

# The Age at which Women Begin Mammographic Screening

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**BACKGROUND.** The American Cancer Society recommends yearly mammographic screening for women starting at the age of 40 years. The authors examined the age at which women began screening at a large tertiary care center.

**METHODS.** Utilization of mammography was assessed in a population of 72,417 women who received 254,818 screening mammograms at the Massachusetts General Hospital Avon Comprehensive Breast Center from January 1, 1985 to February 19, 2002, of which 940 received their first mammogram between January 16, 2000 and February 19, 2002.

**RESULTS.** The median age at first mammogram for women in the population as a whole was 40.4 years. Sixty percent of women had their first mammogram by the end of their 40th year, and almost 90% had begun screening by age 50 years. However, these reassuring findings were not seen in several specific subpopulations of women. Black women began screening at a median age of 41.0 years, 0.7 years later than white women. Hispanic women began screening at a median age of 41.4 years, 1.1 years later than non-Hispanic women. Obese women began screening at a median age of 41.2 years, 1.6 years later than thin women. Women without a primary care physician began screening at a median age of 42.1 years, 1.8 years later than women with a primary care physician. Women without private health insurance began screening at a median age of 46.6 years, 6.3 years later than women with private health coverage. Women who did not speak English began screening at a median age of 49.3 years, 9.0 years later than women for whom English was the primary language. Women who both lacked private health insurance and spoke a language other than English began screening at a median age of 55.3 years, 15.2 years later than women without these characteristics.

**CONCLUSIONS.** The analysis presented in the current study provided one of the most detailed descriptions of the age at screening initiation to be performed to date. Most women in the study population began screening by the end of their 40th year. This contrasted with the widespread failure of women to return promptly for subsequent annual examinations. However, specific subpopulations of women were at risk for not beginning screening on time, including women without private insurance, women without a primary care physician, and women who did not speak English. These findings suggest that there is little to be gained from populationwide efforts to encourage entry into the screening process, and that public health efforts should be focused on those subpopulations of women at highest risk for not using screening. These results also indicate that public health efforts to encourage women to start screening may be less critical than interventions to improve prompt return once they have entered the screening system. *Cancer* 2004; 101:1850-9. © 2004 American Cancer Society.

**KEYWORDS:** breast carcinoma, mammography, screening, disparity.

The American Cancer Society (ACS), the American College of Radiology, and the American Medical Association all recommend yearly mammographic screening for women > 40 years old.<sup>1</sup> Unfor-

tunately, compliance with this recommendation is often far from ideal,<sup>2-8</sup> with potentially very negative health consequences.<sup>9-12</sup> For example, Ulcickas Yood et al.<sup>13</sup> reported that only 16% of the women who had a mammogram between 1983 and 1993 at the largest health maintenance organization (HMO) in Michigan took advantage of all 5 mammograms over the 5-year period after the index mammogram was received. Sabogal et al.,<sup>14</sup> using 1992-1998 California Medicare data, found that only 30% of non-HMO women age  $\geq 65$  years who utilized screening did so regularly without missing screening more than 2 years in a row. Phillips et al.,<sup>15</sup> using several sources of data, found that although 70% of women ages 50-74 years received at least 1 mammogram, only 16% utilized annual screening. We also found, using data available for women using screening at the Massachusetts General Hospital (MGH) Avon Comprehensive Breast Center, that prompt return to screening is rare.<sup>2,16</sup> Although these populationwide estimates of prompt return for screening are disappointingly low, even lower levels of long-term screening use and promptness have been found among traditionally underserved women as defined by race, ethnicity, and socioeconomic status.<sup>13-15</sup>

Although many studies have analyzed the long-term patterns of mammography usage, we are aware of no major study that has investigated the age at which women begin screening. The database of the MGH Avon Comprehensive Breast Center offered the possibility for the analysis of this vital aspect of screening use, as it contains data on  $> 80,000$  women who have received  $> 300,000$  mammograms since 1985.<sup>9,16-19</sup> We present our analysis of the age at which women begin screening at the MGH Avon Comprehensive Breast Center and the factors that influence age at screening initiation.

## MATERIALS AND METHODS

The MGH Avon Comprehensive Breast Center database contains entries on mammography use by 83,511 women who received 314,185 mammograms from January 1985 to February 2002, of which 254,818 were screening mammograms.<sup>2</sup> A 32-question survey is administered routinely to women at the time of each visit. The survey includes questions on referral history, breast history, menstrual history, term pregnancy history, lifestyle, hormone levels, family history of cancer, and other medical history. The survey also contains a graphic tool adapted from the Nurse's Health study to assess each woman's perception of her body type.<sup>20</sup> The study population includes 940 women who came to the MGH Avon Comprehensive Breast Center for mammographic screening between January 16, 2000, and February 19,

2002, and answered "no" to the survey question, "Have you had a previous mammogram?" They also had no record of a previous mammogram at the MGH Avon Comprehensive Breast Center. Asian and Hispanic women were identified by name analysis, the standard method used by tumor registries in the United States,<sup>21,22</sup> whereas information on race, primary language, and primary care physician was received from the MGH patient demographic database (Research Patient Data Registry [RPDR]). Women in the MGH dataset had  $> 180$  types of insurance, which were sorted into 4 major categories: HMO, Preferred Provider Organization (PPO)/private insurance, Medicaid/self-pay, and Medicare. Because Medicare, which accounts for approximately 6% of the 940 women in the dataset, is primarily used by elderly women, and thus biased towards women with later first mammograms, we did not include this category in our analysis. Geographic location was determined by zip code, whereas U.S. Census information provided the median income for each zip code. The gender of primary care physicians was ascertained by examining their first names, and in those cases where this was unclear, physician photographs contained in the Internet-based MGH provider directory were examined.

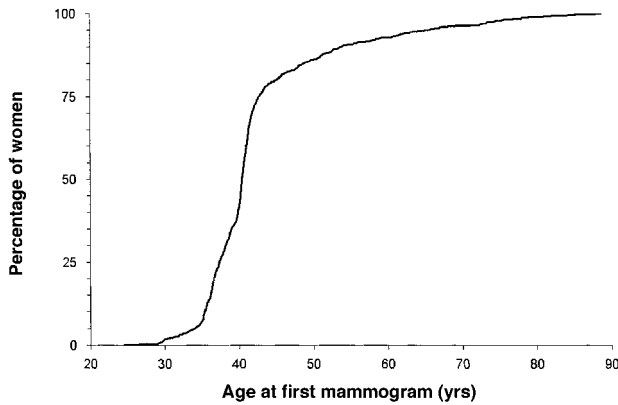
Subgroups of women undergoing their first mammograms were compared by examining their cumulative distributions (Figs. 1-6; Tables 1, 2). Statistical analysis was performed with Microsoft Excel and Winstat (Microsoft Corp., Redmond, WA). Because the distribution of the ages of screening initiation was found by the Kolmogorov-Smirnov test ( $P < 0.001$ ) to describe a non-normal distribution, the statistical validity of the comparisons was assessed by the Mann-Whitney nonparametric test, and all pairwise comparisons are described in terms of the median age at screening initiation. A summary of several of these comparisons, ranked by magnitude of impact on age at screening initiation, is demonstrated in Table 3. Multivariate analysis using SAS software (SAS, Cary, NC) determined how the factors we studied worked together to influence the age at which women receive their first mammogram. The  $P$  values quoted in the multivariate analysis are based on the assumption of a normal distribution, and should be treated as hypothesis generating.

All studies had appropriate institutional review board approval in accordance with National Institutes of Health human research study guidelines.

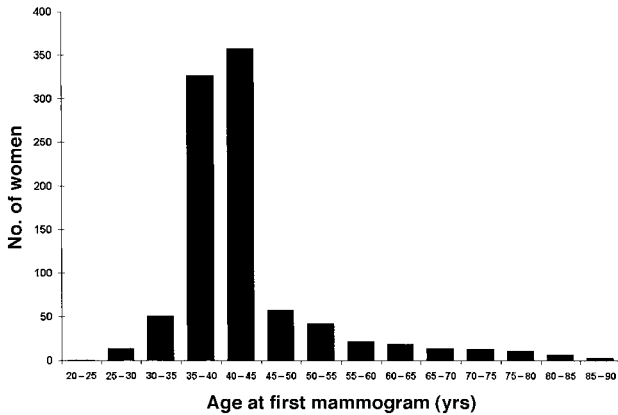
## RESULTS

### Features of the Population of Women Undergoing Their First Screening Mammogram

Among 26,214 women who came to the MGH Avon Comprehensive Breast Center for mammographic



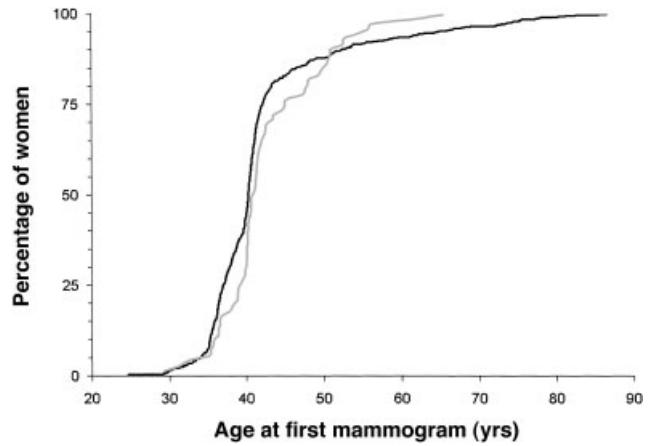
**FIGURE 1.** Cumulative distribution of age at mammography initiation for 940 women who received their first mammogram at the Massachusetts General Hospital Avon Comprehensive Breast Center between January 16, 2000 and February 19, 2002.



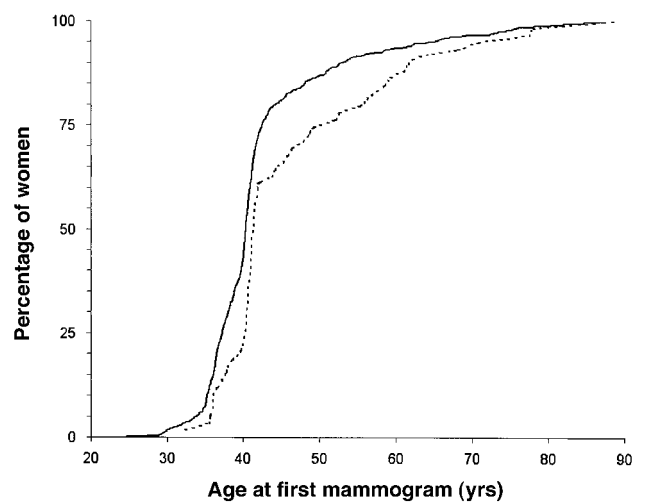
**FIGURE 2.** Histogram of age at which women in the study population received their first mammogram at the Massachusetts General Hospital Avon Comprehensive Breast Center (January 16, 2000–February 19, 2002).

screening between January 16, 2000, and February 19, 2002, 940 answered “no” to the survey question, “Have you had a previous mammogram?” They also had no record of a previous mammogram at the MGH Avon Comprehensive Breast Center (Table 1). The cumulative age distribution of these 940 women is shown in Figure 1, and a histogram of the ages at which women begin mammography is shown in Figure 2. The median age at which women received their first mammogram was 40.4 years, and the average age was 42.7 years. Sixty percent of these women attended their first mammogram by their 41st birthday, whereas 75% had done so by age 45 years, and almost 90% had begun screening by age 50 years (Fig. 1).

Of the 940 women receiving their first mammo-

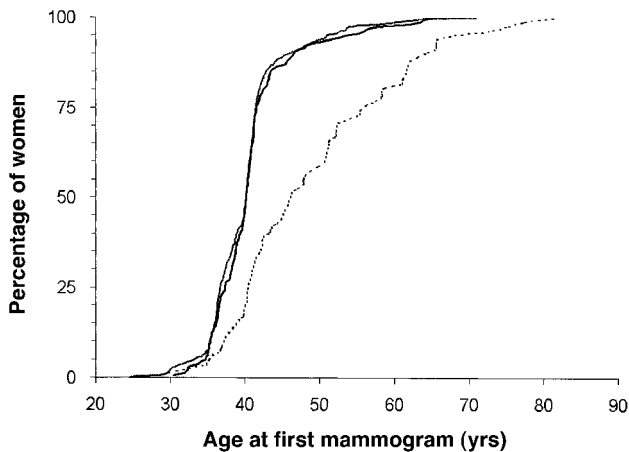


**FIGURE 3.** Cumulative distribution of age at initiation of mammographic screening by race. Black line: white women ( $n = 684$ ); gray line: black women ( $n = 72$ ).

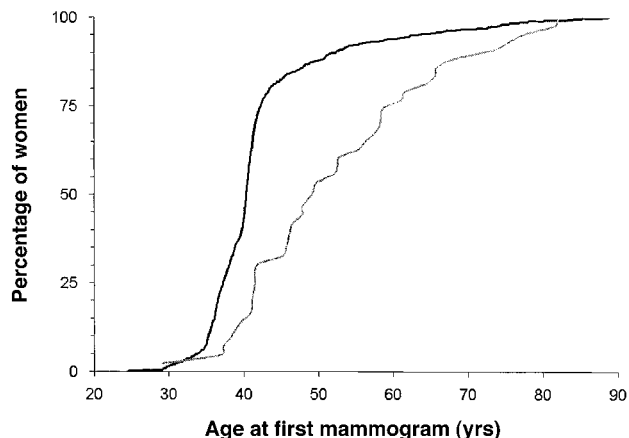


**FIGURE 4.** Cumulative distribution of age at initiation of mammographic screening by ethnicity. Solid line: non-Hispanic women ( $n = 881$ ); dotted line: Hispanic women ( $n = 59$ ).

Table 1 shows, 684 women were identified as white (90%) and 72 as black (10%). Name analysis<sup>21,22</sup> revealed 59 (6%) Hispanic women, 46 (5%) Asian women, and 835 (89%) non-Hispanic/non-Asian women. Payment information was available for 799 women. The data show that 701 women (88%) had HMO/PPO/private insurance and 98 (12%) had Medicaid or were self-payers. Language status was known for 927—884 (95%) spoke English and 43 (5%) spoke a primary language other than English. Of the 940 women, 896 (95%) had an identifiable primary care physician and 43 (5%) had no identifiable primary care physician.



**FIGURE 5.** Cumulative distribution of age at initiation of mammographic screening by source of payment. Gray line: health maintenance organization ( $n = 492$ ); black line: PPO/private insurance ( $n = 209$ ); dotted line: Medicaid/self-pay ( $n = 98$ ).



**FIGURE 6.** Cumulative distribution of age at initiation of mammographic screening by primary language. Black line: English-speaking women ( $n = 884$ ); gray line: non-English-speaking women ( $n = 43$ ).

### Race

Black women had a median age at screening initiation of 41.0 years, whereas white women had a median age at screening initiation of 40.3 years ( $P < 0.05$ ; Fig. 3; Table 1).

### Ethnicity

Hispanic women had a median age at screening initiation of 41.4 years, whereas non-Hispanic women had a median age at screening initiation of 40.3 years ( $P < 0.001$ ; Fig. 4; Table 1). Asian women, with a median age at first mammogram of 40.2 years, were not statistically distinguishable from non-Hispanic women, who had a median age at screening initiation of 40.3 years.

### Insurance

Despite concerns that screening use might be lower among women with indemnity insurance than among women with HMO insurance,<sup>23,24</sup> there was no detectable difference in age at screening initiation between these two groups (Fig. 5; Table 2). In contrast, women who had Medicaid and women who self-paid to cover the cost of screening had a median age for their first mammogram at 46.6 years, > 6 years later than women with private health insurance ( $P < 0.001$ ).

The later age of screening initiation for black and Hispanic women persisted after sorting for private insurance. Black women with private insurance had a median age at first mammogram of 40.5 years, 6 months later than white women with private insurance. Similarly, Hispanic women with private insurance began screening at a median age of 41.1 years, 1 year later than non-Hispanic women with private insurance, who had a median age of 40.1 years ( $P < 0.01$ ).

Within the subgroup of women without private insurance, racial and ethnic differences in age at screening initiation were not detectable. Thus, there was no significant difference between the age at first screening mammogram between white and black women without private insurance. There was also no detectable difference in age at first mammogram between Hispanic and non-Hispanic women without private health insurance.

### Primary Care Physician

There is evidence that physician recommendation can be an important factor in encouraging women to use mammography.<sup>5,25</sup> Other findings have indicated that women with a female provider may be more likely to use screening mammography than women with a male provider.<sup>5</sup> However, in the MGH Avon Comprehensive Breast Center population, there was no detectable difference in age at screening initiation in the comparison of women with male and female providers (Table 1). In contrast, women without a primary care physician tended to have their first mammograms at a later age (median age, 42.1 years) than women who had a primary care physician (median age, 40.3 years;  $P < 0.01$ ).

### Language

Non-English speakers (median age, 49.3 years) began screening 9 years later than English speakers (median age, 40.3 years;  $P < 0.001$ ). Indeed, of all of the categories studied, language had the single strongest impact on age at screening initiation (Fig. 6; Table 1).

The delay in screening initiation for non-English

**TABLE 1**  
**Age at Initiation of Mammographic Screening by Race, Ethnicity, Insurance Status, Primary Care Physician, Language, and Body Type**

Group	No. of women	Average age in yrs (95% CI)	Median age (yrs)
All	940	42.7 (42.0–43.3)	40.4
Race			
Black	72	42.7 (41.1–44.2)	41.0
White	684	42.1 (41.4–42.8)	40.3
Ethnicity			
Non-Hispanic/non-Asian	835	42.4 (41.8–43.0)	40.3
Non-Hispanic	881	42.4 (42.1–42.7)	40.3
Asian	46	41.4 (39.5–43.3)	40.2
Hispanic	59	46.7 (43.6–49.8)	41.4
Payment type			
HMO/PPO/private insurance	701	40.1 (39.9–40.7)	40.3
White	534	40.0 (39.6–40.5)	40.0
Black	52	41.9 (40.3–43.5)	40.5
Non-Hispanic	673	40.2 (39.8–40.6)	40.1
Asian	33	40.5 (38.7–42.4)	40.2
Hispanic	28	42.5 (39.9–45.1)	41.1
Medicaid/self-pay	98	49.2 (47.0–51.5)	46.6
White	38	47.3 (44.5–50.1)	45.4
Black	14	46.4 (41.5–51.3)	46.2
Non-Hispanic	71	49.1 (46.5–51.7)	47.0
Asian	6	46.1 (34.8–57.5)	41.9
Hispanic	27	49.4 (44.6–54.2)	45.2
Primary care physician			
Yes	896	42.4 (41.8–43.1)	40.3
Female physician	537	42.1 (41.4–42.9)	40.4
Male physician	322	42.5 (41.5–43.6)	40.2
No	44	46.8 (43.2–50.4)	42.1
Primary language			
English	884	42.2 (41.6–42.8)	40.3
Hispanic ethnicity	39	44.4 (40.4–48.3)	40.6
Non-Hispanic ethnicity	845	42.1 (41.5–42.7)	40.3
HMO/PPO/private insurance	683	40.3 (39.8–40.7)	40.1
Medicaid/self-pay	66	46.4 (44.1–48.7)	43.4
Non-English	43	52.6 (48.6–56.6)	49.3
Hispanic ethnicity	19	51.7 (46.9–56.5)	49.3
Non-Hispanic ethnicity	23	53.7 (47.2–48.7)	49.8
HMO/PPO/private insurance	10	45.0 (41.3–60.3)	43.9
Medicaid/self-pay	29	54.6 (49.7–59.5)	55.3
Body type			
1–3(thin)	263	40.5 (39.5–41.6)	39.6
4–6 (medium)	455	41.7 (41.0–42.4)	40.3
7–9 (obese)	68	44.7 (42.5–46.9)	41.2

CI: confidence interval; HMO: health maintenance organization; PPO: preferred provider organization.

speakers persisted even after sorting for insurance status. Thus, English speakers with private insurance began screening at a median age of 40.1 years, nearly 4 years earlier than non-English-speaking women with private insurance ( $P < 0.001$ ). English-speaking women without private insurance began screening at a median age of 43.4 years, whereas non-English-speaking women without private insurance began screening at a median age of 55.3 years, a difference of nearly 12 years ( $P < 0.001$ ). Indeed, of all the groups

shown in Table 1, the group with the oldest age at screening initiation was the cohort of non-English-speaking women without private insurance, who began screening at a median age of 55.3 years, 15.2 years later than English-speaking women with private insurance.

Differences in age at screening initiation between Hispanic and non-Hispanic women disappeared after sorting by language (Tables 1, 2). There was no statistically significant difference between the age at which

**TABLE 2**  
**Comparisons of Patient Subgroups with Respect to Age at Screening Initiation**

Comparison	P value <sup>a</sup>
White women vs. black women	0.0110
Hispanic women vs. non-Hispanic women	0.0002
HMO participants vs. PPO participants/private insurance holders	0.2200
HMO participants/PPO participants/private insurance holders vs. Medicaid participants/self-payers	< 0.0001
White private insurance holders vs. black private insurance holders	0.0079
Hispanic private insurance holders vs. non-Hispanic private insurance holders	0.0062
White Medicaid participants/self-payers vs. black Medicaid participants/self-payers	0.4900
Hispanic Medicaid participants/self-payers vs. non-Hispanic Medicaid participants/self-payers	0.4400
Women with a primary care physician vs. women without a primary care physician	0.0020
Women with a male primary care physician vs. women with a female primary care physician	0.2500
English-speaking women vs. non-English-speaking women	< 0.0001
English-speaking Hispanic women vs. English-speaking non-Hispanic women	0.1600
Non-English-speaking non-Hispanic women vs. non-English-speaking Hispanic women	0.4300
English-speaking private insurance holders vs. non-English-speaking private insurance holders	0.0006
English-speaking Medicaid participants/self-payers vs. non-English-speaking Medicaid participants/self-payers	0.0010
Women with Body Types 1-6 ( <i>very thin-slightly overweight</i> ) vs. women with Body Types 7-9 ( <i>overweight-obese</i> )	< 0.0001
Women with Body Types 1-5 ( <i>very thin-average weight</i> ) vs. women with Body Types 6-9 ( <i>slightly overweight-obese</i> )	< 0.0001
Women with Body Types 1-4 ( <i>very thin-slightly underweight</i> ) vs. women with Body Types 5-9 ( <i>average weight-obese</i> )	< 0.0001

HMO: health maintenance organization; PPO: preferred provider organization.  
<sup>a</sup>Mann-Whitney test.

**TABLE 3**  
**Selected Comparisons Ordered by Magnitude of Impact on Age at Screening Initiation**

Comparison	Difference in median age at screening initiation (yrs)	P value <sup>a</sup>
White women vs. black women	0.7	0.0110
Hispanic women vs. non-Hispanic women	1.1	0.0002
Obese women (Body Types 7-9) vs. thin women (Body Types 1-3)	1.6	< 0.0001
Women with a primary care physician vs. women without a primary care physician	1.8	0.0057
HMO participants/PPO participants/private insurance holders vs. Medicaid participants/self-payers	6.3	< 0.0001
English-speaking women vs. non-English-speaking women	9.0	< 0.0001
English-speaking HMO participants/PPO participants/private insurance holders vs. non-English-speaking Medicaid participants/self-payers	15.2	0.0010

HMO: health maintenance organization; PPO: preferred provider organization.  
<sup>a</sup>Mann-Whitney test.

English-speaking Hispanic women (median age, 40.6 years) and the age at which English-speaking non-Hispanic women (median age, 40.3 years) began screening ( $P = 0.16$ ). Similarly, there was no significant difference between the age of non-English-speaking Hispanic women (median age, 49.3 years) and the age of non-English-speaking non-Hispanic women (median age, 49.8 years;  $P = 0.43$ ). These findings suggest that language is the main mechanism behind the finding of older age at screening initiation for Hispanic women.

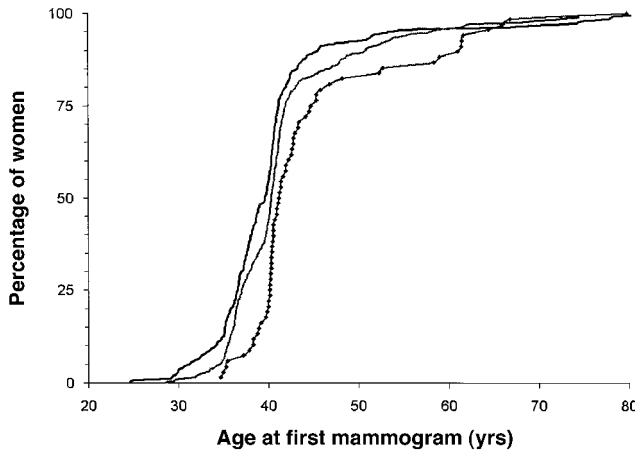
### Obesity

The survey carried out at the time of screening contains a graphic, adopted from the Women's Health

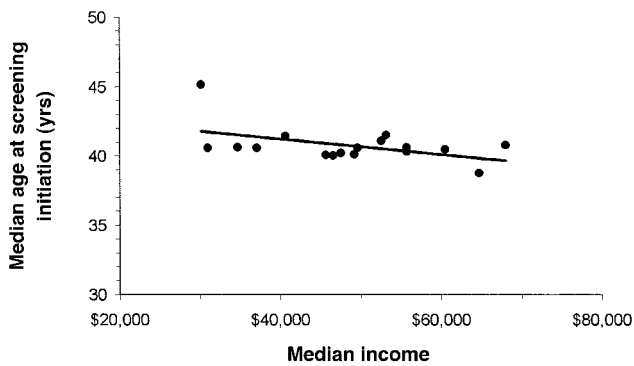
Study, for recording women's perceptions of their body size.<sup>20</sup> Women were asked to rate their body size on a scale from 1 (very thin) to 9 (obese). In agreement with findings by others that obese women are less likely to obtain screening mammography than women of normal body weight,<sup>26</sup> women in the MGH Avon Comprehensive Breast Center population who identified themselves as having obese body types (7-9) began screening at a later age (41.2 years) than women who described themselves as having thinner body types (1-6) (40.2 years;  $P < 0.001$ ; Fig. 7; Tables 1, 2).

### Site of Residence

In an earlier study,<sup>2</sup> we showed that women from more affluent communities return at more frequent



**FIGURE 7.** Cumulative distribution of age at initiation of mammographic screening by self-reported body type. Types 1–3 correspond to a thin body type (black line;  $n = 263$ ), Types 4–6 correspond to an average body type (gray line;  $n = 55$ ), and Types 7–9 correspond to an obese body type (black line with diamonds;  $n = 68$ ).



**FIGURE 8.** Median age at first mammogram in relation to median income of site of residence.  $R^2 = 0.2305$ .

intervals for annual examinations than women from lower-income communities. Using zip codes to sort the 940 women by their sites of residence gave no indication of a correlation of age at first mammogram with the median income of each community, although the few women in each group may well have masked any such effect (Fig. 8; Table 4).

**Screening Before Age 40 Years**

Approximately one-third of the women in the MGH Avon Comprehensive Breast Center population (35%) received their first mammogram between the ages of 35 and 40 years (Fig. 1). Almost one-half of the women with private insurance began screening before age 40 years (Fig. 5).

**TABLE 4**  
**Age at Mammography Initiation by Site of Residence**

Residence	No. of women	Average age in yrs (95% CI)	Median age (yrs)	Median income
Arlington	16	43.1 (36.6–49.6)	38.8	\$64,739
Brookline	14	43.5 (37.7–49.4)	40.8	\$68,007
Cambridge	28	43.5 (39.7–47.3)	40.6	\$49,591
Charles River	19	40.3 (38.2–42.4)	40.3	\$55,678
Charlestown	45	43.7 (40.6–46.7)	40.6	\$55,700
Chelsea	30	49.6 (44.6–54.5)	45.2	\$30,161
Copley	18	40.5 (38.9–42.2)	40.5	\$60,467
Dorchester	30	42.1 (39.7–44.5)	40.6	\$34,693
East Boston	18	44.6 (38.2–51.0)	40.6	\$31,013
Everett	23	45.8 (42.4–49.3)	41.4	\$40,661
Malden	23	42.2 (38.9–45.4)	40.1	\$45,654
Medford	20	44.3 (38.5–50.2)	41.1	\$52,512
North End	15	44.9 (38.5–51.4)	40.2	\$47,547
Quincy	22	43.0 (38.6–47.5)	40.1	\$49,221
Revere	11	46.3 (36.1–56.5)	40.6	\$37,067
Somerville	22	39.5 (38.1–40.9)	40	\$46,538
Winthrop	15	46.8 (40.1–53.5)	41.5	\$53,122

CI: confidence interval.

**Multivariate Analysis**

Multiple regression modeling revealed that insurance status, language, and body type were the most significant independent predictors of the age at which women receive their first mammogram. Controlling for all other factors, women with private insurance began screening earlier than women without private insurance (40.7 years vs. 48.2 years;  $P < 0.0001$ ). Among women with private insurance, language did not influence the age at initiation of mammographic screening ( $P = 0.835$ ). However, among women without private insurance, those who did not speak English received their first mammogram much later than those who did speak English (51.5 years vs. 44.9 years;  $P = 0.0047$ ). The multivariate analysis also revealed that after controlling for other factors, women with larger body types received their first mammogram later than women with smaller body types. Furthermore, body type had a much smaller effect among women who spoke English than among women who did not speak English. For example, obese non-English speakers received their first mammogram almost 13 years later than obese English speakers (57.3 years vs. 44.4 years;  $P < 0.0001$ ).

**Relative Impact of Various Factors on Age at Screening Initiation**

Table 3 shows a series of selected comparisons between subgroups of women in the study population, ranked by magnitude of impact on age at screening initiation. Although black women began screening 0.7

years later than white women, and Hispanic women began screening 1.1 years later than non-Hispanic women, the major factors that affect initiation of screening are having a primary care physician (a difference of 1.8 years), having private health insurance (a difference of 6.3 years), and speaking English (a difference of 9.0 years). Obesity had a larger effect on age at screening initiation than race or ethnicity (a difference of 1.6 years). Furthermore, the inability to speak English and the lack of private insurance had synergistically negative impacts on the age of screening initiation, such that women without private insurance began mammographic screening 15 years later than recommended by the ACS.

## DISCUSSION

The data in the current study indicate that most women receive their first screening close to the age of 40 years, as recommended by the ACS. Indeed, 60% of women attended their first mammogram by their 41st birthday, whereas 75% had done so by age 45 years, and almost 90% had begun screening by age 50 years. However, several subpopulations of women are at risk of screening delay. For example, women who did not speak English, women without a primary care physician, and women without private insurance tended to begin screening at markedly later ages. There were also smaller but statistically significant differences in age at screening initiation in the comparison between black and white women, between Hispanic and non-Hispanic women, as well as between obese and thin women.

A limitation of our study is that our data do not include the women who never attend screening, although the results of telephone surveys suggest that the number of such women is relatively low.<sup>14,27-30</sup> The Behavioral Risk Factor Surveillance System telephone survey has revealed that, by 1997, approximately 80% of women ages 40-49 years and approximately 90% of women ages 50-69 years reported having received at least 1 mammogram.<sup>30</sup> Similar values were found among subpopulations of white, Hispanic, and black women, whereas only marginally lower values were found for women ages 40-49 years, for women with a median income < \$10,000, or for women with < 12 years of education. Even for the group of women in the Behavioral Risk Factor Surveillance System telephone survey that was found to have the lowest screening use, i.e., the women without insurance, 68% had reported having had at least 1 mammogram. Furthermore, because the rate of screening increased between the 1989 and 1997 surveys (from 62% to 80% for women ages 40-49 years and from approximately 65% to approximately 90% for women

ages 50-69 years), it is likely that the number of women who have had at least 1 mammogram is even higher at the present time than indicated by the survey's 1997 values. Indeed, the 2001 Boston Public Health Commission Behavioral Risk Factor Surveillance Survey, whose study population largely overlaps with the MGH dataset, found that 91.2% of women in greater Boston had received at least 1 mammogram, whereas usage among black women surveyed was even higher (96.3% [unpublished data]). Conversely, self-reported mammography usage rates are generally higher than claims-based and medical chart-derived rates, so the results from these samples may not generalize to subgroups of women who do not speak English or are low income earners.<sup>31</sup> These results reinforce the viewpoint that there is little to be gained by populationwide efforts to improve entry into the screening process. Rather, public health efforts should be focused on targeting subpopulations of women at highest risk for not using screening, especially women without private insurance, women without a primary care physician, and women who are not proficient with the English language.<sup>32</sup>

We lack causal information to determine why some women begin screening after the age of 40 years, particularly for women who do not have private insurance, who do not have a primary care physician, or who do not speak English. This information would be of special value in designing focused interventions among women at highest risk. For example, some women who do not speak English may have immigrated to the United States after the age of 40 years. Other women who do not speak English or who do not have a primary care physician may lack information on the benefits of screening or may be unaware of the recommendation to begin screening at age 40 years. Simple cost considerations may apply to women without insurance. Other indirect costs such as lack of childcare or the inability to take time off from work may prevent low-income women from beginning mammography at age 40 years. Further surveying women who do not receive their first mammographic examinations by age 40 years might well provide insight into the precise mechanisms behind the delay in screening initiation and thus provide ideas for ameliorating this problem.

As a large urban tertiary care facility, the MGH Avon Comprehensive Breast Center is probably not representative of most screening centers in the United States. However, as we have reported previously,<sup>2</sup> the overall pattern of screening usage in the MGH population is remarkably similar to that reported for other groups of women, including the women using screening in HAP, the largest HMO in Michigan, with 525,000



**TABLE 5**  
**Comparison of Demographic Composition of Study Population with that of Massachusetts and of the United States<sup>a</sup>**

Race/ethnicity	MGH study population (%)	Massachusetts population (%)	U.S. population (%)
Black	10	5	12
Asian	5	4	4
Hispanic	6	7	13

MGH: Massachusetts General Hospital.

<sup>a</sup>Based on 2000 U.S. Census data.<sup>33</sup>

members,<sup>13</sup> and among the non-HMO women age  $\geq 65$  years in California.<sup>14</sup> The MGH Avon Comprehensive Breast Center population is also roughly representative of the racial and ethnic composition of the United States (Table 5). For these reasons, we would suggest that the results of our analysis of the MGH Avon Comprehensive Breast Center population may well apply to screening utilization in a variety of other settings.

The MGH Avon Comprehensive Breast Center database contains information on one of the largest and most completely described screening populations available.<sup>2,9,16-19</sup> The results of the current study contrast with our previous analysis of the return pattern for annual mammographic screening exams,<sup>2</sup> which found that the median time for the first return to screening for women who had a mammogram at the MGH Avon Comprehensive Breast Center in 1996 was 1.3 years, and approximately 25% had not returned by 3 years. Only 16% of women who had a screening mammogram in 1996 underwent 5 subsequent mammograms during the following 5 years, whereas  $> 35\%$  had received only 1 or 2 mammograms during this 5-year period. This systematic failure to achieve prompt return to screening is particularly pronounced among traditionally underserved women. For example, in contrast to the similarities between the ages at which black and white women begin screening, once black women begin screening, only 11% will utilize all 5 screening mammograms over the following 5 years, compared with 19% of white women.<sup>2</sup> Similarly, only 8% of Hispanic women will receive 5 screening mammograms over a 5-year period. Thus, the findings reported in the current study and in our previous publication<sup>2</sup> suggest that the public health need to find ways to encourage women to start screening may be less critical than the need to find ways to encourage them to return promptly once they have begun screening.

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