# The Impact of Body Mass Index On Women's Physical Health Ratings, Fibroids, Anemia and Infertility

A Didactic Application of OLS Multiple Regression

Yanick Rice Lamb
Howard University
ylamb@howard.edu

**The Impact of Body Mass Index**
**On Women's Physical Health Ratings, Fibroids, Anemia and Infertility**
A Didactic Application of OLS Multiple Regression


## ABSTRACT

Obesity is considered a global epidemic that will be the leading cause of death by 2020, according to the World Health Organization (WHO). This research supports the regression-related central organizing hypothesis that the Body Mass Index is explainable by physical health ratings for women across racial and ethnic groups and their self-reports of diagnosed fibroids, anemia and infertility. Multiple regression and percent distribution were used to address the COH by analyzing data from the Collaborative Psychiatric Epidemiology Surveys (CPES) as part of the National Survey of American Life (NSAL), 2001-2003. Based on the differential effects theory, this research helps to fill a void in the literature on reproductive health through the lens of obesity as it relates to race, ethnicity and gender. It may also have clinical and public health implications, such as enhancing awareness and wellness outcomes among black women who suffer disproportionately from obesity, infertility, fibroids and anemia, which is a risk factor for pregnancy complications and low birthweight.

## INTRODUCTION & SIGNIFICANCE

The intersection of reproductive health and obesity are rarely discussed as they relate to black women, who are already disproportionately affected by health disparities. African-American women are at the center of the global obesity epidemic that WHO predicts will be the leading cause of death by 2020. About four out of five African-American women are overweight or obese — the highest rate of any group in the United States (Office of Minority Health 2016). At this critical juncture in health care, this research will shed light on the impact of obesity on fibroids, infertility and anemia.

"Uterine fibroids are the most common benign tumors in women of childbearing age," according to NIH: National Institute of Child Health and Human Development (2017). "Fibroids are made of muscle cells and other tissues that grow in and around the wall of the uterus, or womb. The cause of fibroids is unknown. Risk factors include being African American or being overweight." Black women are three time more likely than white women to have fibroids (Brigham and Young Hospital 2017). The risk is two to three times higher for heavy women (Office of Women's Health reports 2017). Fibroids are also more prevalent as women reach the 30s and 40s, which includes the median age (44) of the population for this research paper (Brigham 2017).

Infertility is also a rarely discussed issue among African Americans. However, black women are infertile as much as or more than white women, said Rosario Ceballo, who published a 2016 paper in the Psychology of Women Quarterly titled "Silent and Infertile: An Intersectional Analysis of the Experiences of Socioeconomically Diverse African American Women With Infertility."

Anemia disproportionately affects women. It can lead to fatigue, which impairs a woman's ability or willingness to exercise, possibly leading to weight gain and placing her at risk for chronic health conditions. "The prevalence of iron deficiency anemia is 2 percent in adult men, 9 to 12 percent in non-Hispanic white women, and nearly 20 percent in black and Mexican-American women" (Killip, Bennett and Chambers 2007). Anemia can be especially problematic during pregnancy when blood needs increase by a third. Severe anemia increases the risk of pre-term delivery, blood loss during labor, low-birthweight babies and infection (American Society of Hematology 2017). Black women are three times more likely than white women to have low birthweight babies of 5.5. pounds or less (Black Women's Health Imperative 2017).

## LITERATURE REVIEW

Obesity, the dependent variable for this study, is gaining more attention in scholarly literature as a public health problem of growing magnitude nationally and internationally. Kazimierczuk and Bryant discuss the "need for modified approaches to obesity management as it relates to diverse populations," noting that African-American women are the "most obese" group in the United States. They cite data indicating that 77% of black women are either overweight or obese. "Obesity is complex and requires a comprehensive approach examining the multiple interacting social determinants of health (SODH)," they suggested (2016).

Of special concern is obesity's impact as a risk factor for other health conditions. Much of the research examines the link to health disparities and common chronic conditions such as diabetes and hypertension. For example, Romero et al used SAS to conduct a cross-sectional trend analysis of disparities and risk factors for cardiovascular disease across race and ethnicity. They used data from the National Health and Nutrition Examination Survey (NHANES) to study five risk factors: obesity, diabetes, smoking, hypertension and hypercholesterolemia (2012). Other areas of obesity research include nutrition, fitness and weight loss, such as Bronner and Boyington's research on successful intervention models (2002).

Mental health — from depression to PTSD — is also increasingly a focus, with many studies analyzing data from the National Survey of American Life (NSAL), 2001-2003. Assari used NSAL data to study the additive effects of anxiety and depression on BMI among people of African and Caribbean descent (2014). Assari also conducted two studies on mental health and obesity with Lankarani in 2015. And Knox-Kazimierczuk used multiple regression to examine obesity's relationship to racial identity and stereotypes (2017).

It is understandable that so much emphasis is placed on key drivers of obesity such as diet and inactivity as well as the detrimental impact on physical and mental health. Clinical depression is higher among obese people with BMIs higher than 35, according to researchers at the University of Wisconsin-Madison in a quality-of-life assessments of 2,931 patients (Katz 2000). Other researchers have found depression scores for obese people equal to or worse than the commonly used pain scores (Sullivan 1993).

However, the literature is lacking in another important area — reproductive health. This includes research related to my regression-related central organizing hypothesis that BMI is explainable by physical health ratings for women across racial and ethnic groups and their self-reports of diagnosed fibroids, anemia and infertility. This research will use the differential effects theory to contribute to filling a void in the literature on reproductive health through the lens of obesity as it relates to race, ethnicity and gender. Additionally, regression-related hypothesis testing will permit a test that has not yet be done in the literature concerning these topics. My study will highlight the relative effect of my COIV, physical health ratings, on obesity, the dependent variable.

A number of studies look at physical health ratings, also known as self-rated health (SRH), but the focus is largely on adolescents. Mota led one such study assessing the SRH of girls 10 to 18 years old participating in a shuffle-run test with BMI and fitness (2012). The relationship is statistically significant in both studies:

> *"The findings showed that among adolescent girls 23.2% had negative SRH. Girls who were classified as unfit were more likely to report negative SRH in both univariate logistic (OR: 3.05; CI: 1.91-4.87; P < .05) and multivariate (OR: 2.93; CI: 1.82-4.72; P < .05) regression analyses compared with their fit peers. Obese girls were more likely to report negative SRH (OR: 2.30; CI: 1.14-4.62; P < .05) compared with their normal-weight counterparts. However, such association was lost in multivariate analyses suggesting an effect of CRF" (Mota 2012).*

In addition to the COIV, the other independent variables will help to offset a weakness in the reproductive health literature on African-American women and to a lesser extent on women of Caribbean descent. More research is focusing on the latter, but not nearly enough. Typically, black people are treated as a monolith throughout the diaspora without sufficient examination of the nuances among those from the Caribbean, Africa, South America or other regions.

Research connecting obesity and reproductive health tends to target pregnancy. DeJoy et al examined the stigma of obesity as a social determinant of poor birth outcomes in women with high BMI (2015). Zozzaro-Smith et al also looked at obesity and pregnancy primarily for a general population. Their article emphasizes the impact of health disparities. It also mentions fetal birthweight, but focuses primarily on the adequacy of prenatal care. (2016).

It is important to note that reproductive health goes beyond the prime childbearing years, especially considering the lasting impact and connectedness of anemia and fibroids. In addition to expanding the research on reproductive health, one benefit of my study is that it will help add context to these conditions as well as infertility as they relate to obesity and BMI.

As Jacob Cohen noted in 1968, multiple regression is an effective and flexible system to analyze data and enhance understanding of a dependent variable like obesity and its relationship with fibroids, infertility and anemia. And regression can adjust for such factors as age, race, education, income or employment. This is critical, given that research shows that even women with high socioeconomic backgrounds and access to health care have problems with fibroids, infertility and low birthweight, a consequence of anemia. Connecting these dots has profound implications for clinical and public health, such as enhancing awareness and wellness outcomes among black women — some of whom don't know that obesity is a risk factor for nearly everything.

**Table 1: Relevant Literature on Obesity and Health**

| **First Author's last name, (year), title of article, Journal Name(vol): p. #.** | **Exact DV(or COMV) name used in article** | **Names of IVs** (or any var IV to a DV) | **Theory/Conceptualization used in article** | **Major finding re: IVs & DV (or COMV)** |
|---|---|---|---|---|
| Zozzaro-Smith, (2016), Association Between Obesity During Pregnancy and the Adequacy of Prenatal Care, Journal of Maternal and Child Health (20): p. 158-163 | Obesity | Prenatal care, maternal age, race, education, comorbidities | Kotelchuck Index (KI) | According to the study, which used multivariable logistic regression, "after adjusting for age, race, education, diabetes, hypertension, and practice type, obesity remained a significant predictor of adequate prenatal care (OR 1.29, 95 % CI 1.14–1.46)." Several limitations were cited, including a sample of urban women at an academic hospital. |
| Romero, (2012), Changing Trends in the Prevalence and Disparities of Obesity and Other Cardiovascular Disease Risk Factors in Three Racial/Ethnic Groups of USA Adults, Advances in Preventive Medicine. | Race & ethnicity | Obesity, hypertension, smoking diabetes, cholesterol | Cross-sectional trend analysis | According to the study, "race/ethnic disparities did not improve over time (with the exception of smoking); in fact, they widened for obesity and hypercholesterolemia." |
| Knox-Kazimierczuk, (2017), African American Women and Obesity Through the Prism of Race. Health Education & Behavior. https://doi.org/10.1177/1090198117721610 | Obesity | Racial identity, social identity, women | Critical race theoretical framework | According to the study: "Multiple linear regression was used to examine the constructs of racial identity on BMI comparing standardized coefficients (β) and $R^2_{adj}$ values. Results indicated participants ascribing more to the stereotype of "Blacks giving up easily" (β = 0.527, p = .000) showed an increased BMI. Additionally, the negative stereotype of "Blacks being violent" (β = 0.663, p = .000) and "Blacks being lazy" (β = 0.506, p = .001) was associated with an increased BMI." |
| Assari, (2014), Additive Effects of Anxiety and Depression on Body Mass Index among Blacks: Role of Ethnicity and Gender, International Cardiovascular Research Journal 8(2): p. 44–51. | Obesity | MDD, GAD, age, employment status, education, and marital status | Cross-sectional trend analysis | According to the study, "among Caribbean Black men and African American women, lifetime GAD, but not MDD, was associated with high BMI. Among Caribbean Black women, lifetime MDD, but not GAD, was associated with high BMI." |

**Figure 1: Causal Diagram for Dependent Variable: Body Mass Index**

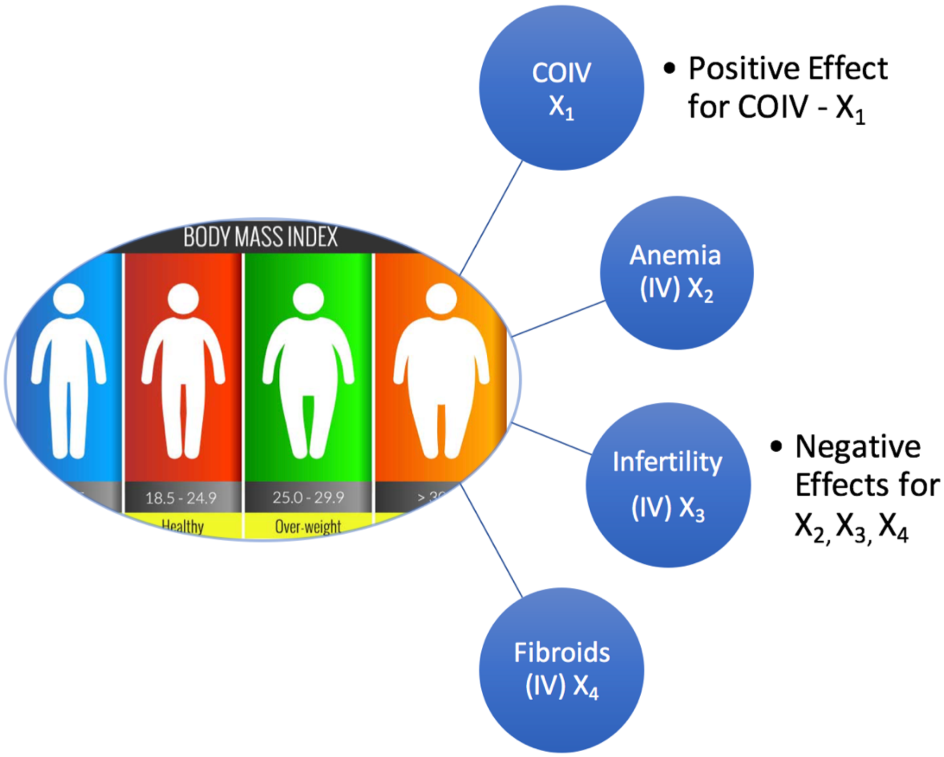



*Photo Source: Science Score/Creative Commons*

## THEORETICAL CONCEPTUALIZATION

The results from the analyses of obesity as measured by Body Mass Index, the dependent variable, against physical health ratings, the COIV, are expected to support the implication from the differential effect/susceptibility theory that as health ratings decrease, BMI will increase among African Americans. A central proposition of the differential effects theory is that "race, ethnicity, gender and place alter the mechanisms behind health and illness." This theory also "posits that complex interrelations between social, psychosocial, physical and mental health are not universal, but rather specific to sub-populations" (Assari 2016).

Compared to the other independent variables, the COIV (physical health ratings) has an inverse relationship with the dependent variable (obesity as reflected by the Body Mass Index). It is posited as physical health ratings improve, the COIV has a positive relationship in driving down BMI — hence the positive causal influence on the path between the COIV and BMI. Good health is associated with healthier weight, and poor health is associated with obesity or being overweight. This association is in line with the differential effect theory, given the complex interrelation between obesity, its effects and the sub-populations of African Americans.

As previously noted, 77% of black women are either overweight or obese, and they are at the center of the epidemic in the United States (Kazimierczuk and Bryant 2016). Additionally, obesity is a risk factor for the independent variables fibroids, infertility and anemia — all of which are altered by "race, ethnicity, gender and place" as suggested by the differential effects theory. Therefore, the causal diagram reflects a negative relationship for each path between BMI and fibroids, infertility and anemia. These negative relationships are being examined along with the relevant hypotheses in this study. The variables and data are part of the National Survey of American Life (NSAL), 2001-2003, which has been recognized for the diversity of its sample population. They are integral in enriching the literature with new research on the relationship between BMI and reproductive health across race and ethnicity.

## HYPOTHESES

**H1$_1$:** It is hypothesized (IIH) that the COIV, *physical health ratings ($X_1$),* is **relatively** more important than being diagnosed with *anemia ($X_2$), infertility ($X_3$)* or *fibroids ($X_4$)* in explaining *BMI levels (Y)* among *black respondents.*

> **H1$_0$:** IIH that the COIV, *physical health ratings ($X_1$),* **IS NOT relatively** more important than being diagnosed with *anemia ($X_2$), infertility ($X_3$)* or *fibroids ($X_4$)* in explaining *BMI levels (Y)* among *black respondents.*

**$H2_1$:** IIH that being diagnosed with *fibroids* *($X_4$)* is an **important independent predictor or explanation** of *BMI levels* *(Y)*.

> **$H2_0$:** IIH that being diagnosed with *fibroids* *($X_4$)* **IS NOT** is an **important independent predictor or explanation** of *BMI levels* *(Y)*.

**$H3_1$:** IIH that the COIV, *physical health ratings ($X_1$),* acts **interactively** with diagnoses of *anemia* *($X_2$),* *infertility* *($X_3$)* and *fibroids* *($X_4$)* and significantly extends understanding of *BMI levels* *(Y)* as part of the overall fit of the model.

> **$H3_0$:** IIH that the COIV, *physical health ratings ($X_1$),* acts **interactively** with diagnoses of *anemia* *($X_2$),* *infertility* *($X_3$)* and *fibroids* *($X_4$),* but **DOES NOT** significantly extend understanding of *BMI levels* *(Y)* as part of the overall fit of the model.

**$H4_1$:** IIH that the variance in *BMI levels* *(Y)* can be reasonably explained by *anemia* *($X_2$),* acting **cumulatively** with *fibroids* *($X_4$) and* *infertility* *($X_3$)*.

> **$H4_0$:** IIH that the variance in *BMI levels* *(Y)* can **NOT** be reasonably explained by *anemia* *($X_2$),* acting **cumulatively** with *fibroids* *($X_4$) and* *infertility* *($X_3$)*.

**This research will seek to reject the null hypotheses.**

## METHODS

This study was conducted using analysis of existing NSAL data on SPSS software version 24 through a combination of multiple regression and percent distribution based on the framework of the differential effects theory. The objective was to investigate the regression-related central organizing hypothesis that the Body Mass Index is explainable by physical health ratings for women across racial and ethnic groups and their self-reports of diagnosed fibroids, anemia and infertility.

### Data Source

The data set came from the Collaborative Psychiatric Epidemiology Surveys (CPES), which is part of the National Survey of American Life (NSAL), 2001-2003. NSAL was sponsored by the Inter-University Consortium for Political and Social Research (ICPSR) at the

University of Michigan in Ann Arbor. The survey was intended to provide a comprehensive investigation of cultural and ethnic influences on mental disorders. It is considered the largest study of its type. It also addresses longstanding criticisms on the lack of diversity in medical research. To achieve such diversity, the study pooled the research efforts of CPES, NSAL, the National Comorbidity Survey Replication (NCS-R) and the National Latino and Asian American Study (NLAAS). The principal investigator was Margarita Alegria from the Center for Multicultural Mental Health Research at Cambridge Health Alliance.

In addition to mental health, the study was rich with data on physical health, including obesity. It was an ideal source for data on the reproductive health of women of African and Caribbean descent. The data was taken from the ICPSR 20240-0003 codebook. Many researchers have used NSAL data, often multiple times like Shervin Assari, MD, MPH, a research assistant professor in the Department of Health Behavior and Health Education at the University of Michigan's School of Public Health. One of Assari's articles cited in this study was on the Additive Effects of Anxiety and Depression on Body Mass Index Among Blacks: Role of Ethnicity and Gender for the International Cardiovascular Research Journal (2014).

NSAL support came from National Institute of Mental Health (NIMH U01-MH57716), with supplemental support from the Office of Behavioral and Social Sciences Research (OBSSR) at the National Institute of Health (NIH), and the University of Michigan. It was supplemented with NCS-R funding from NIMH (U01-MH60220) the National Institute of Drug Abuse (NIDA, R01-DA12058-05), the Substance Abuse and Mental Health Services Administration (SAMHSA), the Robert Wood Johnson Foundation (RWJF, grant 044780) and the John W. Alden Trust. Additional grants through NLAAS came from NIMH (U01-MH062209, and U01-

MH62207), OBSSR at NIH, SAMHSA and the Latino Research Program Project (P01-MH059876).

**Sample Design**

Using a multi-stage process, researchers selected primary sampling units with probabilities proportional to size for all three surveys, based on the 1990 U.S. Census and other geographic data. They used computer-assisted personal interviews (CAPI) in homes, as well as full and partial human or computer-assisted telephone interviews (CATI). The three survey populations covered 252 geographic areas during early 2001 and spring 2003.

For NSAL, researchers identified 11,634 eligible households from 26,495 randomly sampled addresses. They interviewed 6,199 adult respondents, 18 and older. The white respondents aren't necessarily representative of the Caucasian population in the United States. They primarily lived in the same neighborhoods as the black respondents to aid in comparisons with African-American and Afro-Caribbean respondents, a major NSAL focus.

"The NSAL white sample was designed to be optimal for comparative descriptive and multivariate analyses in which residential, environmental and socioeconomic characteristics are carefully controlled in the black/white statistical contrasts," according to the research team. "The original completed interview target for the NSAL White sample was set at n = 1,800. Later in the study period, a decision was made to reduce this target to n = 1,000 White adult interviews based on survey costs and updated analysis objectives for the NSAL."

**<u>Sample Size and Characteristics</u>**

NSAL interviewed 6,199 adult respondents, according to ICPSR's methodology section on the website: http://www.icpsr.umich.edu/icpsrweb/ICPSR/studies/20240#bibcite

| Codebook Description | | Pct. | Frequency | Sample Description |
|---|---|---|---|---|
| 8 | All Other Hispanic | 3% | 183 | |
| 9 | Afro-Caribbean | 23.6% | 1438* | 1,623 |
| 10 | African American | 58.7% | 3570 | 3,570 |
| 11 | Non-Latino Whites | 14.6% | 891 | 1,006** |
| **Total** | | **99.9%** | **6082** | **6,199** |

**Two duplicates were eliminated among 1,623 self-identified, Afro-Caribbean respondents above. There is also a separate five-category in the codebook titled "Caribbean Ethnic Origins 5 Categories." See below.*
***The white sample had been reduced to 1,000 from an initial goal of 1,800. An additional 115 were removed when it turned out that their subsample made up "less than 10 percent of the African-American density stratum."*

| Codebook Description | | Pct. | Frequency |
|---|---|---|---|
| 1 | Spanish-Caribbean | 11.3% | 180 |
| 2 | Haiti | 18.6% | 298 |
| 3 | Jamaica | 31.9% | 510 |
| 4 | Trinidad & Tobago | 10.6% | 170 |
| 5 | Other | 27.5 | 440 |
| **Total** | | **99.9%** | **1598** |

*The sample size used in regression analysis for my study on women's reproductive health are still representative, given that 62.4% of respondents are women. However, the Afro-Caribbean sample failed to meet the threshold of at least 1000 cases.*

*N = 690 Afro-Caribbean respondents in sample size used in regression analysis for my study*
*N = 689 Afro-Caribbean respondents in final effective sample size appearing in formula for degrees of freedom, which falls below the requirement for 1000+ cases*

*N = 1782 African Americans in black-only sample size used in regression analysis for my study*
*N = 1781 African Americans in final effective sample size appearing in formula for degrees of freedom*

*N = 3518 in total sample size used in regression analysis for my study*
*N = 3517 in final effective sample size appearing in formula for degrees of freedom*

***Also see Table 2: Major Demographic Characteristics of Sample on page 15 and in Appendix A.***

**Table 2: Major Demographic Characteristics of NSAL Sample**

| Major Demographic Characteristics of Sample: status on major stratifying processes in society | N | (%) | Mean | SD |
|---|---|---|---|---|
| ***Gender*** | | | | |
| Male | 2286 | 37.6 | | |
| Female | 3796 | 62.4 | | |
| ***Education in years*** | | | 12.64 | 2.61 |
| ***Income*** | | | 3583297 | 31236.41 |
| ***Region of origin*** | | | | |
| US | 5037 | 82.8 | | |
| Non-US | 981 | 16.1 | | |
| ***Ethnicity/Race*** | | | | |
| Black Native | 3670 | 58.7 | | |
| Black-non-Native | 1438 | 23.6 | | |
| Non-Black | 1074 | 17.6 | | |

**Response Rate**

The three survey populations covered 252 geographic areas. For NSAL, researchers identified 11,634 eligible households from 26,495 randomly sampled addresses. They interviewed 6,199 adult respondents, 18 and older.

1. NCS-R: Adults who are 18 and older who speak English and live in the United States
   - 9,282 adult interviews were completed: 7,693 interviews with the main respondent and 1,589 interviews with a second adult in the household. There was also a shortened version to test for nonresponse bias. The response rate was 70.9 percent; 80.4 percent for the secondary respondents.
2. Three NSAL groups: white Americans (1,006 respondents) and black Americans of Caribbean (1,623) or African (3,570) descent in the United States
   - The overall response rate for the core NSAL national sample was 71.5 percent for 6,082 respondents, once duplicates were removed. The Caribbean Supplement sample had a weighted response rate of 76.4 percent.

3. NLAAS respondents who are Asian, Latino and white Americans who are 18 and older in the United States, including Hawaii.
   - The weighted response rate was 75.7 percent among the 3,620 main respondents (77.6 percent for Latinos, 69.3 percent for Asians). The rate was 80.3 percent among the 1,029 second adult interviews (82.4 percent for Latinos, 73.7 percent for Asians).

All in all, the preponderance of the evidence suggests that the results from this sample can be generalized to the larger population — with a possible caveat concerning Caucasians as noted on pages 13 and 14. The results are also suitable to investigate the regression-related central organizing hypothesis that the Body Mass Index is explainable by physical health ratings for women across racial and ethnic groups and their self-reports of diagnosed fibroids, anemia and infertility.

## Data Collection

### (1) Research Design

- Data Collection/Observation Strategy
    - Computer-assisted personal interviews (CAPI) in homes, as well as full and partial human or computer-assisted telephone interviews (CATI)
    - 252 geographic areas for the three survey populations
    - Timetable: early 2001 and spring 2003
    - Incentives
- Type of Instrument
    - CPES questionnaire based on WHM-CIDI — the World Health Organization's expanded version of the Composite International Diagnostic Interview
    - Loaded laptops with computer-assisted interviewing (CAI) software: Blaise Survey Processing System, Version 4.5, developed by Statistics Netherlands
        - Pros: Designed for complicated questionnaire skip patterns and sub-sampling algorithms
        - Cons: Cost and need for programmers who specialize in writing code for complex surveys
- Quality Control

- Timetable: One year for questionnaire design and testing for each project, with a goal of devoting substantial time to developing the psychiatric disorder sections
- Debriefing interviews with CIDI respondents to modify methodology
- Selected software in wide use internationally by governmental agencies and large survey organizations
- Recruited and trained 946 interviewers for overall project (329 for NSAL)
- Matched NSAL interviewers with respondents' race

***Sources for Section on Research Design:*** *ICPSR website (2004); NSAL Codebook (Allegria, Jackson, Kessler, and Takeuchi 2004); ICPSR User Guide (Allegria et al. 2004)*

**(2) Measurement**

The CPES/NSAL study had 15,232 variables (Allegria et al. 2004). The BMI data in the ICPSR 20240-003 codebook was used to examine obesity.

***See Appendix B, Table 3, for measurement statistics and questionnaire items related to the variable.***

***See Appendix E for Independent Variables from NSAL Codebook (Allegria et al. 2004).***

**(2a) Dependent Variable: OBESE6CAT**

The dependent variable for this study is obesity, as measured by the Body Mass Index under OBESE6CAT. NSAL data defines overweight based on a BMI of 25 to 29.9. Of the total sample, 1995, or 34.8%, fell into this category. In NSAL and elsewhere, obesity is defined as BMI $\geq 30$ kg/m$^2$. NSAL also identified three classes of obesity:

| Class | BMI | Frequency | Percentage |
|---|---|---|---|
| I. | 30-34.9 | 1,109 | 19.4% |
| II. | 30-34.9 | 463 | 8.1% |
| III. | > 40 | 289 | 5% |

**(2b) Independent Variables**

1. **COIV $X_1$ Physical Health ratings**

Using an operational definition to measure each variable, we define physical health ratings by a commonly used label, self-rated health (SRH), which is clearer in making the distinction that respondents are being asked to rate *themselves*. The value labels and coding are as follows: 1 Excellent, 2 Very Good, 3 Good, 4 Fair and 5 Poor.

2. **$X_2$ Anemia**

Anemia, the most common blood disorder, is defined as having blood cells that are functioning improperly and/or are insufficient in number. For women, this would mean a hemoglobin value of less than 12.0 gm/dl (American Society of Hematology 2017).

3. **$X_3$ Infertility**

"Infertility is defined as not being able to get pregnant (conceive) after one year (or longer) of unprotected sex. Because fertility in women is known to decline steadily with age, some providers evaluate and treat women aged 35 years or older after 6 months of unprotected sex" (CDC 2017).

4. **$X_4$ Fibroids**

Fibroids are defined as benign tumors that have an unknown cause and that are "made of muscle cells and other tissues that grow in and around the wall of the uterus, or womb. … Risk factors include being African American or being overweight" (NIH: National Institute of Child Health and Human Development 2017.

All in all, the results to the hypotheses, that we are soon to discuss, are credible because the data is valid and reliable with no significant measurement errors. None of the standard errors for the regression coefficients are high, and all of the VIFs (variance inflation factors) are below 10, indicating no problem with multicollinearity.

**<u>Data Analysis</u>**

The data will be analyzed using multiple regression and percent distribution based on the NSAL data. As Jacob Cohen noted in 1968, multiple regression is an effective and flexible system to analyze data and enhance understanding of a dependent variable like obesity and its relationship with fibroids, infertility and anemia. And regression can adjust for such factors as age, race, education, income or employment. For these and other reasons, Cohen considers it far superior to ANOVA. As the least-squares estimator, b has the smallest sampling variance and errors. It is the most efficient and is also known as BLUE, an acronym for best linear unbiased estimator. BLUE should be homoscedastic.

Regression and similar models are "relatively robust," according to Bohrnstedt and Carter (1971). Even if there are problems with non-normality and heteroscedasticity, distortions might not be that serious. Plus, they can be fixed or minimized. The key is to avoid random measurement and specification errors as much as possible. However, nonrandom errors are a different story.

Bohrnstedt and Carter also pointed out that if the variables and their linkages are off, the parameter estimates will also be off and robustness won't exist. Measurement errors can cause biased $\alpha$ and $\beta$ estimates, they added. IV measurement errors can affect the regression coefficients, but not DV measurement errors.

Measurement error can also create a wider gap between $\beta$ and b, they said, citing a fictitious example of $\beta_1=-.0186$ and $b_1=.029$. One clue of measurement error, Bohrnstedt and Carter, said is a sign change when $\beta$ is near zero. This is not an issue for my independent variables. For example, the values for the b and β coefficients are relatively close for the COIV (β=.232 and b=.288) and the anemia IV (β=.055 and b=.041).

Bohrnstedt and Carter celebrated the growing use of parametric techniques by sociologists and more consistent emphasis on statistical significance. They credited Hubert M. Blalock Jr. for championing this type of data analyses and reversing assumptions that the methods were "too sophisticated" for sociological research.

## Template (Illustrative for Total Sample)

**Table 4: Bivariate Correlation Matrix ($r_{xy}$ & $r_{xixj}$) & Multivariate Tolerances/$R^2$**

| **Variables** | Obesity | Physical Health Ratings | Anemia | Infertility | Fibroids |
|---|---|---|---|---|---|
| Obesity | 1 | .232 | .027 | -.053 | -.041 |
| Physical Health Ratings | .232 | 1 | -.097 | -.098 | -.082 |
| Anemia | .027 | .-097 | 1 | .054 | .136 |
| Infertility | -.053 | -.098 | .054 | 1 | .077 |
| Fibroids | -.041 | -.082 | .136 | .077 | 1 |
| *Tolerance*<br>*$R^2$= 1-Tolerance* | | .978<br>.022 | .973<br>.027 | .984<br>.016 | .973<br>.027 |

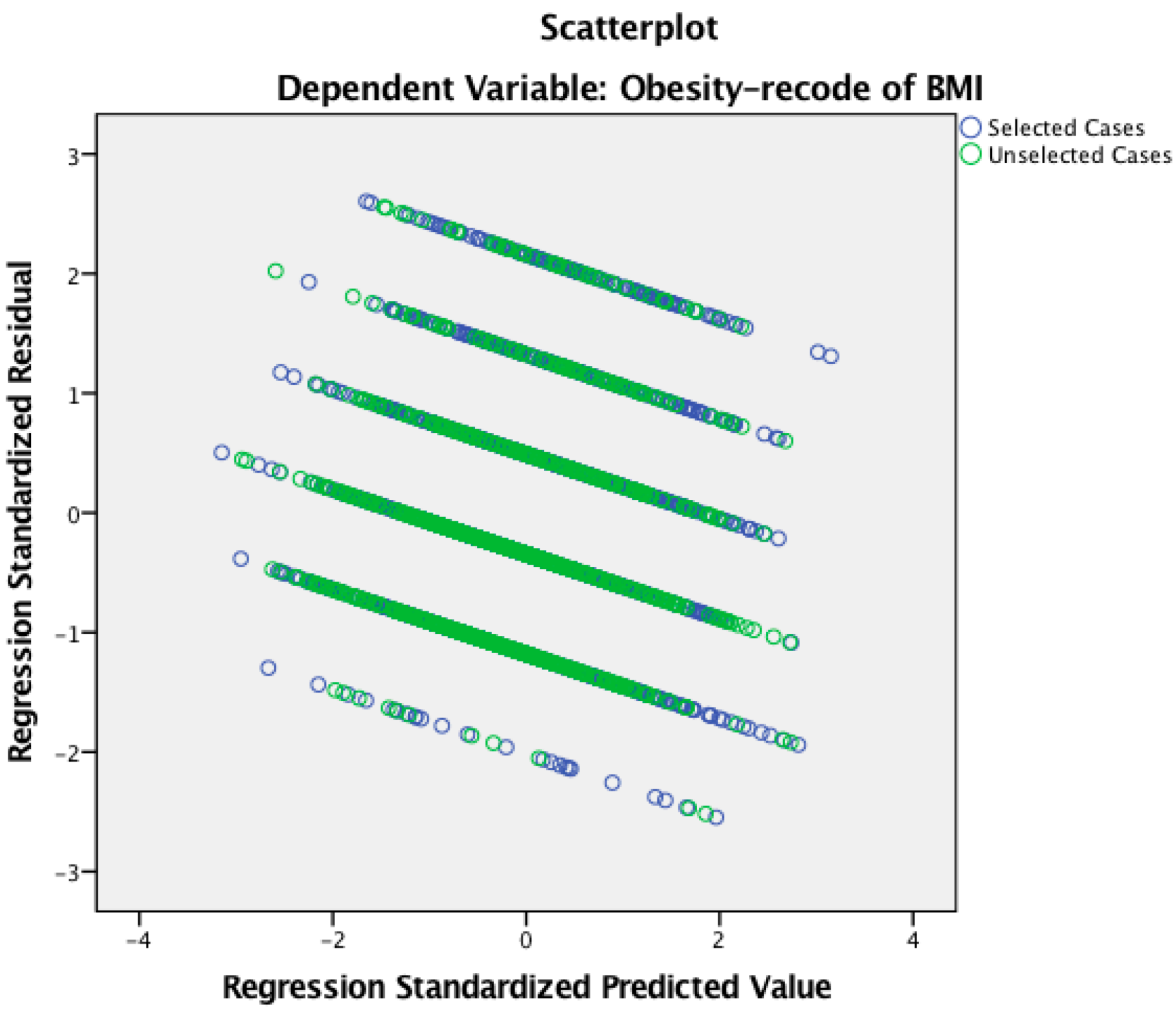
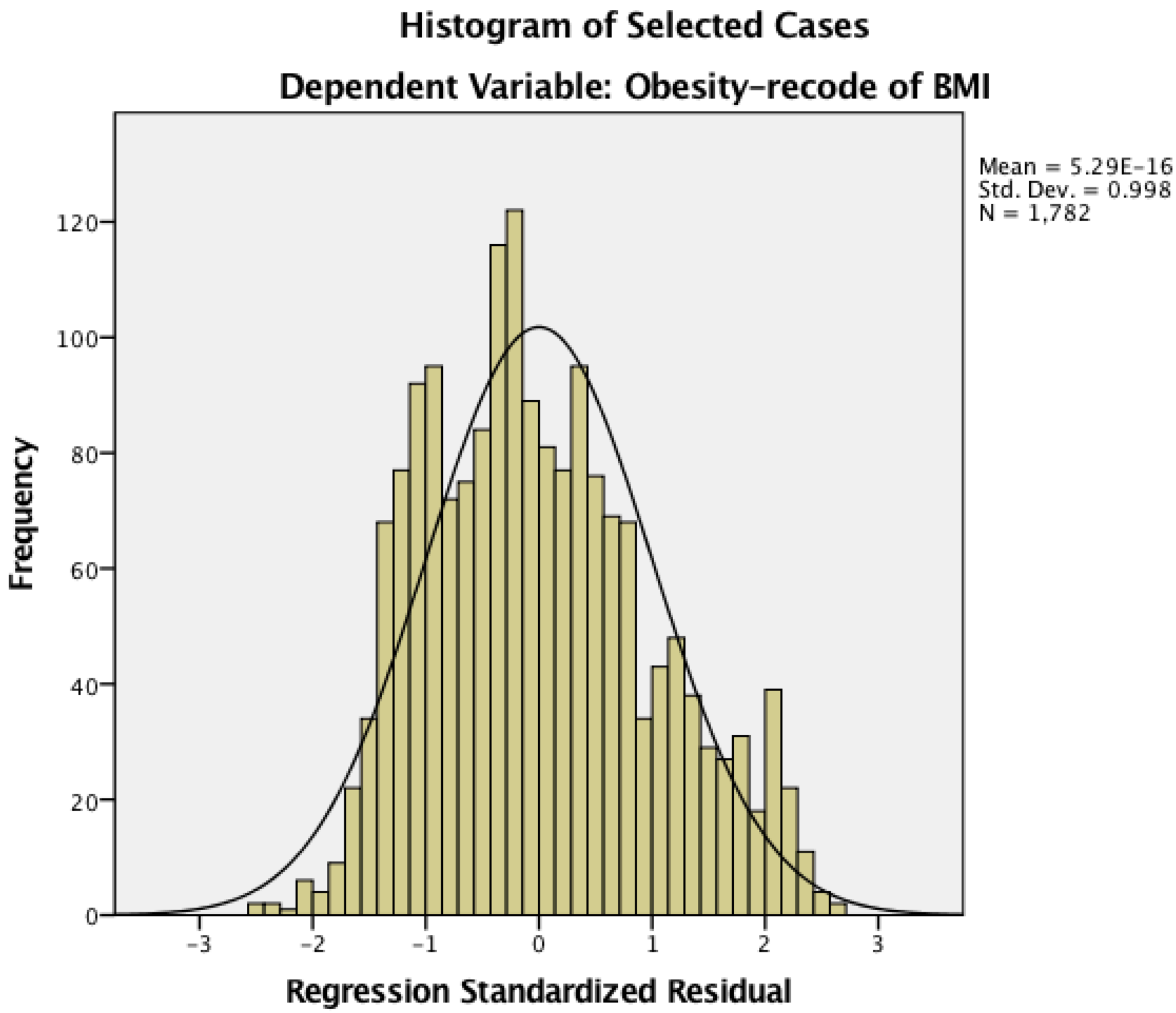



***Figure 2:*** *Standardized residuals plotted against the standardized predicted Y values for obesity among African Americans. This scatterplot indicates possible problems with normality and linearity. It has an overall negative regression line. Here are the correlations that fall between -1 and 1:*

| *<u>Positive Correlations</u>* | | *Total Sample* |
|---|---|---|
| *Obesity/DV* | *SRH/COIV* | *.232* |
| *Anemia* | *Fibroids* | *.136* |
| *Infertility* | *Fibroids* | *.077* |
| *Infertility* | *Anemia* | *.054* |
| *Obesity* | *Anemia* | *.027* |
| | | |
| *<u>Negative Correlations</u>* | | |
| *Obesity* | *Fibroids* | *-.041* |
| *Obesity* | *Infertility* | *-.053* |
| *Fibroids* | *SRH* | *-.082* |
| *Anemia* | *SRH* | *-.097* |
| *Infertility* | *SRH* | *-.098* |


Histogram of Selected Cases
Dependent Variable: Obesity-recode of BMI
Mean = 5.29E-16
Std. Dev. = 0.998
N = 1,782
Frequency
0
20
40
60
80
100
120
-3
-2
-1
0
1
2
3
Regression Standardized Residual

**RESULTS**

Multiple linear regression and percent distribution were used to analyze whether obesity is associated with physical health ratings by women across racial and ethnic groups and their self-reports of diagnosed fibroids, anemia and infertility. The analysis supports the central organizing hypothesis that there is a statistically significant association between BMIs and physical health ratings, also known as self-rated health or SRH (b=.266; SE=.019; p=.000). The bivariate correlation between the COIV and DV is positive (r=.232; p=.000). In the NSAL study, 77.4% of respondents rated their health as good, very good or excellent (Appendix A). Higher SRH ratings have been associated with lower BMIs in many studies, though not always consistently (Kim 2014; Noh 2017). In NSAL and elsewhere, obesity is defined as body mass index (BMI) ≥30 $kg/m^2$.

Looking at African Americans alone, the association between the COIV and DV is less strong (b=.209; SE=.028; p=.000). Similarly, the bivariate correlation is also positive, but less so (r=.188; p=.000). The final effective sample size for this regression analysis is 3,517 from the total of 6,199 NSAL respondents. In a separate regression analysis, the effective sample size appearing in the formula for degrees of freedom of African Americans is 1,781 (n=3,570 for NSAL). However, the final effective sample size was only 689 for Afro-Caribbean respondents, which falls below the requirement for at least 1,000 cases (n=1,621 for NSAL).

***See Appendix C, Table 4, for correlations and Appendix D, Table 5, for regression summary.***

**Table 5 (Obesity[z]): Regression Summary Table: Regression of BMI on COIV/Health Ratings, Anemia, Infertility & Fibroids ($N_{effective}{}^{a}$ =3517)[1216]**

| Model Multiple Regression | b | $SE_b$ | t | p=Sig | $\beta^b$ | $R^2_{Adj}$ | $F^b$ | $F_{I\text{-}A\ chng}{}^{c}$ |
|---|---|---|---|---|---|---|---|---|
| Additive (A) | 2.674 | .139 | 19.205 | .000 | | .057 | 54.056 | 54.056 |
| $X_1$=COIV | .288 | .019 | 14.004 | .000 | .232 | | | |
| $X_2$=Anemia | .041 | .012 | 3.328 | .001 | .055 | | | |
| $X_3$=Infertility[d] | -.042 | .023 | -1.876 | .061 | -.031 | | | |
| $X_4$=Fibroids | -.089 | .055 | -1.608 | .108 | -.027 | | | |
| Interactive (I) | | | | | | | | |
| $X_1X_4$ | -.081 | .051 | -1.606* | .108 | .091 | .057 | 43.780* | 2.579 |

**Importance of Physical Health Ratings**

**$H1_1$:** It is hypothesized (IIH) that the COIV, *physical health ratings ($X_1$),* is **relatively** more important than being diagnosed with *anemia ($X_2$), infertility ($X_3$)* or *fibroids ($X_4$)* in explaining *BMI levels (Y)* among *black respondents.*

Practically speaking, the data provides strong evidence to reject the null ($H1_0$) in favor of this research hypothesis (p=.000; α=.05). The p-value is less than the level of significance, or alpha. Logically speaking, a woman might not think that her SRH — her *perceived* health status — would be relatively more important than her *actual* health status with a real-life diagnosis of anemia, infertility of fibroids. Yet, the COIV, physical health ratings, is relatively more important than the other independent variables. Anemia is the only other IV that is statistically significant (p=.001).

In terms of being significantly different from zero, the beta coefficient, β, for the COIV exceeds those for the other IVs with a more significant t-value as well to support the research hypothesis (β=.232; t=14.004). By comparison, anemia is (β=.055; t=3.328). The unstandardized regression coefficient is also stronger for the COIV (b=.288; SE=.019) compared to anemia (b=.041; SE=.012). For every one point increase, BMI would change 29% or 4.1%, respectively. (For more, see Expanded Regression Summary Table, above and in Appendix D.)

The outcome is somewhat similar for the African-American sample in support of the research hypothesis with all of the IVs being statistically significant except for infertility. Thus, we have the following beta coefficients and t-values: COIV (β=.184; t=7.561), anemia (β=.107; t=4.522) and fibroids (β=-.056; t=-2.348).

In terms of BLUE, the COIV is stronger (b=.209; SE=.028; p=.000) compared to anemia (b=.077; SE=.017; p=.000) and fibroids, which has a negative coefficient (b=-.047; SE=.020; p=.019). (For more, see Excel spreadsheet in Appendix E.)

**The Fibroids Factor: An Important Predictor of BMI?**

**$H2_1$:** IIH that being diagnosed with *fibroids* *($X_4$)* is an **important independent predictor or explanation** of *BMI levels* *(Y)*.

We fail to reject the null ($H2_0$) for the overall population, because the p-value exceeds alpha at 0.108. However, the data provides evidence to reject the null in favor of this research hypothesis (p=.019; α=.05) as it relates to the African-American sample. The data indicates that having fibroid tumors is an important independent predictor or explanation of BMI levels for African Americans, but not in the direction we had assumed (β=-.056; t=-2.348). The fibroids IV and obesity DV have a negative linear relationship with a correlation coefficient of -.041. The unstandardized regression coefficient is also negative for the African-American sample (b = -.047), meaning that for every one unit increase in the fibroids variable, BMI drops by 4.7%.

The significance of uterine fibroids in the African-American sample can be generalized to the U.S. population in which these tumors are more prevalent and a greater health risk for black women. It had been hypothesized that there would be a correlation between fibroids and BMI, given that risk factors for developing fibroid tumors include being African American or being overweight. Black women are three time more likely than white women to have fibroids (Brigham and Young Hospital 2017), and the risk is two to three times higher for heavy women (Office of Women's Health reports 2017). In addition, fibroids are also more prevalent as women reach the 30s and 40s, which covers the median age of 44 for the African-American regression sample in this study (Brigham 2017).

In the NSAL questionnaire, 16.6% of all respondents said they have been diagnosed with fibroid tumors. The invalid total of 2,405 slightly exceeds the overall male sample of 2,286.

**Understanding BMI: How Self Ratings Interact With Reproductive Health**

**$H3_1$:** IIH that the COIV, *physical health ratings* ($X_1$), acts **interactively** with diagnoses of *anemia* ($X_2$), *infertility* ($X_3$) and *fibroids* ($X_4$) and significantly extends understanding of *BMI levels* (Y) as part of the overall fit of the model.

We fail to reject the null ($H2_0$), because the p-value of the interactive relationship between the COIV and fibroids ($X_1X_4$) exceeds alpha at 0.108. In addition, the interactive t-value and beta coefficient are not significantly different from zero in the same direction (β=.091; t=-1.606.

However, in terms of the overall fit, all of the VIFs (variance inflation factors) are below 10, indicating no problem with multicollinearity. None of the standard errors for the regression coefficients are high.

The results of this research mirror some of the findings of Kazimierczuk and Bryant (2016), who also analyzed NSAL data and found that “educational attainment, work status and marital status were all significant predictors of BMI.” The researchers pointed out that such findings are “counter intuitive,” because they are typically linked to better health outcomes. The team attributed this to heightened social stress from marriage and employment that may lead to increases in BMI.

**Coefficients**

The constant or baseline score for the b coefficients is 3.5%. Among the unstandardized regression coefficients, the highest scores are for the COIV on physical health ratings (20.9%) and anemia with every one-point increase resulting in BMI going up 7.7%. The strength of anemia as a standardized beta coefficient raises slightly to 10.7%, but drops slightly for physical health ratings to 18.4%. Both b coefficients are statistically significant with p-values that are lower than 0.05 at 0.000. However, the relationships for the other variables were less strong in both areas, possibly indicating a problem with multicollinearity.

**Model Summary**

Taking shrinkage into account, the adjusted R square is 6.4% — the amount of variation in the dependent variable, BMI/obesity, that can be explained by variation in the independent variables. The standard error of the estimate is 1.197.

**ANOVA**

For the analysis of variance or ANOVA, the p-value is .000, which is below alpha (0.05) and therefore statistically significant. There is also a statistically significant difference between the predictors [$df$ (8, 1773) =16.22, $p$ = .000).

**Coefficient Correlations**

A number of data points are linearly related, falling between -1 and 1. (See Appendix, African-American Regression.) Not surprisingly, paired variables with lacking a linear relationship with a correlation of zero (0) include years of education and the following:

- Marital status
- Physical health rating
- Number of living biological children

Similarly, positive linear correlations exist between fibroids and:

- Fertility problems (.002)
- Physical health rating (.062)

This in line with health data from the federal Centers for Disease Control, indicating that fertility declines with age and that women 35 and older often under treatment after six months of unprotected sex. The median age of respondents in this sample is 44. In addition, the CDC cites fibroids among the causes of infertility (CDC 2017). However, it must be noted that correlations do not guarantee a causal relationship.

## DISCUSSION AND CONCLUSIONS

This research helps to fill a void in the literature on reproductive health through the lens of obesity as it relates to race, ethnicity and gender. It may have clinical and public health implications, such as enhancing awareness and wellness outcomes among black women who suffer disproportionately from obesity, infertility, fibroids and anemia (a risk factor for low birth-weight).

One strong aspect is that the NSAL data that included a nationally representative sample of African Americans. However, the limitations include using pre-existing data, relying only on self-reports and having a limited number of respondents of Caribbean descent, which resulted invalid sample for this research.

In addition, NSAL focused only on English speakers, which could limit the number of respondents from islands that speak other languages. “Promotion of health and wellbeing of populations requires an understanding about group differences and heterogeneities in unique social and psychosocial processes that affect health and illness of diverse populations. This argument is central to the differential effect theory” (Assari 2017).

It would also be ideal to have a greater pool of white respondents for comparison. It would also be good to have more questions about fibroids, anemia and infertility as well as some qualitative data such as in-depth interviews to capture nuances and variations.

More research is needed in this area, especially to address the limitations cited above. It may have clinical and public health implications, such as enhancing awareness and wellness outcomes among black women who suffer disproportionately from obesity, infertility, fibroids and anemia (a risk factor for low birth-weight). In addition, it may help to control health-care costs nationally.

**REFERENCES**


Alegria M., James S. Jackson, Ronald C. Kessler, and David Takeuchi. 2004. "Codebook for National Survey of American Life (NSAL), 2001-2003" as part of Collaborative Psychiatric Epidemiology Surveys (CPES), (ICPSR 20240-0003). Ann Arbor, MI: University of Michigan Inter-University Consortium for Political and Social Research.

Alegria M., James S. Jackson, Ronald C. Kessler, and David Takeuchi. 2004. "User Guide" for Collaborative Psychiatric Epidemiology Surveys (CPES), 2001-2003, including National Survey of American Life (NSAL) ICPSR 20240-0003. Ann Arbor, MI: University of Michigan Inter-University Consortium for Political and Social Research.

Assari, S. (2014). Additive effects of anxiety and depression on body mass index among blacks: Role of ethnicity and gender. *International Cardiovascular Research Journal, 8*(2), 44-51.

Assari, S. (2016). Race and ethnic differences in additive and multiplicative effects of depression and anxiety on cardiovascular risk. *International Journal of Preventive Medicine, 7*(1), 22-22. doi:10.4103/2008-7802.173931

Assari, S., & Caldwell, C. H. (2017). The Link between Mastery and Depression among Black Adolescents; Ethnic and Gender Differences. Behavioral Sciences, 7(2), 32. http://doi.org/10.3390/bs7020032

Assari, S., & Lankarani, M. M. (2015). The association between obesity and weight loss intention weaker among blacks and men than whites and women. *Journal of Racial and Ethnic Health Disparities, 2*(3), 414.

Assari, S., & Lankarani, M. M. (2015). Mediating effect of perceived overweight on the association between actual obesity and intention for weight control; role of race, ethnicity, and gender. *International Journal of Preventive Medicine, 6*(1), 102-102. doi:10.4103/2008-7802.167616

American Society of Hematology 2017. "Anemia and Pregnancy. Washington DC: American Society of Hematology. Retrieved November 29, 2017. (http://www.hematology.org/patients/anemia/pregnancy.aspx).

Aviva Must, Jennifer Spadano, Eugenie H. Coakley, Alison E. Field, Graham Colditz, William H. Dietz. The Disease Burden Associated With Overweight and Obesity. *JAMA.* 1999;282(16):1523–1529. doi:10.1001/jama.282.16.1523

Black Women's Health Imperative 2017. "Low Birth Weight Babies and Black Women: What's the Connection?" Washington DC: Black Women's Health Imperative. Retrieved November 29, 2017. (https://www.bwhi.org/2017/07/23/low-birth-weight-babies-black-women-connection/).

Bohrnstedt, George W. and T.M. Carter (1971). "Robustness in Regression Analysis." 118-146 in G.W. Bohrnstedt and E.F. Borgatta (eds). *Sociological Methodology.* San Francisco: Jossey-Boss.

Borgatta, Edgar F. and George W. Bohrnstedt. 1980. "Level of Measurement: Once Over Again." *Sociological Methods & Research* 9(2):147-160.

Bronner, ScD, RD, LD, Y, Josephine E.A. Boyington, MPH, RN. Developing weight loss interventions for African-American women: elements of successful models. J Natl Med Assoc. 2002;94(4):224–35.Google Scholar

Ceballo, R. Erin T. Graham and Jamie Hart. "Silent and Infertile: An Intersectional Analysis of the Experiences of Socioeconomically Diverse African American Women With Infertility." *Psychology of Women Quarterly*, Vol 39, Issue 4, pp. 497 – 511, First Published April 27, 2015

Center for Uterine Fibroids. "Facts About Fibroids" 2017. Boston, MA: Brigham and Young Hospital. (http://www.fibroids.net/homepage.html).

Centers for Disease Control 2017. "Reproductive Health: Infertility FAQs." Atlanta, GA: Retrieved December 5, 2017. (https://www.cdc.gov/reproductivehealth/infertility/index.htm).

Dagadu, H. E., & Christie-Mizell, C. A. (2014). Heart trouble and racial group identity: Exploring ethnic heterogeneity among Black Americans. *Race and Social Problems, 6*(2), 143-160. doi:10.1007/s12552-013-9109-7

DeJoy, Sharon Bernecki; Bittner, Krystle. (2015). Obesity stigma as a determinant of poor birth outcomes in women with high BMI: a conceptual framework. Maternal and child health journal, Volume 19, Issue 4

Inter-University Consortium for Political and Social Research. Collaborative Psychiatric Epidemiology Surveys (CPES), 2001-2003 (ICPSR 20240). National Survey of American Life (NSAL). Ann Arbor, MI: University of Michigan. Retrieved December 5, 2017. (http://www.icpsr.umich.edu/icpsrweb/ICPSR/studies/20240#bibcite).

Katz, D. A. et al. Impact of obesity on health-related quality of life in patients with chronic illness. Journal of General Internal Medicine, Vol. 15, November 2000, pp. 789-96.

Shersten Killip, M.D., M.P.H., John M. Bennett, M.D., M.P.H., And Mara D. Chambers, M.D., University of Kentucky, Lexington, Kentucky Am Fam Physician. 2007 Mar 1;75(5):671-678.

Kazimierczuk, F. et al. The Social Determinants of Obesity: Examining The Intersections of Race, Class, and Gender in African American Women. Journal of the Academy of Nutrition and Dietetics , Volume 116 , Issue 9 , A34

Kazimierczuk, F. et al. African American Women and the Obesity Epidemic: A Systematic Review

Kim G, Parmelee P, DeCoster J, Bryant AN, Chiriboga DA. The relation between body mass index and self-rated mental health among older adults: do racial/ethnic differences exist? Am J Geriatr Psychiatry. 2014; 22(7): 661–669. doi: 10.1016/j.jagp.2012.08.011

Know-Kazimierczuk, Francoise, PhD, RD, CSSD, LD, Karly Geller, PhD, Sherrill Sellers, PhD, Denise Taliaferro Baszile, PhD. Meridith Smith-Shockley, PhD. (2017). African American Women and the Obesity Through the Prism of Race. Journal of Pan African Studies.

Medline Plus 2017. Uterine Fibroids." Bethesda, MD: NIH: National Institute of Child Health and Human Development. Retrieved December 1, 2017. (https://medlineplus.gov/uterinefibroids.html).

Noh, J.-W., Kim, J., Yang, Y., Park, J., Cheon, J., & Kwon, Y. D. (2017). Body mass index and self-rated health in East Asian countries: Comparison among South Korea, China, Japan, and Taiwan. *PLoS ONE*, *12*(8), e0183881. http://doi.org/10.1371/journal.pone.0183881

Office of Minority Health. "Obesity and African Americans." 2016. Washington, DC: Department of Health and Human Services. Retrieved November 29, 2017 (https://minorityhealth.hhs.gov/omh/browse.aspx?lvl=4&lvlid=25).

Pagoto, S. L., Curtin, C., Lemon, S. C., Bandini, L. G., Schneider, K. L., Bodenlos, J. S., & Ma, Y. (2009). Association between adult attention Deficit/Hyperactivity disorder and obesity in the US population. *Obesity, 17*(3), 539-544. doi:10.1038/oby.2008.587

Pagoto, S. L., Schneider, K. L., Bodenlos, J. S., Appelhans, B. M., Whited, M. C., Ma, Y., & Lemon, S. C. (2012). Association of post-traumatic stress disorder and obesity in a nationally representative sample. *Obesity (Silver Spring, Md.), 20*(1), 200-205. doi:10.1038/oby.2011.318

Paradies, Y., Ben, J., Denson, N., Elias, A., Priest, N., Pieterse, A., . . . Gee, G. (2015). Racism as a determinant of health: A systematic review and meta-analysis. *PloS One, 10*(9), e0138511. doi:10.1371/journal.pone.0138511

Romero, C. X., Romero, T. E., Shlay, J. C., Ogden, L. G., & Dabelea, D. (2012). Changing Trends in the Prevalence and Disparities of Obesity and Other Cardiovascular Disease Risk Factors in Three Racial/Ethnic Groups of USA Adults. *Advances in Preventive Medicine*, *2012*, 172423. http://doi.org/10.1155/2012/172423

Sullivan, M. et al. Swedish obese subjects (SOS) – an intervention study of obesity. Baseline evaluation of health and psychosocial functioning in the first 1743 subjects examined. International Journal of Obesity and Related Metabolic Disorders, Vol. 17, September 1993, p. 503-12

WomensHealth.gov 2017. “Uterine Fibroids.” Washington, DC: Office of Women’s Health, U.S. Department of Health and Human Services. Retrieved November 29, 2017. (https://www.womenshealth.gov/a-z-topics/uterine-fibroids).

Paula E. Zozzaro-Smith, Stephen Bacak, Ciara Conway, Jennifer Park, J. Christopher Glantz Loralei L. Thornburg. (2016). Association Between Obesity During Pregnancy and the Adequacy of Prenatal Care. Journal of Maternal and Child Health (20): p. 158-163.

# APPENDICIES

**Appendix A**

Table 2: Major Demographic Characteristics of NSAL Sample[1]

| Major Demographic Characteristics of Sample: status on major stratifying processes in society | N | (%) | Mean | SD |
|---|---|---|---|---|
| ***Gender*** | | | | |
| Male | 2286 | 37.6 | | |
| Female | 3796 | 62.4 | | |
| ***Education in years*** | | | 12.64 | 2.61 |
| ***Income*** | | | 3583297 | 31236.41 |
| ***Region of origin*** | | | | |
| US | 5037 | 82.8 | | |
| Non-US | 981 | 16.1 | | |
| ***Ethnicity/Race*** | | | | |
| Black Native | 3670 | 58.7 | | |
| Black-non-Native | 1438 | 23.6 | | |
| Non-Black | 1074 | 17.6 | | |

## Appendix B

**TABLE 3: Descriptive Statistics for Model Constructs**

| **Model Constructs/Variables** | **Continuous** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Interval/Ratio | | | | Ordinal | | | |
| | Hi/Lo Score | #of Valid Values | $\bar{X}$ | s | Hi/Lo Score | #ofValid Values | $\bar{X}$ | s |
| **Independent** | | | | | | | | |
| $X_1$= ***SRH*** N=3189 miss | 1979/256 | 5893 | 2.56 | 1.08 | 0/00 | 00 | 0.00 | .00 |
| $X_2$=***Anemia*** N=2405 | 2878/799 | 3677 | 4.13 | 1.65 | | | | |
| $X_3$=***Infertility*** N=195 | 5665/222 | 5887 | 4.85 | 0.76 | | | | |
| $X_4$=***Fibroids*** N=2405 | 3068/609 | 3677 | 4.34 | 1.49 | | | | |
| **Dependent** | | | | | | | | |
| Y=***Obesity*** N=354 | 1995/89 | 5728 | 3.16 | 1.15 | 0/00 | 00 | 0.00 | .00 |

SOURCE: APPENDIX F and G: SPSS Output: Measurement Frequencies for Table 3, IV Table and Codebook

# Template (Illustrative)

**Table 4: Bivariate Correlation Matrix ($r_{xy}$ & $r_{xixj}$) & Multivariate Tolerances/$R^2$**

| **Variables** | Obesity | Physical Health Ratings | Anemia | Infertility | Fibroids |
|---|---|---|---|---|---|
| Obesity | 1 | .232 | .027 | -.053 | -.041 |
| Physical Health Ratings | .232 | 1 | -.097 | -.098 | -.082 |
| Anemia | .027 | .-097 | 1 | .054 | .136 |
| Infertility | -.053 | -.098 | .054 | 1 | .077 |
| Fibroids | -.041 | -.082 | .136 | .077 | 1 |
| *Tolerance*<br>*$R^{2=}$1-Tolerance* | | .978<br>.022 | .973<br>.027 | .984<br>.016 | .973<br>.027 |

**Table 5 (<u>Obesity</u>[z]): Regression Summary Table: Regression of BMI on COIV/Health Ratings, Anemia, Infertility & Fibroids ($N_{effective}$[a] =3517)[1216]**

| Model<br>Multiple Regression | b | $SE_b$ | t | p=Sig | $\beta^b$ | $R^2_{Adj}$ | $F^b$ | $F_{I-A\ chng}^c$ |
|---|---|---|---|---|---|---|---|---|
| Additive (A) | 2.674 | .139 | 19.205 | .000 | | .057 | 54.056 | 54.056 |
| $X_1$=COIV | .288 | .019 | 14.004 | .000 | .232 | | | |
| $X_2$=Anemia | .041 | .012 | 3.328 | .001 | .055 | | | |
| $X_3$=Infertility[d] | -.042 | .023 | -1.876 | .061 | -.031 | | | |
| $X_4$=Fibroids | -.089 | .055 | -1.608 | .108 | -.027 | | | |
| Interactive (I) | | | | | | | | |
| $X_1X_4$ | -.081 | .051 | -1.606* | .108 | .091 | .057 | 43.780* | 2.579 |

**Table 6: Independent Variables From NSAL Codebook** (Dependent Variable: OBESE6CAT for Obesity/BMI)

| Variable | Codebook Variable Name and Label | Tape Location | Questionnaire Wording | Values (Labels and Number) | Codebook Frequency and Percentage | Missing Values |
|---|---|---|---|---|---|---|
| C8<br>COIV<br>IV 1<br>Health Rating<br>Type: Numeric<br>Interval: Discrete | Physical health rating | 401-403 (width: 3; decimal: 0) | C8. F (RB, PG 11) Now I have a few questions about health and other things that may affect you. How would you rate your physical health at the present time? Would you say it is excellent, very good, good, fair or poor? | 1 Excellent<br>2 Very Good<br>3 Good<br>4 Fair<br>5 Poor | 17.3% (1017)<br>33.6% (1979)<br>29.5% (1737)<br>15.3% (904)<br>4.3% (256) | (-9, -8) |
| C10S<br>IV 2<br>Fibroids<br>Type: Numeric (ISO)<br>Interval: Discrete | Prof said you had fibroid tumors | 495-497 (width: 3; decimal: 0) | Professional said you had fibroid tumors? (no setup for question shown) | 1 Yes<br>5 No | 16.6% (609)<br>83.4% (3068) | (-9, -8) |
| C10T<br>IV 3<br>Anemia<br>Type: Numeric (ISO)<br>Interval: Discrete | Prof said you had anemia | 501-503 (width: 3; decimal: 0) | Professional said you had anemia? (no setup for question shown) | 1 Yes<br>5 No | 21.7% (799)<br>78.3% (2878) | (-9, -8) |
| C10Q<br>IV 4<br>Infertility<br>Type: Numeric (ISO)<br>Interval: Discrete | Prof said you had fertility problems | 485-487 (width: 3; decimal: 0) | Professional said you had fertility problems? (no setup for question shown) | 1 Yes<br>5 No | 3.8% (222)<br>96.2% (5665) | (-9, -8) |

**Demographics From NSAL Codebook**

| Variable | Codebook Variable Name and Label | Tape Location | Questionnaire Wording | Values (Labels and Number) | Codebook Frequency and Percentage | Missing Values |
|---|---|---|---|---|---|---|
| SEX<br>Type: Numeric (ISO)<br>Interval: Discrete | Sex | 7162-7163 (width: 2; decimal: 0) | Exact wording not listed. | 1 Male<br>2 Female | 37.6% (2286)<br>62.4% (3796) | (-9, -8) |
| MAR3CAT<br>Type: Numeric (ISO)<br>Interval: Discrete | Marital Status – 3 categories | 7160-7161 (width: 2; decimal: 0) | Exact wording not listed. | 1 Married/Cohabitating<br>2 Div/Sep/Widowed<br>3 Never Married | 38.5% (2344)<br>30.2% (1836)<br>31.1% (892) | (-9, -8) |
| E23 Children<br>Type: Numeric (ISO)<br>Interval: Discrete | # living biological children | 7487-7489 (width: 3; decimal: 0) | How many living biological children do you have? IF R SAYS NONE, ENTER ZERO. | 0 Zero<br>1 One<br>2 Two<br>3 Three<br>4 Four<br>5 Five<br>6 Six or more | 1.1% (49)<br>26% (1211)<br>29.8% (1389)<br>19.6% (914)<br>10.7% (499)<br>6% (279)<br>6.8% (318) | (-9, -8) |
| AGE<br>Type: Numeric (ISO)<br>Interval: Discrete | Age | 7164-7165 (width: 2; decimal: 0) | Exact wording not listed. | **Listed individually from 18 to 94. Please see attachment.** | | (-9, -8) |
| ED4CAT<br>Type: Numeric (ISO)<br>Interval: Discrete | Years of education – 4 categories | 7172-7173 (width: 2; decimal: 0) | Exact wording not listed. | 1: 0-11 years<br>2: 12 years<br>3: 13-15 years<br>4: Greater than or equal to 16 years | 22.6% (1375)<br>35.1% (2136)<br>24.1% (1468)<br>18.1% (1103) | (-9, -8) |
| RANCEST<br>Type: Numeric (ISO)<br>Interval: Discrete | Race/Ancestry | 7641-7642 (width: 2; decimal: 0) | Exact wording not listed. | 8 All Other Hispanic<br>9 Afro-Caribbean<br>10 African American<br>11 Non-Latino White | 3.0% (183)<br>23.6% (1438)<br>58.7% (3570)<br>14.6% (891) | |
| CAR5CAT Caribbean<br>Type: Numeric (ISO)<br>Interval: Discrete | Caribbean Ethnic Origins 5 categories | 7485-7486 (width: 2; decimal: 0) | Exact wording not listed. | 1 Spanish Caribbean<br>2 Haiti<br>3 Jamaica<br>4 Trinidad and Tobago<br>5 Other | 11.3% (180)<br>18.6% (298)<br>31.9% (510)<br>10.6% (170)<br>27.5% (440) | |

**Dependent Variable From NSAL Codebook: OBESE6CAT**
Location: Variable Type: Interval: Range of Missing Values (M):

Obesity-recode of BMI

7168-7169 (width: 2; decimal: 0) numeric (ISO) discrete -9 , -8 , .

| Value | Label | Frequency | % | Valid % |
|---|---|---|---|---|
| -9 (M) | REFUSED | 0 | 0.0 % | - |
| -8 (M) | DONT KNOW | 0 | 0.0 % | - |
| 1 | UNDERWEIGHT (BMI LESS THAN 18.5) | 89 | 1.5 % | 1.6% |
| 2 | HEALTHY WEIGHT (18.5-24.9) | 1783 | 29.3 % | 31.1% |
| 3 | OVERWEIGHT (25.0-29.9) | 1995 | 32.8 % | 34.8% |
| 4 | OBESITY CLASS I (30.0-34.9) | 1109 | 18.2 % | 19.4% |
| 5 | OBESITY CLASS II (35.0-39.9) | 463 | 7.6 % | 8.1% |
| 6 | OBESITY CLASS III (GREATER THAN 40.0) | 289 | 4.8 % | 5.0% |
| . (M) | - | 354 | 5.8 % | - |

| Valid | Invalid | Min | Max | Mean | Median | Stdev |
|---|---|---|---|---|---|---|
| 5728 | 354 | 1.00 | 6.00 | 3.16 | 3.00 | 1.15 |