Drug and Alcohol Dependence 154 (2015) 243–250

Contents lists available at ScienceDirect

Drug and Alcohol Dependence

journal homepage: www.elsevier.com/locate/drugalcdep

Individual and neighborhood predictors of mortality among HIV-positive Latinos with history of injection drug use, Florida, 2000–2011

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ARTICLE INFO

Article history:
Received 24 February 2015
Received in revised form 29 June 2015
Accepted 2 July 2015
Available online 16 July 2015

Keywords:
Latinos
Human immunodeficiency virus
Mortality
Injection drug use
Neighborhood

ABSTRACT

Background: The objectives are to examine disparities in all-cause mortality risk among HIV-positive Latinos with injection drug use (IDU) history, and to identify individual- and neighborhood-level predictors.
Methods: Florida surveillance data for persons diagnosed with HIV 2000–2008 were merged with 2007–2011 administrative data from the American Community Survey. Hazard ratios (HR) were calculated using multi-level weighted Cox regression adjusting for individual and neighborhood (ZCTA-level) factors.
Results: Of 10,989 HIV-positive Latinos, 10.3% had IDU history. Latinos with IDU history were at increased mortality risk compared with Latinos without IDU history after controlling for individual and neighborhood factors (adjusted HR [aHR] 1.61, 95% confidence interval [CI] 1.43–1.80). Factors associated with mortality for those with IDU history included: being 40–59 (aHR 6.48, 95% CI 1.41–121.05) and ≥60 years (aHR 18.75, 95% CI 3.83–356.45) compared with 13–19 years of age; being diagnosed with AIDS within 3 months of HIV (aHR 2.31, 95% CI 1.87–2.86); residing in an area with ≥50% Latinos compared with <25% Latinos (aHR 1.56, 95% CI 1.19–2.04); and residing in a rural compared with an urban area at the time of diagnosis (aHR 1.73, 95% CI 1.06–2.70). Race and neighborhood poverty were not predictors among those with IDU, but were among those without.
Conclusion: HIV-positive Latinos with IDU history are at increased mortality risk and have unique contributing factors. Tertiary prevention strategies should target those who are older, diagnosed at later stages, and those who live in predominantly Latino and rural areas.

1. Introduction

The rate per 100,000 population of new human immunodeficiency virus (HIV) diagnoses is more than 3 times higher for Latinos than for non-Latino whites. Similarly, the rate of death among Latinos with HIV is 2 times higher than for non-Latino whites with HIV (Centers for Disease Control and Prevention (CDC), 2014). In 2011, there were 31,254 Latinos with HIV attributable to injection drug use (IDU) in the United States (US; CDC, 2014). Florida is among the top states in number of yearly HIV diagnoses and prevalent cases attributable to IDU (CDC, 2014). In 2011, among HIV cases attributable to IDU in Florida, 30% of males and 17% of females were Latino (Florida Department of Health, 2014a).

Latinos with HIV attributable to IDU experience poor outcomes along each step of the HIV care continuum when compared with Latinos in other HIV risk groups (Gant et al., 2014). Thus, it is expected that Latinos with HIV attributable to IDU have lower one and five year survival rates when compared with Latinos with HIV

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http://dx.doi.org/10.1016/j.drugalcdep.2015.07.007
0376-8716/

attributable to other transmission modes (Espinoza et al., 2008). In 2013, among individuals with HIV in Florida, 86% were linked to care, 55% were retained in care, 50% were receiving antiretroviral treatment, and 39% were virally suppressed (Florida Department of Health, 2014b). Outcomes along the HIV care continuum for injection drug users with HIV are partially affected by the availability of HIV and drug treatment programs, as well as related services in the area. Individuals living with HIV in Florida receive HIV services through the Acquired Immune Deficiency Syndrome (AIDS) Insurance Continuation Program (est. 1989), AIDS Drug Assistance Program (est. 1987), Ryan White HIV/AIDS Program (est. 1990), Medicaid/Medicare, non-governmental organizations, and case management programs (Florida Department of Health, n.d.). Statewide substance abuse treatment in Florida is primarily provided by the Substance Abuse and Mental Health Program under the Florida Department of Children and Families (Florida Department of Children and Families, 2014).

In addition to individual-level health care-related factors, neighborhood-level (e.g., as measured by census tract, zip code, county, etc.) social factors have been linked to HIV and drug use. HIV-positive injection drug users tend to reside in clusters and concentrate in high poverty areas (Martinez et al., 2014a). Living in socioeconomically disadvantaged areas is associated with high-risk injection drug use behavior (Buchanan et al., 2003; Genereux et al., 2010), HIV seroconversion (Maas et al., 2007), and low rates of drug use cessation among injection drug users (Genberg et al., 2011; Nandi et al., 2010). Contributing to the association between neighborhood disadvantage and drug use behaviors are increased psychological stress, decreased positive social networks, and fewer health and social support services (Boardman et al., 2001; Galea et al., 2003; Kirby and Toshiko, 2005). Neighborhood disadvantage also is associated with increased mortality risk among the general HIV-positive population (Hanna et al., 2008; Joy et al., 2008; McFarland et al., 2003). However, no studies to date have examined the association between neighborhood socioeconomic status (SES) and mortality among HIV-positive injection drug users.

Furthermore, neighborhood-level ethnic density (i.e., neighborhood racial/ethnic composition) is associated with health outcomes. Studies have shown lower all-cause mortality among the general Latino population who reside in neighborhoods with high Latino density (Bécares et al., 2012). Based on current data, the protective effect appears to be specific to Latinos (Bécares et al., 2012). Mechanisms for the ethnic density effect include lower perceived racism (Bécares et al., 2009; Whitley et al., 2006), enhanced social support (Das-Munshi et al., 2010; Halpern and Nazroo, 2000), and increased access to culturally appropriate health care (Benjamins et al., 2004; Whitley et al., 2006). The association between ethnic density and mortality has not been examined for individuals with HIV or who use illicit drugs.

Literature suggests interactions between HIV, drug use, and neighborhood factors. However, studies have focused predominantly on non-Latino populations. Thus, our objective was to: (a) examine disparities in mortality risk among HIV-positive Latinos with a history of IDU compared with those without a history of IDU, and (b) compare individual- and neighborhood-level predictors of mortality for these two groups.

2. Methods

2.1. Datasets

De-identified HIV surveillance records were obtained from the Florida Department of Health enhanced HIV/AIDS reporting system (eHARS). Cases of Latinos age ≥13 who met the Centers for Disease Control and Prevention (CDC) HIV case definition (Schneider et al., 2008) during the years 2000–2008 were analyzed. Vital status was ascertained through 2011 by linkage with Florida Vital Records, the Social Security Death Master File, and the National Death Index. Cases with missing or invalid data for ZIP code at time of HIV diagnosis, and cases diagnosed in a correctional facility, were excluded. The 2007–2011 American Community Survey (ACS) was used to obtain data by ZIP code tabulation area (ZCTA) (ACS, 2014a). ZCTAs are ZIP code approximations used by the US Census Bureau to tabulate summary statistics (US Census Bureau, n.d.). Hereinafter, ZIP code/ZCTA-level data will be referred to as neighborhood-level data.

2.2. Individual- and neighborhood-level variables

The following individual-level data were extracted from eHARS: ethnicity, race, HIV diagnosis year, sex at birth, age at HIV diagnosis, HIV transmission mode, birth country, HIV-to-AIDS interval in months (if case progressed to AIDS), HIV-to-death interval in months (if individual died by December 31, 2011), residential ZIP code at time of HIV diagnosis, and whether the case was diagnosed at a correctional facility. Thirteen neighborhood-level SES indicators were extracted from the ACS (Niyonsenga et al., 2013): percent of households without access to a car, percent of households with ≥1 person per room, percent of population living below the poverty line, percent of owner-occupied homes worth ≥$300,000, median household income in 2011, percent of households with annual income <$15,000, percent of households with annual income ≥$150,000, income disparity (derived from percent of households with annual income <$10,000 and percent of households with annual income ≥$50,000), percent of population age ≥25 with less than a 12th grade education, percent of population age ≥25 with a graduate professional degree, percent of households living in rented housing, percent of population age ≥16 who were unemployed, and percent of population age ≥16 employed in high working class occupation. We additionally extracted percent of population who identified as Hispanic or Latino from the ACS.

Individual- and neighborhood-level data were merged by matching the ZIP code at time of HIV diagnosis of each case with the ZIP code's corresponding ZCTA. Cases with IDU, or IDU plus MSM, listed as a mode of HIV transmission were categorized as having a history of IDU. Data on mode of HIV transmission were self-reported during HIV testing, reported by a health care provider, or extracted from medical chart reviews. Latinos were coded as US-born if they were born in any of the 50 states, District of Columbia, Puerto Rico, or any US dependent area. The 2011 ACS/US Census Bureau Hispanic origin classification was used to define birthplace for the Central America and South America categories (ACS, 2014b). We defined late HIV diagnosis as an AIDS diagnosis within 3 months of HIV diagnosis (CDC, 2013). Income disparity was calculated as the logarithmic of 100 times the percent of households with annual income <$10,000 divided by the percent of households with annual income ≥$50,000 and was used as a proxy measure of the Gini-coefficient (Niyonsenga et al., 2013; Singh and Siahpush, 2002). All neighborhood-level indicators were coded so that higher scores meant higher poverty and were standardized (Niyonsenga et al., 2013). The percent of Latinos/Hispanics in a neighborhood was divided into 3 categories: <25%, 25–49%, and ≥50% (Alvarez and Levy, 2012; Shaw et al., 2010). Categorization C of Version 2.0 of the Rural-Urban Commuting Area (RUCA) codes, developed by the University of Washington WWAMI Rural Research Center (WWAMI Rural Health Research Center, n.d.), were used to categorize neighborhoods into rural or urban status.

2.3. Statistical analyses

Following the analytical methods of Niyonsenga et al. (2013), we sought to develop an SES index using the 13 ACS indicators. First, we conducted a reliability analysis. The Cronbach's alpha for all 13 indicators was 0.9411. We selected 7 indicators based on the correlation of the indicator with the total index (high correlation), and the Cronbach's alpha if the item was deleted (low alpha). The 7 indicators selected were: percent below poverty, median household income, percent of households with annual income <$15,000, percent of households with annual income ≥$150,000, income disparity, percent of population age ≥25 with less than a 12th grade education, and high-class work. The resulting Cronbach's alpha increased (0.9564).

Second, we conducted a principal component analysis with and without varimax rotation, which revealed one factor with an eigenvalue greater than 1 (5.5632). These results are consistent with previous research (Krieger et al., 2003a, 2003b; Messer et al., 2006; Hogan and Tchernis, 2004). This factor accounted for 79.47% of the variance in the indicators. Because all the factor loadings were high (between 0.80 and 0.95), we retained all 7 indicators. The selected indicators were consistent with those chosen for the urban "poverty index" in Niyonsenga et al. (2013). Finally, we calculated a "poverty index" score by adding the standardized scores for the 7 variables and categorized the scores into quartiles.

Following development of the poverty index, we compared individual- and neighborhood-level characteristics by history of IDU. We used the Cochran–Mantel–Haenszel general association statistic for individual-level variables controlling for ZCTA, and the chi-square test for neighborhood-level variables. Third, we generated Kaplan–Meier survival curves for all-cause mortality by history of IDU and by neighborhood characteristics stratified by history of IDU. These analyses revealed a violation of the proportional hazard assumption. Therefore, the SAS macro PHSREG by Kohl and Heinze (2012) was used to run weighted Cox models. Multi-level (level 1: individual; level 2: neighborhood) modeling was used to account for correlation among cases living in the same neighborhood. Crude and adjusted hazard ratios and 95% confidence intervals were calculated comparing