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Health Disparities with Mammogram and Pap Test Utilization Among Low Income Black  
Women

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## ABSTRACT

Black women and other minority women have high mortality rates from breast cancer and cervical cancer. Mortality from both of these cancers are highly preventable through routine mammograms, which are x-rays of breast tissue, and Pap smear tests, which study the cells in the cervix. Both of these tests can detect cancerous cells before the cancer progresses to later stages, and detecting cancer early can give a patient the best chance for survival. If cancer is caught in the later stages, then there is a lower chance for survival and higher treatment costs (World Health Organization, 2023). A systemic literature review and quantitative analysis was done to understand the various factors that affect the utilization of these preventative tests. The purpose of this study is to analyze the utilization rates of mammograms and Pap smear tests among low-income Black women and other minority women. The study also aims to identify some of the factors that are associated with utilization rates such as education, income, and insurance status. The Medical Expenditure Panel Survey (MEPS) data from 2018 was used to observe the different rates of utilization among white, African American, Asian, Indigenous, Hispanic, and mixed-race women of various age groups. The utilization was also broken down into race and then further into education level, income level, and insurance status. A linear regression analysis was done to look at the correlation between race and insurance status, education, and income. The results showed that mammogram utilization among Black women 40 years old and older was 42.37%. Mammogram utilization was lower for those in poor, near-poor, and low-income categories, whereas Black women aged 65 and older those with Medicare and private insurance had the highest utilization. Pap smear utilization among Black women from ages 21 to 64 was 49.45%. The near-poor category had the lowest utilization of Pap smears. The results indicate

that income and insurance status have a significant impact on the utilization of these preventative tests among minority women. However, further research must be done to better understand the policy implications of these barriers in order to increase utilization.

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## **Chapter 1**

### **Background**

In the United States, cancer is the second leading cause of death after heart disease. In 2020, 284,619 women died of cancer. Of those women, 42,275 females died of breast cancer and 4,000 of the women died from cervical cancer (Centers for Disease Control and Prevention, 2022a, b). Women from minority communities are disproportionately affected by these two types of cancer. The American Cancer Society found that from 2015 to 2019, Black women had the highest rates of mortality from breast cancer followed by Indigenous women, even though white women had the highest rates of breast cancer incidence (McDowell, 2022). Black women also have the highest rates of mortality from cervical cancer compared to white women (Balzer, 2022). These deaths are preventable through various testing for both cancers.

A mammogram is an x-ray picture of the breast in which doctors will use the image to detect early signs of breast cancer. These tests are highly accurate and can detect early signs almost three years before a woman can feel the symptoms of breast cancer (CDC Breast Cancer, 2022a). The Centers for Disease Control and Prevention (CDC) recommends that women who are 50 to 74 years are at the highest age for risk and should get the test done every two years. Women who are 40 to 49 years old should begin thinking about getting tests regularly, and women below 40 should weigh the benefits and risks of mammograms before getting a test. A history of breast cancer in the family, smoking, and other factors are all things to consider when thinking about getting a mammogram under 40 (CDC Breast Cancer, 2022b).

For cervical cancer, some women may get a Pap smear (also a Pap test or Papanicolaou test) which is a procedure where a small brush is used to remove cells from the surface from the cervix and the area around. The cells are examined to look for cervical cancer or cell changes that could lead to cervical cancer (National Cancer Institute, 2011). The goal of this test is to detect abnormal cells early. The Mayo Clinic recommends that Pap testing should begin at age 21 and should be done every three years. Then, women aged 30 years or older can also consider getting a Pap test every five years until 64 years (Mayo Clinic, 2022).

This raises the question of whether or not minority women are utilizing these tests and what barriers are in the way that prevent them from utilizing these preventative tests. The purpose of this study is to analyze the utilization rates of mammograms and Pap smear tests among low-income Black women and other minority women. The study also aims to identify some of the factors that are associated with observed utilization rates such as education, income, and insurance status.



## Chapter 2

### Literature Review

The purpose of this literature review is to examine the existing literature on disparities in the utilization of Pap smear testing and mammograms.

#### Methods

Through a systematic review, the review was narrowed down to eight articles. The databases used to find the articles included: Google Scholar and PubMed. There were various search terms used, but the main terms were: Pap smear test, mammograms, minority, cancer, health disparities, women, and barriers.

#### *Review Process:*

To be included in this review, studies had to: 1) be written in the last ten years (2013-2023), 2) analyze the utilization of Pap smear tests and mammograms, 3) include women from underrepresented or underserved communities, and 4) identify some of the barriers that prevent women from utilizing cancer screenings. The criteria for choosing these studies were to ensure the credibility of the sources and to supplement the findings for the rest of the study.

Ten years was chosen as the time frame of the studies to ensure relevant data. Since the data set used in this study is from 2018 there was a need for literature from that time or before, but any study older than ten years could lead to outdated data and would not be consistent with the findings in the study. All the studies analyze cancer screenings within minority populations;

however, all the studies had different approaches to collecting data and describing specific minority groups. Lastly, the studies had participants from underrepresented or underserved communities.

*Review Methods:*

The data was extracted from the eligible studies, then was reviewed and led to a narrowed down list of eight sources to be included in this review. The articles were evaluated on the basis of research questions, quality of methods, significance of findings, and potential for future research. The eight articles selected satisfied these requirements at high levels.

Table 1: Literature Review Summary

Name	Author	Publication Year	Purpose	Methods	Participants	Results
Explaining Correlates of Cervical Cancer Screening among Minority Women in the United States	Manoj Sharma, Kavita Batra, Christopher Johansen, and Siddharth Raich	2022	The purpose of this study was to examine the correlates of cervical cancer screening by Pap test using MTM as a theoretical paradigm in U.S. minority women	Survey model using Qualtrics  Double-opt-in panels  Respondents self-select to participate in the survey  Qualtrics established criteria for inclusion in the study  Data was collected through a questionnaire	Women in racial minority groups aged 21-65 living in the US  Sample size of 364 participants	69.2% of participants reported having a Pap smear test  31% had not had a Pap smear test over the past 3 years  Participants who had not had a Pap smear test were less educated, unemployed, and had a lower income  Poverty is a big barrier to cervical cancer screening
Differences in Cervical Cancer Screening and Follow-Up for Black and white Women in the United States	Sabrina Ford, Wassim Tarraf, Karen Patricia Williams, Lee Anne Roman, Richard Leach	2020	The purpose of this study was to analyze the differences in screening adherence and follow-up after an abnormal Pap test in Non-Hispanic Black (Black) and Non-Hispanic white (white) women.	Observational cohort study using the 2010 National Health Interview Survey	Sample size of 7509 women  Women 18 years or older  Black or white women	Black women had lower odds of HPV awareness  Black women had higher odds of reporting recent Pap screening

Cervical Cancer Screening Barriers and Risk Factor Knowledge Among Uninsured Women	Marvellous Akinlotan, Jane N Bolin, Janet Helduser, Chinedum Ojinnaka, Anna Lichorad, David McClellan	2017	The purpose of this study was to assess the correlates of cervical cancer risk factor knowledge and predictors of perceived structural and personal barriers to screening among a group of uninsured or low-income underinsured women.	The Cancer Prevention and Research Institute of Texas provided free or subsidized cervical cancer screening to eligible women  The intake survey data from this initiative was used as data for the study	524 women from Texas were screened  Survey participation was 81%  51.8% were between 30-49 years old  41% Hispanic, 25.9% Black, 31% white  95% uninsured	There is a lack of knowledge in some of the factors that caused cervical cancer outside of sex in the Hispanic and Black community  Hispanic and Black communities had the highest barriers to receiving cervical cancer screening  Older women faced more barriers to cervical cancer screenings
Barriers to Mammography Screening Among Racial and Ethnic Minority Women	Brittany C. Miller, Jennifer M. Bowers, Jackelyn B. Payne, Anne Moyer	2019	The purpose of this study was to summarize self-reported barriers to mammography screening in racial/ethnic minority women in studies using open-ended assessments and closed-ended assessments.	Literature review categorized literature by the barriers and race/ethnicity	22 open ended studies  6 close ended studies	Black women most often reported psychological/knowledge barriers  Asian women reported the most cultural barriers to receiving mammogram screenings  Hispanic women also reported psychological/knowledge barriers  Indigenous women reported financial

						<p>barriers to getting mammograms</p> <p>Lack of doctor referral was a top barrier for Black Women and Asian women for getting a mammogram</p>
Assessing the Key Attributes of Low Utilization of Mammography Screening and Breast Self-Exam Among Black Women	Rupak Chowdhury, Nganwa David, Asseged Bogale, Shami Nandy, T. Habtemariam, and Berhanu Tameru✉	2016	The purpose of this study was to answer the question: can disparities with mammogram utilization be predicted by socioeconomic and demographic factors?	<p>Survey results through the Health Disparity Questionnaires</p> <p>Regression done to see the relationship between breast cancer screening rates and self-exam with income, level of education, family doctor, health insurance, age, and obesity</p>	<p>Sample size of 516 all from Alabama</p> <p>352 Black women 50 years or older</p>	<p>Mammography is related to a woman's education, income, health insurance, health condition, and affordability to visit the doctor</p> <p>Women aged more than 50 years had lower utilization rates</p> <p>Obese women reported less mammogram utilization</p>
Racial Disparities in Screening Mammography in the United States: A	Ahmed T. Ahmed MB, Brian T. Welch MD, Waleed Brinjikji MD,	2017	The purpose of this study was to assess racial disparities in screening mammography in the United States via a	<p>Literature review</p> <p>Analyzed comparative studies from</p>	<p>39 relevant studies</p> <p>5,818,380 patients across the studies</p>	Black and Hispanic women had lower rates of utilization of mammograms compare to white women

Systemic Review and Meta-Analysis	Wigdan H. Farah MBBS, Tara L. Henrichsen MD, M. Hassan Murad MD, John M. Knudsen MD		systematic review and meta-analysis.	1946 to 2015 comparing mammogram utilization among various racial groups		No differences in mammogram utilization between Asian/Pacific Islander populations and white women
Cancer Screening Among Racial/Ethnic Groups in Health Centers	De-Chih Lee, Hailun Liang, Nanqian Chen, Leiyu Shi & Ying Liu	2020	The purpose of this study was to measure the rates of receiving three types of cancer screening services, Pap test, mammogram and colorectal cancer screening, among patients seen at U.S. health centers (HCs) to investigate if cancer screening among patients varies by race/ethnicity.	Data analysis from the 2014 U.S. Health Center Patient Survey including samples age 21 and above	Sample size of 5453  People from various racial/ethnic groups	Minorities had higher odds of getting Pap tested than non-Hispanic whites  Elderly were less likely to receive Pap testing  Racial/ethnic difference led to differences in mammogram testing
Persistent Racial Disparities in Cervical Cancer Screening with Pap Test	Cassidi C McDaniel, Hayleigh H Hallam, Tiffany Cadwallader, Hee Yun Lee, Chiahung Chou	2021	The purpose of this study was to estimate cervical cancer screening behaviors through self-reported Pap testing among racial groups in the U.S. in 2014, 2016, and 2018.	Cross sectional study using the Behavioral Risk Factor Surveillance System data set comparing Pap testing behavior	Sample size of 538,218 women  Women aged 18-69	white women had the highest rates of Pap testing  Asians and Native Hawaiians/other Pacific Islanders screened the lowest  All racial/ethnic groups had significantly lower odds of screening compared to white females

### **Synthesis:**

*There are several barriers that prevent minority communities from utilizing mammograms and Pap smear tests:*

One of the key takeaways from the literature review was that there are several different barriers that prevent women from minority communities from utilizing Pap smear testing and mammograms. One study found that lack of health insurance and an annual income of less than \$25,000 significantly explained the differences in women getting a Pap test every three years (Sharma et al., 2022). This applies to all women regardless of race/ethnicity. A second barrier identified throughout the studies was the lack of knowledge and the lack of health literacy.

Another study found that educational attainment had a positive correlation with knowledge of risk factors on cervical cancer (Akinlotan et al., 2017). A person's educational status can lead to differences in health literacy and in turn affect the likelihood of a woman getting a Pap test or mammography.

In addition to the social determinants of health affecting utilization rates, different communities have their own unique barriers to utilizing these tests. The social environment has a major impact on whether or not someone will utilize these tests. Language can be a big barrier when communities do not know what exactly is being said to them or just how they communicate with their healthcare providers, which Hispanics have reported as experiencing. Anxiety about finding out about cancer is also a barrier to getting a preventative cancer screening. Black and Hispanic communities have been reported to have more fatalistic beliefs about cancer (Akinlotan et al., 2017). Negative experiences with the healthcare system are also something that creates a barrier to access. People who have negative experiences are less likely

to want to go back to the system especially for a preventative test. Overall, the literature has found that there are other barriers that prevent minority communities from utilizing preventative care tests (Akinlotan et al., 2017).

*Education is an important factor in increasing Pap smear and Mammogram testing:*

As mentioned above, there are many factors that affect the utilization of preventative cancer screenings. Lack of education, however, has been proven to be a key barrier in the lack of utilization of Pap smear testing and mammograms (Miller et al., 2019). Studies have repeatedly found lower Pap testing rates for women with lower education levels and lack of health insurance (McDaniel et al., 2021). Education can help women follow up with their providers, learn more about some factors that lead to breast cancer, and help them know the signs for breast cancer on their own.

Provider follow up and provider recommendations prove that education is an important determinant of whether a woman will utilize these services. One study found that Black women had less knowledge about HPV, but they did have high initial utilization of cervical cancer screenings; however, there were lower rates of follow up after being informed of an abnormal screening (Ford et al., 2021). This can be due to the lack of knowledge of their treatment options and the fear of physician judgement. Age is a significant factor in women not getting their mammogram screenings. Many women are not aware that post-menopausal obese women are more likely to get breast cancer, but the lack of knowledge is the reason for lower rates of mammography screenings (Chowdhury et al., 2016). Lastly, self-breast exams are a great way to detect cancer and can lead to a proper mammogram. Studies have found that higher education levels among Black women in rural Alabama have a positive correlation with self-breast exams (Chowdhury et al., 2016).



There are ways that education can help increase the utilization of preventative cancer screenings. There is evidence that one on one education programs and community led campaigns can increase breast cancer screenings (Ahmed et al., 2017). These programs and campaigns raise awareness for women to get the proper screenings done and also educate them on the signs and treatment options. The increase in patient centered care also helps increase awareness. Providers are more likely to take the time to educate their patients on their unique needs for specific cancer screenings. For example, if a woman is over 50 years of age, then her providers can take more time to explain the importance of a mammogram test at that age (Ahmed et al., 2017). Lastly, health centers are also great ways for women, specifically those that are uninsured, to access care and increase education. Health centers are medical centers that are federally qualified, and they provide affordable care to underserved populations. They also try to integrate culturally competent care by including language translation services, building trust for patients, and hiring diverse groups of clinicians. Health centers increase awareness for preventative screenings and advocate for patients to take care of themselves before they face any significant challenges (Lee et al., 2020).

#### **Gaps in the Literature:**

Mammograms and Pap smear tests have been shown to be effective in preventing breast and cervical cancers. The literature has highlighted the various barriers, for women in minority communities, to utilizing these types of tests and some ways to close the gap on health disparities in regard to these tests. Lack of education, insurance, poverty, and other social factors are all

barriers to utilizing these preventative tests. The literature did have some gaps that were not covered, however.

One of the biggest gaps in the literature was that there were no details on the level of education. The literature stated that the lack of education was a barrier, but the levels of education were not identified. The effects of certain levels of education on the utilization of preventative tests can further help providers and other healthcare organizations better support their communities. This might mean creating educational programs for women at earlier ages or going to other places to educate women on the importance of preventative testing. Knowing the education levels of women can also aid in the kind of language that organizations need to use to reach their specific patient population. Lastly, understanding the status of education can create opportunities for education reform in general. This means creating programs that advocate for continuing education where health literacy rates are low. Further research must be done on the education status of women who are utilizing these preventative services.

Another gap in the literature is the lack of information on insurance status and utilization rates. Multiple studies have stated that poverty and being uninsured are barriers that prevent women from utilizing mammograms and Pap smear tests. There is no information on the income levels and the type of insurance that women have that might prevent them from utilizing preventative tests. Further research must be done on the types of insurance and the income level of women and the correlation with the utilization of cancer screenings. Understanding income levels can help organizations understand who they need to provide subsidized care to. They can get a better understanding of the threshold of income that they need to use to provide healthcare services to women. Data on the correlation between public, private, and lack of insurance and utilization can help health care organizations look at their payor mix and utilization. Insurance

companies can also expand their coverage or incentivize their customers to utilize the preventative cancer screenings.

Lastly, there is less information about women from other ethnic minority groups. Most of the literature compared white women, Black women, and Hispanic women, but there was very limited information on Asian/Pacific Islander women or Indigenous women. This limitation is understandable because of the lower numbers of women from these groups in the U.S. population; however, further research must be done to include more data on women belonging to these communities. As the population grows and more people identify themselves as members of specific communities, it will be the job of health care organizations to cater to the unique needs of these communities. The more data that is available the better prepared healthcare organizations can be to support these women and push for higher utilization rates. Further research must be done to include women from other racial/ethnic minority groups. There needs to also be research on the LGBTQ+ community and the utilization of preventative cancer screenings.

### **Conclusion:**

Overall, the literature showed a lot of promise for future research and advocacy for minority women to utilize Pap smear tests and mammograms. The data allows healthcare organizations to start to recognize the barriers that minority women face to utilize the preventative screenings. There are still many gaps in the literature to fill that this thesis will further explore.

## **Chapter 3**

### **Methods**

#### **Background**

The data used in this study was the 2018 Medical Expenditure Panel Survey (MEPS). MEPS was initiated in 1996 and each year a new sample of households is selected. All the data is comparable to other data sets so long-term data trends can be determined utilizing this data set. MEPS collects data that is nationally representative of the estimates of health care use, expenditures, sources of payment, and health insurance coverage for the U.S. This data set includes estimates of the participants' health status, demographic, socioeconomic characteristics, employment, access to care, and overall satisfaction with health care. The data was collected through a panel survey which included five rounds of interviews that covered a span of two years. The 2018 data set contains 1,501 variables. All the data utilized in this study is available on the MEPS website. Analyses were conducted using the STATA 17.0 Statistics/Data Analysis software.

#### **Variables:**

The analysis process began with the MEPS 2018 full year consolidated data file. 2018 was chosen due to the extra survey data that was collected on Pap smear and mammogram utilization rates. The 2018 data also does not consider the COVID-19 pandemic, therefore showing a representative sample of utilization rates before the pandemic. The variables that were

utilized in the analysis were related to demographic information, insurance status, education level, income level, and insurance status.

Using the STATA 17.0 software, the first set of variables were generated starting with the demographic variables. This analysis only studied women of specific ages. For mammogram utilization the age groups that were coded were ages 40 plus, 40-64, and 65 plus. This is due to the CDC guidelines that women over 40 years need have mammograms yearly after age 40. For Pap smear tests, the age groups that were coded were from: ages 21 plus, 21 to 29, and 30 to 64. These age groups were broken down based on the CDC guidelines for the age at which women should women start getting Pap smear tests and how frequently. The next demographic variables that were generated were for specific races/ethnicities. Race was broken down into: Caucasian, African American, Asian, Indigenous, Hispanic, and Mixed race.

The next variables that were created using recoding were for education, income, and insurance variables. Education was broken down into no high school diploma, high school diploma, some college, bachelor's degree, and beyond bachelor's degree. Income was broken down into categories based on the federal poverty level: poor (less than 100%), near-poor (100%-125%), low income (125%-200%), middle income (200%-400%), and high income (greater than or equal to 400%). Lastly, the insurance status of the participants under age 65 was broken down into: private, public, and uninsured. For persons age 65 and older the insurance categories were: uninsured, Medicare only, Medicare and private, Medicare and other public, and no Medicare and public/private insurance.

Lastly, the variables for mammograms and Pap smear utilization were created. The mammogram variable accounts for females who have had mammograms in the last two years. The Pap smear variable accounts for women who have had a Pap smear test in the last five years.

## Analysis

Once the variables were created, descriptive analyses were undertaken to understand the variables. First, the overall population was broken down into race, age, education level, income level, and insurance status. Then mammogram and Pap smear utilization was measured for the overall population. To answer the research question, the utilization of both mammograms and Pap smears was analyzed but only using Black women as the study population. Descriptive tables were first generated (Tables 3, 4, and 5 below) for the utilization rates of Pap smears and mammograms and the key study variables, education, income and insurance status. After the utilization rates were determined, a weighted linear regression analysis was done to determine the correlation between utilization rates and specific factors. The regression analysis found the likelihood of utilization for specific variables relative to the control group, which was defined as persons with the lowest levels of income (poor), education (no high school diploma) and insurance. In the insurance category, for mammograms, the uninsured group was excluded for the under 65 plus age group and the Medicare with public insurance was excluded for the over 65 age group. This was because women with Medicare and public insurance tend to be in the most disadvantaged position.

## **Chapter 4**

### **Results**

The original sample from the MEPS survey had 14,023 women from all races and ages with a mean age of 51 years old. When the sample was weighted, there was a total of 142,156,397 women from all races and ages with the mean age of 50 years old. The majority of the women in the sample self-identified as Caucasian. Black was the second largest racial group with 12.85% of the population being African American. Of the sample population, some college had the highest percentage among all ages and the 21-64 group, while high school diploma had the most people in the elderly population. About 40% of the sample was identified as having a high-income level across all age groups. The majority of the population in the 21 to 64 age group had private insurance while the majority of the elderly group had Medicare or Medicare with private insurance. The socioeconomic characteristics can be seen in Table 2.

**Table 2: Socioeconomic Characteristics of the Population (Weighted Percent Distribution)**

	<b>All Ages &gt;= 21</b>	<b>Age 21-64</b>	<b>Age 65+</b>
<b>Race:</b>			
Caucasian	76.78	74.98	82.56
African American	12.85	13.73	10.03
Asian	6.85	7.44	4.94
Indigenous	.69	.75	.52
Hispanic	15.61	17.73	8.79
Mixed	2.83	3.10	1.95
<b>Age (mean and SD)</b>	M: 50.02 SD: 17.70	M: 42.54 SD: 12.70	M: 74.08 SD: 6.59
<b>Education:</b>			
No High School Diploma	9.67	8.63	13.02
High School Diploma	24.98	23.11	30.99
Some College	27.40	27.86	25.91
Bachelor's Degree	22.23	24.29	15.62
Beyond Bachelor's	14.84	15.40	13.07
<b>Income:</b>			
Poor	11.70	11.90	11.06
Near Poor	4.27	4.12	4.73
Low Income	12.82	11.59	16.79
Middle Income	28.10	28.17	27.88
High Income	43.11	44.22	39.54
<b>Insurance:</b>			
Private	57.09	74.83	--
Public	13.30	17.43	--
Uninsured	5.90	7.74	0.25
Medicare & Private	--	--	47.45
Medicare & other public	--	--	13.61
No Medicare & Public/Private	--	--	0.97
Medicare only	--	--	37.72



### **Overall Population Utilization of Mammograms and Pap smear Testing:**

The total number of women from the weighted sample was a total of over 37 million women who utilized a mammogram. For all the women 40 and older, the utilization was about 41%. That number declined for the 40-64 age group to about 36% and then increased for the 65 plus age group to almost 53%. Of all the white women in the population about 42% had utilized a mammogram and of all the Black women 42% also utilized mammograms. The utilization rates for the 40 to 64 age group declined but in the 65 plus age group the utilization rates increased dramatically. When looking at education levels, the women with no high school diploma had the lowest rates of utilization among all age groups. The results in the income level category showed that utilization of mammograms increased as the income levels increased. The uninsured had the lowest utilization rates among the 40 to 64 age group but in the elderly the no Medicare or private insurance group had the lowest utilization rates. The mammogram utilization for the population is shown in Table 3.

Table 3: Mammogram Utilization for the Population (Weighted Percent)

	All Ages >= 40	Age 40-64	Age 65+
<b>Overall</b>	41.45	36.40	53.00
<b>Race:</b>			
Caucasian	42.18	37.43	52.43
African American	42.37	35.69	61.06
Asian	30.17	25.87	44.42
Indigenous	28.12	16.81	54.50
Hispanic	32.81	29.44	49.18
Mixed	45.04	41.56	57.12
<b>Education:</b>			
No High School Diploma	35.18	32.73	40.19
High School Diploma	42.75	37.66	51.14
Some College	42.16	36.81	55.28
Bachelor's Degree	40.63	35.93	56.14
Beyond Bachelor's	44.39	37.07	64.37
<b>Income:</b>			
Poor	33.89	29.59	43.86
Near Poor	35.66	27.15	47.87
Low Income	37.72	29.62	48.11
Middle Income	38.59	32.54	51.28
High Income	46.35	41.77	59.47
<b>Insurance:</b>			
Private	--	38.47	--
Public	--	34.95	--
Uninsured	--	16.68	49.45
Medicare & Private	--	--	57.32
Medicare & other public	--	--	44.90
No Medicare & Public/Private	--	--	38.84
Medicare only	--	--	50.89

The total number of women the weighted sample was a total of over 60 million women who utilized a Pap smear test. For all the women 21 to 64, the utilization was about 55%. That number decreased for the 21-29 age group to about 54% and increased again for the 30-64 age group to about 55%. Of all the white women in the population about 57% had utilized a Pap smear test and of all the Black women 50% also utilized a Pap smear test. The utilization rates for the 21 to 29 and 30 to 64 age group stayed steady with slight increases and decreases among various racial groups. When looking at education levels, the women with no high school diploma had the lowest rates of utilization among all age groups. The results in the income level category showed that utilization of Pap smear tests increased as the income levels increased. The uninsured had the lowest utilization rates among the both the 21-29 and the 30-64 age group. The Pap smear utilization for the population is shown in Table 4.

Table 4: Pap Smear Utilization for the Population (Weighted Percent)

	All Ages >= 21 & <=64	Age 21-29	Age 30-64
<b>Overall</b>	55.03	54.50	55.17
<b>Race:</b>			
Caucasian	56.93	57.57	56.78
African American	49.55	49.71	49.50
Asian	46.34	35.63	49.42
Indigenous	50.67	55.88	49.63
Hispanic	52.46	46.33	54.58
Mixed	55.21	54.85	55.38
<b>Education:</b>			
No High School Diploma	41.45	44.98	40.80
High School Diploma	48.16	50.94	47.38
Some College	52.88	52.70	52.94
Bachelor's Degree	61.80	59.23	62.61
Beyond Bachelor's	67.17	71.09	66.85
<b>Income:</b>			
Poor	47.50	50.75	46.29
Near Poor	47.75	47.32	47.95
Low Income	50.00	56.71	47.72
Middle Income	55.09	58.41	54.12
High Income	59.02	52.99	60.11
<b>Insurance:</b>			
Private	57.90	56.98	58.13
Public	49.22	54.24	47.68
Uninsured	40.34	34.12	42.16

After determining the utilization rates for various factors, a linear regression analysis was performed to understand the association between the utilization rates of mammograms and Pap smears and the socioeconomic factors. For mammogram utilization there was a positive correlation between mammogram utilization and level of education (Table 5). Higher education had the highest utilization rate of mammograms compared to having no education which was followed by having a high school education (Table 5). This was also the case for Pap smear testing and education. As the level of education increased the likelihood of getting a Pap smear increased (Table 6). No high school education was omitted from the regression because it is considered the control group.

With the exception of the near-poor bracket for the 40 to 64 age group, there was a significant positive correlation between mammogram utilization and level of income compared to the poor income bracket. The same was true for the Pap smear utilization and income with the exception of the near-poor bracket in the 21-29 age group. Poor was omitted from the regression as that was the reference group. Mammogram utilization and insurance status also showed a significant positive correlation. The elderly population was considered for persons aged 65 and older as this is the age of Medicare eligibility. For the mammogram regression, the uninsured group was omitted for the under 65 age group for and the Medicare with other public insurances was omitted. Pap smear utilization and insurance status also had a significant positive correlation with the uninsured being the omitted category (Table 6).

**Table 5: Regression for Mammogram Utilization Including Socioeconomic Characteristics (Weighted Population)<sup>a</sup>**

	All Ages >= 40	Age 40-64	Age 65+
<b>Education:</b>			
No High School Diploma (Excluded Group)			
High school	.079*	.050*	.119*
Some college	.073*	.041*	.160*
College	.058*	.032*	.169*
Higher Education	.093*	.044*	.251*
<b>Constant:</b>	.348*	.326*	.392*
<b>Income:</b>			
Poor (Excluded Group)			
Near Poor	.017*	-.024*	.040*
Low Income	.038*	.000	.042*
Middle Income	.046*	.029*	.074*
High Income	.125*	.121*	.156*
<b>Constant:</b>	.338*	.295*	.438*
<b>Insurance:</b>			
<b>Under 65+ Insurance Groups:</b>			
Uninsured (Excluded Group)			
Private Insurance	--	.217*	--
Public Insurance	--	.182*	--
<b>Over 65+ Insurance Groups:</b>			
Medicare and other public (Excluded Group)	--	--	
Medicare and Private	--	--	.063*
Medicare only	--	--	.127*

a \* The coefficient is significant as the p value < .05.

**Table 6: Regression for Pap Smear Utilization Including Socioeconomic Characteristics (Weighted Population)<sup>a</sup>**

	<b>Ages &gt;= 21&amp; &lt;=64</b>	<b>Ages 21-29</b>	<b>Ages 30-64</b>
<b>Education:</b>			
No High School Diploma (Excluded Group)			
High school	.073*	.074*	.070*
Some college	.120*	.092*	.126*
College	.209*	.157*	.222*
Higher Education	.263*	.275*	.265*
<b>Constant:</b>	.408*	.435*	.403*
<b>Income:</b>			
Poor (Excluded Group)			
Near Poor	.002*	-.034*	.017*
Low Income	.025*	.059*	.014*
Middle Income	.075*	.077*	.078*
High Income	.115*	.022*	.138*
<b>Constant:</b>	.475*	.508*	.463*
<b>Insurance:</b>			
Uninsured (Excluded Group)			
Public Insurance	.089*	.228*	.160*
Private Insurance	.176*	.201*	.055*
<b>Constant:</b>	.403*	.341*	.422*

a \* The coefficient is significant as the p value < .05.

**Mammogram and Pap smear Utilization for Black Women:**

In the overall population, there were over 4 million Black women who utilized a mammogram. For Black women aged 40 years and older the utilization was about 42%. This decreased for the 40 to 64 age group to 35% and then increased in the 65 plus age group to 61%. When looking at the education category, higher education had the lowest utilization rates except for the 65+ category. In that category, those with no high school diploma had the lowest mammogram utilization rates. In the income category, the near-poor bracket had the lowest utilization rates in the 40 to 64 age group. In the 65 plus age group, the low-income women had the lowest utilization rates. Uninsured women had the lowest utilization rates in both age groups as well as the no Medicare and public/private insurance in the 65 plus age group. Overall, the women in the 65 plus age group had much higher mammogram utilization rates compared to the women in the 40 to 64 age group. The results are demonstrated in Table 7.



Table 7: Mammogram Utilization for Black Women (Weighted Percent)

	All Ages >= 40	Age 40-64	Age 65+
<b>Overall Among Black Women:</b>	42.37	35.69	61.06
<b>Education:</b>			
No High School Diploma	43.29	40.47	49.80
High School Diploma	43.76	36.86	60.89
Some College	40.69	33.91	62.42
Bachelor's Degree	45.76	38.59	75.47
Beyond Bachelor's	36.66	28.60	63.03
<b>Income:</b>			
Poor	39.09	31.55	58.14
Near Poor	39.26	25.91	60.02
Low Income	39.86	36.33	48.23
Middle Income	43.56	35.22	65.96
High Income	45.33	39.63	68.16
<b>Insurance:</b>			
<b><i>Under 65+ Insurance Groups:</i></b>			
Private	--	36.65	--
Public	--	40.26	--
Uninsured	--	11.82	
<b><i>Over 65+ Insurance Groups:</i></b>			
Medicare & Private	--	--	68.62
Medicare & other public	--	--	55.28
No Medicare & Public/Private	--	--	0
Medicare only	--	--	57.58
Uninsured			0

In the overall population, there were over 7 million Black women who utilized a Pap smear test. For Black women aged 21 to 64 the utilization was about 50%. This remained constant within the 21 to 29 age group and the 30 to 64 age group. When looking at the

education category, no high school diploma had the lowest utilization rates of 39.43%. In the income category, the near-poor bracket had the lowest utilization rates in the 30 to 64 age group. Uninsured women had the lowest utilization rates in both age groups. The results are demonstrated in Table 8.

**Table 8: Pap Smear Utilization for Black Women (Weighted Percent)**

	All Ages >= 21 & <=64	Age 21-29	Age 30-64
<b>Overall Among Black Women</b>	49.55	49.71	49.50
<b>Education:</b>			
No High School Diploma	39.43	19.45	41.97
High School Diploma	46.45	51.97	44.66
Some College	47.38	46.52	47.68
Bachelor's Degree	59.25	58.80	59.40
Beyond Bachelor's	56.68	50.44	57.40
<b>Income:</b>			
Poor	50.05	51.03	49.76
Near Poor	39.96	42.83	38.18
Low Income	47.98	63.42	42.36
Middle Income	53.80	52.37	54.19
High Income	47.57	35.09	50.05
<b>Insurance:</b>			
Private	51.24	51.55	51.14
Public	48.03	52.85	46.84
Uninsured	41.33	30.48	45.22

A second regression analysis was done to understand the correlation between mammogram utilization rates for Black women and their education, income, and insurance status (Table 9). The analysis showed that having a college education had the highest likelihood of

utilizing a mammogram compared to not having a high school diploma. The no high school diploma was omitted from the regression. For the overall age group, income had a significant positive likelihood of utilizing a mammogram as the income status increased. In the 40 to 64 age group, there was a negative likelihood of Black women in the near-poor income bracket utilizing a mammogram test and women 65 and older in the low-income bracket had a negative likelihood of mammogram utilization. Insurance also had a significant positive correlation between insurance status and mammogram utilization with the exception of the near-poor income bracket for the 40 to 64 age group and the low-income bracket for the 65 plus age group. For women under 65 having public insurance gave them a higher chance of utilizing a mammogram compared to having private insurance, but both increased the likelihood of utilizing a mammogram compared being uninsured. For the women 65 and older, having Medicare and private insurance showed the greatest likelihood of utilizing a mammogram compared to having Medicare and other public insurances. The coefficients are shown in Table 9.

**Table 9: Regression of Mammogram Utilization Coefficients for Black Women (Weighted) Population <sup>a</sup>**

	All Ages >= 40	Age 40-64	Age 65+
<b>Education:</b>			
No High School Diploma (Excluded Group)			
High school	.004*	-.026*	.098*
Some college	-.025*	-.056*	.113*
College	.024*	-.009*	.243*
Higher Education	-.066*	-.108*	.119*
<b>Constant:</b>	.432*	.395*	.510*
<b>Income:</b>			
Poor (Excluded Group)			
Near Poor	.001*	-.056*	.018*
Low Income	.008*	.048*	-.099*
Middle Income	.044*	.036*	.078*
High Income	.062*	.080*	.100*
<b>Constant:</b>	.390*	.315*	.581*
<b>Insurance:</b>			
<b>Under 65+ Insurance Groups:</b>			
Uninsured (Excluded Group)			
Private Insurance	--	.248*	--
Public Insurance	--	.284*	--
<b>Over 65+ Insurance Groups:</b>			
Medicare and other public (Excluded Group)	--	--	
Medicare and Private	--	--	.138*
Medicare only	--	--	.028*
<b>Constant:</b>	--	.118*	.547*

a \* The coefficient is significant as the p value < .05.

A regression analysis was also done to understand the correlation between Pap smear utilization rates for Black women and their education, income, and insurance status. All the education coefficients indicated a significant positive correlation between level of education and utilization. The no high school diploma variable was omitted from the regression. For the 21 to

29 age group there was a significant positive likelihood of Pap smear utilization compared to the poor bracket with the exception of the near-poor and high-income brackets. The near-poor is consistent with the mammogram utilization as those in the near-poor bracket may not have access to insurance. The high-income bracket may be an outlier for this data. For the Black women in the 30 to 64 age group, there was a significant positive likelihood of utilizing a Pap smear compared to women in the poor income bracket with the exception of near-poor and low income. Insurance also had a significant positive correlation between insurance status and Pap smear utilization. For the 21 to 29 age group having private insurance means a greater likelihood of utilizing a Pap smear test compared to being uninsured. For the 30 to 64 age group having public insurance means a greater likelihood of utilizing a Pap smear test compared to being uninsured. The coefficients are shown in Table 10.

Table 10: Regression of Pap Smear Utilization for Black Women (Weighted Population)<sup>a</sup>

	Ages >= 21& <=64	Ages 21-29	Ages 30-64
<b>Education:</b>			
No High School Diploma (Excluded Group)			
High school	.078*	.309*	.038*
Some college	.087*	.255*	.068*
College	.205*	.378*	.186*
Higher Education	.180*	.294*	.165*
<b>Constant:</b>	.387*	.210*	.408*
<b>Income:</b>			
Poor (Excluded Group)			
Near Poor	-.100*	-.081*	-.116*
Low Income	-.020*	.124*	-.073*
Middle Income	-.038*	.013*	.044*
High Income	-.025*	-.159*	.002*
<b>Constant:</b>	.500*	.510*	.498*
<b>Insurance:</b>			
Uninsured (Excluded Group)			
Public Insurance	.067*	.210*	.059*
Private Insurance	.100*	.223*	.016*
<b>Constant:</b>	.413*	.304*	.452*

a \* The coefficient is significant as the p value < .05

### Mammogram and Pap smear Utilization for Poor Black Women:

Looking closely at mammogram utilization rates among Black women in the poor income bracket there is a clear difference in utilization rates from women with no high school degree and women with a higher education degree. There is a 20 to 30 percent difference in utilization rates between no high school diploma and a higher education degree. Insurance status rates differ from the previous utilization data on all Black women. Black women from a poor income bracket with private insurance utilize mammograms at a rate of 47.08% (Table 11) which differs from

the 36.65% mammogram utilization rate for Black women with private insurance (Table 7).

Black women who are 65 and older with Medicare and other public insurance had the highest utilization rates for that age group.

**Table 11: Mammogram Utilization Rates Among Poor Black Women (Weighted Percent)**

	<b>All Ages &gt;= 40</b>	<b>Age 40-64</b>	<b>Age 65+</b>
<b>Education:</b>			
No High School Diploma	32.68	26.25	52.88
High School Diploma	43.73	34.34	60.93
Some College	38.87	32.21	66.48
Bachelor's Degree	33.03	34.92	30.38
Beyond Bachelor's	59.00	49.19	83.70
<b>Insurance:</b>			
Private	--	47.08	--
Public	--	31.14	--
Uninsured	--	14.18	0
Medicare & Private	--	--	55.05
Medicare & other public	--	--	64.70
No Medicare & Public/Private	--	--	0
Medicare	--	--	50.45

Looking closely at Pap smear utilization rates among Black women in the poor income bracket, the difference in utilization rates from women with no high school degree and women with a higher education degree is not as distinct compared to mammogram usage (Table 12). Having an education level of high school or above leads to higher Pap smear utilization rates, however; the level of education after high school does not make a difference in higher or lower rates of utilization. This differs from the data in Table 8 for all Black women where the difference in education is seen in a hierarchical pattern. Insurance patterns are similar to the data

in Table 8, but poor Black women are more likely to utilize a Pap smear test if they have private insurance for both age groups which is different than Black women in general where only one age group has higher utilization rates with private insurance.

**Table 12: Pap smear Utilization Rates Among Poor Black Women (Weighted Percent)**

	<b>All Ages &gt;= 21&amp; &lt;=64</b>	<b>Age 21-29</b>	<b>Age 30-64</b>
<b>Education:</b>			
No High School Diploma	40.99	16.80	45.45
High School Diploma	54.81	67.09	50.53
Some College	49.50	40.82	53.00
Bachelor's Degree	67.85	100	62.70
Beyond Bachelor's	65.21	100	48.63
<b>Insurance:</b>			
Private	57.26	58.65	56.64
Public	50.97	49.45	51.39
Uninsured	28.43	37.52	26.05



## **Chapter 5**

### **Discussion**

The findings in this study show that while education and income levels do impact utilization rates of mammogram and Pap smear screenings, insurance is the key factor that can help determine if a woman will utilize these screenings. Medicare is a driving force for women 65 and older to get a mammogram. Specifically, poor Black women have the highest utilization rates of mammograms when they have Medicare combined with another public insurance or a private insurance. For poor Black women under 65, those with private insurance had high utilization rates but those with public insurance were not far behind. Education can also affect utilization rates for poor Black women. The data has shown that having an education at least until high school can greatly increase utilization rates of preventative screenings.

The study aimed to analyze the utilization rates of mammograms and Pap smear tests among low-income Black women and other minority women while also identifying some of the factors that lead to observed utilization rates such as education, income, and insurance status. The overall mammogram utilization rate for women 40 and over was 41.45%. For Black women the utilization is 42.37%. The overall Pap smear utilization rate for women aged 21 to 64 was 55.03%. For Black women the utilization was 49.55%. These utilization rates differ based on factors such as age, education, income, and insurance. Overall, the Pap smear test utilization rates were higher than the mammogram utilization.

## Insurance

Overall for both preventative tests, private insurance coverage was associated with the highest rates of utilization. Women with private insurance were more likely to get preventative tests done.

For mammograms the utilization for the 65 plus age group was over 50% regardless of socioeconomic status. This could be due to these women being eligible for Medicare and having routine mammograms done for a lower cost. This held true for Black women as well. Those 65 and older who had the highest mammogram utilization rates had Medicare in addition to private insurance. However, when looking at poor Black women who are 65 and older those with Medicare and other public insurance had the highest utilization rates for that age group. That was an interesting find because the women that qualify for Medicare in addition to other public insurances are considered to be in the most disadvantaged position as this category also includes Medicaid. These findings support the hypothesis that Medicare eligibility is a driving force to utilizing a mammogram screening for women of 65 years. When looking at elderly women over 65 years of age, women with Medicare only were .127 times more likely to utilize a mammogram test compared to women with Medicare and other public insurances. Women who had Medicare and other private insurances were .063 times more likely. When looking at the 40 to 64 age group, women with private insurance were the most likely to receive a mammogram screening. Black women in the 40 to 64 age group had slightly different outcomes. For Black women, those having public insurance, which includes Medicaid and other public insurance, had the highest utilization rates for mammograms.

Pap smear testing had much higher utilization rates compared to mammograms. Overall, women with public insurance were .089 times more likely to receive a Pap smear compared to

the uninsured and those with private insurance were .176 times more likely to receive a Pap smear. When looking at the Pap smear utilization rates among Black women, there were similar utilization rates between public and private insurance.

For women below the age of 65 to have public insurance would mean that they would be Medicaid eligible or part of another government issued insurance such as TRICARE or Veterans Health Administration or receive Medicare due to disability (Health Affairs, n.d.). In order to be eligible for Medicaid a woman must meet their state's income requirement, receive supplemental security income, or meet Medicaid's other requirements (Center for Medicare and Medicaid, n.d.). Black women from low-income backgrounds are more likely to utilize a mammogram screening or Pap smear testing if they are eligible for Medicaid or other public insurances.

### **Education**

When looking at the entire population, as education levels go up the utilization of both mammograms and Pap smear testing also goes up. Mammogram utilization for women with no high school diploma was 35.18% compared to those with a degree beyond their bachelor's degree of 44.39%. This pattern stays consistent with the 40 to 64 age group and the 65 plus age group. Pap smear utilization rates for the total population are 41.45% for women with no high school diploma and 67.17% for those with a degree beyond their bachelor's degree. This pattern also is consistent with the two other age groups. Even moving from no high school diploma to a high school diploma can increase a woman's chances of receiving a preventative screening.

As shown in the literature review, education is a major factor in whether or not women receive screenings. Generally the more education someone has the more opportunities they have

to be exposed to good health literacy, however; higher levels education does not always correlate to better health literacy. Patients with higher levels of education may have a higher chance of understanding some of the information their providers convey to them. When patients understand their providers, they will have an understanding as to why preventative tests are important as well as allowing them to follow up with any questions or concerns. Education is also a factor for someone's potential future earnings, their job, and their insurance status. Reaching a certain level of education can greatly increase a person's chances of landing a job and joining a certain income bracket.

Black women also follow a similar pattern with Pap smear testing. Those with no high school diploma had the lowest utilization rate and the rate went up as education levels also rose. This pattern stayed true with both the 21 to 29 age group and the 30 to 64 age group. Mammogram usage was different for Black women. For mammogram utilization, those with a bachelor's degree had the highest utilization rate, with the exception of women in the 40 to 64 age group. Those with a degree past their bachelor's had the lowest rates of utilization in the 40 to 64 age group. The low rates for the women with higher education degrees was unexpected and could be an outlier in the data.

### **Income**

With the cost of healthcare today it is not surprising to see the impact that income has on utilization of healthcare services. Income levels can dictate if a patient will be electing to pay for medical care. Preventative tests are not mandatory so women are able to decide if they want to utilize a mammogram and a Pap smear test. One of the interesting findings was that women in

the near-poor income bracket had lower utilization rates compared to those in the poor bracket which could be due to the lack of health insurance, as these women might not be poor enough to be eligible for Medicaid but not wealthy enough to have adequate health insurance. This was true for the mammogram utilization rates of women in the 40 to 64 age range. The same was true for Pap smear utilization for women ages 21 to 29 years old. The coefficient for the near-poor Pap smear utilization rate was negative for the 21 to 29 age group indicating that women in this income bracket were less likely to utilize a Pap smear test compared to those in the poor income bracket.

For Black women ages 40 to 64 years old women in the near-poor bracket had a mammogram utilization rate of 25.91%. In the 65 plus age group low income women had the lowest utilization rates. Pap smear utilization rates for Black women in the 30 to 64 age group also followed the pattern of the near-poor income bracket having the lowest utilization rates. The gap between poor and near-poor was almost 9% with near-poor being the lowest. This could be due to the eligibility of Medicaid. Those in the poor income bracket could be more likely to be on Medicaid which can increase utilization rates compared to women in the near-poor bracket who might not meet the income threshold for Medicaid.

Low-income Black women were the main focus of this study. The data on poor Black women shows that education levels do not affect utilization of both mammograms and Pap smears as much as insurance does. The data showed that having a level of education that is high school and beyond can increase utilization rates compared to having no high school degree, however; after a high school education utilization rates can vary with no correlation to the level of education. This finding rejects the original hypothesis that the higher the education level the higher the utilization rates.

Insurance for this population is a very significant factor in utilization rates. There was a significant increase in utilization of both mammograms and Pap smear tests for women with both private or public insurance compared to being uninsured. Medicare is key to mammogram utilization for the 65 plus community as those with Medicare or a combination of Medicare and other insurances had utilization rates above 50%.

## **Chapter 6**

### **Limitations**

There are several limitations to the study. When looking at the study population, the data was collected from survey data. MEPS administered a survey to collect the information about mammogram and Pap smear utilization. Since the data were based on a survey, there is the possibility of nonresponse bias. This could skew the data. In addition to the non-response bias, the survey questions can also skew the data. In the MEPS self-administered survey, the question asked if the participant utilized a mammogram test in the last two years and a Pap smear test in the last five years. This can also create a lack of accurate data because education status or health insurance status can change in that time period. Another limitation is the time frame of the data. The data used was the MEPS 2018 data throughout the year. When asking about education, income, and insurance status, all of those factors are subject to change throughout the year but the variables are measured at a single point in time. The results need to be interpreted for the information presented at the time of the data collection. Further studies can be done to measure the utilization of preventative tests at a single moment in time. Lastly, there were some populations not considered in the study. The transgender and non-binary populations were not considered and people of mixed race and unknown races were also not considered in this study.

Overall, there were several limitations to the study where further research would enable a better understanding of utilization rates and the factors that influence these rates.

## **Chapter 7**

### **Conclusion**

The purpose of this study was to analyze the utilization rates of mammograms and Pap smear tests among low-income Black women and other minority women, as well as, aimed to identify some of the factors that lead to observed utilization rates such as education, income, and insurance status.

The data collected in the study showed that utilization rates of mammogram and Pap smear screenings varied based on education, income, and insurance. Insurance status was identified as the major factor in determining utilization rates among poor Black women. Public insurance such as Medicare and Medicaid are imperative to supporting low-income minority women as it is because of these public insurance programs that women are able to access key preventative screenings.

Further research must be done to analyze the demographics of the Black women who are on public insurance under the age of 65, as well as how education can impact preventative screenings based on income and insurance status. Further research must also be done to include women from other racial/ethnic minority groups while including the LGBTQ+ community and the utilization of preventative cancer screenings. Lastly, there are major policy implications to think about specifically with how to increase health literacy about preventive cancer screenings to women who have not received a high school diploma and how to make public insurance more accessible to those who qualify for it.



### Appendix A: Socioeconomic Characteristics of the Population (Unweighted)

	All Ages >= 21	Age 21-64	Age 65+
<b>Race:</b>			
Caucasian	8592	6241	2,351
African American	1876	1455	421
Asian	683	541	142
Indigenous	84	70	14
Hispanic	2436	2,071	365
Mixed	352	288	64
<b>Age (mean and SD)</b>	M: 51.05	M: 43.08	M: 73.96
	SD: 17.63	SD: 12.56	SD: 6.56
<b>Education:</b>			
No High School Diploma	14.02	12.81	17.48
High School Diploma	29.18	28.12	32.22
Some College	24.78	25.22	23.50
Bachelor's Degree	18.56	20.33	13.50
Beyond Bachelor's	12.19	12.40	11.60
<b>Income:</b>			
Poor	16.99	17.81	16.44
Near Poor	5.13	5.04	5.38
Low Income	14.97	14.35	16.74
Middle Income	28.16	28.41	27.44
High Income	34.75	35.02	33.99
<b>Insurance:</b>			
Private	49.50	66.74	--
Public	17.00	22.92	--
Uninsured	7.67	10.34	.47
Medicare & Private	--	--	44.05
Medicare & other public	--	--	17.41
No Medicare & Public/Private	--	--	.97
Medicare only	--	--	31.10

### Appendix B: Mammogram Utilization for the Population (Unweighted)

	All Ages >= 40	Age 40-64	Age 65+
<b>Race:</b>			
Caucasian	2483	1273	1210
African American	539	239	246
Asian	147	74	73
Indigenous	12	5	7
Hispanic	453	283	170
Mixed	83	47	36
<b>Education:</b>			
No High School Diploma	35.53	32.24	40.92
High School Diploma	42.25	36.24	52.59
Some College	41.94	35.13	55.62
Bachelor's Degree	40.88	35.32	57.18
Beyond Bachelor's	45.65	38.91	61.67
<b>Income:</b>			
Poor	34.10	29.07	44.11
Near Poor	35.88	25.71	50.93
Low Income	36.88	29.02	48.30
Middle Income	39.57	34.09	51.04
High Income	47.34	41.97	60.18
<b>Insurance:</b>			
Private	--	38.66	--
Public	--	33.23	--
Uninsured	--	17.39	42.86 (total 14)
Medicare & Private	--	--	57.13
Medicare & other public	--	--	44.15
No Medicare & Public/Private	--	--	37.93 (11)
Medicare only	--	--	51.53

### Appendix C: Pap Smear Utilization for the Population (Unweighted)

	All Ages >= 21 & <=64	Age 21-29	Age 30-64
<b>Race:</b>			
Caucasian	3926	596	2748
African American	751	126	528
Asian	274	30	203
Indigenous	35	8	24
Hispanic	1124	211	824
Mixed	157	35	111
<b>Education:</b>			
No High School Diploma	32.88	43.95	39.41
High School Diploma	38.54	45.71	45.51
Some College	44.65	49.22	51.51
Bachelor's Degree	54.63	57.56	60.80
Beyond Bachelor's	57.04	62.86	64.06
<b>Income:</b>			
Poor	38.95	50.85	44.44
Near Poor	39.23	45.19	45.29
Low Income	37.89	49.26	44.33
Middle Income	44.62	52.72	51.48
High Income	50.41	47.16	58.28
<b>Insurance:</b>			
Private	--	52.86	55.90
Public	--	50.12	44.42
Uninsured	--	33.51	38.53

### Appendix D: Mammogram Utilization for Black Women (Unweighted)

	All Ages >= 40	Age 40-64	Age 65+
<b>Education:</b>			
No High School Diploma	42.04	37.39	48.60
High School Diploma	43.52	35.81	62.65
Some College	39.61	32.44	60.49
Bachelor's Degree	44.65	37.50	69.05
Beyond Bachelor's	39.80	34.92	54.84
<b>Income:</b>			
Poor	40.56	31.22	59.38
Near Poor	36.36	24.53	46.75
Low Income	39.04	36.05	65.71
Middle Income	45.66	37.71	62.50
High Income	43.73	37.98	62.68
<b>Insurance:</b>			
Private	--	37.07	--
Public	--	37.69	--
Uninsured	--	13.51	0 (1 person)
Medicare & Private	--	--	62.68
Medicare & other public	--	--	55.15
No Medicare & Public/Private	--	--	0 (3 people)
Medicare only	--	--	58.99

### Appendix E: Pap Smear Utilization for Black Women (Unweighted)

	All Ages >= 21& <=64	Age 21-29	Age 30-64
<b>Education:</b>			
No High School Diploma	28.06	23.81	36.67
High School Diploma	37.69	47.06	40.62
Some College	42.69	50.55	45.57
Bachelor's Degree	49.03	62.16	52.25
Beyond Bachelor's	48.97	42.86	54.21
<b>Income:</b>			
Poor	39.21	49.37	44.15
Near Poor	31.65	41.38	35.90
Low Income	37.32	58.18	38.86
Middle Income	44.44	49.21	48.81
High Income	40.78	35.29	45.02
<b>Insurance:</b>			
Private	--	50.69	46.00
Public	--	49.44	42.42
Uninsured	--	33.33	38.68

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## ACADEMIC VITA

**Arunaarathi Kallur**

### EDUCATION

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**The Pennsylvania State University | College of Health and Human Development  
Schreyer Honors College**

**University Park, PA 16802  
September 2019- May 2024**

*Integrated BS/MHA in Health Administration | Bachelor of Science in Health Policy and Administration  
Information Science Technology Minor*

**Thesis:** *Health Disparities with Mammogram and Pap Test Utilization Among Low Income Black Women*

**Relevant Coursework & Awards:** Proficiency in: Excel, Stata, SQL, R Certification in Progress, Foster G. McGaw Scholarship Recipient 2022, HPA Mockingbird Award Recipient 2023

### WORK EXPERIENCE

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**The Institute of Public Policy & Economic Development**

**Wilkes-Barre, PA**

*Research and Development Intern*

*June 2021-August 2021*

- Collected data on COVID-19 vaccine distribution and hesitancy in northeastern Pennsylvania to aid in establishing community guidelines for partnered organizations and readers to reference so they can increase vaccine distribution in lacking areas and within specific community groups
- Transformed raw data on vaccine hesitancy rates and organized data by county and by demographics with the use of Excel charts and pivot tables
- Examined over 60 pieces of state legislation on COVID-19 vaccine bills and resolutions to include in the Summer 2021 Policy Tracker Issue, which highlighted how Pennsylvania was supporting healthcare organizations during the pandemic
- Contributed to the Summer 2021 Policy Tracker Issue, a quarterly newsletter that informs readers about challenges, opportunities, and potential solutions to non-partisan issues

**Abington-Jefferson Hospital**

**Abington, PA**

*Office of Medical Education Intern*

*May 2021-July 2021*

- Managed a premedical program of 20 undergraduate students by running weekly meetings with students and serving as an information source
- Created sign-up sheets via excel for 8 weeks, communicated with 10 different hospital departments to coordinate volunteer times, and created 2 Qualtrics surveys
- Assisted in preparing the office for an Accreditation Council of Graduate Medical Education site visit by ensuring the office followed all Council's policy guidelines
- Supported the new resident orientation onboarding process by inputting resident information into the hospital system and relaying hospital resources at orientation

**Public Health Ambassador**

**University Park, PA**

*General Ambassador*

*September 2020-March 2021*

- Advocated for safety protocols by engaging in dialogue with peers about the importance of mask-wearing, physical distancing, proper cough/hand hygiene during COVID-19
- Addressed questions and expectations surrounding health and safety guidelines at the University

### LEADERSHIP EXPERIENCE

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**Asian Pacific Desi Islander Americans Caucus (APIDA)**

*Co-President*

*UPUA Representative*

**University Park, PA**

*March 2022-Current*

*March 2021-March 2022*

**University Park Undergraduate Association (Student Government)**

*Co-Director of the First Year Council*

*Chair of the Committee on Justice and Equity*

*Vice-Chair of the Committee on Justice and Equity*

*At-Large Representative*

*First-Year-Council Member*

**University Park, PA**

*March 2022-Current*

*March 2021-March 2022*

*March 2020-March 2021*

*March 2020-March 2021*

*September 2019-March 2020*

**OTHER ACTIVITIES**

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- Medical University of South Carolina Case Competition for Health Administration Programs Finalist
- Penn State Health Administration Case Competition – 3<sup>rd</sup> Place

**Charleston, SC**

*October 2022*

**University Park, PA**

*November 2022*