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## Age at initiation of screening mammography by family history of breast cancer in the Breast Cancer Surveillance Consortium

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## Abstract

**Purpose:** Women with a first-degree family history of breast cancer (FHBC) are sometimes advised to initiate screening mammography when they are 10 years younger than the age at which their youngest relative was diagnosed, despite a lack of unambiguous evidence that this is an effective strategy. It is unknown how often this results in women initiating screening earlier (<40 years) than screening guidelines recommend for average-risk women.

**Methods:** We examined screening initiation age by FHBC and age at diagnosis of the youngest relative using data collected by the Breast Cancer Surveillance Consortium on 74,838 first screening mammograms performed between 1996–2016.

**Results:** Of the 74,838 women included in the study, nearly 9% reported a FHBC. Approximately 16.8% of women who initiated mammography before 40 years reported a FHBC. More women with a FHBC than without initiated screening <40 years (48% vs. 23%, respectively). Among women with a FHBC who initiated screening <40 years, 65% were 10 years younger than the age at which their relative was diagnosed.

**Conclusion:** Women with a first-degree relative diagnosed with breast cancer were more likely to start screening before 40 years than women reporting no FHBC, especially if their relative was diagnosed before 50 years.

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Between 12–16% of US women report at least one first-degree relative with breast cancer<sup>1–3</sup> and thus are at increased risk of the disease.<sup>4–6</sup> Women with a first-degree family history of breast cancer (FHBC) at high-risk due to known or suspected genetic mutations (e.g. BRCA1/2) are recommended to begin annual screening at 30 years.<sup>6–8</sup> Women with above average-risk due to a FHBC without a genetic mutation may have differing mammography utilization patterns from average-risk women,<sup>9–11</sup> who are encouraged to initiate mammography at 45 or 50 years.<sup>12, 13</sup> Women with a FHBC who do not meet high-risk criteria are sometimes advised to initiate mammography when they are 10 years younger than the age of diagnosis of their youngest relative, although the origin of this recommendation is unknown.<sup>14</sup> While this could permit earlier detection of breast cancer than would be possible if screening began between 45 and 50 years, most women with a FHBC will not develop breast cancer before age 40 but may have an increased risk of screening-related harms.<sup>15</sup> We did not identify studies that examined the impact of relative's age at breast cancer diagnosis on mammography initiation or that characterized use of the '10-years-before' screening strategy. We examined age at mammography initiation among women with a FHBC by relative's age at diagnosis compared with women without a FHBC.

This study comprised data collected by three US breast imaging registries in the Breast Cancer Surveillance Consortium (BCSC) that collect relative's age breast cancer diagnosis: Carolina Mammography Registry, San Francisco Mammography Registry, and Vermont Breast Cancer Surveillance System. Each BCSC registry and the Statistical Coordinating Center (SCC) received institutional review board approval for study procedures, including passive consenting processes or a waiver of consent to enroll participants, link data, and perform analytic studies. All procedures are Health Insurance Portability and Accountability Act (HIPAA) compliant. All registries and the SCC have received a Federal Certificate of Confidentiality and other protections for the identities of women, physicians, and facilities.

We included first screening mammograms performed on women 18–74 years between 1996 and 2016, defined by the BCSC as mammograms indicated as screening for which the woman reported no prior mammogram or personal history of breast cancer.<sup>16</sup> Women were considered to have a FHBC if they reported a first-degree, female relative (mother, sister, daughter) diagnosed with breast cancer using a self-administered questionnaire. Women without information on family history status were excluded. If multiple ages at diagnosis were reported, we selected the youngest. We evaluated the distribution of age at first screen, grouped to align with breast cancer screening recommendations,<sup>12, 13, 17</sup> by relative's age at breast cancer diagnosis. We calculated the difference in the woman's age at first mammogram and her relative's age at diagnosis and graphed the proportion of women using the '10-years-before' screening strategy by age at first screen.

Of 74,838 women, nearly 9% reported a FHBC. Age at relative's diagnosis was unknown for 2%. Approximately 16.8% of women who initiated mammography before 40 years reported a FHBC. Approximately 42% of women with a FHBC and known relative's age reported a relative diagnosed with breast cancer before 50 years. A higher proportion of women with a FHBC, regardless of whether relative's age was known, initiated mammography before 40 years compared to women without a FHBC (48% vs. 23%, respectively). (Table) Among women reporting known relative's age, 53% initiated mammography before 40 years. Among women who reported a relative diagnosed between 40–49 years, 62% initiated mammography before 40 years. This proportion increased to 75% among women with a relative diagnosed before 40 years. Among women with a FHBC who initiated screening before 40 years, 65% initiated screening 10 years earlier. The majority of these women were between 30–39 years. Approximately 58% initiated screening >10 years earlier than the age at which their relative was diagnosed. The groupings were selected to correspond to the '10-years-before' screening strategy. (Figure)

There is no direct evidence of the effectiveness of earlier mammography screening in the absence of genetic mutations. Women with factors that increase their lifetime risk are recommended to discuss screening options with their physician<sup>7</sup> which likely influences the choice to initiate before age 40. This may explain the high proportion of screening before age 40. Further, 34% of women 18–39 years who reported a first mammogram cited routine screening as the reason and 15% cited family history<sup>18</sup> highlighting potential motivators among young women.

Between 1980 and 1992, several organizations recommended women receive a baseline mammogram between 35–39 years.<sup>19, 20</sup> Although not recommended since, the percentage of women who reported a screening mammogram before age 40 suggests some women still may be advised to get a baseline exam.<sup>21</sup> These women may have received a baseline mammogram and may not be screened again until they reach a guideline recommended age. We did not evaluate whether women continued routine screening. Though self-reported FHBC is accurate,<sup>22</sup> we do not have genetic testing results or report of the use of risk prediction tools in consultation with a physician prior to mammography initiation, which may influence screening usage. Women with genetic mutations may be following guidelines that are appropriate, however, we expect this to be a small proportion of young women reporting screening.<sup>23–25</sup> Though we aimed to understand behavior based on knowledge

about family history at the time of first screen, missing relative's age may not be missing at random and these women may initiate screening at a different age. In the study sample, 6.4% of women with a family history did not report the relative's age at diagnosis. Missingness ranged from 1.7–9.3% across the three participating BCSC registries. Assessment of risk due to family history beyond first-degree relative to include second-degree relatives and more than one affected relative may also impact the age at which a woman initiates screening mammography.<sup>26</sup>

We did not assess the impact of early initiation on breast cancer outcomes and cannot make recommendations about appropriate timing of mammography initiation. Initiating screening early in the presence of a FHBC may be beneficial given the higher risk of breast cancer at a younger age<sup>27,28</sup>; especially since survival has been shown to be similar among women with and without a FHBC.<sup>29–31</sup> However, this may increase the lifetime accumulation of screening harms, given young women are more likely to have dense breasts. These harms include false-positive recalls, biopsy,<sup>32</sup> and radiation exposure. Additionally, it could lead to screening fatigue,<sup>33</sup> potentially causing women to discontinue screening when cancer risk is higher and there is greater potential for screening to contribute to a mortality reduction.<sup>34, 35</sup>

We observed women with a first-degree relative diagnosed with breast cancer were more likely to start screening before 40 years than women reporting no FHBC, especially if their relative was diagnosed at a younger age. These data suggest some women initiate screening mammography 10 years before their relative's breast cancer diagnosis age, perhaps following general advice that is not recommended in screening guidelines. Future studies should examine the effect of this screening strategy on breast cancer outcomes to ensure women with a FHBC receive evidence-based advice about the age to begin screening.

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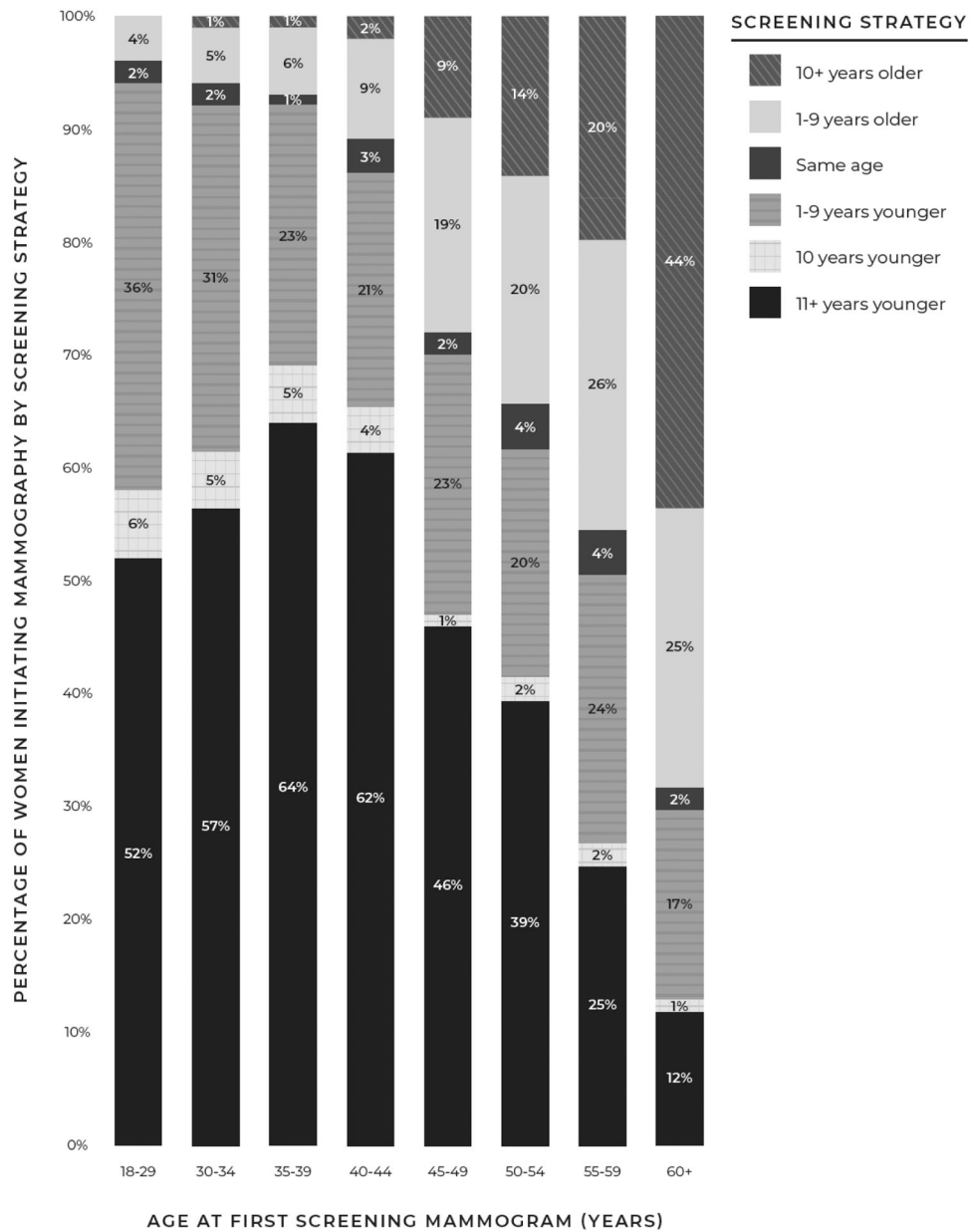
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**Figure:** Timing of screening strategy (difference in relative’s age at breast cancer diagnosis and age at screening mammography initiation) by age in years at first screening mammogram.



**Table:**

Age in years at first screening mammogram by family history status (number of women, row percent)

Family history status and self-reported age (years) of family member at breast cancer diagnosis		Age at first screening mammogram (years) N (%)				
		18–29	30–39	40–49	50–59	60+
Total	74,838	733 (1.0)	18,225 (24.4)	43,125 (57.6)	7,625 (10.2)	5,130 (6.9)
No first-degree family history of breast cancer	68,176	441 (0.7)	15,337 (22.5)	40,652 (59.6)	7,062 (10.4)	4,684 (6.9)
First-degree family history of breast cancer	6,662	292 (4.4)	2,888 (43.4)	2,473 (37.1)	563 (8.5)	446 (6.7)
Relative's exact age known	4,799	243 (5.1)	2,311 (48.2)	1,683 (35.1)	338 (7.0)	224 (4.7)
18–29	97	26 (26.8)	49 (50.5)	16 (16.5)	3 (3.1)	3 (3.1)
30–39	640	120 (18.8)	356 (55.6)	122 (19.1)	25 (3.9)	17 (2.7)
40–49	1,295	61 (4.7)	745 (57.5)	389 (30.0)	65 (5.0)	35 (2.7)
50–59	1,304	32 (2.5)	703 (53.9)	421 (32.3)	94 (7.2)	54 (4.1)
60+	1,463	4 (0.3)	458 (31.3)	735 (50.2)	151 (10.3)	115 (7.9)
Relative's exact age unknown	1,863	49 (2.6)	577 (31.0)	790 (42.4)	225 (12.1)	222 (11.9)