# Annual Screening Associated with Lower All-Cause Mortality Risk After Breast Cancer Diagnosis Compared to Screening Every Two Years

Team A: Kersten Bartelt, RN; Alex Piff
Team B: Blaine Franklin, PT, DPT; Joe Deckert, PhD
Last updated 04 January 2024 • Check for updates at EpicResearch.org

## Key Findings:

- Women screened for breast cancer annually have a 17% lower risk of all-cause mortality after a breast cancer diagnosis compared with those screened every two years.
- Women who are over age 60, are Black, live in a more socially vulnerable area, or live in a rural area also have an increased risk of all-cause mortality after a breast cancer diagnosis.

The United States Preventive Services Task Force (USPSTF) recommends breast cancer screening every two years for women aged 50 to 74.[1] Screenings every two years continued to be recommended in a draft released in May 2023 by the USPSTF.[1] The American Cancer Society (ACS) recommends annual screenings for those aged 40 to 54, with the option for screenings every year or every two years for those aged 55 and older.[2] The optimal interval for mammography has been debated as there is a potential trade-off between the benefits and harms of screening annually versus every two years.

We evaluated all-cause mortality rates after breast cancer diagnosis by whether a woman had a mammogram every year or every two years prior to her diagnosis. If the patient's two most recent screening mammograms were 9 to 15 months apart, she was classified as being screened every year, and if her two most recent screening mammograms were 18 to 30 months apart, she was classified as being screened every two years.

The study included 25,512 women aged 50 to 74 diagnosed with breast cancer between January 1, 2018, and August 1, 2022, who were not identified as high risk for breast cancer prior to their diagnosis. We found that women screened annually had a 17% lower risk of all-cause mortality after diagnosis during the study period compared with those screened every two years, as seen in Figure 1. We found that women who are over age 60, who are Black, who live in a more socially vulnerable area, or who live in a rural area also had an increased risk of all-cause mortality after a breast cancer diagnosis compared with women who are under age 60, who are White, who live in a less socially vulnerable area, or who live in an urban area, respectively.

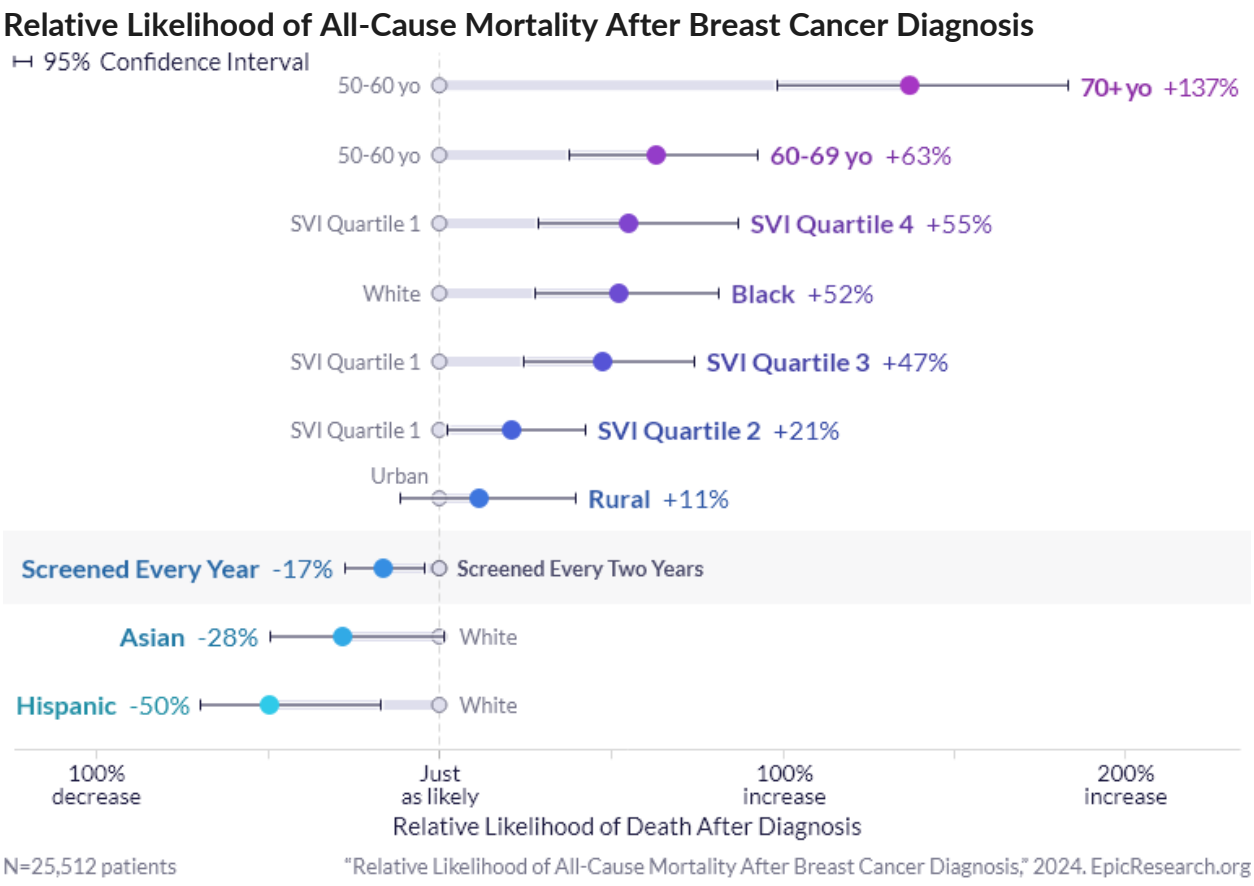


*Figure 1. The relative likelihood of all-cause mortality after breast cancer diagnosis during study period.*

Screenings and deaths are likely undercounted in this analysis, as these events might not be documented if they occur outside of a Cosmos healthcare organization.[3] This analysis does not adjust for comorbidities or health-related behaviors, which may differ between patients who choose yearly mammograms and those who elect screening less frequently.

*These data come from Cosmos, a collaboration of 236 Epic health systems representing over 220 million patient records from 1,301 hospitals and more than 28,600 clinics from all 50 states and Lebanon. This study was completed by two teams that worked independently, each composed of a clinician and research scientists. The two teams came to similar conclusions. Graphics by Brian Olson.*

## References


1. Breast cancer: Screening. Uspreventiveservicestaskforce.org. Published May 9, 2023. Accessed November 20, 2023. https://www.uspreventiveservicestaskforce.org/uspstf/draft-recommendation/breast-cancer-screening-adults
2. ACS breast cancer screening guidelines. Cancer.org. Accessed November 20, 2023. https://www.cancer.org/cancer/types/breast-cancer/screening-tests-and-early-detection/american-cancer-society-recommendations-for-the-early-detection-of-breast-cancer.html
3. Wenger NS, Sanz Vidorreta FJ, Dudley MT, Walling AM, Hogarth M. Consequences of a Health System Not Knowing Which Patients Are Deceased. JAMA Intern Med. Published online December 04, 2023. doi:10.1001/jamainternmed.2023.6428

## Data Definitions

| Term | Definition |
|---|---|
| **Study period** | 1/1/2018 - 8/2/2023. |
| **Study population** | Females aged 50 to 74 years with a **breast cancer diagnosis between 1/1/2018 and 8/1/2022**. Patients must have at least two **breast cancer screenings**, **every year** or **every two years**, prior to their **breast cancer diagnosis and** no history of **high risk for breast cancer**. |
| **Model** | Patients were observed until the first of either:<br>• Evidence of **patient death**.<br>• The last face-to-face encounter in the **study period**.<br>The following covariates were considered:<br>• Patient age<br>• Patient's **Social Vulnerability Index**<br>• Patient's rural urban classification<br>• Patient's race and ethnicity |
| **Length of follow up** | Median 2.2 years (range: 0-6.6 years) |
| **Breast cancer diagnosis** | An encounter or billing diagnosis with ICD-10-CM code C50*. |
| **High risk for breast cancer** | Diagnosis indicating **genetic predisposition**, personal history of **breast cancer diagnosis**, or **family history of breast cancer**. |
| **Genetic predisposition** | A diagnosis with ICD-10-CM code Z15.01*. |
| **Family history of breast cancer** | A diagnosis with ICD-10-CM code Z80.3*. |
| **Breast cancer screening** | A procedure with SNOMED code 24623002 or 384151000119104, or an encounter or billing diagnosis with ICD-10-CM code Z12.31.<br><br>Exclusions: Screenings within three months of another screening are not counted. |
| **Screening every year** | A patient's past two **breast cancer screenings** prior to **breast cancer diagnosis** were 9 to 15 months apart. |
| **Screening every two years** | A patient's past two **breast cancer screenings** prior to **breast cancer diagnosis** were 18 to 30 months apart. |
| **Social Vulnerability Index** | The SVI quartile for the ZIP Code of the patient's most recent address. |
| **Patient death** | A documented date of death. |

## Table 1: Relative Likelihood of All-Cause Mortality After Breast Cancer Diagnosis

| Group | Baseline | Hazard Ratio | Lower .95 CI | Upper .95 CI | Relative Likelihood | Lower .95 CI | Upper .95 CI |
|---|---|---|---|---|---|---|---|
| **Age 70+** | Age 50-60 | 2.37 | 1.98 | 2.83 | 137% | 98% | 183% |
| **Age 60-69** | Age 50-60 | 1.63 | 1.38 | 1.93 | 63% | 38% | 93% |
| **SVI quartile 4** | SVI quartile 1 | 1.55 | 1.28 | 1.87 | 55% | 28% | 87% |
| **Black** | White | 1.52 | 1.28 | 1.81 | 52% | 28% | 81% |
| **SVI quartile 3** | SVI quartile 1 | 1.47 | 1.25 | 1.74 | 47% | 25% | 74% |
| **SVI quartile 2** | SVI quartile 1 | 1.21 | 1.02 | 1.43 | 21% | 2% | 43% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Rural** | Urban | 1.11 | 0.89 | 1.40 | 11% | -11% | 40% |
| **Annual Screening** | Biennial Screening | 0.83 | 0.72 | 0.96 | -17% | -28% | -4% |
| **Asian** | White | 0.72 | 0.51 | 1.01 | -28% | -49% | 1% |
| **Hispanic** | White | 0.50 | 0.30 | 0.83 | -50% | -70% | -17% |