Gaps in Mammography Screening: Breast Cancer in Pierce County, WA
June 2022
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Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACS</td>
<td>American Community Survey</td>
</tr>
<tr>
<td>AIAN</td>
<td>American Indian and Alaska Native</td>
</tr>
<tr>
<td>BRFSS</td>
<td>Behavioral Risk Factor Surveillance System</td>
</tr>
<tr>
<td>CHARS</td>
<td>Comprehensive Hospitalization and Recording System</td>
</tr>
<tr>
<td>CHAT</td>
<td>Community Health Assessment Tool</td>
</tr>
<tr>
<td>CMBC</td>
<td>Carol Milgard Breast Center</td>
</tr>
<tr>
<td>ICD</td>
<td>International Classification of Diseases</td>
</tr>
<tr>
<td>NH</td>
<td>Non-Hispanic</td>
</tr>
<tr>
<td>NHOPI</td>
<td>Native Hawaiian and Other Pacific Islander</td>
</tr>
<tr>
<td>WSCR</td>
<td>Washington State Cancer Registry</td>
</tr>
</tbody>
</table>

Acknowledgements

Thank you to the entire team that supported this project. We couldn’t have done it without their explicit support. Leimamo Wase and Julie Tergliafera for their review and suggestions, without which, I would never have been able to home in on the most important issues. Matt LaMonaca kept me on track and ensured I met deadlines, held meetings and didn't forget what I agreed to during meetings. Finally, thank you to Carol Milgard Breast Center for their excellent coordination and cooperation. Queena Tupou ensured the final product covered all the health domains that were of interest to her organization and was one they would be proud to support.
Executive Summary
In 2022, the Public Health Centers for Excellence at Tacoma-Pierce County Health Department was asked by Carol Milgard Breast Center (CMBC) to describe the current status of breast cancer screening, incidence and mortality in Pierce County, as well as document changes relative to previous needs assessments from 2015 and 2011. Previous reports presented geographic areas based on legislative districts. The current analysis focuses on the current CMBC catchment area as defined by ZIP codes. We reviewed four domains relevant to breast cancer surveillance:

- Mammography (screening)
- Incidence and diagnosis
- Hospitalization
- Mortality

Populations were disaggregated based on:

- Race and ethnicity categories
- Age
- Location of residence, within and outside the CMBC catchment area

Levels and Trends
Across Washington State, incidence of breast cancer among women 40–64 years of age has gradually reduced. The smaller populations in Pierce County and the Carol Milgard Breast Center catchment area show similar, non-significant changes. Although the trends in incidence do not suggest major differences between racial and ethnic groups, a review of mortality suggests stark differences at the end. Black non-Hispanic, Native Hawaiian and Other Pacific Islander (NHOPI) non-Hispanic, and American Indian/Alaska Native (AIAN) non-Hispanic women have higher mortality rates than White non-Hispanic women, considering the modest differences in incidence rates.

Black non-Hispanic women are more likely to have had a recent mammogram than White non-Hispanic women in Pierce County. Women with the least education, lowest income and not having a personal doctor are least likely to have had a recent mammogram, similar to results from 2015. White non-Hispanic and Asian women are least likely to be diagnosed with late stage disease and its associated worse outcomes.

Disaggregation of the Asian population into Asian non-Hispanic and NHOPI non-Hispanic categories is critical for observing the notable differences in these groups which were previously invisible. It demonstrates that NHOPI women have among the highest rates of incidence, mortality and screening for breast cancer while Asian women has one of the lowest rates of incidence, mortality and screening. It also highlights the potentially high burden of mortality and incidence even in a population with relatively high rates of mammography. National estimates of survival and mortality combine the NHOPI population with the Asian population, obscuring the differences in these groups and demonstrating the need for local analysis to reflect local populations.
Conclusions
Changing demographics in Pierce County suggest that Hispanic, Multiracial and NHOPD women will double in size and proportion in the 40–64 year age group over the next twenty years. Although the proportion of women who are poor and medically underserved has been declining over recent years, they are still clustered in the groups that are increasing in Pierce County. These changing demographics suggest a need to qualitatively understand breast health access and utilization and the interaction with the health system by different sub-populations, to be prepared for when they account for a much larger proportion of the population needing mammography services.
Introduction
Breast cancer is the most common cause of cancer in women, the second most common cause of cancer mortality in women and causes premature mortality in women 40–64 years of age. Breast cancer is diagnosed through breast imaging. Early diagnosis of cancer, in many cases, can prevent or delay mortality due to this disease. The Carol Milgard Breast Center, in Tacoma, Washington, supports many services around breast health including routine screening mammograms, second opinions, and outreach services designed to encourage those at higher risk of the negative impacts of breast cancer to get a regular screening mammogram exam.

Methods
The Carol Milgard Breast Center (CMBC) works to provide breast health and mammography services to those in need in Pierce County, regardless of the financial circumstances of the individuals. This report presents a quantitative review of levels, trends and surveillance of breast cancer and breast health in Pierce County, 2004–2020, as data are available.

CMBC catchment area
CMBC has determined that a subset of the Pierce County population is the area of their greatest interest. Much of this area was identified in the breast cancer screening report 2015 as in need of mammography services. The final area is highlighted in pink on the map below (Figure 1) and covers the majority of the western half of Pierce County.

Figure 1 Map of CMBC catchment area
The focused map in figure 2 shows greater detail on the catchment area specifically as well as the locations of churches that are partners in the FaithHealth in Action program. Although the majority of the locations are within the catchment area, some do fall outside, indicative of the fact that many CMBC beneficiaries fall in broader Pierce County. As a result, although we conducted analyses of catchment area residents when possible, we also present information on Pierce County as a whole as well.
Data sources
We used four primary data sources for these analyses.

- Vital registration, as reported in the Community Health Assessment Tool (CHAT)³
- Washington State Cancer Registry, as reported in CHAT
- Behavior Risk Factor Surveillance System (BRFSS)
- Comprehensive Hospital Abstract Reporting System, as reported in CHAT

Death certificates through vital registration are generated by the state and include information on causes of death, underlying and contributing conditions as defined by the person certifying the death, typically, but not always, a physician, medical examiner or coroner. Additional data are gathered by the informant (often, but not always, a family member) on items such as residence and race/ethnicity. Cause-of-death data are derived from underlying causes of death and not immediate causes. For example, if a person dies of a complication or metastasis of breast cancer, breast cancer would be entered as the underlying cause of death. Data are compiled and cleaned by the Washington State Department of Health, Center for Health Statisticsiv. We present data for 2006–2020, disaggregated into 5-year periods: 2006–2010, 2011–2015, 2016–2020.

The Washington State Cancer Registry (WSCR)v standardizes the monitoring of cancer incidence, specifically including data on stage at diagnosis, type of cancer as well as a variety of demographic and clinical information. Case definitions are routinely updated in accordance with national cancer guidelines. In 2018, the methodology for staging of breast cancer formally changed to incorporate genetic information. When aggregations were needed, we used four-year periods: 2004–2007, 2008–2011, 2012–2015, 2016–2019.

The Behavioral Risk Factor Surveillance System (BRFSS)vi is an annual phone survey which gives each household an equal chance to be selected. It allows for reliable estimates at both the state and county-level on an annual basis. It includes questions on topics such as health, risk factors and conditions. It also includes data on tobacco use and breast cancer screening, although not every question is asked every year. For example, in 2017 and 2019, questions on breast cancer screening were not included. The household sampling methodology and weighting methods changed in 2011, resulting in data from before 2011 being not directly comparable to more recent estimates. The dataset includes weighting in order to estimate population proportions. Due to the relatively small size of this population as well as the lack of data available for 2017 and 2019, we aggregated data into two periods: 2011–2015 and 2016–2020. Select analyses covered 2011–2020. Not all analyses could be disaggregated to individual race/ethnicity categories, due to small sizes.

The Comprehensive Hospitalization and Recording System (CHARS)vii is a Washington State database that includes information on diagnosis of all patients hospitalized in the state at non-Federal institutions. Within Pierce County, the Madigan Army Medical Center does not report into CHARS. A key limitation is that the hospitalization rates and details may include the same individual hospitalized more than one time. In addition, as the data are recorded initially for hospital billing purposes, the true underlying clinical cause may not always be fully recorded. Due to changes in ICD codes (from ICD-9
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to ICD-10) in 2015, we cannot present comparable data prior to 2016. Although 2020 and 2021 data are available through other sources, we are not presenting these data here to ensure comparability among all data. Our analysis covered 2016–2019, parallel with the incidence data from WSCR.

Underlying population estimates, pre-built into the Community Health Assessment Tool, were based on US Census estimates which have been disaggregated by the Washington State Office of Financial Management Forecasting Division. These were last updated February 2020. Poverty Rates were calculated from the 5-year estimates of the American Community Survey. Note that the data from 2020 appeared inconsistent with previous estimates, potentially due to pandemic impacts on the Census process, so we present data from 2015–2019 as our most recent time period.

Methodology and analyses

Decisions around which years to aggregate or disaggregate were made based on the timing of previous reports and the characteristics of the underlying datasets. Although population estimates are available back to 1990, the disaggregation between Asian and Native Hawaiian and Other Pacific Islander (NHOPI) was not possible before 2004 in the CHAT database. In 2015, hospitalization data were reported using ICD-10 codes rather than the ICD-9 codes used previously. This notable change eliminates the ability to directly compare to earlier years; no data before 2016 are shown. Finally, previous CMBC assessment reports were available in 2011 and April 2015. We attempted to disaggregate our data before and after these years when possible. Therefore, many aggregations used 2016–2020, or 2016–most recent, as appropriate for the data source.

Additional data considerations

Although the impact of breast cancer is large on the total population of women and on individual women, many of the highest risk populations are relatively small compared to the overall population of Pierce County. Analyzing these smaller populations may be difficult given the relatively small sample size available for reliable estimates. As a result of this concern, we considered reliability as we aggregated and disaggregated data on multiple levels. The main variables of consideration

Figure 3 Correlation between sample size and analysis level
were the number of people who had the outcome of interest (i.e. screened for breast cancer, died of breast cancer) and the number who were at risk (i.e. were eligible for screening). We aggregated or disaggregated such that the smallest data presented had a minimum of 10 events and a minimum of 30 people in the underlying population of interest. For populations with smaller numbers, we had the option to 1) increase the number of calendar years being aggregated (i.e. 1 vs. 5 vs 10), 2) increase the width of the age groups being aggregated (1 year of age vs. 5 years of age vs 25 years of age) or 3) increasing the geographic area of interest (i.e. Washington State, Pierce County, CMBC catchment area). For example, due to the small size of the Native Hawaiian and Other Pacific Islander (NHOPI) non-Hispanic population in Pierce County, the sample size was infrequently large enough to present small time period analyses. To resolve this, we presented 10-year aggregated data for individual racial and ethnic groups for all of Washington State in order to see trends more clearly. Alternatively, for a different analysis, we combined multiple racial and ethnic groups within Pierce County to show the differences between Pierce County and other geographies. The White non-Hispanic population was the largest individual population and often used as a reference population because the estimates were stable due to the large number of women to draw from.

**Race and ethnicity**

Racial and ethnic groups are defined and asked about in different ways depending on the needs of the questioner. They may also be defined differently by different individuals of similar backgrounds and is thus a personal decision rather than an objective categorization in many cases. Hispanic as Race is defined as any individual reporting Hispanic or Latino/a as their ethnicity, regardless of their race. Different data sources use different reporters, which is also critical. See the table below for key descriptors of race and ethnicity questions and data. Note the differences in source as well as options. Bridging uses consistent methodology to allow the results to be compared in situations where, for example, Hispanic is asked about as a race vs. when it is asked about as an ethnicity, or when an opened question is asked vs. one with limited options. No reliable data on the race and ethnicity of breast cancer hospitalizations from the CHARS data is available because the data are notably incomplete. As with race and ethnicity, we are also limited to the questions currently and historically asked about sexual orientation and gender identity. When these questions are not asked or are asked in inconsistent ways, we lack the information to evaluate the trends around breast cancer screening, treatment and mortality among trans or non-binary individuals, leaving these populations hidden.
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Table 1 Questions and formats around Race and Ethnicity categorization in select data sources

<table>
<thead>
<tr>
<th></th>
<th>Washington State Cancer Registry</th>
<th>Death Certificates</th>
<th>Census/American Community Survey*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ethnicity question</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you Hispanic, Latino/a, or Spanish Origin?</td>
<td>Hispanic / Non-Hispanic</td>
<td>Was Decedent of Hispanic Origin?</td>
<td>Is person (N) of Hispanic, Latino or Spanish origin?</td>
</tr>
<tr>
<td><strong>Race questions or categories</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>White</td>
<td>White only-NH</td>
<td>White – non-Hispanic</td>
</tr>
<tr>
<td>Black or African American</td>
<td>African American</td>
<td>Black only-NH</td>
<td>Black or African Am.</td>
</tr>
<tr>
<td>American Indian or Alaska Native</td>
<td>American Indian American</td>
<td>American Indian/Alaskan Native only-NH</td>
<td>American Indian or Alaska Native</td>
</tr>
<tr>
<td>Asian</td>
<td>Asian</td>
<td>Asian only-NH</td>
<td>Asian</td>
</tr>
<tr>
<td>Pacific Islander</td>
<td>Pacific Islander</td>
<td>Pacific Islander only-NH</td>
<td>Hispanic</td>
</tr>
<tr>
<td>Other</td>
<td>Unknown</td>
<td>Multi-race-NH</td>
<td>Multi Race</td>
</tr>
<tr>
<td>Don’t know/Not Sure</td>
<td>Hispanic as race</td>
<td>Native Hawaiian and Other Pacific Islander</td>
<td></td>
</tr>
<tr>
<td>Refused</td>
<td></td>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

**Source**

Interview formally asked | Health care practitioner | Informant, family member or friend | Questionnaire formally asked |

**Notes**

2 questions: 1 ethnicity; 1 race; multiple responses accepted | 2 questions: 1 ethnicity; 1 race | 1 open-ended question on the combination of race/ethnicity | 2 questions: 1 ethnicity; 1 race, multiple Asian, open-ended options; multiple responses accepted; |

*see ACS survey for more details as additional options and categorizations are available; the questions above do not necessarily reflect the display data in the final product.

In this document, we refer to the Hispanic population as ‘Hispanic as race’ or ‘Hispanic’ which includes all individuals who state that their race or ethnicity are ‘Hispanic’ or ‘Latino/a’, depending on the source. For all other categories, the Hispanic population has been excluded. The categories are, for example, ‘Black’, ‘Black only NH’ or ‘Black non-Hispanic’ which are used interchangeably to refer to that group. See table 2 for potential group level labels. The other, missing, unknown categories may include Hispanic individuals or other individuals of other racial/ethnic groups, but we are unable to determine if they are Hispanic or from one of the other specific groups. Previous iterations of this analysis included a single Asian category, which included both of the current categories of ‘Asian’ and ‘Native Hawaiian and Other Pacific Islander’, also known as NHOPI, as the standard to disaggregate these groups did not begin until the early 2000s*.
Table 2 Racial and ethnic categories used in this report

<table>
<thead>
<tr>
<th>Full category name</th>
<th>Also labelled as</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Indian/Alaska Native non-Hispanic</td>
<td>AIAN-NH AIAN</td>
</tr>
<tr>
<td>Asian non-Hispanic</td>
<td>Asian-NH Asian</td>
</tr>
<tr>
<td>Black non-Hispanic</td>
<td>Black-NH Black</td>
</tr>
<tr>
<td>Hispanic as Race</td>
<td>Hispanic Hispanic</td>
</tr>
<tr>
<td>Multi-Race non-Hispanic</td>
<td>Multi-NH Multiracial</td>
</tr>
<tr>
<td>Native Hawaiian and Other Pacific Islander non-Hispanic</td>
<td>NHOPI-NH NHOPI</td>
</tr>
<tr>
<td>White non-Hispanic</td>
<td>White-NH White</td>
</tr>
</tbody>
</table>

**Statistical analyses**

We calculated age-adjusted rates based on the underlying number of women in the population of interest. This is calculated within the CHAT database based on the age distribution of the US Standard Population. For some analyses, we calculated the age-adjusted rate based on a subset of the population, typically 40–64 years of age. To assess the age distribution within 5-year bands, we calculated an age-specific estimate, using the known underlying population from the year(s) of interest. For other analyses, we presented raw counts or proportions as appropriate. 95% confidence intervals were presented.

**Display**

We show 95% confidence intervals around the estimates presented as black vertical or horizontal bars with whiskers when appropriate. Data where the confidence intervals overlap are not necessarily significantly different. Such values, when combined with qualitative understanding, should be considered not different and only observed as a result of random chance. Such considerations will be formally presented in the written text describing the results.

**Overview**

The remainder of this report is divided into five domains: screening, incidence, hospitalizations, mortality and the Pierce County population. Within each domain we also review sub-populations such as age groups, race/ethnicity and location of residence to identify potential high-risk or high-burden groups.

**Results**

Although all humans can develop breast cancer, this report focuses exclusively on those who report being female at birth. Males can and do get breast cancer, but the rates are magnitudes lower than in women and thus routine screening, the focus of Carol Milgard Breast Center, will not identify those cases of cancer.
Breast cancer screening

Guidelines for routine breast cancer screening vary based on organization\textsuperscript{xii}. The Carol Milgard Breast Center recommends annual screening beginning at age 40\textsuperscript{xii}, while the American Cancer Society recommends optional screening from 40–44, annual screening for 45–54 and biennial screening for women over 55. For the purposes of this report, we are focused on screening among women 40–64 years of age.

The questions from BRFSS about mammography are in the figure to the right. For adequate sample size and comparability with previous reports, we defined a recent mammogram as within the past 2 years.

As a result of the COVID-19 pandemic, which began in Washington State in early 2020, access to and utilization of health care were reduced\textsuperscript{xi}. Although this is likely to have reduced breast cancer screening and follow-up-care\textsuperscript{xiv} since then, the data in this report are unlikely to be impacted materially. Interviews on breast cancer screening from 2020 accounted for approximately 12% of the total dataset evaluated. In addition, as the question asked about mammograms in the previous two years, the majority of women interviewed in 2020 would have reported on screening conducted in 2018 and 2019 (pre-pandemic) or 2019 and 2020 (partially pre-pandemic). Although some mammograms in 2020 would have been missed or delayed due to the pandemic, their modest proportion of the dataset is unlikely to affect the overall numbers dramatically. The BRFSS 2022 estimates are likely to clearly display the impact of the pandemic on breast cancer screening.

The proportion of women who reported having a recent mammogram ranged from 66% to 70% in the CMBC catchment area, Pierce County, King County and Washington State. These values were not statistically significantly different even though King County had the highest, and the CMBC catchment area the lowest, levels of recent mammogram.

<table>
<thead>
<tr>
<th>Box 1. Breast cancer screening questions in BRFSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you ever had a mammogram?</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Don’t know/Not sure</td>
</tr>
<tr>
<td>Refused</td>
</tr>
<tr>
<td>How long has it been since your last mammogram?</td>
</tr>
<tr>
<td>&lt; 12 months</td>
</tr>
<tr>
<td>1- &lt;2 years</td>
</tr>
<tr>
<td>2- &lt;3 years</td>
</tr>
<tr>
<td>3- &lt; 5 years</td>
</tr>
<tr>
<td>5+ years</td>
</tr>
</tbody>
</table>
Within Pierce County, no significant trends in recent mammograms have been observed. Although there is a suggestion that there might be a decline in mammography since 2016 in the CMBC catchment area, the wide confidence intervals suggest that this is uncertain. It would also be notably different from the rest of Pierce County, where no trend was noticed.

**Sub populations**

Although Pierce County has a relatively high level of routine screening for breast cancer, the same is not true of all sub-populations within the county. Screening levels vary by the racial and ethnic group of the woman reporting. The Black non-Hispanic population has the highest rate of screening (78%) while the lowest is the Asian non-Hispanic population (55%).
Due to very small sample sizes in BRFSS, trends in mammography within race/ethnicity groups (for women of all ages in Pierce County) cannot be shown and were not significantly different between 2011–2015 and 2016–2020. When there were at least 30 respondents in both time periods, we report the qualitative descriptions below. No change in recent mammograms proportion was observed among the White non-Hispanic and Hispanic populations. There may have been a slight increase in the Asian mammography rate and a slight decrease in the Black and multiracial mammography rates. There were too few respondents in the other groups to report on.

Education was associated with reporting a recent mammogram. Women who had not graduated from high school were significantly less likely to have had a recent mammogram (43%) than all other groups. Women who graduated college or technical school (76%) were most likely to have had a recent mammogram and were significantly more likely than those graduating high school (62%).
A similar trend was seen for income with women earning less than $15,000 annually being significantly less likely to have a recent mammogram (47%) than those earning over $50,000. No other significant associations were noted.

![Figure 8: Mammograms by level of income](image)

Two additional indicators related to interaction with the health system showed notable trends. Uninsured women were statistically significantly less likely to have a recent mammogram (42%) than those who reported being insured (71%). Similarly, women who reported having no personal doctor were significantly less likely to have a recent mammogram (27%) than those who had one (75%) or multiple (69%) personal doctors.

![Figure 9: Mammograms by insurance and having a personal doctor](image)
Additionally, recent mammography was lowest at approximately 50% in the 40-44 year age group and increased to around 74% in women in all 5-year age groups between 50 and 64 years of age. This masks differences in the peak age for recent mammography among race/ethnicity groups. It was highest in the 55–59 year age group among Black, AIAN, Asian and Hispanic women. White women had the highest rate in the 60–64 year of age group. The numbers were too small to estimate among multiracial and NHOPI women.

Another way to evaluate the population in need of mammography services is to review all women who reported not having a recent mammogram as shown in table 3. Due to very small sample sizes, we elected to assess characteristics of non-white women separately from White non-Hispanic women, rather than by specific race/ethnicity. The non-white population included those who self-reported as Black, AIAN, Asian, NHOPI, Multiracial and Hispanic. We did not include ‘other’ or ‘don’t know/not reported/missing’ in the non-white or White populations although they are included in the all women population. We only assessed characteristics of women 40–64 years of age who had not had a recent mammogram. Among all women who did not report a recent mammogram, 74% were White non-Hispanic, 9% Hispanic, 7% Asian, 3% Black, 2% AIAN and the remainder NHOPI, Other, Multiracial and don’t know/refused/missing.

Women 40-44 years of age accounted for the largest portion of women without a recent mammogram. The income distribution of women without a mammogram shows that the lowest income category is more common among non-white women without a mammogram than among White women without a mammogram. Nearly 30% of non-white women without a mammogram did not graduate from high school. In all groups, insurance and having a personal doctor is more common than not.
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Table 3 Percent of women without a recent mammogram, by select characteristics

<table>
<thead>
<tr>
<th>Category</th>
<th>All women</th>
<th>White women</th>
<th>Non-white women*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40–44 years</td>
<td>31.6%</td>
<td>28.2%</td>
<td>41.8%</td>
</tr>
<tr>
<td>45–49 years</td>
<td>19.0%</td>
<td>18.9%</td>
<td>19.6%</td>
</tr>
<tr>
<td>50–54 years</td>
<td>18.7%</td>
<td>19.7%</td>
<td>15.5%</td>
</tr>
<tr>
<td>55–59 years</td>
<td>15.4%</td>
<td>16.4%</td>
<td>12.6%</td>
</tr>
<tr>
<td>60–64 years</td>
<td>15.3%</td>
<td>16.7%</td>
<td>10.5%</td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;$15,000</td>
<td>10.3%</td>
<td>9.0%</td>
<td>14.1%</td>
</tr>
<tr>
<td>$15,000-$25,000</td>
<td>12.8%</td>
<td>11.0%</td>
<td>18.1%</td>
</tr>
<tr>
<td>$25,000-$35,000</td>
<td>7.5%</td>
<td>6.9%</td>
<td>9.6%</td>
</tr>
<tr>
<td>$35,000-$50,000</td>
<td>11.3%</td>
<td>11.5%</td>
<td>10.3%</td>
</tr>
<tr>
<td>$50,000+</td>
<td>47.4%</td>
<td>51.5%</td>
<td>35.5%</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Did not graduate high school</td>
<td>12.8%</td>
<td>7.8%</td>
<td>28.6%</td>
</tr>
<tr>
<td>Graduated high school</td>
<td>21.6%</td>
<td>22.9%</td>
<td>17.8%</td>
</tr>
<tr>
<td>Some college or tech school</td>
<td>36.5%</td>
<td>39.4%</td>
<td>27.3%</td>
</tr>
<tr>
<td>Graduated college or tech school</td>
<td>29.0%</td>
<td>29.9%</td>
<td>26.2%</td>
</tr>
<tr>
<td><strong>Insured?</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>82.9%</td>
<td>86.0%</td>
<td>74.0%</td>
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<tr>
<td><strong>Personal doctor?</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>73.4%</td>
<td>76.2%</td>
<td>68.4%</td>
</tr>
</tbody>
</table>

Source: BRFSS; *non-white: AIAN, Asian, NHOPI, Hispanic, Black, Multiracial; groups may not add to 100, due to exclusion of other/don’t know/refused/unsure/missing categories and rounding.

Breast cancer incidence

Breast cancer identified through routine screening and screening as a result of symptoms results in the total number of breast cancer cases. Between 2009 and 2019, there have been an average of 820 breast cancer cases in women in Pierce County, ranging from 739 to 931. In Washington State breast cancer incidence in women has displayed a steady, but small, decline since at least 2009. In Pierce County, the breast cancer incidence rate has fluctuated from year to year, but with an overall decline such that the rate in 2018 was significantly slower than that reported in 2009, with an increase seen in 2019. The same uneven trend was also seen in the CMBC catchment area.
Age distribution of breast cancer cases

The age distribution of breast cancer cases is similar across Pierce County and Washington State. We are also able to look at the distribution specifically within the CMBC catchment area described earlier. The number of breast cancer cases diagnosed increases from minimal in women under the age of 25 and peaks between 65 and 69 years of age and declines after that. Approximately 50% of cases were diagnosed in women between the age of 40 and 64, with less than 5% being diagnosed before 40 years of age and the remainder in women 65 and older.
We also look at the incidence rate of breast cancer by the same 5-year age groups. The peak age-specific incidence is in women 70–74 years of age in 2016–2019 in both Pierce County and Washington State. No significant change has been recorded relative to what was seen in 2006–2009 for these smaller age groups (data not shown).

![Age distribution at breast cancer diagnosis, 2016-2019](image)

**Figure 12 Age-specific rate of breast cancer incidence**

**Incidence among women 40–64 years of age**

Breast cancer incidence among women 40–64 years of age shows a similar trend in Washington State to that seen for all women, with a significant reduction in recent years, even though 2019 is not as low as prior years. The trend of fluctuations seen in the smaller populations of Pierce County and the CMBC catchment area are also similar to that seen by the overall population.
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Figure 13 Breast cancer incidence among women 40–64 years of age

Racial distribution of breast cancer cases in women 40–64 years of age

There are no significant trends in the incidence of breast cancer within any racial/ethnic group among women 40–64 years of age. There is a non-significant declining trend among White non-Hispanic women. The number of women diagnosed in the NHOPI non-Hispanic population is too small to report for 2004–2007 and is not shown. The available data shows such wide confidence intervals, that the observed changes are not considered to be reliable. Previous analyses combined the Asian and Pacific Islander groups, masking the potentially much higher rate of breast cancer incidence in the Pacific Islander population. In 2008–2011, breast cancer incidence was approximately 25% higher in NHOPI women than in White women. In 2012–2015, Black and AIAN women had rates approximately 15–20% higher. Asian and Multiracial women appear to have incidence rates between 15 and 50% lower.
At the state level however, there is some evidence of changes in incidence rates in selected race/ethnicity groups. The same significant decline in breast cancer incidence in the White non-Hispanic population has been seen. Significant increases are also seen in the Asian, Multi-racial, NHOPI and Hispanic populations. No trend is obvious among AIAN or Black groups, similar to what has been seen in Pierce County. Also, the overall level of incidence is highest among the NHOPI population and lowest among the Multiracial population. The other groups are qualitatively very similar. It is unclear if the high level of breast cancer incidence among the NHOPI population is due to a true increase, to increased screening and identification and participation in the health system, or to some external factor such as health migration due to minimal services in their island nations.
Breast cancer stages upon diagnosis

When cancer is diagnosed a series of quantitative and qualitative factors specific to that type of cancer are analyzed and combined to categorize the stage of the disease for the individual. The stage can be indicative of the outcomes that are likely for that individual. The most promising stages are in situ and localized (called early stage) while those with higher mortality are regional or distant (called late stage). Although there have been some changes in the incidence and screening for breast cancer over recent years, the evidence is not strong for notable changes in the stage at diagnosis. The values below are not notably changed over time within each specific stage. The only exception is that the proportion that are unstaged is much higher in 2008–2011 and 2012–2015 than earlier or later.
Unstaged refers to a group of cases for which there is inadequate information to determine what the stage actually was. In some cases, the individual moves and there is no continuity between records. In other cases, the individual simply does not return for follow up. SEER data suggests that the mortality rate of individuals with unstaged breast cancer is intermediate between the other stages, and likely reflects a combination of stages upon diagnosis. Among women 40–64 years of age in Pierce County, 69% are diagnosed at the in situ or localized stages, also known as early stage, with about 27% diagnosed at the distant or regional stages, also known as late stage.

There is notable variability among the stage at diagnoses based on the race/ethnicity reported. More than 70% of Asian and White non-Hispanic women are diagnosed at an early stage of disease while less than 60% of NHOPI and AIAN women are diagnosed early in the disease process. More than 40% of NHOPI and 30% of multiracial and AIAN women are diagnosed at the late stages. Additionally, more than 10% of NHOPI women have their cancer designated as unstaged, potentially reflecting inadequate and inconsistent interaction with the health system. The proportion of those women with an unknown race/ethnicity also have high proportions of unstaged disease. Note however, small numbers (less than 20 for each group except the white and all races populations) make this estimate somewhat unreliable in Pierce County.

Another question is the change over time within these groups. The overall estimate of percent diagnosed at an early stage was the same (69%) for 2004–2011 and 2012–2019. However, these numbers mask potential increases in early stage diagnoses in the AIAN, Black and NHOPI populations as well as potential decreases in early stage diagnoses in the Hispanic and multiracial populations. None of these changes are significantly different but highlight that averages can hide differences in smaller populations.
**Breast cancer hospitalizations**

Hospitalizations are a burden on the health system and on the patient, although they are not a key indicator of breast cancer disease burden. Due to changes in the coding around hospitalizations, we are unable to show trends over time prior to 2016. There average number of hospitalizations due to breast cancer was 37 among women living in Pierce County between 2016 and 2019. The largest number of hospitalizations was in women 60-64 years of age, while the rate was highest among women 70–74 years of age. The numbers are very small and statistically insignificant although the rates tend to increase as women age. The hospitalization rates appear to remain constant and similar after age 60.

![Breast cancer hospitalizations by age, Pierce County 2016-2019](image)

**Figure 18 Breast cancer hospitalizations**

When focused on women 40–64 years of age in Washington State, there appears to be a reduction in the rate of breast cancer related hospitalizations over the past 4 years. However, the trend is not as clear among women in Pierce County or in the CMBC catchment area. In both the later areas, there appeared to be a decline followed by an increase, but none of these differences were significant.
Due to the small number of women included in any of these analyses, and the significant proportion of missing race and ethnicity in the CHARS data, we do not report on these characteristics.

**Breast cancer mortality**

In Pierce County, the number of women dying from breast cancer has increased from 905 between 2003–2012 to 1005 between 2011–2020. On average less than one male died of breast cancer in Pierce County per year. As previously mentioned, these males have been excluded from all analyses as routine mammography cannot impact these deaths.
In Washington State, breast cancer mortality is very similar to that seen in Pierce County and in the subset of ZIP codes in Pierce County that make up the CMBC catchment area, ranging from about 21 to 25 per 100,000 women. Similar values are seen for women 40–64 years of age, although Pierce County has a slightly higher point estimate which is not significantly different than either of the other two geographies. In Washington State, the rate of breast cancer mortality among all women has been relatively unchanged since 2006, at around 24 per 100,000. This is somewhat different than what has been observed among women 40–64 years of age in Washington who have seen a statistically significant decline from 29 to 25 per 100,000 women. The trends in Pierce County and in the CMBC catchment area are not as clear cut with no significant differences noted among all women nor among women 40–64 years of age.

Age distribution of all breast cancer deaths
Approximately 3% of all breast cancer deaths in Pierce County since 2006 have occurred in women under the age of 40, ranging from 1.4% to 4.5% of all breast cancer deaths, with fewer than 25 deaths in this age group over each of the three 5-year time periods. Approximately 58% of breast cancer deaths are in women 65 years of age and older, between 200 and 300 women over each 5 year period. The remainder, 37–41% of breast cancer deaths, occurred in women 40–64 years old. Although the largest number of deaths occurred in women over the age of 85, the second largest number was in women 60–64 years of age, an age group that could potentially benefit from routine screening. Although the graph shows differences across different time periods, these are not significant, but likely random variation in terms of distribution.
Figure 22 Age distribution of breast cancer deaths

Although the raw number of deaths due to breast cancer peaks in the 60–64 and 85+ age groups, the mortality rate is notably higher in the 85+ age group, due to reduced survival due to other causes of death. However, the overall mortality rate due to all causes is also notably higher in that age group and diagnosis could have occurred at any point earlier. It does not indicate time to survival. There are no notable differences in breast cancer mortality rates between Pierce County and Washington State.

Figure 23 Age-specific breast cancer mortality rate

Race and ethnicity distribution of breast cancer deaths

Due to the small number of individuals in each racial/ethnic group in Pierce County, we are presenting the racial and ethnic distribution of Washington State. In addition, see the methods for a description of
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race/ethnicity data and limitations. In Washington State, NHOPI non-Hispanic women have the highest level of mortality due to breast cancer, with similar rates among White non-Hispanic, Black and American Indian/Alaska Native women. Asian, Hispanic and multiracial individuals report the lowest rates. Data from Pierce County specifically do appear very similar, although with far wider confidence in the specific rates.

The levels of breast cancer mortality in women of all ages in Washington State vary based on the race and ethnicity reported on the death certificate. The levels ranged from a low of between 11 and 12 for Asian non-Hispanic women to a high of between 22 and 38 for NHOPI non-Hispanic women. The trends have also been varied. Although the White non-Hispanic population had a small but significant decline in breast cancer mortality across the state, the remaining racial/ethnic groups had quite different and non-significant trends. For example, the Asian non-Hispanic population appears to have had no change in the age-adjusted mortality rate while the AIAN non-Hispanic, Hispanic, Multi-Racial non-Hispanic and NHOPI non-Hispanic populations all suggest that there might be an increase in their age-adjusted mortality rates. None of these increases are significant. The Black non-Hispanic population, on the other hand, may have seen a decline since 2011–2015, although this change is also not statistically significant. Note that changes in how people report their multiracial status may have changed over this relatively long time period, impacting the trends. Data from Pierce County specifically show similar, but even less significant trends due to the much smaller sample sizes.

Figure 24 Breast cancer mortality trends by race and ethnicity, Washington State

![Breast cancer mortality trends by race and ethnicity, Washington State](image)
An important consideration is 5-year survival which was not available in this dataset. Nationally, Black non-Hispanic women 40–64 years of age have the lowest 5-year survival rates regardless of the stage at which the cancer was diagnosed. The data used for this analysis was based on national estimates from 2012–2018, and the most recent trends seen in Washington State may not be fully incorporated into these estimates.

**Pierce County population**

Pierce County has a population of approximately 900,700 people as of 2020, according to the CHAT estimates. This accounts for about 11.8% of Washington State. Women make up more than 50% of Pierce County, approximately 458,600 people or 12.0% of women in Washington State. There are 144,500 women 40–64 years of age who could benefit from routine breast cancer screening. The racial and ethnic distribution of women in Pierce County is not static across all age groups. Overall, White non-Hispanic women account for approximately 65% of women in Pierce County while they are nearly 72% of the women in the 40–64 year age group. The racial and ethnic distribution of women 40–64 years of age is likely to change notably as the younger women in Pierce County age. For example, the proportion of women identifying as Hispanic is greater in those under 40 years of age while the White non-Hispanic population is smaller in that same age group. Decision making around outreach will need to change in order to reach those at greatest risk.

In the CMBC catchment area, the proportion and number of women who identify as Hispanic in the 40–64 year age group will more than double (to 15% and 12,000 women) in the next 20 years while the proportion identifying as White non-Hispanic will decrease to 55%. Similarly, the Multiracial and NHOPI proportions will likely increase, assuming that individuals remain living in this area. The AIAN proportion and numbers are unlikely to change while there appears to be a slight decline in the proportion identifying as Asian in the 15–39 year age group. These estimates cannot account for future migration but reflect the current population in the 15–39 year age group.
Economic distribution and trends

Income is an important predictor of access to health care at a population level. Using the BRFSS survey, we see that the proportion of women with a very low income below $15,000 annually is declining while the proportion with an income above $50,000 is increasing. Note that the proportion of women who choose not to respond to this question has increased from 14% to 20% over the same time period, raising questions about the reliability of these data.

Table 5 Annual income among women in Pierce County

<table>
<thead>
<tr>
<th>Income Level</th>
<th>2011-2015</th>
<th>2016-2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;$15,000</td>
<td>7.9% (7-9%)</td>
<td>5.4% (4-7%)</td>
</tr>
<tr>
<td>$15,000 to &lt; $25,000</td>
<td>13.2 (11-15)</td>
<td>9.8 (8-11)</td>
</tr>
<tr>
<td>$25,000 to &lt; $35,000</td>
<td>9.8 (8-11)</td>
<td>8.5 (7-10)</td>
</tr>
<tr>
<td>$35,000 to &lt; $50,000</td>
<td>14.7 (13-16)</td>
<td>10.6 (9-12)</td>
</tr>
<tr>
<td>$50,000+</td>
<td>39.9 (38-42)</td>
<td>45.6 (43-49)</td>
</tr>
</tbody>
</table>

Source: BRFSS
Another indicator potentially related to access to health care at a population level is poverty. Poverty levels typically vary by geography, race, ethnicity, gender and age. The table below indicates the proportion of women who lived in poverty by age and race/ethnicity. Over the last ten years, there has been a decline in the proportion of women living in poverty. Higher rates of poverty are seen among women younger than 35 than 35–64. These numbers are qualitatively relatively similar to those reported in the BRFSS survey.

Table 6 Poverty among women in Pierce County

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All women</td>
<td>Women 35-64</td>
<td>All women</td>
<td>Women 35-64</td>
</tr>
<tr>
<td>AIAN</td>
<td>24.2%</td>
<td>19.5%</td>
<td>15.1%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Asian</td>
<td>13.5%</td>
<td>9.3%</td>
<td>11.7%</td>
<td>11.2%</td>
</tr>
<tr>
<td>Black or African American</td>
<td>19.9%</td>
<td>16.7%</td>
<td>16.8%</td>
<td>14.1%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>25.6%</td>
<td>18.7%</td>
<td>19.1%</td>
<td>11.5%</td>
</tr>
<tr>
<td>Multiracial</td>
<td>16.3%</td>
<td>11.6%</td>
<td>13.2%</td>
<td>7.9%</td>
</tr>
<tr>
<td>NHOPI</td>
<td>21.3%</td>
<td>13.2%</td>
<td>15.9%</td>
<td>9.4%</td>
</tr>
<tr>
<td>White non-Hispanic</td>
<td>11.3%</td>
<td>9.6%</td>
<td>9.4%</td>
<td>8.9%</td>
</tr>
</tbody>
</table>

Source: ACS; Other, AIAN, Asian, Black, Multiracial, NHOPI all include a portion that identify as Hispanic; the ‘other’ category is not presented due to lack of comparability with other sources in this document.

Educational distribution and trends

Educational attainment is a critical characteristic indicative of access to health care and income at a population level. The proportion of women in Pierce County who have not graduated from high school has non-significantly declined over the past ten years, in concert with a similar small potential increase in those who have graduated from college or technical school. If these trends continue, it is likely that the proportion of women who did not graduate from high school is likely to decline. The estimates and trends among women living in the CMBC catchment area are similar (data not presented).

Table 7 Educational status of women in Pierce County

|                                 | 2011-2015 (% (95%CI))* | 2016-2020 (% (95%CI)) |
|                                 |                        |                       |
| Did not graduate high school    | 10.5% (8-13%)          | 7.6% (6-10%)          |
| Graduated high school           | 25.3 (23-27)           | 25.9 (23-29)          |
| Some college or tech school     | 40.7 (38-43)           | 40.8 (38-44)          |
| Graduated college or tech school| 23.1 (21-24)           | 25.5 (23-28)          |
| Unknown/Refused/Missing         | <1 (0-1)               | <1 (0-1)              |

*Source: BRFSS

Conclusions and limitations

Limitations

Data used for this report are pulled from a wide variety of sources, each of which categorize race/ethnicity in different ways and have different sample sizes. Thus, the population which is considered to be ‘other’ in one data source may be ‘multiracial’ in a different source and ‘mixed’ in a third. In addition, people change their personal definition of the race/ethnicity that they report over time, based on both personal decisions as well as the external environment. These limit the direct
comparability of the conclusions based on racial and ethnic characteristics of women. However, they are useful for understanding general characteristics that can be further investigated.

The BRFSS dataset which is used to estimate the rate of recent mammograms is a relatively small dataset. Most of the sub-populations of interest cannot be formally evaluated due to the small sample sizes and the wide confidence intervals around the data. Additional sources of data or a larger number of women being included in the BRFSS is necessary to refine our estimates of which types of women need to be encouraged to receive a timely mammogram.

Finally, the incidence data are relatively old and are not directly aligned with the time periods assessed by other data sources. Although these data will be included in future analyses, changes in definitions of stages may make it more difficult in the future, even if the overall data are available.

**Conclusions**

Recent declines in breast cancer incidence and mortality have been observed in Washington State and may also be occurring at the county and sub-county level. There is notable variation in both the levels and trends in breast cancer incidence and mortality within and across racial and ethnic sub-groups. For the first time in this series, we present the Asian and Pacific Islander breast cancer burden separately and show that the level of breast cancer in NHOPi populations is notably higher than in Asian populations. There may also be an increased burden over time in this population, even though relatively high rates of mammography have been seen. Mammography data indicate that there is relatively high utilization of mammography services by women 40–64 years old in the NHOPi population, but this does not seem to have yet translated into reduced incidence or mortality due to breast cancer. One explanation to be evaluated should be selective utilization of the health system as 10% of NHOPi women diagnosed with breast cancer are categorized as unstaged, the largest for any group in Pierce County. Another potential reason for this disparity may be because appropriate treatment is not available at home jurisdictions for some Pacific Islanders. Qualitative evaluation of the Pacific Islander population and patients in Pierce County is warranted to better understand their needs.

Characteristics related to reduced rates of mammography included a lack of a high school education, low income and a lack of a personal doctor. These characteristics are similar to those reported in the 2015 report, which suggested women under-50 years of age, non-white, uninsured, without a usual source of health care and unable to afford needed health care were least likely to have a recent mammogram. Targeting any and all of these characteristics should be continued. At the same time, the largest absolute number of women not having a recent mammogram are White individuals and those making over $50,000 per year. These results reflect two features of Pierce County. The first is that overall, a significant proportion of all groups lack needed mammography services, and the other is that currently, the demographics show that Pierce County is majority White. This analysis also highlights the relatively small portion of the population that does not have a high school education or earns less than $15,000 per year.
The women at highest risk of negative outcomes associated with breast cancer (Black and NHOPi) appear to be more likely to be screened than others, however they do not necessarily make up the majority of women who have not been screened. Interactions between the health system and society both before and after screening need to be formally considered to ensure the best possible outcomes for all women. A greater understanding of health care utilization after screening is needed for the NHOPI population to ensure that they receive the best care possible.

The proportion and number of women of Hispanic, Multiracial and NHOPI backgrounds is going to approximately double over the next twenty years while the White non-Hispanic population is going to shrink both absolutely and relatively. This is true across both the CMBC catchment area and all of Pierce County. At the same time, the NHOPI and AIAN populations have the highest incidence and mortality rates. Qualitative research on how to reach these groups is needed.
Appendix: Glossary of Terms

**Age-adjustment:** A statistical method for standardizing different population with different age distributions. Because breast cancer burden is strongly age-dependent, two populations can differ significantly in breast cancer burden if they are very different in age. If age-adjusted values are different for two populations, it means the difference must be attributable to something other than age. Age-adjusted measured are indicated in the figure legends. (2015 report)

**BRFSS:** The Behavioral Risk Factor Surveillance System is an ongoing national telephone survey conducted by the Centers for Disease Control and Prevention. The survey includes adults age 18 years and older and provides state- and county-level data for each calendar year. Topics are wide ranging and include disease prevalence, health care access and use, health behaviors and demographics. (2015 report)

**Breast cancer stages:** (adapted from 2015 report)
- Distant - The cancer is found in other parts of the body as well. Considered to be ‘late stage’
- Localized - The cancer is confined within the breast. Considered to be ‘early stage’
- In situ - Means "in its original place" or "non-invasive" because the cancer hasn’t spread into any normal surrounding breast tissue. Considered to be ‘early-stage’
- Regional - The lymph nodes, primarily those in the armpit, are involved. Considered to be ‘late stage’

**Incidence:** Incidence rate is the number of new breast cancer cases diagnosed in one year divided by the total population, multiplied by 100,000. (2015 report)
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viii https://data.census.gov/cedsci/table?q=poverty
xii https://www.carolmilgardbreastcenter.org/services/mammography/screening-mammography/