Distribution Agreement

In presenting this thesis as a partial fulfillment of the requirements for a degree from Emory University, I hereby grant to Emory University and its agents the non-exclusive license to archive, make accessible, and display my thesis in whole or in part in all forms of media, now or hereafter now, including display on the World Wide Web. I understand that I may select some access restrictions as part of the online submission of this thesis. I retain all ownership rights to the copyright of the thesis. I also retain the right to use in future works (such as articles or books) all or part of this thesis.

Phoebe Taiwo March 27, 2024

Examining the Relationship Between Physical and Mental Comorbidities and Human Immunodeficiency Virus (HIV) Serostatus in Black Women

by

Phoebe Taiwo

Anna Rubtsova, PhD
Adviser

Rachel Hall-Clifford, PhD
Adviser

Anthropology

Anna Rubtsova, PhD

Adviser

Rachel Hall-Clifford, PhD

Adviser

Craig Hadley, PhD

Committee Member

2024

Examining the Relationship Between Physical and Mental Comorbidities and Human Immunodeficiency Virus (HIV) Serostatus in Black Women

By

Phoebe Taiwo

Anna Rubtsova, PhD

Adviser

Rachel Hall-Clifford, PhD

Adviser

An abstract of
a thesis submitted to the Faculty of Emory College of Arts and Sciences
of Emory University in partial fulfillment
of the requirements of the degree of
Bachelor of Science with Honors

Anthropology

2024

Abstract

Examining the Relationship Between Physical and Mental Comorbidities and Human Immunodeficiency Virus (HIV) Serostatus in Black Women

By Phoebe Taiwo

Background: Black women are disproportionately affected by Human Immunodeficiency Virus (HIV) as compared to women of other races/ethnicities. People with HIV (PWH) are more likely to have Serious Mental Illnesses compared to the general public. Socioeconomic factors and physical comorbidities can also negatively affect PWH. The objective of this study was to compare the mental health outcomes in Black women with and without HIV, and to examine if there is any correlation between mental illness and physical comorbidities in these two samples. **Methods:** This study is a retrospective analysis of 81 Black women with HIV and 43 ("at-risk") Black women without HIV who are participants of the SCORE-BBH study. Chi-square tests and t-tests were used to assess the differences in the demographics, socioeconomic factors, physical comorbidities, and mental illnesses between the two serostatus groups. We used Pearson correlations and unadjusted logistic regressions to examine associations between the mental illness and physical comorbidities variables. Logistic regression models were fit to examine associations between mental illness variables, adjusting for the sociodemographic covariates (age, income, education, and marriage status). **Results:** The seronegative women had on average, higher scores for depression, PTSD, and anxiety. There was a statistically significant correlation between all the mental illnesses in the seropositive samples, which remained after adjusting for socioeconomic status. The seronegative participants had a correlation between anxiety and PTSD, and depression and anxiety, no correlation between PTSD and depression. However, after adjusting for socioeconomic status, the associations were no longer significant. There was also a significant association between anxiety and diabetes, when adjusting for socioeconomic status in

the seropositive sample. **Conclusion**: This study provides limited evidence of associations between depression, anxiety, PTSD, and some physical comorbidities in Black women with HIV.

Examining the Relationship Between Physical and Mental Comorbidities and Human Immunodeficiency Virus (HIV) Serostatus in Black Women

By

Phoebe Taiwo

Anna Rubtsova, PhD

Adviser

Rachel Hall-Clifford, PhD

Adviser

A thesis submitted to the Faculty of Emory College of Arts and Sciences
of Emory University in partial fulfillment
of the requirements of the degree of
Bachelor of Science with Honors

Anthropology

2024

Acknowledgements

I would like to thank my Honors Committee, Dr. Rubtsova, Dr. Hall-Clifford, and Dr. Hadley, for their mentorship and feedback throughout this project. I would also like to extend a special token of appreciation to Dr. Igho Ofotokun, Antonina Foster, and the MACS/WIHS CCS Atlanta team who have provided me a space to learn and grow in academic research over the last four years.

Finally, I would like to express my deepest gratitude for my parents whose unwavering support and countless hours of guidance have been instrumental in shaping not only this thesis, but the person I am today. Their wisdom, encouragement, and boundless patience have been invaluable throughout this journey.

Table of Contents

Chapter #1: Literature Review & Introduction

Human Immunodeficiency Virus (HIV)

The Human Immunodeficiency Virus (HIV) has constituted a significant global health epidemic since its emergence in the mid to late 1970s (*CDC.gov*, 2021). As a retrovirus, HIV specifically targets the immune system, focusing on CD4 cells (T cells) that are instrumental in safeguarding the body against infections and diseases. If undetected or untreated, HIV can progress to the severe stage known as Acquired Immunodeficiency Syndrome (AIDS). The Centers for Disease Control (CDC) characterizes AIDS as a significant weakening of the immune system, rendering individuals more susceptible to opportunistic infections and, in some instances, certain cancers (CDC, 2021).

According to the CDC, HIV can only be transmitted through direct contact with certain bodily fluids (i.e. blood, semen, rectal fluids, vaginal fluids, etc.) from a person who has a detectable HIV viral load. "Viral load" is defined as the amount of HIV in the blood of someone who has HIV. For transmission to occur, HIV in bodily fluids must enter a seronegative person's bloodstream "through a mucous membrane (found in the rectum, vagina, mouth, or tip of the penis), through open cuts or sores, by direct injection (from a needle or syringe), or transfusion of infected blood products (*HIV.gov*, 2021). In the United States of America, the most common forms of transmission continue to be through sexual intercourse (male-to-male and heterosexual sexual contact) and direct injection, usually from drug-related activities (*HIV.gov*, 2021).

Based on recent CDC estimates, approximately 1.2 million individuals aged 13 or older were living with HIV in the United States by the end of 2021. Within this total, "approximately 32,100 new HIV infections occurred in the year 2021 (*CDC, 2021*). These figures reveal a significant reduction (66%) in annual HIV infections since the peak of the epidemic in the mid-

1980s and a 12% decrease in new infections from 2017-2021 (*HIV.gov,* 2021). Despite an overall decline in new HIV cases, certain demographics continue to experience disproportionately high infection rates.

Although Black individuals constituted approximately 12% of the U.S. population, they accounted for 40% of new HIV infections in 2021. Moreover, according to the CDC, Black females accounted for 54% of new HIV diagnoses among people assigned female sex at birth, though women only accounted for 18% (6,666) of the 36,136 new HIV diagnoses. Further, Black women are disproportionately affected by HIV as compared to women of other races/ethnicities. Although annual HIV infections remained stable overall among Black women from 2015 to 2019, **t**he rate of new HIV infections among Black women was 11 times that of white women and four times that of Latina women (CDC, 2021).

Comorbidities

The term "comorbidities" refers to an individual having two or more diseases at the same time (*NIH.org,* n.d.). Comorbidities are typically associated with "worse health outcomes, more complex clinical management, and increased health care costs" (Valderas et al., 2009). Comorbidities in HIV can be defined as "a disease outside the scope of an AIDS-defining illness" (Lorenc et al., 2014).

Mental Illness

Mental health in the United States is a multifaceted and complex issue that significantly impacts individuals, families, and communities across the nation. The mental health landscape is characterized by successes and challenges, reflecting the dynamic interplay of various factors, including social, economic, cultural, and healthcare elements.

According to the National Institute of Health/National Mental Health Institute (NIH/NMHI), Mental Illness is quite common, as an estimated 57.8 million adults aged 18 or older struggle with some type of mental illness across the nation. Mental illnesses are placed into two categories: Any Mental Illness (AMI) and Severe Mental Illness (SMI). Per the NMHI, AMI is defined "as a mental, behavioral, or emotional disorder that can vary in impact, ranging from no impairment to mild, moderate, and even severe impairment." Conversely, SMI is defined as "a mental, behavioral, or emotional disorder resulting in serious functional impairment, which substantially interferes with or limits one or more major life activities." In cases of SMI, the burden of mental illnesses is particularly concentrated among those who experience disability due to it.

Mental illness affects individuals irrespective of sex, yet women specifically often face unique challenges and societal expectations that can contribute to distinct manifestations of psychological distress. Research indicates that women are more likely than men to experience conditions such as depression and anxiety disorders. According to the NIH, 27.2% of people who identify as female had any mental illness in the United States (2021). Further, the prevalence of SMI was higher among females (7%) than males (4%). The World Health Organization (WHO, 2019) also highlights how factors like hormonal fluctuations, reproductive life events, and social determinants contribute to women's increased vulnerability to mental health issues.

Other specific factors can also worsen the effects of the mental illnesses that individuals may be grappling with. Elements like socioeconomic, racial, & cultural issues and physical illness could also contribute to the exacerbation of mental health challenges and are important components in the research that I am currently embarking on.

HIV & Mental Health

According to the CDC, the same factors that increase the risk of mental illnesses in otherwise healthy people also raise the risk in people with other medical illnesses, particularly chronic illnesses. Depression, for example, is common among people who have chronic illnesses such as people with HIV (PWH). The prevalence of mental health issues, such as substance abuse, depression, PTSD, sleep disturbances, and psychosis is notably elevated, ranging from 1.5 to 8 times higher among PWH, compared to those in the general or uninfected population (Nedelcovych et al., 2018). This type of relationship indicates that mental illness is a comorbidity of HIV. In a study by Travaglini et. al (2018), PWH are three times more likely to have a co-occurring mood disorder, five times more likely to have a substance use disorder, and eight times more likely to have an SMI (e.g., schizophrenia, bipolar disorder) compared to the general public.

Further, PWH tend to experience more instances of traumatic experiences and have higher prevalence rates of post-traumatic stress disorder (PTSD) relative to the general population (20–45% vs. 6.8%, respectively). Travaglini et. al also found that women with HIV (WWH) report higher levels of HIV stigma, greater psychiatric concerns (most notably trauma experiences and symptoms), increased difficulty coping with their positive HIV status, and less perceived social support than men with HIV (MWH). WWH can also face debilitating instances of stigma that negatively impact their relationship with the disease. Research conducted by Heer et. al (2022) found that traditional gender roles may have an impact on treatment and adherence to life-saving antiretroviral therapy or ART. Because women are often placed in roles such as caregivers for children, elderly parents, and extended family members, they may not prioritize their own medical care. This can make them more vulnerable to developing serious health

problems on top of HIV/AIDS. Women can also be placed in harmful domestic situations, which can lead to isolation and depression, further impeding their adherence to ART (Heer et. al, 2022).

Other socioeconomic factors, such as race/ethnicity, poverty, and education level can also interact with gender. Black WWH specifically have their own realm of problems related to mental health and racially related stigma. As described by Dale SK et. al (2020), the lives of Black WWH are impacted by mental health struggles, such as depression and social and structural adversities, including racial discrimination and gendered racial microaggressions. Wright et al. (2022) found that in a sample of 151 Black WWH (BWWH), negative neighborhood characteristics (e.g., unemployment, low education, crime, income, and low-income housing) were significantly related to higher levels of intersectional stigma and discrimination. Moreover, Ojikutu et. al. (2018) also found common themes of psychological distress, anxiety, and depressive symptoms, HIV-related stigma (especially heightened in the African immigrant community), intimate partner violence (IPV), and economic insecurity in communities of BWWH in New York City and Boston. Some of the women from this study were undocumented, which heightened stress and anxiety and led to further difficulties in attaining care for their illnesses.

HIV & Physical Health/Comorbidities

HIV is also known to have severe physical affects in PWH. The weakened state of the immune system not only leaves the person vulnerable to infections, but also causes inflammation throughout the body. The NIH/NIMH (2023) reports that virus-caused inflammation can damage the central nervous system (the spine and the brain), leading to neurological complications, and even neurocognitive disorders.

HIV is also commonly associated with physical comorbidities that negatively affect PWH. Some common physical comorbidities for PWH, especially among the older people in this population, are diabetes mellitus, cardiovascular disease (CVD, e.g. hypertension), respiratory diseases (e.g. chronic obstructive pulmonary diseases and pneumonia), and hepatic diseases (hepatitis B and C) (Lorenc et al., 2014; Chhatre et al., 2022; Gallant et. al, 2017). Certain physical illnesses and comorbidities are also associated with socioeconomic factors, such as obesity (Anekwe et al., 2021) and diabetes (Hill-Briggs et al., 2021).

Applications in Society

When examining BWWH, the intricate interplay between their social treatment and the impact it has on their mental well-being is particularly evident. Therefore, discovering if and how HIV and its mental and/or physical health comorbidities interrelate could be instrumental in how Black women living with these ailments should receive and respond to treatment. Further, addressing both the racial and gendered health inequities surrounding mental health and HIV is imperative when considering clinical health care.

The syndemic theoretical framework is a lens through which to analyze the relationship of HIV/AIDS and its mental & physical comorbidities. According to Singer's (1996) original theory, syndemics are comprised of three central ideas: "two or more diseases cluster together in time or space; these diseases interact in meaningful ways, whether social, psychological, or biological; and harmful social conditions drive these conditions" (Singer, 1996; Mendenhall et al., 2022). Additionally, syndemic theory (ST) theorizes how social environments, particularly conditions of inequality and injustice, play a role in the clustering and interaction of diseases, as well as in exacerbating vulnerability (Singer et al., 2017). This can be useful in understanding HIV and the prevalence/severity of its comorbidities, as the theory explains how these co-

occurring diseases can be synergistically affected by negative biological, socioeconomical, and psychiatric interactions. Pellowski et al. (2013) characterizes HIV transmission as a "biological event that is entirely dependent on social context and behavioral practices… a function of four interrelated factors: Biological Factors, Risk Behaviors, HIV Prevalence, and Social Factors". A popular conceptualization of this interaction is these four factors as interlocking gears, where "changes in one cog invariably shift the next" (Strathdee et al., 2012). In the context of this theory, the socioeconomic inequalities, physical (biological) health, and mental illness facets surrounding BWWH can interact with each other, making the outcomes of each disease worse.

Moreover, anthropological theories, like ST, can provide valuable insights in examining the unique challenges faced by different demographic groups living with HIV and its comorbidities, and further guide clinical healthcare practices in emphasizing the social determinants of health when establishing treatment (Mendenhall et al., 2022).

Research Objectives

I plan to conduct research with the Emory University branch of the Specialized Center of Research Excellence (SCORE) study. My proposed study is well-aligned with the research done at SCORE, especially because the study collects annual data regarding mental illness symptoms and behaviors from both WWH and women without HIV. I intend to use a retrospective study design to analyze female-identifying participants (both seropositive and seronegative).

Recognizing and addressing the factors that influence physical and mental health outcomes for BWWH is essential for the development of culturally competent interventions and policies aimed at promoting mental well-being within this population. Several studies have shown that perceived quality of life and social stigma influence physical and mental health diseases in BWWH; the most common mental health disorder being depression (Dale et. al,

2020; Ojikutu et. al, 2018; Waldron et. al). Additionally, studies have indicated a correlation between mental illness and physical health comorbidities among BWWH, suggesting interactions between multiple health issues as predicted by ST. For example, Heer et al. (2022) reported that 47.1% of their sample of WWH (n=1,039) reported both physical and mental health comorbidities. The focus on comorbidities could lend insight into the effects of disease burden in WWH. My literature review and ST framework have led me to believe that BWWH are at increased likelihood of poor mental and physical health relative to Black women at-risk for HIV.

Research Questions & Hypothesis:

1.) Do Black women diagnosed with HIV have worse mental health outcomes than similar Black women without HIV?
2.) Is there a correlation between mental illness and physical comorbidities in Black women who have HIV compared to those who do not have the disease?

Regarding these research questions, my hypothesis is:

There would be more instances of mental illness among Black women with HIV and they would most likely be more severe, and in Black women living with HIV mental illnesses would be positively correlated with physical comorbidities.

Chapter #2: Methods

Study Design

Emory Specialized Center of Research Excellence in Sex Differences (SCORE)

To carry out my research, I leveraged data sourced from the Emory Specialized Center of Research Excellence in Sex Differences (SCORE). Established in 2018, Emory SCORE is a research group supported by the National Institutes of Health (NIH) dedicated to advancing Emory University's exploration of "the influence of biological sex on disease" by providing research funding, support, and education (SCORE, n.d.). The participant pool for my study was derived from one of Emory SCORE's projects based at Grady IDP Clinic in Atlanta, Georgia. The SCORE Brain, Bone, Heart (BBH) study, spearheaded by Principal Investigators Dr. Ofotokun and Dr. Lisa Haddad, has been actively engaged in researching the burden of HIV/AIDS among women of childbearing age.

According to SCORE, "Understanding mechanisms underlying ongoing inflammation in virologically suppressed women living with HIV (Human Immunodeficiency Virus) could ultimately lead to novel preventative and therapeutic interventions to limit inflammation and subsequent end organ damage in the women" (Mehta et al., 2022, p. 2). The study population includes WWH and at-risk women without HIV (as controls). According to a summary of the project, Emory SCORE "investigates the effect of relative estrogen insufficiency" in WWH through the Brain, Bone, Heart (BBH) study. Because of their overlap in population and convenience in location, the BBH study is a sub-study of the larger Multicenter AIDS Cohort Study / Women's Interagency HIV Study Combined Cohort Study (MWCCS).

BBH Study Procedures

Data Collection

To enhance efficiency in gathering data, cutting expenses, and lessening the load on participants, BBH uses extensive data obtained from the primary study (MWCCS). This includes numerous factors such as social and demographic details, medication usage and compliance, health-related behaviors, medical background, and blood chemistry with lipid profiles. These data elements are collected by MWCCS over a series of visits: an entry (baseline) and annual follow-up visits.

BBH also employs project-specific data gathering at study entry, one-, and two years post-study entry (Mehta et al., 2022). These visits include interviews, selected bloodwork, and collections of specimens for all participants. The interviews cover a broad range of physical and mental health topics, while the fully comprehensive examinations (data provided by MWCCS) cover many of the physical comorbidities that may burden women living with HIV.

Participants

Again, considering that SCORE BBH has historically taken a substantial proportion of their study population from the primary study MWCCS, the eligibility criteria for SCORE BBH has similarities to that of MWCCS. Some are as follows: 1.) Women between the ages of 30 and 70 years who are living with HIV, OR at risk for HIV (HIV negative), who can give informed consent and willing to have blood drawn and regular HIV testing in accordance with the protocol stated timeline, if they are HIV negative, 2.) They must have never used the following HIV medication: ddI (Videx, didanosine), ddC (Hivid, zalcitabine), or d4T (Zerit, stavudine), and 3.) They could not have been born with HIV.

It is important to note that the seronegative women in the study have their own eligibility criteria to determine if they are considered "at-risk" for HIV/AIDS. These criteria are based on IV/hard drug use (ex. crack, cocaine, heroin, etc.), sexual behaviors (i.e., frequency of sexual interactions and/or history of sexual solicitation), sexual partners (i.e., number of sexual partners over a 5-year period), and sexually transmitted disease history.

Since SCORE-BBH involves procedures that have additional inclusion/exclusion criteria, consented participants receive additional screening for eligibility. Some of the exclusion criteria includes: the women may not be pregnant or breastfeeding; must be fully ambulatory; must not have non-HIV-related active immunological or metabolic bone disorders, including: bone marrow or organ transplantation, osteosarcoma, Paget's disease, inflammatory bowel diseases, rheumatoid arthritis; and other chronic and/or severe illnesses (ex. any cancers, thyroid/parathyroid disorders, chronic liver disease, etc.).

Current Analysis

Participants/ Study Sample

I performed a retrospective analysis utilizing data comprised of both seropositive and seronegative Black women who were participants in the SCORE BBH study. This cohort consisted of 124 Black women, among whom 81 were seropositive and 43 were seronegative. Their ages spanned from 30 to 65 years, with a mean age of approximately 48 years.

Variables & Measures

Variables were separated into three domains: "Socioeconomic Data," "Physical Comorbidity Data," and "Mental Illness Data". "Age" and "Status" are also reoccurring data

points used throughout the categories. These data points are among the many collected through each annual in-person visit a SCORE-BBH participant undergoes.

Socioeconomic Data

Socioeconomic data encompassing marital status, income, and education level among the participants were analyzed as part of the Comorbidities study. Marital status was encoded as a categorical variable, with numerical values representing different statuses: (1) Married/Partner, (2) Divorced/Widowed/-Separated, and (3) Never Married/Other. Annual income was also categorized into ranges denoted by numerical codes: (1) $0-12,000, (2) $12,001-$24,000, and (3) >$24,000. Similarly, education level was assigned numerical codes to denote categories: (1) < HS (indicating attainment below a high school-level education), (2) HS (indicating completion of high school education/diploma), and (3) >HS (indicating education beyond high school to varying degrees).

Mental Illness Data

To determine Mental Illness prevalence and frequency among both the seropositive and seronegative populations, four (4) different mental health metrics were gathered: (1) Depression, (2) Post-Traumatic Stress Disorder (PTSD), (3) Anxiety and (4) history of psychiatric illness.

Depression was measured by the Center for Epidemiology Studies Depression Scale (CES-D) (Radloff, 1977,1991). The scores range for this sample is 0-51, with the following score cutoffs: [0-15 no/mild depression], [16-23 moderate depression], and [24-51 severe depression]. PTSD is derived from the Post-Traumatic Stress Disorder Checklist (PCL-5) found in the DSM-5 (Weathers et al., 1991). The general score ranges from 0-80, but for this sample the range was

17-72. A score of 31+ is indicative of moderate PTSD symptoms. Anxiety comes from the Generalized Anxiety Summary Score (GAD-7) (Spitzer et al., 2006). The score ranges from 0-21, and the cutoffs are: [0-4 minimal anxiety], [5-9 mild anxiety], [10-15 moderate anxiety], and [16+ severe anxiety]. Lastly, the history of psychiatric illness indicates whether a participant has been diagnosed with a psychiatric illness at any point in their lives. Depression, PTSD, and Anxiety are numerical variables, while history of psychiatric illness is a categorical variable.

Physical Comorbidities Data

The Physical Comorbidities data were chosen and collected to determine any association between mental illness & HIV/AIDS and their potential effects on the body in this population. The Physical Health/Comorbidity data points are encoded as follows: (1) Diabetes, (2) Obesity, (3) Hypertension, (4) Hyperlipidemia, and (5) Bone Disease. Diabetes was assessed based on the following criteria: 1) participant ever self-reported anti-diabetic medication, or 2) a confirmation of (a) a fasting glucose level of 126 or greater, (b) hemoglobin A1C level of 6.5% or greater, or (c) self-reported diabetes. Obesity refers to the Body Mass Index (BMI) of each participant, measured in $kg/m^{2.}$ The CDC provides the following ranges and cutoffs for adult BMI: If an individual's BMI< 18.5, it falls within the underweight range, if it is 25.0 to <30, it falls within the overweight range, and if it is 30.0 or higher, it falls within the obesity range (*CDC.gov, 2022*). The American Heart Association categorizes hypertension, or high blood pressure as above 130-139 systolic and/or above 80-89 diastolic. There are 3 stages: hypertension stage one (130-139 systolic blood pressure (SBP)) or 80-89 diastolic blood pressure (DBP)), hypertension stage two (>140 systolic DBP or >90 diastolic DBP), and hypertension stage three (>180 DBP and/or >120 DBP). The Hypertension variable represents whether the participant was ever diagnosed with hypertension. In MWCCS, this variable was operationalized using historical

clinical cut points, based on the following criteria: 1) indication of hypertension based on SBP≥140 or DBP≥90) or 2) use of hypertensive medications with ever self-reported diagnosis of hypertension. Hyperlipidemia and Bone disease indicate if a participant ever had or currently has hyperlipidemia and ever had or currently has bone disease, respectively. Hyperlipidemia, more commonly known as high cholesterol, refers to elevated levels of lipids (fat particles) in the blood (Hill, 2023). The Diabetes, Obesity, Hypertension, Hyperlipidemia, and Bone disease variables are categorically encoded as (0) for No and (1) for Yes.

Methods

Statistical Analysis

For the numerical/continuous variables in each of the three domains, the mean and standard deviation were computed to characterize central tendency and dispersion within each serostatus group. Concurrently, categorical variables were presented as frequencies and percentages to depict their distribution among seropositive and seronegative participants.

To assess the statistical differences between the two serostatus groups, a Welch's Two-Sample t-test was conducted for numerical variables and Pearson's Chi-squared test with simulated p-values (based on 2000 replicates) for categorical variables. Each variable underwent these tests to determine if there was a statistically significant difference between the seropositive and seronegative groups. For these assessments, the null hypothesis was that there would not be a statistical difference in these variables (separately) between the two sample populations. The alternative hypothesis is a statistical difference between the two sample populations for each variable. The alpha level was set at < 0.05 for hypothesis testing. This testing was used to determine if there was a statistically significant difference between the socioeconomic status of

the two samples, as well as the prevalence and severity of their mental & physical health comorbidities.

Correlation Analyses

Pearson correlation analyses, using the Stata statistical software, was conducted to examine pairwise correlations between the continuous mental illness variables (CES-D (depression) score, PTSD score, and anxiety score). The analysis was repeated three times – within the whole sample and stratified by HIV status. The correlation coefficients and p-values were reported from the model.

Adjusted Logistic Regression Models (Mental Illness Comorbidities)

Following the correlation analysis, I used logistic regression models to further examine the associations between the mental illness variables, adjusting for the socioeconomical covariates (age, income, education, and marriage status) was conducted. The three socioeconomical variables (which were each separated into three categories) were dichotomized for these analyses to accommodate the sample sizes and distributions. Income was coded to represent whether a participant made >/= $12,000 or <$11,999.99, annually. Education was coded to represent whether a participant had a </= a high school education (diploma) or greater than a high school education. Marital status was coded to reflect whether a participant was Married/Had a Partner/Divorced/Separated/Divorced or if they were Never Married/Single.

Because of the nature of logistic regression models, the dependent variable had to be categorical. So, a dichotomized version of the depression score ("cesddep") was used as the outcome. The "cesddep" variable was coded to represent if a participant had a score greater >/=

16, the cutoff for severe depressive symptoms. The model fit was assessed and found to be satisfactory. Two logistic regressions were run with this model - the association of anxiety with depressive symptoms (adjusting for socioeconomical covariates) and the association of PTSD with depressive symptoms (adjusting for socioeconomical covariates). The logistic regressions were repeated with the seronegative and seropositive populations, individually. These models were used to determine if socioeconomic variables were a confounding factor when testing the correlation between the mental illness comorbidities. In other words, if the correlation between the variables changed when adjusted for socioeconomic variables. The odds ratio and p-value were reported from this testing.

Unadjusted Logistic Regression Models (Physical Health by Mental Illness)

Unadjusted logistic regression models were used to explore the associations between mental health and physical health in both the seronegative and seropositive samples. The purpose was to determine if the physical health comorbidities increased the odds of mental illness comorbidities. In these models, the mental illness comorbidities (depression, anxiety, and PTSD) were regressed on the physical comorbidities (diabetes, obesity, hypertension, bone disease, and hyperlipidemia). The mental illness variables were recoded and dichotomized to represent a "moderate" diagnosis of their diseases, based on the cutoffs for their respective diagnostic scores. They were encoded as the following: depression (>/= 16), anxiety (>/= 5), PTSD (>/=31). Each physical comorbidity was analyzed separately in relation to each mental illness comorbidity, with individual regression models being fitted for each combination of physical and mental health variables. The models were repeated in both the seropositive and seronegative populations. The odds ratio and the p-value were reported from this testing.

Adjusted Logistic Regression Models (Physical Health by Mental Illness)

Following the same patterns from the previous two analyses, I conducted an adjusted logistic regression analysis to determine any associations between the physical health comorbidities and the mental illnesses, adjusting for the socioeconomic covariates (age, income, education, and marriage status). The mental illness comorbidities (depression, anxiety, and PTSD) were, again, regressed on the physical comorbidities (diabetes, obesity, hypertension, bone disease, and hyperlipidemia), but were also adjusted for the socioeconomic covariates. The dichotomized versions of the socioeconomic factors (income, education, and marriage status), as well as the dichotomized versions of the mental illness variables (depression, PTSD, and anxiety) were used for the analyses.

Tools

R-studio was preliminarily used to organize the raw data from the variables in each domain and determine associations between the serostatus groups. R-studio was also used for the average, standard deviation, prevalence percentage, and the two-sample T tests or Chi-squared analysis tests for each variable. The correlation analyses and the unadjusted logistic regression models were run using the Stata statistical software. The adjusted logistic regressions were run using the SAS statistical software. The alpha level for hypothesis testing (p-value) was set at <0.05.

Chapter #3: Results

Results of Statistical Analysis

In this study, four key categories of data were examined— Socioeconomic Data (Table 1), Mental Illness Data (Table 2), and Physical Comorbidity Data (Table 3) among 124 participants, comprising 81 BWWH and 43 seronegative Black women who were at-risk for HIV.

Table 1 is a comparison of the demographic and socioeconomic variables (age, income, and marital status) between the seropositive and seronegative participants. We found no statistically significant differences in sociodemographic characteristics between these two groups. Even though larger proportions of seronegative women fell in the lowest income & education levels and were single or divorced, these differences were not statistically significant.

Table 2 evaluates the mental illness data by HIV status. The sample testing results show that the seronegative participants had higher mean scores on the scales measuring depression (SP=8.8 vs. SN=12.6, p=0.042), PTSD (SP=31.5 vs. SN=37.5, p=0.0397), and anxiety (SP=3.48 vs. SP=5.5, p= 0.033) symptoms than their seropositive counterparts. The seropositive participants, however, had a slightly higher prevalence of any psychiatric illness, although this was not statistically significant.

The analysis of physical comorbidities by serostatus (Table 3) shows that the seropositive sample has higher prevalence of bone diseases, hyperlipidemia (high cholesterol), hypertension, and obesity. However, diabetes is more prevalent in the seronegative population. However, there were no statistically significant differences in the prevalence of any of the physical comorbidity variables.

Results of Correlation Analysis Between Mental Illness Variables

The first correlation analysis model was run with the full sample population (Table 4). It indicated that there was a positive, statistically significant correlation between all three mental illness conditions: PTSD and depression [0.5312, <.001], depression and anxiety [0.4526, <.001], and anxiety and PTSD [0.5603, <.001].

The second model analyzed the correlation between the mental health conditions among the seropositive participants (Table 5). Overall, this also showed a positive, moderate correlation between all three mental health conditions: PTSD and depression [0.6654, <.001], depression and anxiety [0.4772, <.001], and anxiety and PTSD [0.5701, <.001]. These correlations highlight the interconnectedness of depression, PTSD, and anxiety, suggesting that experiencing one of these conditions may increase the likelihood or severity of experiencing the others in this sample.

Table 6 describes the correlation between the mental health conditions among the seronegative participants. There appears to be positive, statistically significant correlation between anxiety and depression [0.3551, 0.0210] and PTSD and anxiety [0.4985, 0.001]. I found no correlation between PTSD and depression in this sample [0.2376, 0.1298]. The relationship between the mental illness conditions appears to be stronger among the seropositive participants.

Results of Adjusted Logistic Regression Models (Mental Illness)

Table 7 and Table 8 present the results of logistic regressions examining the associations of PTSD and anxiety with depressive symptoms, adjusting for socioeconomic factors. Table 7 confirms that among the seropositive participants, higher scores for the anxiety and PTSD variables are associated with increased odds of depressive symptoms (anxiety, p=0.0115 and PTSD, p=0.0002). Table 8 presents results for the seronegative group. When adjusted for

socioeconomic factors, anxiety and PTSD no longer have an association with depression (p=0.252 and 0=.265, respectively) among women without HIV in our sample.

Results of Unadjusted Logistic Regression Models (Physical Health by Mental Illness)

Tables 9, 10, and 11 examine relationships between each mental health outcome (depression, anxiety, and PTSD) and each physical comorbidity, stratified by HIV status. I found no statistically significant associations between any of the mental health conditions and the physical comorbidities, regardless of serostatus.

Results of Adjusted Logistic Regression Models (Physical Health by Mental Illness)

Tables 9, 10, and 11 also examined relationships between each mental health outcome (depression, anxiety, and PTSD) and each physical comorbidity, adjusting for socioeconomic factors (marital status, income, and education) and stratified by HIV status. I found that, after adjusting for these covariates, there was a statistically significant correlation between diabetes and anxiety in the seropositive sample (p=0.020). Notedly, bone disease and anxiety in the seropositive sample was approaching statistical significance (p=0.079). There were no other statistically significant associations between any of the mental health conditions and the physical comorbidities, regardless of serostatus.

Chapter #4 – Discussion & Conclusion

Key Findings

The seronegative women in this sample had higher mean scores for depression, PTSD, and anxiety (based on diagnostic scales), suggesting that this group has worse mental health outcomes than seropositive Black women. Based on the analysis results, there is a significant difference in the severity of the two samples' mental illnesses (depression, PTSD, and anxiety), indicating that the seronegative women had more severe cases of the mental illnesses individually.

Correlation analysis showed that there was moderate correlation between all the mental illnesses (anxiety, depression, and PTSD) in the seropositive samples. This association remained even after adjusting for socioeconomic status. However, in seronegative participants, there was a weaker correlation between some of the mental health conditions (anxiety/depression and anxiety/PTSD) and no correlation between PTSD and depression. Further, the association between mental illnesses were no longer significant, after adjusting for socioeconomic status.

There were no initial associations between any of the mental health conditions and physical comorbidities in the study population regardless of serostatus. However, after adjusting for socioeconomic covariates, there was a moderate correlation between diabetes and anxiety in the seropositive sample. Bone disease and anxiety also approached significance, after adjusting for socioeconomic covariates.

Limitations

Eligibility Criteria

Literature and prior research indicate that lower socioeconomic status (i.e. lower income and education) and higher mental illness scores (i.e. depression, anxiety, and PTSD) are more consistently associated with seropositive populations. Research reviewed by Pellowski et al., for example, finds that "HIV infection nearly exclusively impacts those who face economic adversity…HIV prevalence is highest among people who are at or below the poverty level…and is concentrated among individuals who have less than a high school education" (Pellowski et al., 2013, p.4). Further, WWH "are three times more likely to have a co-occurring mood disorder…and eight times more likely to have a serious mental illness compared to the general public" (Travaglini et al., 2018, p. 3784). Travaglini et al. (2018) continues, "WWH also experience a greater number of traumatic experiences and have a higher prevalence of PTSD relative to the general population" (p.3784). When analyzing the statistical data, however, there seemed to be an unexpected trend among the socioeconomic and mental illness outcomes in the study population. Inconsistent with prior research, I found higher mean scores on depression, anxiety, and PTSD scales in the seronegative sample (Table 2). Like the mental illness variables, when comparing socioeconomic factors (Table 1), higher proportions of seronegative participants fell in lower income & education categories. This can be explained by the differences in eligibility criteria for the larger sub study, SCORE BBH.

As mentioned in Chapter Two, the eligibility for seropositive women is: 1.) to be between the ages of 30-70 years old, 2.) to not have taken certain restrictive medications, and 3.) to not have been born with HIV. The eligibility for the seronegative women is: 1.) to be between the ages of 30-70 years old, and 2.) to demonstrate a lifestyle "at-risk" for contracting HIV. To reiterate, the criteria involved in (2.) include reporting the following actions over the last 5 years: IV/hard drug use (ex. crack, cocaine, heroin, etc.), sexual behaviors (i.e., frequency of sexual

interactions and/or history of sexual solicitation), sexual partners (i.e., number of sexual partners over a 5-year period), and sexually transmitted disease history.

A critical difference between the two samples' eligibility criteria is the time frame: the seronegative group has a 5-year constraint, and the seropositive group has none. In essence, a seropositive woman eligible for the study could have lived an "at-risk" lifestyle 20 years ago but have since made different lifestyle choices and/or received the support and guidance needed to shift away from "at-risk" behaviors. For the seronegative sample, the women must demonstrate that they are still living an "at-risk" lifestyle. These "risky" lifestyles or behaviors could be factors in the seronegative women's higher mean scores on depression, PTSD, and anxiety scales. Research conducted by Staton-Tindall et. al (2015) found mental health was significantly correlated with severity of certain types of drug use, as well as risky sexual activity among the 136 women at-risk for HIV in the study's population. Moreover, the findings for the Staton-Tidall study reported nearly 80% of women self-reported symptoms of depression, and more than 60% endorsed symptoms consistent with anxiety and PTSD symptoms (Staton-Tindall et al, 2015). This observation is consistent with the results of this study.

Finally, the results from this research emphasize the fact that the seronegative participants were purposefully selected to be comparable to their seropositive counterparts and may not be representative of the general population in this regard.

Sample Sizes

This study used a relatively modest sample size (n=124), which could pose notable limitations on the robustness and generalizability of the findings. Therefore, the outcomes derived from the study might not be entirely representative of the broader population due to the

limited scope of individuals included. Moreover, the findings might lack the necessary statistical power to detect subtle but significant effects within the population.

Furthermore, within this study's population, the seropositive (n=81) and seronegative (n=43) sample sizes could also present challenges. These subgroup sizes, being relatively small, might not adequately capture the diversity and variations present within the population (Andrade, 2020). The limited representation within these groups could compromise the ability to generalize findings to broader demographics, particularly if certain characteristics or factors are overrepresented or underrepresented within the sample. If given the opportunity in future research endeavors, increasing the sample sizes, particularly within these subgroups, would enhance the study's statistical power and improve its ability to provide meaningful insights into the populations of Black women living and living without HIV.

Cardiovascular & Chronic Diseases

As previously cited, certain diseases and chronic illnesses have been established to be associated with HIV, including cardiovascular disease (CVD) such as hypertension, respiratory diseases like chronic obstructive pulmonary diseases and pneumonia, and hepatic diseases such as hepatitis B and C (Lorenc et al., 2014; Chhatre et al., 2022; Gallant et al., 2017). While this study aimed to investigate some of these diseases, the distribution of samples was constrained, limiting the scope of diseases that could be thoroughly analyzed. Consequently, illnesses such as cancer, lung disease, and others, which could have provided valuable insights, had to be excluded due to insufficient sample sizes.

Implications

Adjusted Correlation Analysis

Though there might be differences in the general lifestyles between the two samples, their socioeconomic factors (income, marital status, and education) have no statistically significant difference (Table 1). So, the differences in the two samples' adjusted correlation results were intriguing. Again, within the seropositive group, we found significant correlations among all studied mental health conditions. This association held true even after adjusting for differences in socioeconomic status, suggesting that the correlation is not merely due to socioeconomic factors. Among seronegative participants, the correlations were slightly weaker (but still statistically significant) or non-existent between some mental health conditions. Furthermore, any existing correlations between these mental health conditions ceased to be statistically significant after accounting for socioeconomic status, indicating that these associations are more influenced by factors outside the scope of this study in seronegative women.

This finding could be interpreted in a couple ways for the seropositive Black women. Because the samples are not significantly different, besides their serostatus, this could indicate that HIV infection (or an aspect of the disease) is having an additional effect in the way multiple mental illnesses affect each other. In other words, HIV may be acting as a common underlying factor contributing to the co-occurrence and exacerbation of depression, PTSD, and anxiety within this population. For example, HIV infection affects the central nervous system, which can cause neurocognitive decline, neuropsychiatric illnesses, and dementia in the affected individuals (NIH/NIMH, 2023). This can directly impact how mental illnesses present in seropositive populations, as these cognitive conditions can induce anxiety and mood disorders (NIH/NIMH, 2023; Mitra, 2022).

Alternatively, this could suggest that other variables, not examined in this study, are bolstering the correlation among the mental illnesses, even after accounting for socioeconomic

factors. For instance, HIV-related stigma is a detrimental factor that BWWH experience and could significantly influence the severity and interrelation of mental health conditions such as depression, PTSD, and anxiety. The psychological impact of stigma related to HIV may magnify feelings of isolation, shame, and stress, potentially leading to or intensifying existing mental health issues, and is present among BWWH (Logie et. al, 2013; Travaglini et. al, 2018). Moreover, stigma can deter individuals from seeking necessary medical care or social support, further isolating them and compounding their mental health challenges (Dale SK et. al, 2020; Ojikutu et. al, 2018). Though this is beyond the scope of this research, exploring these underlying variables should be something to investigate further.

Furthermore, the moderate correlation between diabetes and anxiety does indicate that certain socioeconomic factors can affect how mental illness and physical health present in seropositive Black women. This correlation underscores the relationship between chronic health conditions and psychological distress, particularly within marginalized communities. Within the framework of this study, it seemed that marital status was the covariate that drove this correlation ($p= 0.037$), which speaks to the importance of social support systems within this population. In fact, it may significantly influence the manifestation and management of both diabetes and anxiety among seropositive Black women. The correlation hints at the multifaceted nature of health disparities experienced by this demographic. To reiterate, seropositive Black women encounter unique challenges related to systemic inequalities, including racial discrimination, economic instability, and inadequate access to healthcare resources. These stressors can exacerbate both physical health conditions like diabetes and mental health disorders such as anxiety.

For the seronegative Black women, other factors might directly amplify vulnerabilities to mental health issues. Though the socioeconomic factors also did not demonstrate statistically significant correlation to the mental illnesses in the analyses, it could still indicate that other factors may be at play. Generally, lack of financial stability, lower education levels, and inadequate social support can all exacerbate feelings of stress, anxiety, and depression (Lorant et. al, 2007). As this study findings suggest, seronegative (at-risk) women may experience more severe symptoms of mental health conditions, indicating that other factors might play a more pronounced role in worsening these conditions.

Lastly, I must mention that Black women, regardless of serostatus, must grapple with a unique set of issues regarding their mental health due to their race. For Black people, institutional racism increases the probability of experiencing psychological distress due to insufficient or harmful conditions encountered across various life domains (Yelton et. al, 2022). Examples of institutional racism include residential segregation, exposure to environmental hazards, discriminatory employment or law enforcement practices, and limited access to opportunities and resources for economic advancement (Williams et. al, 2021). When combined with societal racial bias and discrimination, the heightened stress across these domains contributes to unfavorable conditions for mental health (Yelton et. al, 2022).

Ultimately, discovering the factors that increase or decrease the co-occurrence of multiple mental health conditions in these populations should be explored further, as it could positively impact clinical approaches to mental illness and HIV and potentially reduce the overall burden of mental health among both BWWH and Black women at risk for contracting the disease.

Syndemic Theory (ST)

As previously cited, ST is a medical anthropology concept that explains how multiple illnesses occur together within a given timeframe or location, with interactions occurring across social, psychological, or biological dimensions. Detrimental social factors underlie these interactions and play a role in the clustering and interaction of diseases. ST has proven to be a useful framework when studying HIV co-occurring with other disease outcomes, such as Mycobacterium tuberculosis (MTb), T-lymphotropic virus (HTLV), sexually transmitted diseases (STDs), mental illnesses, and chronic diseases (i.e. asthma) (Singer & Clair, 2008). It can also be a useful lens when applied to the research conducted in this study.

For the sample of at-risk seronegative women, outside factors significantly influence their mental health outcomes, potentially exacerbating existing vulnerabilities. ST would suggest that certain socioeconomic disadvantages (outside the scope of this study) experienced by these women may have interacted in a synergistic manner, exacerbating the burden of mental illness. This synergistic effect could have led to a correlation between the co-occurrence of mental health conditions and their severity, indicating that the presence of multiple mental health issues was not just coincidental but potentially influenced by their socioeconomic circumstances.

While this research did not pinpoint a specific factor explaining the moderate correlation between the co-occurrence and severity of mental health conditions among seropositive women, potential contributors such as stigma may be at play. Stigma, for instance, could be a detrimental social factor that could be underlying the co-occurrences of mental health diseases in BWWH– a syndemic. Further, the relationship between anxiety and diabetes, when adjusted for the socioeconomic covariates may indicate a synergistic relationship between mental illness and physical health comorbidities within the seropositive population. Again, a negative

socioeconomic condition exacerbated the effects of two previously uncorrelated disease – demonstrating a syndemic.

Though the primary objectives of this research did not include confirming the presence of syndemics within this population, ST remains a valuable framework for understanding and addressing the complex interplay between multiple health issues. By recognizing the interconnectedness of various health conditions and the influence of social determinants, such as socioeconomic factors, ST offers insights into how these detrimental occurrences manifest and persist. For HIV, specifically, researchers have been able to identify subgroups of HIV-infected patients experiencing adverse outcomes that were not solely attributable to their viral characteristics, but rather, were determined by factors related to other components of the syndemic (Rudd et al., 2021). This has allowed clinicians to re-orient their ideologies upon realizing PWH could benefit from more holistic approaches in the clinical setting, as maintaining strictly biological methods would be an overtly simplistic view of addressing clinical care (Mendenhall et al., 2022, Rudd et al., 2021). Leveraging ST can inform the development of comprehensive solutions aimed at mitigating the adverse effects of these intersecting health challenges and promoting holistic well-being within both populations of Black women.

Future Directions

Future studies could further examine the relationship between mental illness, socioeconomic status, and other social factors that could disproportionately affect BWWH and Black women at risk for the disease. Additionally, exploring how ST can apply to these populations may provide valuable insights into the interconnectedness of various health issues and the underlying social determinants contributing to health disparities.

Supplementary Tables

Table 1: Descriptive Table of Comorbidities Study by Serostatus

	Total (n=124)	Seropositive (n=81)	Seronegative (n=43)	p-value (< .05)
Age, mean (SD)	48.2 (9.46)	48.9 (9.75)	47.0 (9.3)	0.322
Annual Income, % ($0-12K, $12001-24K, >24K)^	52.5%, 23.3%, 24.2%	50.6%, 26.6%, 22.8%	56.1%, 17.1%, 26.8%	0.615
Education, % (1<HS, 2 HS, 3>HS)	28.2%, 31.5%, 40.3%	25.9%, 28.4%, 45.7%	32.6%, 37.2%, 30.2%	0.247
Marital Status , % (married, never married, divorced)+	24.6%, 27.05%, 48.3%	26.3%, 45%, 28.8%	21%, 23%, 53%	0.739

^Two seropositive and two seronegative women did not provide an answer for annual income.
+One seropositive woman and one seronegative woman did not provide information for marital status.

Table 2: Mental Illness Data of Comorbidities Study by Serostatus

	Total (n=124)	Seropositive (n=81)	Seronegative (n=43)	p-value (< .05)
CES-D score, mean (SD)	10.1 (10.01)	8.8 (9.97)	12.6 (9.73)	0.042
PTSD score, mean (SD)	33.5 (14.61)	31.5 (14.06)	37.35 (15.04)	0.0397
Anxiety score, mean (SD)	4.17 (4.8)	3.48 (4.53)	5.5 (5.05)	0.033
Psychiatric Illness History, frequency (%)	45.16%	45.7%	44.18%	0.999

** Welch Two-Sample T-Test*
*** Pearson's Chi-squared test with simulated p-value (based on 2000 replicates)*

Table 3: Physical Comorbidity Data of Comorbidities Study by Serostatus

	Total (n=124)	Seropositive (n=81)	Seronegative (n=43)	p-value (< .05)
Obesity, frequency (%)	71.54%	75.0%	65.12%	0.532
Bone Diseases, frequency (%)	18.55%	22.22%	11.62%	0.227
Hyperlipidemia, frequency (%)	31.45%	34.57%	25.58%	0.352
Diabetes, frequency (%)	20.97%	18.52%	25.58%	0.448
Hypertension, frequency (%)	61.29%	65.43%	53.49%	0.275

** Welch Two-Sample T-Test*
*** Pearson's Chi-squared test with simulated p-value (based on 2000 replicates)*

Table 4: Pearson Correlation Between Mental Illness for Full Sample (n=124)

Variables [r, p-value]	**Depression**	**PTSD**	**Anxiety**
Depression	1		
PTSD	[0.5312, <.001]	1	
Anxiety	[0.4526, <.001]	[0.5603, <.001]	1

Table 5: Pearson Correlation Analysis Between Mental Illness for Seropositive Participants (n=81)

Variables [r, p-value]	Depression	PTSD	Anxiety
Depression	1		
PTSD	[0.6654, <.001]	1	
Anxiety	[0.4772, <.001]	[0.5701, <.001]	1

Table 6: Pearson Correlation Analysis Between Mental Illness for Seronegative Participants (n=43)

Variables [r, p-value]	Depression	PTSD	Anxiety
Depression	1		
PTSD	[0.2376, 0.1298]	1	
Anxiety	[0.3551, 0.0210]	[0.4985, 0.001]	1

Table 7: Association of PTSD and Anxiety with Depressive Symptoms, adjusting for Socioeconomic covariates among Seropositive Participants (n=81)

Outcome (y) = Depression		
	Odds Ratio	**p-value**
Anxiety	1.199	0.0115
PTSD	1.174	0.0002

Table 8: Association of PTSD and Anxiety with Depressive Symptoms, adjusting for Socioeconomic covariates among Seronegative Participants (n=43)

Outcome (y) = Depression		
	Odds Ratio	**p-value**
Anxiety	1.100	0.252
PTSD	1.028	0.265

Table 9: Association of Physical Comorbidities with Depression by Serostatus

Seropositive (n=81)				
	Odds Ratio	**p-value**	**aOR**	**p-value**
Diabetes	1.86	0.322	2.64	0.203
Obesity	0.913	0.879	0.803	0.749
Hypertension	1.192	0.397	0.964	0.957
Bone disease	0.914	0.889	0.856	0.829
Hyperlipidemia	1.14	0.812	1.40	0.603
Seronegative (n=43)				
	Odds Ratio	**p-value**		
Diabetes	2.29	0.244	1.81	0.449
Obesity	0.971	0.964	1.26	0.759
Hypertension	1.43	0.571	0.720	0.682
Bone disease	7.69	0.081	5.16	0.183
Hyperlipidemia	0.835	0.803	0.626	0.555

Table 10: Association of Physical Comorbidities with Anxiety by Serostatus

Seropositive (n=81)				
	Odds Ratio	**p-value**	**aOR**	**p-value**
Diabetes	2.82	0.075	4.96	0.020
Obesity	1.62	0.411	0.471	0.456
Hypertension	1.397	0.510	1.459	0.511
Bone disease	2.5	0.094	2.86	0.079
Hyperlipidemia	0.921	0.869	1.26	0.680
Seronegative (n=43)				
	Odds Ratio	**p-value**		
Diabetes	0.882	0.863	0.279	0.201
Obesity	0.4	0.172	0.884	0.884
Hypertension	2.625	0.129	1.05	0.995
Bone disease	4.22	0.216	1.79	0.661
Hyperlipidemia	1.5	0.582	1.27	0.792

Table 11: Association of Physical Comorbidities with PTSD by Serostatus

Seropositive (n=81)				
	Odds Ratio	**p-value**	**aOR**	**p-value**
Diabetes	0.987	0.983	1.002	0.997
Obesity	1.14	0.796	1.38	0.588
Hypertension	0.828	0.686	0.640	0.417
Bone disease	2.09	0.176	2.37	0.151
Hyperlipidemia	0.828	0.493	1.44	0.505
Seronegative (n=43)				
	Odds Ratio	**p-value**		
Diabetes	1.03	0.972	0.617	0.580
Obesity	0.625	0.484	0.629	0.581
Hypertension	1.43	0.570	0.637	0.607
Bone disease	3.04	0.339	1.12	0.929
Hyperlipidemia	1.26	0.747	0.855	0.858

Bibliography

Adkins-Jackson, P. B. (2020). How socioeconomic status influences self-care for Black/African American women: A differential item analysis. *Preventive Medicine Reports*, *20*, 101155. https://doi.org/10.1016/j.pmedr.2020.101155

Andrade C. (2020). Sample Size and its Importance in Research. *Indian journal of psychological medicine*, *42*(1), 102–103. https://doi.org/10.4103/IJPSYM.IJPSYM_504_19

Anekwe, C. V., Jarrell, A. R., Townsend, M. J., Gaudier, G. I., Hiserodt, J. M., & Cody Stanford, F. (2020). Socioeconomics of Obesity. *Current Obesity Reports*, *9*(3), 272–279. https://doi.org/10.1007/s13679-020-00398-7

Charlson, M. E., Carrozzino, D., Guidi, J., & Patierno, C. (2022). Charlson Comorbidity Index: A Critical Review of Clinimetric Properties. *Psychotherapy and Psychosomatics*, *91*(1), 8–35. https://doi.org/10.1159/000521288

Chhatre, S., Woody, G., Metzger, D. S., & Jayadevappa, R. (2021). Burden of chronic conditions among persons with HIV/AIDS and psychiatric comorbidity. *Current HIV Research*, *19*(6), 504–513. https://doi.org/10.2174/1570162X19666210805092258

Dale, S. K., & Safren, S. A. (2019). Gendered racial microaggressions predict posttraumatic stress disorder symptoms and cognitions among Black women living with HIV. *Psychological Trauma: Theory, Research, Practice and Policy*, *11*(7), 685–694. https://doi.org/10.1037/tra0000467

Dale, S. K., & Safren, S. A. (2020). Gendered Racial Microaggressions Associated with Depression Diagnosis among Black Women Living with HIV. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, *97*(3), 377–386. https://doi.org/10.1007/s11524-020-00432-y

Erica Richards, M. D. (2021). *The State of Mental Health of Black Women: Clinical Considerations*. https://www.psychiatrictimes.com/view/the-state-of-mental-health-of-black-women-clinical-considerations

Gallant, J., Hsue, P. Y., Shreay, S., & Meyer, N. (2017). Comorbidities Among US Patients With Prevalent HIV Infection—A Trend Analysis. *The Journal of Infectious Diseases*, *216*(12), 1525–1533. https://doi.org/10.1093/infdis/jix518

Generalized Anxiety Disorder 7-item (GAD-7)—Mental Health Screening—National HIV Curriculum. (n.d.). Retrieved February 22, 2024, from https://www.hiv.uw.edu/page/mental-health-screening/gad-7

Heer, E., Kaida, A., O'Brien, N., Kleiner, B., Pierre, A., Rouleau, D., Burchell, A. N., Skerritt, L., Proulx-Boucher, K., Nicholson, V., Loutfy, M., & de Pokomandy, A. (2022). Prevalence of Physical Health, Mental Health, and Disability Comorbidities among Women Living with HIV in Canada. *Journal of Personalized Medicine*, *12*(8), 1294. https://doi.org/10.3390/jpm12081294

Hill, M. F., & Bordoni, B. (2024). Hyperlipidemia. In *StatPearls*. StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/NBK559182/

HIV and AIDS and Mental Health—National Institute of Mental Health (NIMH). (2023, June 28). https://www.nimh.nih.gov/health/topics/hiv-aids

HT Literature Review. (n.d.). Google Docs. Retrieved February 20, 2024, from https://docs.google.com/spreadsheets/d/15bzlo320Eyg-WMxHRI4SqLxBI9Bs-WICzvry6oadMwA/edit?usp=drive_web&ouid=117273938735301421185&usp=embed_facebook

Lancet, T. (2017). Syndemics: Health in context. *The Lancet*, *389*(10072), 881. https://doi.org/10.1016/S0140-6736(17)30640-2

Logie, C., James, L., Tharao, W., & Loutfy, M. (2013). Associations between HIV-related stigma, racial discrimination, gender discrimination, and depression among HIV-positive African, Caribbean, and Black women in Ontario, Canada. *AIDS Patient Care and STDs*, *27*(2), 114–122. https://doi.org/10.1089/apc.2012.0296

Lorant, V., Croux, C., Weich, S., Deliège, D., Mackenbach, J., & Ansseau, M. (2007). Depression and socio-economic risk factors: 7-year longitudinal population study. *The British Journal of Psychiatry: The Journal of Mental Science*, *190*, 293–298. https://doi.org/10.1192/bjp.bp.105.020040

Lorenc, A., Ananthavarathan, P., Lorigan, J., Jowata, M., Brook, G., & Banarsee, R. (2014). The prevalence of comorbidities among people living with HIV in Brent: A diverse London Borough. *London Journal of Primary Care*, *6*(4), 84–90.

Mehta, C. C., Hagen, K. S., Collins, L. F., Moore, R. H., & Ofotokun, I. (2022). Nested and multipart prospective observational studies, flaming fiasco or efficiently economical?: The Brain, Bone, Heart case study. *BMC Medical Research Methodology*, *22*, 203. https://doi.org/10.1186/s12874-022-01675-w

Mehta, C. C., Hagen, K. S., Rubtsova, A. A., Lahiri, C. D., Michopoulos, V., Moran, C. A., Haddad, L. B., Titanji, K., Collins, L. F., Quyyumi, A. A., Neigh, G., Shaw, L. J., Weitzmann, M. N., Waller, L., & Ofotokun, I. (2022). Bone, Brain, Heart study protocol: A resilient nested, tripartite prospective cohort study of the role of estrogen depletion on HIV pathology. *PLoS ONE*, *17*(8), e0272608. https://doi.org/10.1371/journal.pone.0272608

Mendenhall, E., Newfield, T., & Tsai, A. C. (2022). Syndemic theory, methods, and data. *Social Science & Medicine (1982)*, *295*, 114656. https://doi.org/10.1016/j.socscimed.2021.114656

Mitra, P., & Sharman, T. (2024). HIV Neurocognitive Disorders. In *StatPearls*. StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/NBK555954/

Nedelcovych, M. T., Manning, A. A., Semenova, S., Gamaldo, C., Haughey, N. J., & Slusher, B. S. (2017). The Psychiatric Impact of HIV. *ACS Chemical Neuroscience*, *8*(7), 1432–1434. https://doi.org/10.1021/acschemneuro.7b00169

Ojikutu, B., Nnaji, C., Sithole-Berk, J., Masongo, D., Nichols, K., Weeks, N., Ngminebayihi, M., Bishop, E., & Bogart, L. (2018). African Born Women Living with HIV in the United States: Unmet Needs and Opportunities for Intervention. *AIDS Care*, *30*(12), 1542–1550. https://doi.org/10.1080/09540121.2018.1497767

Ojukwu, E., Cianelli, R. I., FAAN, Villegas, R., Natalia IBCLC, FAAN, De, O., Giovanna ANP-C, PMHNP-BC, & Kalu, V. c. (2022). A Qualitative Study on the Social Determinants of HIV Treatment Engagement Among Black Older Women Living With HIV in the Southeastern United States. *JANAC: Journal of the Association of Nurses in AIDS Care*, *33*(2), 211–223. https://doi.org/10.1097/JNC.0000000000000299

Pellowski, J. A., Kalichman, S. C., Matthews, K. A., & Adler, N. (2013). A pandemic of the poor: Social disadvantage and the U.S. HIV epidemic. *The American Psychologist*, *68*(4), 197–209. https://doi.org/10.1037/a0032694

Poteat, T., Millett, G. A., Nelson, L. E., & Beyrer, C. (2020). Understanding COVID-19 risks and vulnerabilities among black communities in America: The lethal force of syndemics. *Annals of Epidemiology*, *47*, 1–3. https://doi.org/10.1016/j.annepidem.2020.05.004

Rudd, K. E., Mair, C. F., & Angus, D. C. (2022). Applying Syndemic Theory to Acute Illness. *JAMA*, *327*(1), 33–34. https://doi.org/10.1001/jama.2021.22583

Selection bias. (2017, March 28). Catalog of Bias. https://catalogofbias.org/biases/selection-bias/

Singer, M., Bulled, N., Ostrach, B., & Mendenhall, E. (2017). Syndemics and the biosocial conception of health. *The Lancet*, *389*(10072), 941–950. https://doi.org/10.1016/S0140-6736(17)30003-X

Singer, M., & Clair, S. (2003). Syndemics and Public Health: Reconceptualizing Disease in Bio-Social Context. *Medical Anthropology Quarterly*, *17*(4), 423–441. https://doi.org/10.1525/maq.2003.17.4.423

Sparrow-Downes, V. M., Loutfy, M., Antoniou, T., & Vigod, S. N. (2019). Postpartum mental health service utilization in women with Human Immunodeficiency Virus (HIV): A population-based study. *AIDS Care*, *31*(11), 1332–1339. https://doi.org/10.1080/09540121.2019.1612007

Spitzer, R. L., Kroenke, K., Williams, J. B. W., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. *Archives of Internal Medicine*, *166*(10), 1092–1097. https://doi.org/10.1001/archinte.166.10.1092

Stall, R., Mills, T. C., Williamson, J., Hart, T., Greenwood, G., Paul, J., Pollack, L., Binson, D., Osmond, D., & Catania, J. A. (2003). Association of Co-Occurring Psychosocial Health Problems and Increased Vulnerability to HIV/AIDS Among Urban Men Who Have Sex With Men. *American Journal of Public Health*, *93*(6), 939–942.

Staton-Tindall, M., Harp, K. L., Minieri, A., Oser, C., Webster, J. M., Havens, J., & Leukefeld, C. (2015). An exploratory study of mental health and HIV risk behavior among drug-using rural women in jail. *Psychiatric Rehabilitation Journal*, *38*(1), 45–54. https://doi.org/10.1037/prj0000107

The Lancet. (2017). Syndemics: Health in context. *The Lancet*, *389*(10072), 881. https://doi.org/10.1016/S0140-6736(17)30640-2

Tomko, C., Musci, R. J., Kaufman, M. R., Underwood, C. R., Decker, M. R., & Sherman, S. G. (2023). Mental health and HIV risk differs by co-occurring structural vulnerabilities among women who sell sex. *AIDS Care*, *35*(2), 205–214. https://doi.org/10.1080/09540121.2022.2121374

Travaglini, L. E., Himelhoch, S. S., & Fang, L. J. (2018). HIV Stigma and Its Relation to Mental, Physical and Social Health Among Black Women Living with HIV/AIDS. *AIDS and Behavior*, *22*(12), 3783–3794. https://doi.org/10.1007/s10461-018-2037-1

Valderas, J. M., Starfield, B., Sibbald, B., Salisbury, C., & Roland, M. (2009). Defining Comorbidity: Implications for Understanding Health and Health Services. *Annals of Family Medicine*, *7*(4), 357–363. https://doi.org/10.1370/afm.983

Waldron, E. M., Burnett-Zeigler, I., Wee, V., Ng, Y. W., Koenig, L. J., Pederson, A. B., Tomaszewski, E., & Miller, E. S. (2021). Mental Health in Women Living With HIV: The Unique and Unmet Needs. *Journal of the International Association of Providers of AIDS Care*, *20*, 2325958220985665. https://doi.org/10.1177/2325958220985665

Williams, D. R., & Etkins, O. S. (2021). Racism and mental health. *World Psychiatry*, *20*(2), 194–195. https://doi.org/10.1002/wps.20845

Wright, I. A., Reid, R., Shahid, N., Ponce, A., Nelson, C. M., Sanders, J., Gardner, N., Liu, J., Simmons, E., Phillips, A., Pan, Y., Alcaide, M. L., Rodriguez, A., Ironson, G., Feaster, D. J., Safren, S. A., & Dale, S. K. (2022). Neighborhood Characteristics, Intersectional Discrimination, Mental Health, and HIV Outcomes Among Black Women Living With HIV, Southeastern United States, 2019–2020. *American Journal of Public Health*, *112*(S4), S433–S443. https://doi.org/10.2105/AJPH.2021.306675

Yelton, B., Friedman, D. B., Noblet, S., Lohman, M. C., Arent, M. A., Macauda, M. M., Sakhuja, M., & Leith, K. H. (2022). Social Determinants of Health and Depression among African American Adults: A Scoping Review of Current Research. *International Journal of Environmental Research and Public Health*, *19*(3), 1498. https://doi.org/10.3390/ijerph19031498

(N.d.).