Subsample for analyses—Because only the latter portion of the sample received the HIV knowledge questionnaire at baseline, we restricted our analyses to this subgroup of 798 participants.

Cross-sectional analyses—Because some participants were interviewed more often than others, we used a subset of interviews to summarize HIV knowledge at three time points: baseline, Time 1, and Time 2. Time 1 consisted of the first follow-up interviews that were conducted approximately three years after baseline (median time from baseline to Time 1, 3.0 years; mean [SD], 3.2 [0.3] years; range, 2.7–4.5 years). Time 2 interviews occurred approximately five years after baseline (median time between baseline and Time 2, 4.7

years; mean [SD], 4.9 [0.4]; range, 4.3–6.0 years). There were at least 16 months between Time 1 and Time 2 interviews. Further details have been published elsewhere (Teplin, Welty, Abram, Dulcan & Washburn 2012).

Of the 798 participants in the HIV subsample, 681 (85.3%) completed the HIV knowledge questionnaire at Time 1: 10 died prior to the interview, 2 withdrew from the study, 19 were lost to follow-up, 38 received an interview that was out of the follow-up time range, 38 received a telephone interview, and 10 were missing the HIV knowledge score. For Time 2, 650 (81.4% of 798; 95.4% of 681) participants completed the interview: 17 died, 8 withdrew from the study, 39 were lost to follow up, 32 received an interview that was out of the follow-up time range, 29 received a telephone interview, and 23 were missing the HIV knowledge score.

To generate descriptive statistics that reflected CCJTDC's population, each participant was assigned a sampling weight, which was based on the HIV subsample and was augmented with a nonresponse adjustment to account for missing data (Korn & Graubard 1999). Taylor series linearization was used to estimate standard errors (Cochran 1997, Levy & Lemeshow 1999). We estimated sociodemographic differences in HIV knowledge scores at single time points using *t* tests.

Longitudinal analyses—We used generalized estimating equations (GEEs) to fit marginal models examining the associations between HIV knowledge and sociodemographic characteristics as youth aged (Zeger & Liang 1986, Liang & Zeger 1986). We used all available interviews: an average of 3.4 per person (range, 1–5 interviews per person); 89% of adolescent participants had every scheduled interview. We treated HIV knowledge as a continuous outcome; models used an identity link with an unstructured correlation matrix. The initial model included sex, race/ethnicity (non-Hispanic black, Hispanic, non-Hispanic white), age at baseline (10–13 years old, 14 years old), legal status at detention (processed as a juvenile or adult), and time (measured in years since baseline). Four participants who identified as “other” race/ethnicity were excluded from the analysis. We estimated models with quadratic terms for time when the linear term was statistically significant. When main effects were significant, we estimated models with the corresponding interaction terms. Only interaction terms or quadratic terms that were statistically significant were included in the final model. All sociodemographic characteristics—sex, race/ethnicity, age at baseline, and legal status—were retained in the final model, regardless of statistical significance, because they were stratification characteristics. GEE models were estimated with sampling weights (described above) to account for study design.

All analyses were conducted using Stata 12 and its associated survey routines (StataCorp 2001). All statistically significant ($p < 0.05$) comparisons are noted in the text or tables.

RESULTS

Cross-sectional analysis

Table 1 presents sociodemographic characteristics of adolescents who received the HIV knowledge questionnaire at baseline, Time 1, and Time 2. At baseline, males scored

significantly lower than females; Hispanics scored significantly lower than non-Hispanic blacks and non-Hispanic whites; and younger adolescents scored significantly lower than older adolescents. These patterns were similar at Time 1 and Time 2, but sociodemographic differences were no longer statistically significant. The highest average scores (approximately 14 points of a possible 18) were achieved at Time 2 but were still suboptimal.

Longitudinal analysis

Figure 2 illustrates changes in HIV knowledge scores by sex, race/ethnicity, and age at baseline, over time. Table 2 shows regression coefficients for the longitudinal model relating HIV knowledge scores to sociodemographic characteristics.

HIV knowledge scores increased by an average of 0.28 points per year, (95% confidence interval [CI] 0.17, 0.38). Over time, Hispanics scored an average of 1.16 points (95% CI 0.24, 2.09) lower than non-Hispanic blacks, and 1.21 points (95% CI 0.31, 2.11) lower than non-Hispanic whites. Participants who were younger (10 – 13 years) at baseline scored an average of 0.83 points (95% CI 0.28, 1.37) lower than older (≥ 14 years) adolescents. Males scored lower than females over time, but this difference was not statistically significant (0.36 points, 95% CI –0.06, 0.78, $p = 0.09$). The increase in HIV knowledge scores over time did not vary significantly by sex, race/ethnicity, age at baseline, or legal status. Although HIV knowledge increased significantly ($p < 0.01$), overall knowledge remained suboptimal, with most adolescents scoring an average of 14 of 18 points five years after baseline interview (Table 1).

DISCUSSION

To our knowledge, this is the first study to assess HIV knowledge longitudinally among a representative sample of previously detained adolescents. There are several major findings. First, our survey questions revealed a suboptimal level of HIV knowledge and awareness, even while adolescents were at an increased risk of HIV exposure based on local HIV epidemiology at the time (Teplin et al. 2003, Romero et al. 2007). Second, HIV knowledge differed by age, race/ethnicity, and sex. Male, Hispanic, and younger detained adolescents had significantly less HIV knowledge than female, non-Hispanic, and older detained adolescents. Finally, adolescents' HIV knowledge did not increase substantially from Time 1 to Time 2, even with intermittent exposure to the community and detention facility recidivism. After baseline, there were no longer any significant sex, racial/ethnic, or age differences in knowledge scores.

The lower HIV knowledge scores of Hispanic youth compared with non-Hispanic white youth has implications for prevention efforts with racial/ethnic minorities who are disproportionately affected by incarceration and the HIV epidemic. Improved access to HIV education is needed in detention settings and the communities where adolescents return after release. Recent small-scale studies of interventions in correctional settings suggest that racially and ethnically relevant cultural approaches and peer-driven education may influence beliefs and intentions related to condom use, especially for HIV/STI prevention (Bryan, Robbins, Ruiz & O'Neill 2006). In addition, a randomized controlled trial that compared a

multi-session HIV prevention intervention with a health promotion condition with juvenile drug court offenders found that engaging multiple family and community systems and addressing co-occurring mental health challenges can effect sexual behavior change among at-risk adolescent youth (Tolou-Shams et al. 2011).

The difference in HIV knowledge between males and females in detention suggests that sex-specific content in the development of HIV prevention interventions for incarcerated youth may be warranted (Abiona et al. 2009, Robertson et al. 2011). A cohort of incarcerated adolescent girls showed improved HIV risk-reduction knowledge and condom use skills compared with control participants after an 18-session training, but these changes were not accompanied by reductions in incident STIs (Robertson et al. 2011). More intensive interventions with detained female youth may be required to better translate HIV/STI risk-reducing skills and improve biomedical outcomes (Robertson et al. 2011). However, our study findings suggest that detained males may also have needs for intensive education and prevention interventions. Access to prevention methods with condoms and/or with effective sex negotiation techniques should also be provided to both male and female adolescents in order to translate HIV knowledge and skills into safer sex practices.

In the U.S., detained adolescents are also at increased risk of HIV exposure often due to high recidivism through the juvenile and adult correctional systems (Bond & Semaan, 1996, De Leon, Melnick, Cao & Wexler 2006, Baillargeon et al. 2010, Draine, Solomon & Meyerson 1994). Detained youth appear to have less accurate knowledge about HIV than general population youth. CDC has reported that most (88% to 98%) U.S. general population teenagers were aware of high-risk behaviors that led to HIV infection (CDC 1990). In contrast, our participants' average HIV knowledge score was 74%, less than national estimates among general population adolescents, highlighting the need for improved HIV education for detained youth.

Our study focuses on changes over time in HIV knowledge among a cohort of detained adolescents. While there was improvement in HIV knowledge over time, overall HIV knowledge remained suboptimal. This finding suggests a lack of full implementation of effective HIV educational interventions to help equip youth with tools that they can implement during and after detention to reduce their risk of HIV infection. Low HIV knowledge in this group suggests missed opportunities for sexual health education during detention. A comprehensive and sustained response for improved HIV education as well as collaborative partnerships and transitional programs between correctional health care providers and community-based adolescent service providers are warranted (Spaulding et al. 2002, Hammett 2006).

Our study has several limitations. First, although the CCJDTC's demographic composition is similar to detention centers nationwide, generalizability may still be limited to urban detention centers. Second, data collection on HIV knowledge began during the final year of the baseline enrollment period and many early participants were unable to provide baseline HIV knowledge information; however, there appears to be no systematic differences between the subsample with HIV knowledge surveys at each time point and the overall sample. Third, the data were collected using an HIV survey that was developed early in the

epidemic. However, the area of remains understudied even today, and risk remains high for HIV (Tolou-Shams et al. 2012) and other sexually transmitted diseases (Belenko et al. 2008); these data still fill a large gap in our public health HIV/STI prevention portfolio for detained and incarcerated youth. New studies with detained youth should include more recently developed HIV knowledge surveys. Fourth, some participants (n = 148 of 798, or 18.5%) could not provide follow-up data because they died, withdrew from the study, or could not be found. This finding points to the increased social risks that may also serve as barriers to HIV education and prevention efforts with these adolescents and highlights the potential importance of a broad, social and structural determinants approach to find solutions for the HIV epidemic in some large, urban settings with at-risk youth (Liddle, Dakof, Henderson & Rowe, 2010). Lastly, although baseline interviews were administered in Spanish upon request, our surveys were administered in English for follow-up interviews because few participants requested Spanish interviews and because bicultural/bilingual interviewers were unavailable. We have no data regarding whether availability of Spanish-language surveys would have affected the HIV knowledge question responses from Hispanic participants during follow-up interviews; some data suggest that translation and cultural adaptation are important components for some HIV knowledge surveys with Spanish-speaking youth (Zometa et al. 2007).

Despite these limitations, our findings have several implications for increasing public health efforts to improve HIV education and risk reduction with detained adolescents. First, HIV education strategies should be implemented in detention and community settings and should use various formats to ensure adequate exposure to the educational content. Literacy levels of detained youth are often lower than among youth in the general population (Salinger 2010). Moreover, many NJP adolescent participants reportedly had verbal skills that may warrant expanded educational approaches (Lansing et al. 2013). Hence, it is imperative to develop HIV education materials that use unique strategies, such as social media, audio files, and educational videos, which are accessible to everyone, including persons with low literacy. Pamphlets, which are widely used for HIV education, may not be easily read by everyone in the target population of adolescents (Salinger 2010). Knowledge about HIV protective measures should also be accompanied by access to the means to protect themselves, such as condoms for sexually active persons.

Second, to improve the effectiveness of HIV knowledge and prevention efforts, programs should engage parents or caretakers. Many black and Hispanic adolescents prefer their parents and/or guardians to provide information on sex topics (Forehand et al. 2007, Prado et al. 2012). Innovative reintegration strategies increasingly engage parents and other trusted adults in preventive interventions (Liddle et al. 2010). When significant adults are absent, organizations that interface with juvenile detention centers must play a stronger role in the sexual education of these young persons.

Third, our finding on suboptimal suggests we need to improve sexual health education, specifically general HIV knowledge, for detained youth in the U.S. These findings are especially important for HIV prevention efforts with Hispanic youth in the juvenile justice system. Although there are national efforts to decrease racial/ethnic inequities in the US judicial process and in HIV-related health disparities, both black and Hispanic males will

benefit from stronger HIV prevention efforts in both detention centers and the communities to which they return (Liddle et al. 2010). Facilities like youth temporary detention centers offer opportunities to reach specific populations at high risk of HIV. Implementation of effective, culturally and linguistically appropriate evidence-based health/HIV education programs is crucial in such centers to equip at-risk adolescents with important knowledge and skills to increase their HIV preventive behaviors.

As suggested by adolescent health care specialists (English, Park, Shafer, Kreipe & D'Angelo 2009), we must focus on adolescents' health, especially for those who are from, and are living in, socially and structurally unsettled environments. With the recent passage of the Affordable Care Act (HHS 2010) and the U.S. National HIV/AIDS Strategy (NHAS), which seeks to reduce HIV incidence and HIV-related racial/ethnic disparities (The White House Office of National AIDS Policy, 2010), we anticipate that all adolescents, including detained youth and young men, will have greater opportunities to access health care services (Lanier & Sutton 2012) and HIV prevention and care will be an important part of that process. Our national goal of fewer new cases of HIV infection and improved health equity underscores the need to provide appropriate, contextual sex education to youth in detention. These services will help youth be better informed about risk-reduction strategies and supply them with tools to facilitate healthier behavior choices.

Acknowledgments

This project is funded by NIMH, NIDA, NIAAA, OJJDP, CDC, CMHS, CSAP, CSAT, NIH Office of Rare Diseases, NIH Office of Minority Health and Health Disparities, NIH Office on Women's Health, Department of Labor, Robert Wood Johnson Foundation, and William T. Grant Foundation.

References

- Abiona T, Adefuye A, Balogun J, Sloan p. Gender differences in HIV risk behaviors of inmates. *Journal of Women's Health*. 2009; 18(1):65–71. DOI: 10.1089/jwh.2008.0941
- Abram KM, Teplin LA, McClelland GM, Dulcan MK. Comorbid psychiatric disorders in youth in juvenile detention. *Archives of General Psychiatry*. 2003; 60(11):1097–108.
- Baillargeon J, Giordano TP, Harzke AJ, Spauldin gAC, Wu ZH, Grady JJ, Paar DP. Predictors of reincarceration and disease progression among released HIV-infected inmates. *AIDS Patient Care And STDS*. 2010; 24(6):389–94. DOI: 10.1089/apc.2009.0303 [PubMed: 20565323]
- Belenko S, Dembo R, Weiland D, Rollie M, Salvatore C, Hanlon A, Childs K. Recently arrested adolescents are at high risk for sexually transmitted diseases. *Sexually Transmitted Diseases*. 2008; 35(8):758–63. DOI: 10.1097/OLQ.0b013e31816d1f94 [PubMed: 18461014]
- Bond L, Semaan S. At risk for HIV infection: incarcerated women in a county jail in Philadelphia. *Journal of Women's Health*. 1996; 24(4):27–45.
- Bryan A, Robbins RN, Ruiz MS, O'Neill D. Effectiveness of an HIV prevention intervention in prison among African Americans, Hispanics, and Caucasians. *Health Education and Behavior*. 2006; 33:154–177. [PubMed: 16531511]
- Centers for Disease Contraol and Prevention. Current trends HIV-related knowledge and behaviors among high school students -- selected U.S. sites, 1989. *Morbidity and Mortality Weekly Report*. 1990; 39(23):385, 388, 395–397. [PubMed: 2111874]
- Centers for Disease Contraol and Prevention. HIV/AIDS education and prevention programs for adults in prisons and jails and juveniles in confinement facilities--United States, 1994. *Morbidity and Mortality Weekly Report*. 1996; 45(13):268–71. [PubMed: 8596527]
- Centers for Disease Control and Prevention. Youth risk behavior surveillance--United States, 2003. *Morbidity and Mortality Weekly Report*. 2004; 53(2):1–96. [PubMed: 14724557]

- Centers for Disease Control and Prevention. Vital Signs: HIV Infection, Testing, and Risk Behaviors Among Youths — United States. Morbidity and Mortality Weekly Report. 2012; 61:971–976. [PubMed: 23190571]
- Centers for Disease Control and Prevention. Youth risk behavior surveillance—United States, 2011. Morbidity and Mortality Weekly Report. 2012; 61(SS-4)
- Centers for Disease Control and Prevention. [Accessed June 6, 2013] HIV Surveillance Report, Diagnoses of HIV infection among adults and adolescents, by sex and transmission category, 2010—46 states and 5 U.S. dependant areas; vol. 22. Available at: http://www.cdc.gov/hiv/surveillance/resources/reports/2010report/pdf/2010_HIV_Surveillance_Report_vol_22.pdf#Page=1. Published March 2012
- Centers for Disease Control and Prevention. HIV Surveillance Report. 2011; 23 [Accessed May 28, 2013] <http://www.cdc.gov/hiv/topics/surveillance/resources/reports/>. Published February 2013.
- Cochran, WG. Sampling Techniques. 3. New York, NY: John Wiley & Sons; 1977.
- Cronbach LJ. Coefficient alpha and the internal structure of tests. Psychometrika. 1951; 16(3):197–334.
- De Leon G, Melnick G, Cao Y, Wexler HK. Recovery-oriented perceptions as predictors of reincarceration. Journal of Substance Abuse Treatment. 2006; 31(1):87–94. [PubMed: 16814014]
- DiClemente RJ, Lanier MM, Horan PF, Lodico M. Comparison of AIDS knowledge, attitudes, and behaviors among incarcerated adolescents and a public school sample in San Francisco. American Journal of Public Health. 1991; 81:628–630. [PubMed: 2014866]
- Draine J, Solomon P, Meyerson A. Predictors of reincarceration among patients who received psychiatric services in jail. Hospital & Community Psychiatry. 1994; 45(2):163–7. [PubMed: 8168798]
- English, A. Health care for special adolescent population: Homeless youth, incarcerated youth & youth in foster care. Washington, DC: National Research Council and Institute of Medicine; 2007.
- English A, Park MJ, Shafer MA, Kreipe RE, D'Angelo LJ. Health care reform and adolescents—an agenda for the lifespan: a position paper of the Society for Adolescent Medicine. Journal of Adolescent Health. 2009; 45(3):310–5. DOI: 10.1016/j.jadohealth.2009.06.001 [PubMed: 19699430]
- Forehand R, Armistead L, Long N, Wyckoff SC, Kotchick BA, Whitaker D, Miller KS. Efficacy of a parent-based sexual-risk prevention program for African American preadolescents: a randomized controlled trial. Archives of Pediatrics & Adolescent Medicine. 2007; 161(12):1123–9. [PubMed: 18056556]
- Gillmore MR, Morrison DM, Lowery C, Baker SA. Beliefs about condoms and their association with intentions to use condoms among youths in detention. Journal of Adolescent Health. 1994; 15(3):228–37. [PubMed: 8075093]
- Hammett TM. Sexually transmitted diseases and incarceration. Current Opinion in Infectious Diseases. 2009; 22(1):77–81. DOI: 10.1097/QCO.0b013e328320a85d [PubMed: 19532084]
- Hammett TM. HIV/AIDS and other infectious diseases among correctional inmates: Transmission, burden, and an appropriate response. American Journal of Public Health. 2006; 96(6):974–978. [PubMed: 16449578]
- Hammett TM, Harmon AB, Rhodes W. The burden of infectious disease among inmates of and releasees from US correctional facilities, 1997. American Journal of Public Health. 2002; 92(11):1789–1794. [PubMed: 12406810]
- Harwell T, Trino R, Rudy B, Yorkman S, Gollub E. Sexual activity, substance abuse, and HIV/STD knowledge among detained male adolescents with multiple versus first admissions. Sexually Transmitted Diseases. 1999; 26(5):265–271. [PubMed: 10333279]
- Health and Human Services. [Accessed May 6, 2013] Understanding the Affordable Care Act: Health Disparities and the Affordable Care Act. 2010. <http://www.healthcare.gov/law/infocus/disparities/index.html>
- John Howard Association. Characteristics of juvenile court admission to secure detention in 1992. Chicago: 1993.
- Korn, E., Graubard, B. Analysis of Health Surveys. New York: Wiley; 1999.

- Lanier L, Sutton MY. Reframing the context of preventive health care services and prevention of HIV and other sexually transmitted infections for young men: New opportunities to reduce racial/ethnic sexual health disparities. *American Journal of Public Health*. 2012; :e1–e8. doi: 10.2105/AJPH.2012.300921. DOI: 10.2105/AJPH.2012.300921
- Lansing AE, Washburn JJ, Abram KM, Thomas UC, Welty LJ, Teplin LA. Cognitive and academic functioning of juvenile detainees: Implications for correctional populations and public health. *Journal of Correctional Health Care*. 2012 (in press).
- Levy, PS., Lemeshow, S. Sampling of Populations: Methods and Applications. 3. New York, NY: John Wiley & Sons; 1999.
- Liang K-Y, & Zeger SL. Longitudinal data analysis using generalized linear models. *Biometrika*. 1986; 73:13–22.
- Liddle HA, Dakof GA, Henderson C, Rowe C. Implementation outcomes of multidimensional family therapy—detention to community: A reintegration program for drug-using juvenile detainees. *International Journal of Offender Therapy and Comparative Criminology*. 2011; 55(4):587–604. DOI: 10.1177/0306624X10366960 [PubMed: 20427547]
- Loecker G, Smith DA, Smith L, Bunger P. HIV associated risk factors: a survey of a troubled adolescent population. *S D J Med*. 1992; 45(4):91–4. [PubMed: 1579869]
- Maruschak, LM., Beavers, R. HIV in Prisons, 2007–2008. U.S. Department of Justice, Bureau of Justice Statistics Bulletin; 2010. Available at <http://www.bjs.gov/index.cfm?ty=pbdetail&iid=1747> [accessed August 27, 2013]
- Nader PR, Wexler DB, Patterson TL, McKusick L, Coates T. Comparison of beliefs about AIDS among urban, suburban, incarcerated, and gay adolescents. *Journal of Adolescent Health Care*. 1989; 10(5):413–8. [PubMed: 2808087]
- Prado G, Pantin H, Huang S. Effects of a family intervention in reducing HIV risk behaviors among high-risk Hispanic adolescents: a randomized controlled trial. *Archives of Pediatrics and Adolescent Medicine*. 2012; 166(2):127–33. DOI: 10.1001/archpediatrics.2011.189
- Puzzanchera C, Adams B, Hockenberry S. *Juvenile Court*. 2012
- Robertson A, Levin ML. AIDS knowledge, condom attitudes, and risk-taking sexual behavior of substance-abusing juvenile offenders on probation or parole. *AIDS Education and Prevention*. 1999; 11(5):450–61. [PubMed: 10555628]
- Robertson AA, St. Lawrence JS, Morse DT, Baird-Thomas C, Liew H, Gresham K. Comparison of health education and STD risk reduction interventions for incarcerated adolescent females. *Health Education and Behavior*. 2001; 38(3):241–250. DOI: 10.1177/1090198110372332
- Romero EG, Teplin LA, McClelland GM, Abram KM, Welty LJ, Washburn JJ. A longitudinal study of the prevalence, development, and persistence of HIV/sexually transmitted infection risk behaviors in delinquent youth: implications for health care in the community. *Pediatrics*. 2007; 119(5):e1126–41. [PubMed: 17473083]
- Salinger, T. Meeting the literacy needs of students in juvenile justice facilities. Education Do. , editor. Washington, DC: The National Evaluation and Technical Assistance Center for Children and Youth Who Are Neglected, Delinquent or At Risk; 2010.
- Spaulding A, Stephenson B, Macalino G, Ruby W, Clarke JG, Flanigan TP. Human immunodeficiency virus in correctional facilities: a review. *Clinical Infectious Diseases*. 2002; 35:305–312. [PubMed: 12115097]
- Spaulding AC, Seals RM, Page MJ, Brzozowski AK, Rhodes W, Hammett TM. HIV/AIDS among inmates of and releasees from US correctional facilities, 2006: Declining share of epidemic but persistent public health opportunity. *PLoS ONE*. 2009; 4(11):e7558.doi: 10.1371/journal.pone.0007558
- StataCorp. *Stata Statistical Software: Release 12*. College Station, TX: StataCorp LP; 2011.
- Statistics, 2009. Pittsburgh, PA: National Center for Juvenile Justice;
- Teplin LA, Welty LJ, Abram KM, Dulcan MK, Washburn JJ. Prevalence and Persistence of Psychiatric Disorders in Youth After Detention. *Archives of General Psychiatry*. 2012; 69(10):1031–1043. DOI: 10.1001/archgenpsychiatry

- Teplin LA, Mericle AA, McClelland GM, Abram KM. HIV and AIDS Risk Behaviors in Juvenile Detainees: Implications for Public Health Policy. *American Journal of Public Health*. 2003;906–912. [PubMed: 12773351]
- The Center for HIV Law and Policy. [Accessed May 13, 2013] Juvenile Injustice: The Unfulfilled Rights of Youth in State Custody to Comprehensive Sexual Health Care. 2010. Available at: <http://www.hivlawandpolicy.org/resources/view/565>
- The White House Office of National AIDS Policy. [Accessed May 13, 2013] National HIV/AIDS Strategy for the United States, 2010. <http://www.whitehouse.gov/sites/default/files/uploads/NHAS.pdf>
- Tolou-Shams M, Houck CD, Conrad SM, Tarantino N, Stein L, Brown LK. HIV prevention for juvenile court offenders: A randomized controlled trial focusing on affect management. *Journal of Correctional Health Care*. 2011; 17(3):226–232. DOI: 10.1177/1078345811401357 [PubMed: 21474529]
- Tolou-Shams M, Houck CD, Nugent N, Conrad SM, Reyes A, Brown LK. Alcohol use and HIV risk among juvenile drug court offenders. *Journal of Social Work Practice in the Addictions*. 2012; 12(2):178–188. [PubMed: 22997487]
- Tolou-Shams M, Stewart A, Fasciano J, Brown LK. A review of HIV prevention interventions for juvenile offenders. *Journal of Pediatric Psychology*. 35(3):250–261. DOI: 10.1093/jpepsy/jsp069
- Washburn JJ, Teplin LA, Voss LS, Simon CD, Abram KM, McClelland GM. Psychiatric disorders among detained youths: a comparison of youths processed in juvenile court and adult criminal court. *Psychiatr Serv*. 2008; 59(9):965–73. DOI: 10.1176/appi.ps.59.9.965 [PubMed: 18757588]
- Watters, JK., Beschner, G. Street youth at risk for AIDS: Final report. Washington, DC: National Institute on Drug Abuse; 1994.
- Zeger SL, Liang KY. Longitudinal data analysis for discrete and continuous outcomes. *Biometrics*. 1986; 42(1):121–30. [PubMed: 3719049]
- Zometa CS, Dedrick R, Knox MD, Westhoff W, Siri RS, Debaldo A. Translation, Cross-cultural adaptation and validation of an HIV/AIDS knowledge and attitudinal instrument. *AIDS Education and Prevention*. 2007; 19(3):231–244. [PubMed: 17563277]

1. Can people get infected with HIV by eating in a restaurant where a cook or waiter has AIDS? (No)
2. Can a woman give HIV to a man if they are having sex without a condom? (Yes)
3. Can a person tell if an individual has HIV by just looking at him or her? (No)
4. Can a pregnant woman give HIV to her fetus? (Yes)
5. Can a person get infected with HIV by sharing a needle or a syringe with a drug user who has HIV or AIDS? (Yes)
6. If a person does not use a condom, can pulling out before coming prevent the spread of HIV or AIDS? (No)
7. Does using a condom or lubricant with nonoxynol-9 give extra protection against HIV? (No)
8. Does the blood test for HIV tell whether or not the virus is in your blood? (Yes)
9. Is Vaseline a safe lubricant to use with a condom? (No)
10. Is AIDS caused by a virus called HIV? (Yes)
11. If blood cannot be seen on a needle or in a syringe, does it need to be cleaned before use? (Yes)
12. Are lambskin condoms as good as latex condoms for preventing infection from HIV? (No)
13. Will warm water clean a needle or a syringe to prevent the spread of HIV? (No)
14. Can teenagers get AIDS or HIV testing and counseling without giving their names? (Yes)
15. Will bleach clean a needle or a syringe to prevent the spread of HIV? (Yes)
16. Does using condoms during sex prevent getting syphilis? (Yes)
17. Does having genital sores increase the risk of becoming HIV-infected? (Yes)
18. If you are treated for a sexually transmitted disease, does that mean you cannot get it again? (No)

* Watters JK, Beschner g. **Street youth at risk for AIDS: Final report.** Washington, DC: National Institute on Drug Abuse; 1994.

Figure 1.

Street Youth at Risk for AIDS: Questions used in the Northwestern Juvenile Project HIV Knowledge Study (with correct responses in parentheses)*

Figure 2. Differences in mean HIV knowledge scores and 95% confidence intervals overall and at baseline, Time 1 and Time 2, by Gender, Race/Ethnicity and Age at Baseline, Northwestern Juvenile Project

Table 1

Sociodemographic characteristics and mean HIV knowledge scores at baseline, Time 1, and Time 2 for the sub-sample of the last 798 participants enrolled, Northwestern Juvenile Project^a

Interview	Sociodemographic factors	N	(%)	HIV Knowledge Score Mean (95% CI)					
Baseline	Sex								
	Male	458	(57%)	12.4	(12.0, 12.9)				
	Female	340	(43%)	13.2	(12.9, 13.5)				
	Age group								
	10-13 years old	165	(21%)	11.5	(11.1, 12.0)				
	≥ 14 years old	633	(79%)	12.6	(12.1, 13.0)				
	Race/ethnicity^b								
	Non-Hispanic white	145	(18%)	12.9	(12.4, 13.3)				
	Non-Hispanic black	429	(54%)	12.7	(12.3, 13.2)				
	Hispanic	222	(28%)	11.4	(10.6, 12.2)				
	Total	798	#####	12.5	(12.1, 12.9)				
Time 1	Sex								
	Male	384	(56%)	13.6	(13.0, 14.2)				
	Female	297	(44%)	13.9	(13.6, 14.1)				
	Age group								
	10-13 years old	132	(19%)	13.2	(12.6, 13.8)				
	≥ 14 years old	549	(81%)	13.6	(13.0, 14.3)				
	Race/ethnicity^c								
	Non-Hispanic white	119	(17%)	14.0	(13.6, 14.5)				
	Non-Hispanic black	373	(55%)	13.8	(13.2, 14.5)				
	Hispanic	187	(27%)	12.6	(11.2, 14.0)				
	Total^e	681	#####	13.6	(13.0, 14.2)				
Time 2	Sex								
	Male	375	(58%)	13.9	(13.3, 14.5)				
	Female	275	(42%)	14.1	(13.8, 14.4)				
	Age group								
	10-13 years old	132	(20%)	13.4	(12.9, 13.9)				
	≥ 14 years old	518	(80%)	14.0	(13.4, 14.6)				
	Race/ethnicity^d								
	Non-Hispanic white	114	(18%)	14.0	(13.4, 14.5)				
	Non-Hispanic black	355	(55%)	14.1	(13.4, 14.8)				
	Hispanic	180	(28%)	13.1	(12.1, 14.1)				
	Total^f	650	#####	13.9	(13.4, 14.5)				
* p < 0.05; CI = confidence interval									

^a Means and 95% confidence intervals are weighted to reflect the demographic characteristics of the Cook County Juvenile Temporary Detention Center.

^b Excludes 2 participants who identified race/ethnicity as "other."

^cExcludes 2 participants who identified race/ethnicity as "other."

^dExcludes 1 participant who identified race/ethnicity as "other."

^eOf the 798 baseline participants, 10 had died, 2 withdrew from the study, 19 were lost to follow-up, 38 received an interview that was out of range, 38 received a telephone interview, and 10 were missing the HIV knowledge score.

^fOf the 798 baseline participants, 17 had died, 8 withdrew from the study, 39 were lost to follow-up, 32 received an interview that was out of range, 29 received a telephone interview, and 23 were missing the HIV knowledge score.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 2

GEE Model of overall impact of socio-demographic factors on HIV knowledge score for the sub-sample of the last 798 participants enrolled, Northwestern Juvenile Project^a

	β	95% CI	<i>p</i> Value
Sex			
Male	Referent		
Female	0.36	(−0.06, 0.78)	0.09
Age at baseline			
10–13 years old	Referent		
14 years old	0.83	(0.28, 1.37)	0.00
Race/ethnicity			
Hispanic	Referent		
Non-Hispanic white	1.21	(0.31, 2.11)	0.01
Non-Hispanic black	1.16	(0.24, 2.09)	0.01
Legal status			
Processed as an adult	Referent		
Processed as a juvenile	0.30	(−0.27, 0.88)	0.31
Time (years)	0.28	(0.17, 0.38)	0.00

CI = confidence interval

^a Beta coefficients come from marginal models, estimated with generalized estimating equations (GEE), for HIV knowledge score on sex, age at baseline, race/ethnicity, legal status, and time. We used an unstructured correlation matrix, and included sampling weights to account for study design. Four participants who identified as "other" race/ethnicity were excluded from these analyses. We used all available interviews (range 1–5, average 3.4).