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Social Determinants of Health and HIV/AIDS in Florida

Alane C. Ertel, BS & Robert J. Zeglin, PhD, LMHC, NCC

ABSTRACT

As of 2016, there were reported to be 135,986 people living with HIV/AIDS (PLWH) in Florida alone, and its cities lead the nation's incidence rates at around 5,000 new HIV diagnoses annually. Using a few social determinants of health (SDH) associated with deaths of despair (DOD), this paper aims to connect HIV rates to SDH to gain more understanding of how SDH can aid in the alleviation of HIV through public health policy and social change. Methods: This analysis evaluated the predictive ability of the SDH: Education, Insurance, Race, and RaceXEducation for HIV incidence in Florida using regression analysis. Results: A backwards regression analysis using the four variables a) Race, b) Insurance, c) Education, and d) RaceXEducation was statistically significant, $F(4,51) = 11.10$, $p < .001$, and accounted for 42% of the variance in HIV incidence. Higher rates of white residents and insured residents was associated with a significant decrease in HIV rate ($ps < .05$), while higher levels of education were associated with a significant increase in HIV rate ($p < .001$). The RaceXEducation interaction was significant in the negative direction ($p = .001$). Conclusion: Social Determinants of Health, particularly education and race, have a significant effect on HIV/AIDS prevalence and incidence and are great predictors of HIV status in Florida.

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BACKGROUND

According to the World Health Organization (WHO; 2018), approximately 37 million people worldwide are living with HIV/AIDS. More than 1.1 million people in the United States are living with HIV/AIDS (Centers for Disease Control and Prevention, 2018a). Of the 1.1 million people living with HIV/AIDS (PLWHA) in the US, Florida is home to approximately 116,994 (Florida Department of Health, 2018b). The Centers for Disease Control and Prevention (CDC; 2018b) noted that Florida had the highest HIV incidence in the US with 4,800 new diagnoses in 2017. There have been continuing increases in new HIV diagnoses in Florida each year since 2013 (Florida Department of Health, 2018b). For decades, public health efforts to reduce HIV infections prioritized barrier methods, early detection, and risk reduction. In recent years, with the advent of Pre-Exposure Prophylaxis (PrEP) and the official endorsement of Undetectable = Untransmittable by the CDC (see CDC, 2017), there is a growing focus on pharmacological HIV prevention efforts. In fact, Florida began offering free PrEP throughout the state in 2018 (Human Rights Campaign, 2018). Florida has identified HIV as one of its seven health priorities (Florida Department of Health, 2019).

Despite the prioritization of reducing HIV in Florida, there is still relatively little known about how social

factors influence the transmission of HIV in the state. Researchers have noted that the epidemiology of HIV, and any derivative intervention efforts, must include an examination of the social context within which the virus is being transmitted (Dean & Fenton, 2010; Poundstone, Strathdee, & Celentano, 2004). The WHO Commission on Social Determinants of Health (2008) identified a series of social determinants of health (SDH) that impact health, health outcomes, and health inequities, including HIV (Braveman, Egerter, & Williams, 2011; Braveman & Gottlieb, 2014). The SDH include factors such as housing, health insurance, race, employment status, gender, sexuality, income, and community crime (Braveman et al., 2011; Commission on the Social Determinants of Health, 2008; Gupta, Parkhurst, Ogden, Aggleton, & Mahal, 2008).

Previous studies have identified a significant association between SDH and HIV-related outcomes in the United States (Aidala, Cross, Stall, Harre, & Sumartojo, 2005; Campbell & Gibbs, 2009; Commission on the Social Determinants of Health, 2008; Zeglin & Stein, 2015). For example, Bhattacharya, Goldman, and Sood (2003) noted that the type of health insurance (i.e., public or private) has a significant impact on HIV-related mortality. Also, HIV continues to disproportionately impact communities of color and sexual minorities (CDC,

2018a). In Florida, a recent study noted that the SDH were significantly associated with deaths attributable to drug overdose, alcoholic liver disease, and suicide (Zeglin, Niemela, & Baynard, 2018), highlighting the possible extension of the SDH to HIV in the same state.

Purpose

Considering all of the aforementioned research, the aim of the current study is to determine whether and which SDH are associated with HIV incidence rates across Florida. By doing so, the results of the study could help identify the SDH with the greatest association to HIV transmission and thus inform intervention development and dissemination across the state. In essence, the goal is to help provide the social context within which the Florida Department of Health (2019) can achieve its stated priorities.

METHODS

Measures

The website for the Florida Department of Health Community Health Assessment Resource Tool Set (2018a) contained all relevant data and was thus the sole data source. Data were collected from all Florida counties. Because data from all counties was available, the initial sample size was $n = 67$.

The dependent variable, new HIV cases, was represented as a rate per 100,000 residents. The independent variables were SDH hypothesized to be associated with HIV. These included: a) Regular Medical Care, b) Insurance Coverage, c) Income, d) Education, e) County Health Expenditures, f) Unemployment, g) Unstable Housing, h) Age, and i) Race. These were operationalized as a) Percent of Adults with a Medical Checkup in the Last 12 months, b) Percent of Adults with any Type of Health Insurance, c) Median Household Income, d) Percent of Adults over 25 with a Bachelor's Degree or Higher, e) County Public Health Department Expenditures in Dollars per Resident, f) Unemployment Rate, g) Percent of Population that Had Lived in a Different House 1 year Earlier, h) Median Age, and i) Percent of Residents who are White.

Means and standard deviations for all variables are included in Table 1. Due to Florida Department of Health data collection cycles, not all variables were available for the same years. The dependent variable was the 2016 rate; the most recent year available. Table 1 includes the year of the data used for each variable.

Analysis

All analyses were conducted using SPSS version 24.0 for Windows. All independent variables were centered in order to improve interpretability of results. Also,

independent variable data points that were more than 2.5 standard deviations from the mean were removed from the analysis. A total of 10 counties were removed because of outlier data, resulting in a final sample size of $n = 57$.

Regression assumptions were tested and no deviations from linearity or homoscedasticity were evidenced. One variable, County Expenditures, did evidence a deviation in normality with a positive skew. To correct for this, the square root of all County Expenditure values was used in the regression analysis. Multicollinearity diagnostics showed a mean variable inflation factor of 3.08 (Max = 8.28) and a mean tolerance level of .46 (Min = .12). In the aggregate, these multicollinearity checks did not reveal a cause for significant concern.

A backwards multiple regression was conducted to identify the model containing the fewest individual predictors of HIV incidence in Florida counties. Considering the constraints on sample size, a criterion power analysis was conducted to identify the required alpha for use in the modeling. With an anticipated effect size of .25, $\beta = .20$, $n = 57$, and 10 independent variables (the model included a RaceXEducation interaction term), the critical alpha was calculated as $\alpha = .13$. This was the alpha used as the criterion for removal from the model at each step.

RESULTS

The backwards regression retained four variables in the final model: a) Race, b) Insurance, c) Education, and d) the RaceXEducation interaction term. This model was statistically significant, $F(4,51) = 11.10$, $p < .001$, accounted for approximately 42% of the variance in HIV incidence (see Table 2), and produced a mean residual of $-.851$. Though the alpha used as the backward regression criterion was $\alpha = .13$, all p-values in the final model were under the traditional alpha of $\alpha = .05$.

Higher densities of white residents and residents with insurance in a Florida county were associated with significantly lower HIV rates in that county (all $ps < .05$). Conversely, higher densities of residents with at least a bachelor's degree in a Florida county was associated with a significant greater HIV incidence in that county ($p < .001$). Also, the interaction between race and education was significant in the negative direction ($p = .001$; see Figure 1).

DISCUSSION

The results of this study were both expected and unexpected. The regression analysis produced a significant model predictive of HIV incidence in a Florida county. In fact, the three SDH of race, education, and insurance coverage accounted for 42% of the variance in HIV incidence, suggesting that

these are particularly important social factors that should be prioritized in future HIV-related public health programming. All three of these SDH share a common theme of healthcare access. Though, as discussed below, the relationship between any one of these SDH and healthcare access can be more complicated than anticipated, the need to examine whether residents of Florida counties have, believe

they have, and/or do access HIV-related healthcare services (e.g., testing, PrEP, condom distribution, Ryan White Programs). Additionally, the roles of race, education, and insurance should be included in such an examination, as the present study seems to suggest that these factors account for a sizable portion of HIV incidence in local Florida communities.

Table 1

Descriptive Statistics

Variable	Year of Measure	Mean	SD
Regular Medical Care (% of adults with recent medical checkup)	2013	70.30	4.29
Insurance Coverage (% of adults with health insurance)	2013	77.94	5.55
Income ^a	2015	43.71	7.21
Education (% of adults with at least a Bachelor's degree)	2015	20.16	8.86
County Expenditures ^b	2015	58.38	32.13
Unemployment Rate	2015	5.60	.86
Unstable Housing (% of population in different house than last year)	2014	14.96	2.55
Median Age	2015	43.14	5.00
Race (% of residents who identified as White)	2016	80.63	9.72
HIV Diagnoses ^d	2016	12.97	9.78

Notes: ^aIn \$1,000; ^bDollars per resident; ^cNumber of clinicians per 10,000 residents; ^dPer 100,000 residents

Table 2

Results of Linear Regression Predicting HIV Incidence

Variable	Unstandardized B	SE B	Standardized β
Race	-.380**	.12	-.337
Insurance	-.418*	.19	-.234
Education	.642***	.12	.561
Race X Education Interaction	-.048**	.01	-.355
Constant	13.89**	.12	
Adjusted R ²		.42	
SEE		7.13	
F		11.10***	

Notes: * = $p < .05$; ** = $p < .01$; *** = $p < .001$

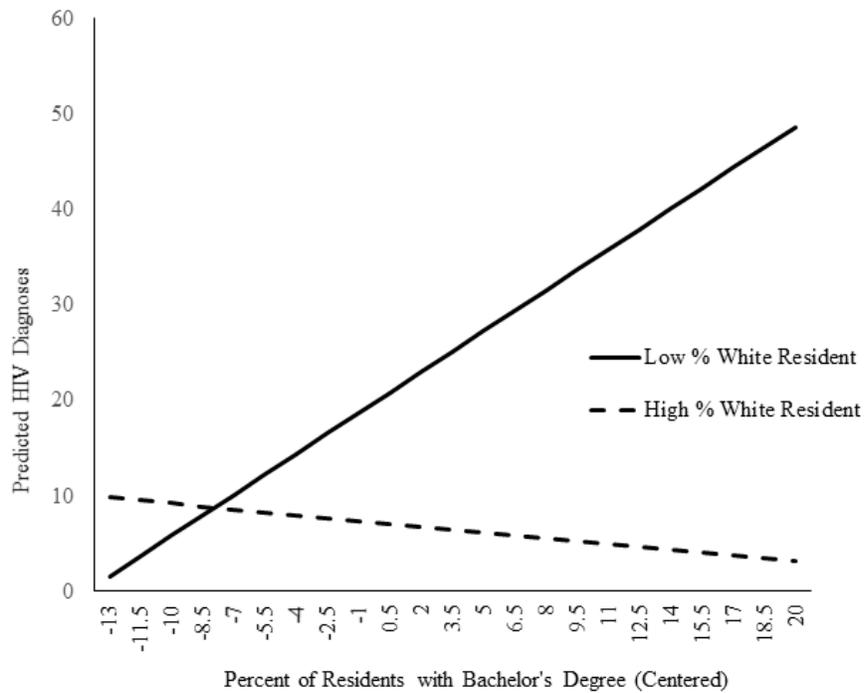


Figure 1. This figure shows the interaction between county education and county racial makeup. Low and high racial makeup was calculated as two standard deviations below and above the mean respectively

As the discussion below examines the independent predictors of HIV incidence, it is important to be mindful of the ecological fallacy. The aggregated county-level data used in the present analysis may not be fully representative of an individual resident's experience living within that county. As such, the following framing of the results within extant literature should be read with that possibility in mind. Future studies, particularly those that employ multilevel analysis, would be better equipped to address this issue. Nonetheless, considering the sizable proportion of variance accounted for by the model presented in this study, these independent predictors still warrant individual discussion.

As expected, a higher density of residents with health insurance was associated with a significantly lower HIV incidence in Florida counties. This most reasonably seems to be attributable to the increased access to care that health insurance coverage affords. This includes greater access to many HIV-related services (e.g., screening, testing, counseling, and treatment; Oney, 2018). Perhaps even more directly, insurance coverage helps patients, especially members of high-risk communities, afford HIV prevention medications such as PrEP; medications that have been shown to have a substantial impact on decreasing HIV transmission in the US (Underhill, 2012). An additional hypothesis for this result relates to greater availability of primary care providers in areas with higher insurance coverage density. This hypothesis is in need of further testing by future research, but does have a basis in past literature linking insurance coverage with geographic access to healthcare (Ricketts, Randolph, Howard, Pathman, & Carey, 2001).

Similarly, congruent with past research, race was identified as a significant independent predictor of HIV incidence. Counties with higher densities of white residents evidenced lower HIV incidence. Communities of color have consistently been disproportionately affected by the HIV epidemic (Centers for Disease Control and Prevention, 2018a; Reif et al., 2015). Research has called attention to the fact that individual risk factors (e.g., risky sexual behavior) are insufficient in explaining why these communities are at greater risk for HIV, calling attention to the SDH that contextualize these risk factors (Friedman, Cooper, & Osborne, 2009; Millett, Flores, Peterson, & Bakeman, 2007). Access, as discussed above, and stigma have been identified in the literature as significant SDH to consider when examining the role of race in HIV transmission (Arnold, Rebchook, & Kegeles, 2014; Earnshaw, Bogart, Dovidio, & Williams, 2013; Friedman et al., 2009). The present analysis, by finding race as an independent predictor of HIV incidence in Florida counties, reinforces this call when planning and

implementing HIV reduction programming in the state. One innovative and timely solution that has potential to combat both poor access and stigma is telehealth, whereby patients can attend healthcare appointments virtually from the comfort of their home (Saber, Yuan, John, Sheon, & Johnson, 2013; Stephenson et al., 2017).

Surprisingly, this study found that increasing density of residents with a bachelor's degree was associated with increased HIV at the county-level. This is contrary to the typical results identified when studying SDH and HIV (e.g., Aggleton, Yankah, & Crewe, 2011; Wilson et al., 2015). There are two primary hypotheses as to why the current study identified a positive association between education and HIV incidence in Florida counties. First, there is a possible link between education and perceived HIV susceptibility. Haile, Kinogir, Dalrington, Basta, and Chavan (2017) found that 81.5% of university students believed that they were not susceptible to HIV. A study conducted in Florida (Villanueva et al., 2010) noted that participants with higher education were less likely to report a heightened risk of HIV. Though there is need for further research into why this association seems true in Florida, it may be the result of the state's anemic sexuality education in general (Sexuality Information and Education Council of the United States, 2018). This may mean that more poor education is not protective against HIV in Florida. Future research should prioritize the role of education in HIV risk perceptions and behaviors in Florida. It may also be important for Florida to begin including education level on their official HIV testing forms (i.e., DH1628; Florida Department of Health, 2019) in order to better track this association. Another explanation for the results of the present study could be related to increased HIV testing, as past research has identified a significant association between educational attainment and testing behavior. This may be the result of increased testing self-efficacy and/or access. Future research is needed to further elucidate which. Nonetheless, the results of the present study do, perhaps, call attention to an opportunity to continue prioritizing Florida colleges and universities for HIV testing efforts.

Another surprising finding of this study was the interaction between race and education. The results showed that higher density of residents with a bachelor's degree was a protective factor for counties with high percentages of white residents, but a risk factor for counties with a low percentage of white residents. There are two hypotheses for the identified pattern of interaction. First, the general health disparity experienced by communities of color (Centers for Disease Control and Prevention, 2005; The Kaiser Family Foundation, 2019) may be so pervasive in Florida that education alone is not enough

to counteract it. This is congruent with Assari's (2018) discussion of "diminished gain" from protective SDH for communities of color. The second hypothesis, admittedly opaquer, is that communities of color may prioritize attaining a successful education over health and healthy behaviors due to the aforementioned disparities in SDH (Fischer, 2007). For example, white non-first-generation students have greater access to parental support systems (e.g., insurance, finances, healthcare system knowledge), whereas students of color and first-generation students do not (Bui, 2002; Fischer, 2007). At the same time, the latter communities may be more likely than white communities to consider education as essential to gaining access to SDH, as white communities do not experience the same inherent systemic barriers to those SDH. This is to say that communities of color may regard higher education as the skeleton key to equity, while white communities hardly regard it at all or except as the natural course of things (Fischer, 2007; Scutchfield & Keck, 2017). Because of this, communities of color, particularly as college students, may not seek out health services (e.g., testing, prevention) due to lack of time, system knowledge, or support (Bui, 2002; Fischer, 2007; Stephens, Fryberg, Markus, Johnson, & Covarrubias, 2012). Both hypotheses are adolescent and require additional future research to fully develop. In either case, the results of the present study may signal an opportunity to work with university student groups that serve students of color in Florida to advocate for HIV education, prevention, and testing.

Limitations

There were some limitations of which the reader should be mindful while reviewing this study. First, the Florida Department of Health data collection cycles prevented the collection all data from the same year. This resulted in data that was collected between the years 2013 and 2016, which may have influenced the results of this study. Secondly, 10 counties had to be removed from the data analysis due to outlier data which may have impacted the results. This removal also meant that valuable information that could have been gained by analyzing those counties was not collected. Lastly, it is important to note that there is a potential ecological fallacy between individual-level and aggregated county associations, possibly accounting for county associations that do not correlate to individual experiences of residents.

Conclusion

In 2017, there were more than 13 new HIV diagnoses every day in Florida (Florida Department of Health, 2019). With Florida ranking first in the US on this measure (CDC, 2018b), it is imperative that more researchers discover the predictive factors of HIV

incidence in order to more effectively reduce, and one day eliminate, new cases of HIV in Florida, a stated priority of the state's Department of Health (Florida Department of Health, 2019). This study used the social determinants of health model to successfully discover some of these predictive factors. The results show that the social determinants of health of education, insurance, and race account for a sizable proportion of variance in HIV incidence in Florida counties. This supports the evidence that social determinants of health are reliable indicators of health, and important harbingers for HIV intervention efforts in the state. Using this knowledge, lawmakers and public health personnel should focus their attention on improving health policies and interventions affecting or affected by the social determinants of health identified in this study.

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