(DIS)ABILITY-INFORMED HIV SCREENING IN THE UNITED STATES:

A Cross-Sectional Study Examining the Relationship between Disability and HIV Testing using NHANES Data

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Ethics for this study is covered by 7.10 in UBC's Policy #89: Research and Other Studies Involving Human Subjects and Article 2.2 of the TCPS-II

BACKGROUND

- In the United States, 38,281 people were diagnosed with HIV in 2017[1]. Knowledge of serostatus is an important **entry-point** for linkage to care; however, rates of HIV-testing are uneven across the US and globally[2].
- Some research suggests that this disparity is linked to avoidance of HIV testing for social, economic, or sexual health reasons[2,3]. In the US, one of the most common socioeconomic **barriers** to accessing health services is disability[4].
- People living with disabilities (PLWD) experience **barriers** to accessing sexual health resources, such as testing, barrier methods, and informational and educational sources[5,6].
- PLWD are underrepresented in sexual health research. In the US, there is a paucity of literature surrounding HIV/AIDS among PLWD.

STUDY AIMS

1) Is there is an association between having a disability and HIV testing, and
2) Does access to HIV testing differ by type of disability?

METHODS

Data source: National Health and Nutrition Examination Survey (NHANES) 2013-2014 and 2015-2016 Cycles.

Sample: US residents aged 18-60.

Primary analysis: A survey-weighted multivariable logistic regression model was fit to examine the association between disability and ever being tested for HIV using complex survey data features for cluster, strata, and weight data.

Secondary analysis: Restricted analysis to each type of disability to assess whether there were differences in effect estimate at each level.

Sensitivity analysis: A missing data analysis was conducted using Multivariate Imputation by Chained Equations (MICE)[7].

PRIMARY EXPOSURE

NHANES *disability questionnaire* (incorporated in 2013): If participants answered "yes" to any of the following questions they were counted as having a disability:

1. *Have serious difficulty hearing?*
2. *Have serious difficulty seeing?*
3. *Have serious difficulty concentrating?*
4. *Have serious difficulty walking?*
5. *Have difficulty dressing or bathing?*
6. *Have difficulty doing errands alone?*

OUTCOME

"HIV Testing" derived from the question "has your blood ever been tested for HIV?" in NHANES current health status questionnaire (HSQ).

Note: HIV data availability in NHANES is poor

ANALYTIC SAMPLE

8599 adults aged 18 to 60 in the NHANES 2013-2014 and 2015-2016 cycles were included in this study, and 3090 complete case data were included in the primary and secondary analyses (**Figure 1**).

STATISTICAL ANALYSIS

- Backward elimination for potential confounders.
- ANOVA to test effect modification.
- Design-adjusted Rao-Scott Chi-Square test to test for independence.
- Archer-Lemeshow test to assess goodness-of-fit.
- All imputations and analyses were conducted in R version 3.2.3.

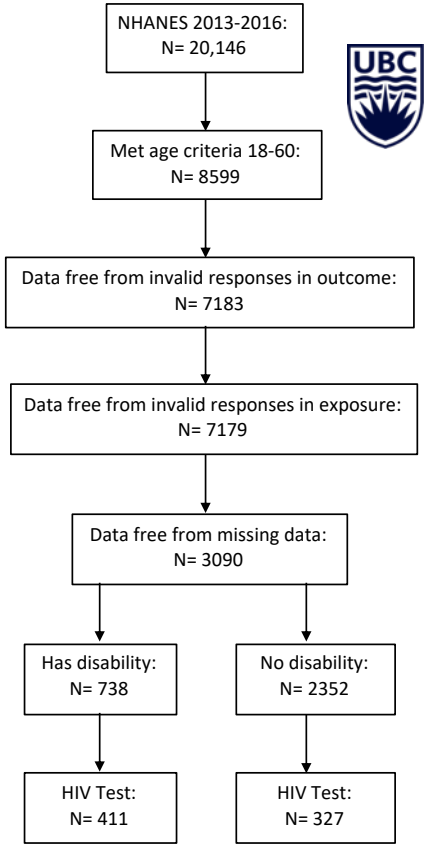

Figure 1. Flow chart of the analytic sample selection using data from the National Health and Nutrition Examination Survey (NHANES) 2013-2014 and 2015-2016 cycles. The primary exposure is disability and primary outcome is HIV test.

RESULTS

Primary analysis: Crude and adjusted odds ratios for disability and HIV testing in the present study, and variables included to address confounding.

PRIMARY ANALYSIS	HIV Test			
Variables	**Levels (vs. reference)**	**Unadjusted OR (95% CI)**	**Adjusted* OR (95% CI)**	**P-value (Adjusted)**
Disability	Yes	1.25 (1.01, 1.55)	1.24 (0.85, 1.80)	0.26
Potential Confounding (reference)				
Coping with Depression (No difficulty)	Somewhat difficult	1.06 (0.855, 1.32)	0.97 (0.76, 1.22)	0.78
	Very difficult	1.20 (0.74, 1.95)	0.80 (0.48, 1.34)	0.39
	Extremely difficult	1.87 (0.96, 3.68)	1.18 (0.60, 2.33)	0.63
Sex (Females)	Males	**0.79 (0.66, 0.95)**	0.83 (0.67, 1.04)	0.10
Age		0.99 (0.99, 1.00)	0.99 (0.99, 1.00)	0.13
***Race** (White)*	**Asian**	**0.58 (0.43, 0.77)**	**0.59 (0.44, 0.79)**	***0.00**
	Black	**2.54 (2.07, 3.13)**	**2.66 (2.15, 3.29)**	***0.00**
	Hispanic	1.07 (0.88, 1.31)	**1.23 (1.01, 1.52)**	***0.05**
	Other/Multi-race	**1.59 (1.00, 2.54)**	**1.65 (1.02, 2.67)**	***0.04**
Education (School)	High school	1.16 (0.78, 1.72)	1.25 (0.85, 1.83)	0.25
	College	**1.56 (1.07, 2.28)**	**1.85 (1.28, 2.69)**	***0.00**
***Any STI** – excluding HCV (No)*	**Yes**	**1.76 (1.28, 2.41)**	**1.61 (1.16, 2.24)**	***0.00**
***HCV** (No)*	**Yes**	**6.06 (1.95, 18.85)**	**7.48 (2.43, 23.00)**	***0.00**
***Seen Mental Health Professional in Past 12 Months** (No)*	**Yes**	**2.06 (1.58, 2.69)**	**1.92 (1.43, 2.57)**	***0.00**

*Adjusted ORs were obtained after controlling for depression coping, age, race, education, HCV infection, the presence of any other STI, access to a mental health professional in the past twelve months, and effect modification of sex on disability. The absence of collinearity was verified (all Variable Influence Factors <2), and Wald test was used to double-check less important variables (with the highest p-values) in the backward elimination procedure individually, and biologically interesting interaction terms were added if significant ($p<0.05$). Model discrimination assessed using a weighted Receiver Operator Curve (ROC) was poor (AUC=0.64), but the Archer-Lemeshow test for goodness of fit found no evidence of lack of fit (p-value= 0.23).

Secondary analysis: Adjusted odds ratios for each disability question included in the NHANES Disability Questionnaire from 2013-2016 and ever being tested for HIV.

SECONDARY ANALYSIS	HIV Test	
Disability Type	Adjusted* OR (95% CI)	P-value
Difficulty Hearing	1.20 (0.76, 1.92)	0.43
Difficulty Seeing	**0.49 (0.25, 0.94)**	***0.03**
Difficulty Concentrating	**1.43 (1.02, 1.96)**	***0.04**
Difficulty Walking	0.98 (0.71, 1.34)	0.88
Difficulty Dressing/Bathing	0.89 (0.48, 1.63)	0.70
Difficulty with Errands	0.87 (0.59, 1.30)	0.50
SENSITIVITY ANALYSIS: *Missing Data Imputed*		
Disability	1.14 (0.83, 1.57)	

Sensitivity analysis: Outcome model using imputed datasets for: *education*, *any STI (besides HCV)*, and *depression coping* variables. Estimates were pooled according to Rubins' rules.

DISCUSSION

***This study found no significant association between disability and ever being tested for HIV after adjusting for relevant covariates**. Though the primary findings of this study were nonsignificant, the **secondary findings showed significant differences among disabilities**, which shows that disabilities are highly contextual and will impact experiences accessing health services in unique ways.*

LIMITATIONS

- Cross-sectional study; cannot ascertain causality
- Self-report data, including outcome (ever tested for HIV) which introduces risk for information biases
- High rate of missing values across conceptually important covariates.
  - To address missingness, a sensitivity analysis was conducted using multiple imputation methods to impute missing values
  - Potentially problematic missing at random (MAR) assumption, wherein the missing data are associated with the observed values
- The non-response rate in the drug-related variables available in NHANES prevented their inclusion in the analysis

IMPLICATIONS FOR FUTURE RESEARCH

The majority of the literature on disability and HIV focuses on the ***development of disabilities among people already living with HIV***, or aging with HIV, and this research increasingly explores disabilities that are episodic in nature—the experiences of individuals who go through periods of wellness and illness are not well understood and should be considered in future research[8,9].

Future studies should be designed to account for temporality to better understand how the presence of a disability might impact access to HIV testing. This study would benefit from community-driven research informed by syndemic theory, taking into consideration the complexity of larger socioeconomic and cultural forces that influence access to sexual health services for people living with disabilities.

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