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A Pilot Study Examining Food Insecurity and HIV Risk Behaviors among Individuals Recently Released from Prison

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Abstract

Annually 700,000 individuals are released from U.S. prison, many at risk for food insecurity and HIV. The association between food insecurity and HIV risk behaviors has been established but not in this population. To investigate this association, we recruited 110 recently released prisoners to participate in a survey. Ninety-one percent of our sample was food insecure; 37% did not eat for an entire day in the past month. Those who did not eat for an entire day were more likely to report using alcohol, heroin, or cocaine before sex or exchanging sex for money compared to those who had at least a meal each day. From this pilot study, released prisoners appear to be at risk for food insecurity, and not eating for an entire day is associated with certain HIV risk behaviors. HIV prevention efforts should include longitudinal studies on the relationship between food insecurity and HIV risk behaviors among recently released prisoners.

Each year 700,000 individuals are released from U.S. prisons, the majority of whom are poor, unemployed, and marginally housed or homeless (Sabol & West, 2010). These individuals generally have difficulties meeting their basic needs, including accessing government resources such as Supplemental Nutrition Assistance Program (SNAP) food benefits, previously called food stamps (Harlow, 2003; Luther, Reichert, Holloway, Roth, & Aalsma, 2011; Springer, Spaulding, Meyer, & Altice, 2011). In many states, individuals convicted of drug felonies are statutorily prohibited from obtaining SNAP food benefits (Office of National Drug Control Policy, 2003). Lacking access to these food benefits, individuals released from prison may be at greater risk of food insecurity (Gundersen & Oliveira, 2001; Wilde, 2007), defined as the absence of “access at all times to enough food for an active, healthy life” (Anderson, 1990).

Internationally, studies have shown that food insecurity is associated with increased HIV risk behaviors in HIV-infected (Byron, Gillespie, & Nangami, 2008; Cluver, Orkin, Boyes, Gardner, & Meinck, 2011) and HIV-negative individuals (Davidoff-Gore, Luke, & Wawire, 2011; Tsai, Hung, & Weiser, 2012; Weiser et al., 2007). Food insecure women, in particular, are at increased risk of HIV acquisition because they may be forced to engage in sex work to procure food for themselves or their children (Oyefara, 2007; Weiser et al., 2007). In the U.S., food insecurity has been found to adversely affect health behavior and outcomes for individuals with HIV (Wang et al., 2011; Weiser, Bangsberg et al., 2009; Weiser, Frongillo

et al., 2009; Weiser et al., 2013), but few studies in the U.S. have studied the association between food insecurity and engagement in HIV risk behaviors. One study, conducted among HIV-infected injection drug users, found that not eating for an entire day was associated with unprotected sex (Shannon et al., 2011). Another recent study found that food insecurity was independently associated with unprotected sexual activity and multiple sexual partners among HIV-infected marginally housed and homeless individuals (Vogenthaler et al., 2011).

Thus, we sought to examine the potential association between food insecurity and HIV risk behaviors among individuals recently released from U.S. prisons in a pilot study. Recently-released prisoners may be at risk for incident food insecurity as they are moving from prison, where three meals a day are guaranteed, to the community where they must procure their own food (Luther et al., 2011). Past research has also shown that during this transition, recently-released individuals often return to HIV risk behaviors they engaged in prior to incarceration and, to a lesser extent, in prison, including sex with multiple partners, noncondom use, and substance abuse, putting them and their partners at risk for acquiring or transmitting HIV (Adams, Nowels et al., 2011; Adams, Kendall et al., 2011; Cartier, Greenwell, & Prendergast, 2008; Grinstead et al., 2005; Khan et al., 2008; MacGowan et al., 2003; Morrow & Project START Group Study, 2009; Ravi, Blankenship, & Altice, 2007; Ziedenberg & Schiraldi, 2005). For these reasons, the period of time immediately following release from prison may be a key window of opportunity for public health interventions focused on either social determinants (including providing food) or structural level interventions (including eliminating the food stamp ban) to control HIV transmission in this high-risk population. For this pilot study, we sought to characterize food insecurity in a population of recently-released prisoners and hypothesized that former prisoners who were food insecure would be more likely to report engaging in HIV risk behaviors compared with those who were food secure. Secondarily, we wanted to explore how living in a state with a ban on SNAP food benefits would affect the relationship between food insecurity and HIV risk behaviors.

Methods

Sample and Setting

Using a community-based participatory research approach, we partnered with a national, community-based civil rights organization of formerly incarcerated individuals for the design and execution of this cross-sectional survey and the dissemination of its findings. We identified three states with differing SNAP food benefit policies: Texas, California, and Connecticut. In Texas, all individuals convicted of drug felonies are subject to a lifetime ban on SNAP food benefits, without exception. In California, individuals convicted of certain types of drug felonies who have not completed a drug treatment program are subject to a lifetime ban on SNAP food benefits. In Connecticut, individuals convicted of drug felonies remain eligible for SNAP food benefits so long as they are compliant with their court sentence. In each state, we hired one to two individuals with histories of incarceration as research assistants and trained them using a curriculum designed to train lay people in survey design and administration, confidentiality, and the ethics of research (Carroll-Scott, Toy, Wyn, Zane, & Wallace, 2012). Research assistants were instructed to interview 50 individuals (25 men and 25 women) recently released from prison in each of their respective states and to recruit from “wherever individuals live upon release,” including but not limited to the streets, shelters, and reentry programs. Recent release from prison was defined as having been released one to twelve months prior to participation in the study. Participants verbally consented to the study and were given \$10 grocery vouchers for their participation. Throughout the course of the study, the Principal Investigator communicated with the

research assistants to troubleshoot issues regarding the administration of the survey. The Yale University School of Medicine Human Investigation Committee approved this study.

Variables

Trained research assistants conducted a structured interview (average length of 30 minutes) in a quiet location (park bench, private Office, room in transitional housing or clinic) with English-speaking individuals released from prison. We collected data on background characteristics, including age, gender, racial/ethnic self-identification, education, marital/partner status, family size, income, and history of homelessness and incarceration.

We used an established measure of food insecurity to capture our independent variable of interest. The Food Security Module (FSM) designed by the United States Department of Agriculture (USDA) measures three different realms of food security—access, quality, and sufficiency—for the respondent's household, with particular questions focused on food insecurity among the respondent's children (Bickel, Nord, Price, Hamilton, & Cook, 2000). Food insecurity, as measured by the FSM, is correlated with common indicators of food consumption, poor physical and mental health among children and adults, worse self-reported health status, and higher rates of chronic conditions (Nord, Andrews, & Carlson, 2011).

For this pilot study, we used a modified FSM survey consisting of fifteen items that had been used in past studies of low-income populations to measure food insecurity (Hromi-Fiedler, Bermudez-Millan, Melgar-Quinonez, & Perez-Escamilla, 2009). Based on pilot interviews, we adapted the FSM items such that they responded to a recall period of “since being released from prison” as opposed to “in the past 12 months.” For respondents with no children, we administered the first eight FSM questions. If there were both adults and children under 18 years of age living in the household, we administered all fifteen questions and classified individuals based on standard definitions. We classified respondents with zero affirmative responses as food secure and those with at least one affirmative response as food insecure. Consistent with the USDA scale, 1–3 affirmative responses was coded as marginal food security, 4–5 affirmative responses as low food security, and 6–8 affirmative responses as very low food security. If there were both adults and children in the household, all 15 questions were asked, in which case, 0 affirmative responses was food secure; 1–5 affirmative responses, marginal food security; 6–10 affirmative responses, low food security, 11–15 affirmative responses, very low food security. (United States Department of Agriculture Economic Research Service, 2012) A priori, we also analyzed the association between not eating for an entire day in the past month, which the USDA describes as the severest form of food insecurity, and HIV risk behaviors. (United States Department of Agriculture Economic Research Service, 2012). Finally, we collected information about the receipt of SNAP food benefits, the amount of SNAP food benefits per month, and access to other sources of free food (i.e., local food banks, shelters).

We measured HIV risk behaviors, our dependent variables of interest, with the HIV Risk-Taking Behavior Scale-PLUS, a modified instrument that includes measures of sexual risk behaviors (multiple partners, noncondom use, transactional sex, sex while using drugs) and drug use risk behaviors (sharing needles, sharing drug paraphernalia) that have been correlated with HIV serostatus and seroconversion (Battjes, Pickens, Haverkos, & Sloboda, 1994; Darke, Hall, Heather, Ward, & Wodak, 1991; Erbeling, Stanton, Quinn, & Rompalo, 2000; Jarlais et al., 2005; Kalichman, Kelly, & Rompa, 1997; Lemp et al., 1994; Nicolosi, Leite, Musicco, Molinari, & Lazzarin, 1992; Shoptaw, Reback, & Freese, 2002; Wiebel et al., 1996). We asked participants if they had engaged in these behaviors in the past 30 days.

The entire survey was pre-tested and adapted prior to formal survey administration with 20 individuals living in New Haven, Connecticut, recently released from prison. These surveys were not included in the final analyses.

Analysis

We described the sample by sociodemographic characteristics, history of homelessness, and incarceration, and presence and severity of food insecurity. We generated proportions for categorical variables and medians and interquartile ranges for continuous variables. We estimated the Cronbach's alpha internal consistency test to evaluate the reliability of the modified FSM instrument in our sample. We then tested for bivariate associations between food insecurity and HIV risk behaviors, as well as between not having food to eat for an entire day and HIV risk behaviors using chi-square tests. Among those HIV risk behaviors found to be significantly associated with food insecurity or not eating for an entire day, we were interested in the role that the SNAP food benefit ban played in the observed associations. We created a dichotomous SNAP food benefit ban variable, where California and Texas residents were categorized as living with a full or partial food stamp ban and Connecticut residents were categorized as living without a ban. We then explored the association between the observed food insecurity and HIV risk behaviors by controlling for age, sex, and race/ethnicity, and living in a state with a SNAP food benefit ban. Given that this was a pilot study with a smaller sample, we chose to only include these covariates a priori based on the past literature on food insecurity and HIV risk behaviors, choosing what we believed to be the strongest and potentially most biasing confounders. The model was thus not intended to be a fully adjusted model, but to assist with generating hypotheses for further research.

Results

Between March and August 2010, we approached a total of 113 recently-released individuals in Connecticut, Texas, and California for participation in the study. We enrolled 110 individuals in the study, amounting to a participation rate of 97%. Forty-six percent of participants were female, 37% were living on the streets or homeless, and 30% had minor children living in the home (Table 1). The median time since release for this sample was 124 days (IQR 74–237 days). A majority of participants (91%, $N=100$) reported any food insecurity (9.1% marginal food security, 72.7% low food security, and 9.1% very low food security). Rates of food insecurity did not vary by the time post release. The Cronbach's alpha of the FSM items in this sample was 0.9. Among the 41 participants who reported not having eaten for an entire day, 39% reported receiving SNAP food benefits, where the median monthly benefit was \$200 and lasted 18 days out of the month.

We found no association between the various categories of food insecurity and HIV risk behaviors in the entire sample (see Table 2). We did find associations between not having eaten for an entire day and HIV risk behaviors. Participants who went without food for an entire day were more likely to use alcohol (78% vs. 36%, $p=0.002$), heroin (30% vs. 6%, $p=0.02$), and cocaine (57% vs. 20%, $p=0.004$) prior to sex and to exchange sex for money (26% vs. 8%, $p=0.04$) compared to those who had at least one meal each day. They were more likely to use opioids prior to sex (30% vs. 10%, $p=0.06$), though this association was only marginally significant. We did not find associations between not eating for an entire day and other HIV risk behaviors, such as condom use or sharing or exchanging needles or drug paraphernalia. Finally, formerly incarcerated individuals who did not eat for an entire day were more likely to live in a state with a SNAP food benefit ban compared to a state without a SNAP food benefit ban (78% vs. 42%, $p<0.001$).

Multivariate adjustment for age, sex, race/ethnicity altered the association between not eating for an entire day and some, but not all, HIV risk behaviors (Table 3). After adjustment, participants who had not eaten for an entire day had twenty times greater odds of using alcohol (AOR 20.7, 95% CI [3.7, 114.7]) and six times greater odds of using cocaine (AOR 6.1, 95% CI [1.6, 23.3]) prior to intercourse compared to those who had eaten at least one meal each day. Sex work and using heroin prior to intercourse were no longer significantly associated with not having eaten in an entire day in multivariate models. Controlling for the presence of a state SNAP food benefit ban reduced the odds of alcohol and cocaine use before sex, suggesting that the ban may impact the association between not eating for an entire day and certain HIV risk behaviors.

Discussion

Individuals released from prison are at high risk for food insecurity. The vast majority of released prisoners (91%) reported food insecurity, and 37% reported not having eaten for an entire day because there was not enough money. While being food insecure is more common among U.S. racial and ethnic minorities and low-income individuals, the levels we report in this study far exceed those sampled in the national USDA survey and mirror the magnitude of food insecurity in developing countries (Anema, Vogenthaler, Frongillo, Kadiyala, & Weiser, 2009; Nord, Andrews, & Carlson, 2011; Weiser et al., 2007). Larger epidemiologic studies are needed to characterize the prevalence of food insecurity among individuals recently released from prison, particularly the timing of risk and geographic variations.

We were unable to detect the association between any food insecurity and HIV risk behaviors in this population of recently-released prisoners. This may be due to the unusually high rate of food insecurity in our sample and, thus, limited variation with which to discover associations. However, we did find a significant association between not having eaten for an entire day and certain HIV risk behaviors, including exchanging sex for money and using alcohol, cocaine, and heroin before intercourse. Our findings are similar to other studies in high-risk populations, which have similarly documented associations between varying degrees of food insecurity and frequent illicit drug use, inconsistent condom use, and exchanging sex for drugs or alcohol (Normen et al. 2005; Shannon et al., 2011; Vogenthaler et al., 2012; Weiser et al., 2007). Given that low socioeconomic status and drug use are associated with both food insecurity and HIV risk behaviors, the role of poverty and drug use in the association between HIV risk behaviors needs to be further studied (Nord et al., 2011; Shannon et al., 2011; Vogenthaler et al., 2012; Werb, Kerr, Zhang, Montaner, & Wood, 2010). Better characterizing the causal association between food insecurity and HIV risk behaviors may inform structural interventions designed to reduce food insecurity and thus HIV transmission, including providing food to individuals at risk for HIV.

We found that residing in a state with a full or partial ban on SNAP food benefits may influence the association between not having eaten in an entire day and alcohol and cocaine use before intercourse. These results should be confirmed with larger samples and suggest that more research is required to measure the health impact of policies that prohibit or deter individuals released from prisons from obtaining SNAP food benefits. In 1996, the U.S. government mandated the prohibition of SNAP food benefits for drug felons as part of the federal Personal Responsibility and Work Opportunity Reconciliation Act (Legal Action Center, 2011). Currently 13 states have a full ban enacted and 19 states have a partial ban, leaving only 18 states and the District of Columbia with no ban on this public entitlement (Figure 1). However, our study revealed that living in a state without a ban did not ensure that individuals released from prison were enrolling in the SNAP food benefit program or receiving sufficient benefits. Only 10% of participants living in Connecticut (a state in which all compliant drug felons are eligible for SNAP food benefits) who reported not

having eaten in an entire day were enrolled in the SNAP food benefit program and receiving sufficient aid to last the full month. One reason may be because ongoing programs such as Operation Talon, where local law enforcement agencies are positioned at SNAP food benefit enrollment offices, deter individuals from applying for SNAP food benefits (Cook County Sheriff Department, 2010).

Limitations

There are several important limitations to this study. This was a pilot study and was intended to explore the extent of food insecurity and its association with HIV risk behaviors among recently-released prisoners. We cannot draw definitive conclusions from this study due to its cross-sectional design and small sample size, which limited full adjustment in multivariate models. One possible alternative explanation of our findings is that individuals using illicit drugs are spending their money on drugs instead of food, which would suggest the need for increased drug treatment access upon release. Another possibility is that food insecurity is a surrogate measure for low socioeconomic status, which is also associated with HIV risk behaviors. These hypotheses merit further investigation using prospective study designs with larger samples to explore such dynamics. Also, 42% of participants in this study reported undergoing weekly urine toxicology testing as part of parole or drug treatment programming. Thus, our study sample may not be generalizable to the population of individuals released from prison who are no longer under the purview of the criminal justice system and who may be more apt to engage in drug-related HIV risk behaviors once they are no longer mandated to provide a weekly urine sample (Himmelgreen et al., 1998). Future studies should explore the association between food insecurity and HIV risk behaviors after individuals are released from parole or probation, as return to HIV risk behaviors is expected to be particularly prevalent once supervision ceases. Moreover, as the majority of our recruitment strategy depended on convenience sampling through community-based research assistants and appropriate venues to approach and enroll recently-released prisoners, our sample may not be representative of all recently-released prisoners in these three states. Lacking a more representative sample of recently-released prisoners to compare to, we do not know the extent of differences and consider this sample a good first step in understanding this issue in this population.

In spite of these challenges, using a community based participatory research approach contributed to the success of the study. Individuals face a number of competing demands upon release from correctional facilities and are often difficult to recruit into studies given time constraints, mistrust of academic researchers, and skepticism of research. A 97% response rate is high and may not have been achieved had we not employed previously-incarcerated research assistants with the comfort and camaraderie to approach potential respondents and enroll participants. This participation rate is in part credited to our partnership with our community-based organization and the efforts of our community-based research assistants.

Conclusion

In this pilot study, individuals recently released from prison are at risk for food insecurity. Not having food to eat for an entire day, food insecurity in its most severe form, is associated with HIV risk behaviors including use of alcohol, cocaine, and heroin prior to sex and exchanging sex for money. Recently-released individuals who did not eat for an entire day were more likely to live in a state with a SNAP food benefit ban compared to a state without a SNAP food benefit ban, and residing in a state with a full or partial ban on SNAP food benefits may impact certain HIV risk behaviors. Longitudinal studies are needed to characterize the prevalence of food insecurity among individuals recently released from

prison and to better understand the relationships between food insecurity and HIV risk behaviors in this high-risk population.

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References

- Adams LM, Kendall S, Smith A, Quigley E, Stuewig JB, Tangney JP. HIV risk behaviors of male and female jail inmates prior to incarceration and one year post-release. *AIDS and Behavior*. 2011;10.1007/s10461-011-9990-2
- Adams J, Nowels C, Corsi K, Long J, Steiner JF, Binswanger IA. HIV risk after release from prison: A qualitative study of former inmates. *Journal of Acquired Immune Deficiency Syndromes*. 2011; 57(5):429–434. [PubMed: 21522015]
- Anderson SA. Core indicators of nutritional state of difficult-to-sample populations: A report of the life sciences research Office. *Journal of Nutrition*. 1990; 120(11S):1559–1600. [PubMed: 2243305]
- Anema A, Vogenthaler N, Frongillo EA, Kadiyala S, Weiser SD. Food insecurity and HIV/AIDS: current knowledge, gaps, and research priorities. *Current HIV/AIDS Report*. 2009; 6(4):224–231.
- Battjes RJ, Pickens RW, Haverkos HW, Sloboda Z. HIV risk factors among injecting drug users in five U.S. cities. *AIDS*. 1994; 8(5):681–688. [PubMed: 8060548]
- Bickel, G.; Nord, M.; Price, C.; Hamilton, W.; Cook, J. Guide to measuring household food security. United States Department of Agriculture Food and Nutrition Services; Alexandria, VA: 2000.
- Byron E, Gillespie S, Nangami M. Integrating nutrition security with treatment of people living with HIV: Lessons from Kenya. *Food & Nutrition Bulletin*. 2008; 29(2):87–97. [PubMed: 18693472]
- Carroll-Scott A, Toy P, Wyn R, Zane JI, Wallace SP. Results from the data & democracy initiative to enhance community-based organization data and research capacity. *American Journal of Public Health*. 2012; 102(7):1384–1391. [PubMed: 22594748]
- Cartier JJ, Greenwell L, Prendergast ML. The persistence of HIV risk behaviors among methamphetamine-using offenders. *Journal of Psychoactive Drugs*. 2008; 40(4):437–446. [PubMed: 19283948]
- Cluver L, Orkin M, Boyes M, Gardner F, Meinck F. Transactional sex amongst AIDS-orphaned and AIDS-affected adolescents predicted by abuse and extreme poverty. *Journal of Acquired Immune Deficiency Syndromes*. 2011; 58(3):336–343. [PubMed: 21857361]
- Cook County Sheriff Department. Fugitives tracked down after signing up for food stamps. 2010. Retrieved April 14, 2011 from http://www.cookcountysheriff.com/press_page/press_FugitivesTrackedDown_05_03_10.html
- Darke S, Hall W, Heather N, Ward J, Wodak A. The reliability and validity of a scale to measure HIV risk-taking behaviour among intravenous drug users. *AIDS*. 1991; 5(2):181–185. [PubMed: 2031690]
- Davidoff-Gore A, Luke N, Wawire S. Dimensions of poverty and inconsistent condom use among youth in urban Kenya. *AIDS Care*. 2011; 23(10):1282–1290. [PubMed: 21562992]
- Erbelding EJ, Stanton D, Quinn TC, Rompalo A. Behavioral and biologic evidence of persistent high-risk behavior in an HIV primary care population. *AIDS*. 2000; 14(3):297–301. [PubMed: 10716506]
- Grinstead OA, Faigles B, Comfort M, Seal D, Nealey-Moore J, Belcher L, Morrow K. HIV, STD, and hepatitis risk to primary female partners of men being released from prison. *Women Health*. 2005; 41(2):63–80. [PubMed: 16219588]
- Gundersen C, Oliveira V. The food stamp program and food insufficiency. *American Journal of Agricultural Economics*. 2001; 83(4):875–887.

- Harlow, CW. Bureau of Justice Statistics Special Report NCJ 195670. Washington, DC: U.S. Department of Justice, Bureau of Justice Statistics; 2003. Education and correctional populations.
- Himmelgreen DA, Perez-Escamilla R, Segura-Millan S, Romero-Daza N, Tanasescu M, Singer M. A comparison of the nutritional status and food security of drug-using and non-drug-using Hispanic women in Hartford, Connecticut. *American Journal of Physical Anthropology*. 1998; 107(3):351–361. [PubMed: 9821498]
- Hromi-Fiedler A, Bermudez-Millan A, Melgar-Quinonez H, Perez-Escamilla R. Psychometric properties of an adapted version of the U.S. household food security survey module for assessing food insecurity among low-income pregnant Latinas. *Journal of Hunger and Environmental Nutrition*. 2009; 4(1):81–94. [PubMed: 20046913]
- Jarlais DC, Perlis T, Arasteh K, Torian LV, Beatrice S, Milliken J, et al. HIV incidence among injection drug users in New York City, 1990 to 2002: Use of serologic test algorithm to assess expansion of HIV prevention services. *American Journal of Public Health*. 2005; 95(8):1439–1444. [PubMed: 15985649]
- Kalichman SC, Kelly JA, Rompa D. Continued high-risk sex among HIV seropositive gay and bisexual men seeking HIV prevention services. *Health Psychology*. 1997; 16(4):369–373. [PubMed: 9237089]
- Khan MR, Miller WC, Schoenbach VJ, Weir SS, Kaufman JS, Wohl DA, Adimora AA. Timing and duration of incarceration and high-risk sexual partnerships among African Americans in North Carolina. *Annals of Epidemiology*. 2008; 18(5):403–410. [PubMed: 18395464]
- Legal Action Center. Advocacy toolkit: Opting out of federal ban on food stamps and TANF. 2011. Retrieved December 15 2011 from <http://www.lac.org/toolkits/TANF/TANF.htm>
- Lemp GF, Hirozawa AM, Givertz D, Nieri GN, Anderson L, Lindegren ML, et al. Seroprevalence of HIV and risk behaviors among young homosexual and bisexual men. The San-Francisco Berkeley Young Men's Survey. *Journal of the American Medical Association*. 1994; 272(6):449–454. [PubMed: 8040980]
- Luther JB, Reichert ES, Holloway ED, Roth AM, Aalsma MC. An exploration of community reentry needs and services for prisoners: A focus on care to limit return to high-risk behavior. *AIDS Patient Care STDS*. 2011; 25(8):475–481. [PubMed: 21663540]
- MacGowan RJ, Margolis A, Gaiter J, Morrow K, Zack B, Askew J, et al. Predictors of risky sex of young men after release from prison. *International Journal of STD & AIDS*. 2003; 14(8):519–523. [PubMed: 12935380]
- Morrow KM. Project START Group Study. HIV, STD, and hepatitis risk behaviors of young men before and after incarceration. *AIDS Care*. 2009; 21(2):235–243. [PubMed: 19229694]
- Nicolosi A, Leite MLC, Musicco M, Molinari S, Lazzarin A. Parenteral and sexual transmission of human immuno-Deficiency virus in intravenous drug users— A study of seroconversion. *American Journal of Epidemiology*. 1992; 135(3):225–233. [PubMed: 1312300]
- Nord, M.; Andrews, M.; Carlson, S. United States Department of Agriculture. Economic Research Report. Vol. 83. Washington, DC: Author; 2011. Household food security in the United States, 2010.
- Normen L, Chan K, Braitstein P, Anema A, Bondy G, Montaner JS, Hogg RS. Food insecurity and hunger are prevalent among HIV-positive individuals in British Columbia, Canada. *Journal of Nutrition*. 2005; 135(4):820–825. [PubMed: 15795441]
- Drug data summary. Office of National Drug Control Policy; 2003. Retrieved April 20, 2008 from <http://www.whitehousedrug-policy.gov/publications/factsht/drugdata/index.html>
- Oyefara JL. Food insecurity, HIV/AIDS pandemic and sexual behaviour of female commercial sex workers in Lagos metropolis, Nigeria. *Journal of the Social Aspects of HIV/AIDS Research Alliance*. 2007; 4(2):626–635.
- Ravi A, Blankenship KM, Altice FL. The association between history of violence and HIV risk: A cross-sectional study of HIV-negative incarcerated women in Connecticut. *Women's Health Issues*. 2007; 17(4):210–216. [PubMed: 17570681]
- Sabol, W.; West, HC. Prisoners in 2009 NCJ 231675. Washington, DC: U.S. Department of Justice, Bureau of Justice Statistics; 2010.

- Shannon K, Kerr T, Milloy MJ, Anema A, Zhang R, Montaner SG, Wood E. Severe food insecurity is associated with elevated unprotected sex among HIV-seropositive injection drug users independent of HAART use. *AIDS*. 2011; 25(16):2037–2042. [PubMed: 21811140]
- Shoptaw S, Reback CJ, Freese TE. Patient characteristics, HIV serostatus, and risk behaviors among gay and bisexual males seeking treatment for methamphetamine abuse and dependence in Los Angeles. *Journal of Addictive Diseases*. 2002; 21(1):91–105. [PubMed: 11831503]
- Springer SA, Spaulding AC, Meyer JP, Altice FL. Public health implications for adequate transitional care for HIV-infected prisoners: Five essential components. *Clinical Infectious Disease*. 2011; 53(5):469–479.
- Tsai AC, Hung KJ, Weiser SD. Is food insecurity associated with HIV risk? Cross-sectional evidence from sexually active women in Brazil. *PLOS Medicine*. 2012; 9(4):e1001203. [PubMed: 22505852]
- United States Department of Agriculture Economic Research Service. Food security in the U.S.. 2012. Retrieved October 17, 2012 from <http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/measurement.aspx>
- Vogenthaler NS, Hadley C, Rodriguez AE, Valverde EE, Del Rio C, Metsch LR. Depressive symptoms and food insufficiency among HIV-infected crack users in Atlanta and Miami. *AIDS and Behavior*. 2011; 15:1520–1526. [PubMed: 20099017]
- Wang EA, McGinnis KA, Fiellin DA, Goulet JL, Bryant K, Gibert CL, et al. Food insecurity is associated with poor virologic response among HIV-infected patients receiving antiretroviral medications. *Journal of General Internal Medicine*. 2011; 26(9):1012–1018. [PubMed: 21573882]
- Weiser SD, Bangsberg DR, Kegeles S, Ragland K, Kushel MB, Frongillo EA. Food insecurity among homeless and marginally housed individuals living with HIV/AIDS in San Francisco. *AIDS and Behavior*. 2009; 13(5):841–848. [PubMed: 19644748]
- Weiser SD, Frongillo EA, Ragland K, Hogg RS, Riley ED, Bangsberg DR. Food insecurity is associated with incomplete HIV RNA suppression among homeless and marginally housed HIV-infected individuals in San Francisco. *Journal of General Internal Medicine*. 2009; 24(1):14–20. [PubMed: 18953617]
- Weiser SD, Hatcher A, Frongillo EA, Guzman D, Riley ED, Bangsberg DR, Kushel MB. Food insecurity is associated with greater acute care utilization among HIV-infected homeless and marginally housed individuals in San Francisco. *Journal of General Internal Medicine*. 2013; 28(1):91–98. [PubMed: 22903407]
- Weiser SD, Leiter K, Bangsberg DR, Butler LM, Percy-de Korte F, Hlanze Z, et al. Food insufficiency is associated with high-risk sexual behavior among women in Botswana and Swaziland. *PLoS Medicine*. 2007; 4(10):1589–1597. [PubMed: 17958460]
- Werb D, Kerr T, Zhang R, Montaner JS, Wood E. Methamphetamine use and malnutrition among street-involved youth. *Harm Reduction Journal*. 2010; 7:5. [PubMed: 20210992]
- Wiebel WW, Jimenez A, Johnson W, Ouellet L, Jovanovic B, Lampinen T, et al. Risk behavior and HIV seroincidence among out-of-treatment injection drug users: A four-year prospective study. *Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology*. 1996; 12(3):282–289. [PubMed: 8673532]
- Wilde PE. Measuring the effect of food stamps on food insecurity and hunger: Research and policy considerations. *Journal of Nutrition*. 2007; 137(2):307–310. [PubMed: 17237302]
- Ziedenberg, J.; Schiraldi, V. Race and imprisonment in Texas: The disparate incarceration of Latinos and African Americans in the Lone Star State. Washington, DC; Justice Policy Institute; 2005.

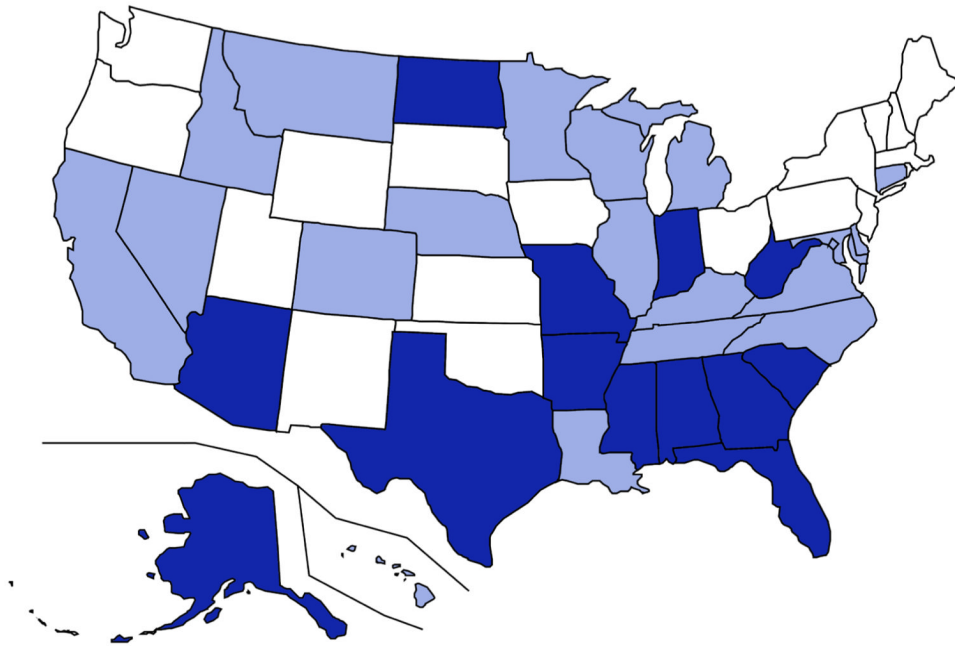


Figure 1. Status of SNAP Food Benefit Ban, 2011. States with a full ban on SNAP food benefits are dark colored. States with a partial ban on SNAP food benefits are light colored. States with no ban on SNAP food benefits are white colored. For more information about the SNAP food benefit ban, see <http://www.nationalreentryresourcecenter.org/reentry-council/activities>.

Table 1
Participants Recently Released from Prison, *N* = 110

Variables	<i>N</i> (%) or median (IQR)
Food Insecurity Variables	
Food Insecure	100 (90.9)
Marginal food security	10 (9.1)
Low food security	80 (72.7)
Very low food security	10 (9.1)
Not eating a meal for an entire day*	41 (37.3)
Median SNAP Food Benefit, \$, <i>N</i> (IQR)	200 (150, 200)
Sociodemographic Variables	
California Residents	50 (45.5)
Connecticut Residents	49 (44.5)
Texas Residents	11 (10.0)
Age	
18–25	17 (15.5)
26–35	35 (31.8)
36–45	30 (27.3)
46–55	24 (21.8)
> 55	4 (3.6)
Gender	
Female	50 (45.5)
Race**	
White	35 (31.8)
Black	67 (60.9)
Other	15 (13.6)
Ethnicity	
Hispanic	15 (13.6)
Not Hispanic	95 (86.4)
Employed	10 (9.1)
Marital Status	
Married	15 (13.6)
Never married	72 (65.5)
Separated, divorced, or widowed	22 (20.0)
Has at Least 1 Minor Child	33 (30.0)
Education	
Less than high school	38 (34.5)
High school degree or GED	50 (45.5)
Some college	21 (19.1)
Employed	10 (9.1)
Low-income (< 130% FPL)***	91 (82.7)
Incarceration History Variables	

Variables	<i>N</i> (%) or median (IQR)
Days Since Most Recent Release	124 (74, 237)
Times Incarcerated, Lifetime	
1	34 (30.9)
2–5	32 (29.1)
> 6	37 (33.6)
Don't know	5 (4.5)
Total Years Incarcerated, Lifetime	
1	33 (30.0)
2–10	51 (46.4)
> 10	26 (23.6)
On Parole	96 (87.3)

* The variable is defined as not eating for at least one day in the past month because “you did not have enough money.”

** Participants could report multiple racial and ethnic categories with which they self-identified.

*** Low-income was categorized as 130% federal poverty level for a single-person household (\$1108, as of October 2011), as that is the income cutoff for SNAP food benefits for most households. See http://www.fns.usda.gov/SNAP/applicant_recipients/eligibility.htm.

Table 2
Association Between Not Eating for an Entire Day, HIV Risk Behaviors, and Presence of SNAP Food Benefit Ban, *N* = 110

Dependent Variables	Participants who reported not eating for an entire day	Participants who had at least one meal each day	Chi-square test statistic	<i>p</i> -value
	<i>N</i> = 41 <i>N</i> (%)	<i>N</i> = 69 <i>N</i> (%)		χ^2
Resides in state with SNAP food benefit ban	32 (78.1)	29 (42.0)	13.51	< 0.001
Risk Behaviors [†]				
Always uses condoms during intercourse	5 (20.8)	14 (38.9)	2.17	0.14
Used alcohol prior to intercourse	18 (78.3)	13 (36.1)	10.0	0.002
Used cocaine/crack prior to intercourse	13 (56.5)	7 (20.0)	8.19	0.004
Used opioids prior to intercourse	7 (30.4)	3 (10.0)	3.55	0.059
Used heroin prior to intercourse	7 (30.4)	2 (6.3)	5.72	0.017
Paying for or being paid for sex work	7 (25.9)	3 (7.7)	4.13	0.042

[†] Out of individuals who report having sex (*N* = 64) using chi-square tests.

Table 3
Association Between Not Having Eaten for an Entire Day and HIV Risk Behaviors, *N* = 110

Hiv risk behavior	Unadjusted odds ratio	Adjusted odds ratio *	Adjusted odds ratio **
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Using alcohol prior to intercourse	6.36 (1.92, 21.18)	20.67 (3.72, 114.74)	9.84 (1.50, 64.36)
Using cocaine/crack prior to intercourse	5.2 (1.62, 16.73)	6.09 (1.59, 23.31)	3.96 (0.90, 17.54)
Using heroin prior to intercourse	6.56 (1.22, 35.37)	3.67 (0.47, 28.42) [†]	0.19 (0.003, 14.42)
Paying or being paid for sex work	4.20 (0.98, 18.06)	4.25 (0.91, 19.98)	2.54 (0.41, 15.61)

* Adjusted for age, sex, race.

** Adjusted for age, sex, race, and existence of SNAP food benefit ban.

[†] Sex was dropped (collinearity).