Published in final edited form as:

J Natl Med Assoc. 2010 June ; 102(6): 452–460.

Mammography Screening Trends: The Perspective of African American Women Born Pre/Post World War II

Karen Patricia Williams, PhD, Athur Mabiso, MS, Yun-Jia Lo, MS, and Louis A. Penner, PhD
Department of Obstetrics, Gynecology, and Reproductive Biology, College of Human Medicine, Michigan State University, East Lansing, Michigan (Dr Williams, Mr Mabiso, and Ms Lo); Karmanos Cancer Institute, Detroit, Michigan (Drs Williams and Penner); Wayne State University, Detroit, Michigan (Dr Penner)

Abstract

Researchers have traditionally combined aging women (aged ≥ 50 years) when reporting their mammography use. This may inadvertently mask important cohort effects in mammography use, which are likely to result from distinct personal life experiences and generational differences. Using the Health and Retirement Study samples of 1998, 2000, and 2004, we examined cohort differences in mammography use between African American women born before 1946 (non–baby boomers) and those born in 1946 to 1953 (baby boomers). Between 1998 and 2004, screening rates for non–baby boomers declined, while those for baby boomers remained relatively steady. Hierarchical linear modeling (HLM) analyses suggest that while screening rates decreased with age (OR, 0.957; 95% CI, 0.947–0.968) cohort effects may have partially reversed the age effect, with non–baby boomers having an increased likelihood of receiving a mammogram compared to baby boomers (OR, 1.697; 95% CI, 1.278–2.254). Because African American women are diagnosed at later stages of breast cancer, documentation of cohort differences in mammography use among older African American women is important as health care professionals design intervention programs that are maximally effective for women from different cohorts. This is particularly critical as more African American women in the baby boomer cohort become part of the aging population.

Keywords

adherence; screening

INTRODUCTION

National statistics show that the incidence and mortality rates for breast cancer increase significantly with age, especially among African American women.¹ Breast cancer incidence rates for African American women aged 70 to 85 or more years are approximately twice those for African American women between the ages of 50 to 69 years.² Similarly, breast cancer mortality rates for African American women aged 50 to 59 years range between 58.5 and 76.3 per 100 000 compared to 107.5 to 123.7 per 100 000 for African American women aged 70 to 79 years.³ Paradoxically, elderly African American women continue to have lower mammography screening rates despite evidence that receiving early and appropriately timed mammography screenings significantly increases women's

Correspondence: Karen Patricia Williams, PhD, Assistant Professor, Department of Obstetrics, Gynecology, and Reproductive Biology, College of Human Medicine, Michigan State University, 626 E Fee Hall, East Lansing, MI 48824-1316 (karen.williams@ht.msu.edu).

probability of early breast cancer detection and survival.⁴ Given empirical evidence on the effectiveness of mammography use among aging women,⁵ investigating mammography screening among the aging African American population is important for finding strategies to increase such screening and eliminate breast cancer disparities among the elderly.

Several studies have pointed to various factors that are associated with increased mammography screening rates among elderly African American women, including improved health insurance access,^{6,7} clinician or health care provider recommendation,^{8–10} family history of cancer,¹¹ and tailored public health messages and interventions.¹² At the same time, setting age limits for breast cancer screening guidelines for elderly women continues to be a source of investigation.¹³ However in studies of mammography screening rates, aging women (age 50 or more) have traditionally been combined as though a homogenous group, when researching or reporting breast cancer screening behaviors. This practice may inadvertently mask important cohort effects in mammography use among older African American women. In this study we defined 2 cohorts of African American women aged 50 years or more: (1) the baby boomer cohort, consisting of women born after 1945 and before 1954; and (2) the non-baby boomer cohort, defined as women born before 1946. The rationale for defining these 2 cohorts was that these groups of women are considered to be from different generations because of their distinct backgrounds, particularly with reference to World War II. These distinct backgrounds potentially influence their health-related behaviors just as they have been shown to influence their socioeconomic behaviors.^{14–16} Thus, there may be cohort effects on mammography screening practices that are the likely result of distinct backgrounds, recent and historical personal experiences, and generational differences in exposure to public health promotions and campaigns. By virtue of being born after 1945, baby boomers were not exposed to the events that occurred prior to 1945 and were less likely to be influenced by them. Thus, national and community-level events potentially related to breast cancer that took place over the course of an elderly woman's life are likely to differ depending on her birth cohort, and this may differentially influence her decision to receive a mammogram. Also, given that the national and social contexts before and after the end of World War II differed significantly, non-baby boomers are likely to have had experiences that were starkly different from those of baby boomers. These experiences had long-term effects on social perceptions and have been documented as significantly influencing each cohort's economic behavior and reactions to marketing and advertising post World War II.^{14–16} It is therefore likely that these long-term effects may have also affected how these cohorts responded to public health messages along with other post-World War II health-related exposures that influence mammography use.

Theoretically, the health belief model posits that preventive health actions of women are motivated by the degree of perceived risk of the disease and the expected risk reduction associated with taking the preventive health action.^{17,18} Women are likely to take action by getting mammograms if their expected reduction in breast cancer risk outweighs practical and psychological barriers to getting screened. Risk attitudes of baby boomers and non-baby boomers have been shown to be significantly different, particularly in socioeconomic studies.^{19,20} The different risk attitudes may also differentially influence mammography screening behaviors between baby boomers and non-baby boomers. Following the health belief model, this study postulates that while practical barriers such as lack of health insurance limited African American women's access to health care services, older African American women in different birth cohorts also experienced psychological (perception-based) barriers emanating from their cohort backgrounds and were thus likely to have different screening rates as a result. We hypothesized that while mammography use would decrease with age, birth cohort would have an independent effect on mammography use, potentially mitigating or exacerbating the age effect. To test this hypothesis, we analyzed data from the Health Retirement Study (HRS). Few studies have used the HRS data to

analyze mammography use among older American women,^{21,22} and none have focused on African American women or compared birth cohorts in terms of baby boomers and non-baby boomers. In addition, none of the previous studies has analyzed breast cancer screening rates using the more recent 2004 wave of the HRS data, which the present study uses.

METHODS

Data

The present study used the 1998, 2000, and 2004 waves of the HRS data to test for cohort differences in mammography use among older African American women. The HRS is a nationally representative cohort study of the aging population in the conterminous United States. Data on health behaviors, disease and disability, use of medical care services, and socioeconomic status of the elderly are collected using a multistage area probability sample design under a steady state longitudinal (repeated) sampling design.^{23–27} Because the HRS surveys are designed to include couples, spouses or partners of age-eligible respondents that are not age eligible themselves are also included. In the present study, we only used the subsample of African American women who were aged 50 years and older.

The HRS wave data have been collected every 2 years since 1992. At the time of writing, the latest wave available for public use was wave 8, collected in 2006. However, we did not use data from all 8 waves because the question on mammography use (the outcome variable of interest in this study) was first asked in wave 3 (1996). Also, in waves 3, 6, and 8, very few African American baby boomers were asked the question on mammography use. Only 16 women who were baby boomers were included in wave 3 (1996) solely because they were spouses or partners of respondents in the target population—individuals born between 1931 and 1941 (non-baby boomers). Similarly, in waves 6 and 8, fewer than 20 African American women responded to the question on mammography use, since in these waves the question was only asked of women who had not answered it in the previous wave or women who were newly enrolled into the study as new spouses of eligible subjects. This left waves 4, 5, and 7 (ie, data collected in 1998, 2000, and 2004) as the only suitable waves for our analyses.

It is important to note that the target population of the HRS changed with each wave as different birth cohorts were targeted in each wave.²³ In wave 4, the target population was individuals born in 1924 to 1930 and 1942 to 1947, inclusive, and the response rate was 84.9%. In wave 5, individuals born in 1947 or before were targeted (response rate 84.0%), while in wave 7 those born in 1953 or before were targeted (response rate, 86.2%). Thus, the number of baby boomers sampled increased from wave 4 to wave 7, making the HRS a dynamic, unbalanced longitudinal sample. The overall wave-to-wave retention rate (ie, women who were interviewed in all 3 waves) was 66.7%. As would be expected, the retention rate between consecutive or closer waves was much higher (81.0% for wave 4 to wave 5, and 82.4% for wave 5 to wave 7).

In creating the final longitudinal data set that was analyzed, files from the 3 usable waves were merged using primary and wave-specific identifier variables. SPSS software (version 17.0)²⁸ was used to merge the files and arrange the merged data into 2-level files. The 2-level files were later converted into a Multivariate Data Matrix file in Hierarchical Linear Model (HLM) version 6.06 software²⁹ for analysis using a 2-level multivariate model.

Variable Definitions

The outcome variable of interest in this study was receipt of mammography screening in the last 2 years. To solicit data on this binary variable (yes/no), HRS participants were asked the following question in each wave of survey interviews: Did you have a mammogram or x-ray

of the breast to search for cancer since [the previous wave of interview] to search for cancer in the last 2 years?”

The main predictor variable was birth cohort (ie, baby boomer or non-baby boomer). As alluded to earlier, *baby boomers* were defined as women born after 1945 and before 1954, while non-baby boomers were born prior to 1946. Income level, education, age, health insurance coverage, quality of life, and visit with a physician/doctor are covariates that were also included in the analyses (Table 1). Income was measured in terms of the total dollar value earned per year for the household irrespective of source, be it employment, pension receipts, an individual retirement account, government social security payments, gifts from family/children, etc,^{24,25} while education was measured in terms of 4 ordinal categories (less than high school, high school graduate/general education development, some college, or college degree/higher). Age was measured in years of age at the time of the survey, and health insurance was a binary variable indicating whether one had health insurance or not. Health-related quality of life was based on an index in the HRS that was computed using a combination of a depression measure, the Center for Epidemiologic Studies Depression Rating scale (CESD), and several yes/no questions on physical wellbeing.^{24,25} The health-related quality of life index ranged from 0 to 8, with 0 being the highest possible level of quality of life and 8 being the worst. The covariate, visit with a physician/doctor, was measured as a binary variable; 1 if the woman had visited a physician or doctor in the last 2 years, and 0 if not.

STATISTICAL ANALYSIS

Descriptive analyses of the data were performed by wave and by birth cohort using SPSS version 17.0.²⁸ Screening rates were plotted against age by cohort to establish trends and differences in mammography screening for each cohort. Using HLM,²⁹ a 2-level model was specified and estimated to assess birth cohort effect on mammography use while controlling for age and other important covariates described in the preceding section (also shown in the mathematical specification of the model below). Other covariates that were initially included and later dropped from the final model estimated, because they were not significant at .05, were marital status, employment status, smoking status, and alcohol consumption. The level of .05 was set as the significance level for this study.

The specification of the model is shown below.

Level 1 Model:

$$\text{Prob}(Y=1 |) =$$

$$\log[/ (1-)] =$$

$$= \beta_0 + \beta_1(\text{Age}) + \beta_2(\text{Quality Life}) + \beta_3(\text{Visit Doctor}) + \beta_4(\text{Insurance}) + \beta_5(\text{Income})$$

Level 2 Model:

$$\beta_0 = \gamma_{00} + \gamma_{01}(\text{Cohort}) + \gamma_{02}(\text{Education}) + r_0$$

$$\beta_1 = \gamma_{10}$$

$$\beta_2 = \gamma_{20}$$

$$\beta_3 = \gamma_{30}$$

$$\beta_4 = \gamma_{40}$$

$$\beta_5 = \gamma_{50}$$

where Y is the binary outcome variable, receipt of a mammogram in the last 2 years (yes = 1 and no = 0).

The main effects of interest were γ_{01} and γ_{11} , which measure the cohort effect and age effect, respectively. Because baby boomers were naturally younger, they had not attained ages greater than 58 years. Therefore, to allow for direct comparison between cohorts when their ages were the same, we also estimated the same HLM model using just the subsample of observations, with ages between 53 and 58 inclusive. Observations for ages between 50 and 52 were excluded in this part of the analysis simply because they did not include non-baby boomers, and those observations for older than 58 years were excluded because they only included non-baby boomers. A third model (a logistic regression model) was specified to investigate predictors of adherence to mammography screening over time. In this logistic regression model, we used a subsample of women who were interviewed in 2 consecutive waves in 1998 and 2000. While we included the 2004 data to obtain descriptive statistics on adherence, we only used the 1998 and 2000 data in the logistic regression to estimate cohort differences in adherence to mammography screening over time. The reason for excluding the 2004 data in the logistic regression analysis is that we would not have properly captured consecutive screening behaviors; there would have been a gap wave for 2002 since data were not available for 2002. The dependent variable in this part of the analysis was receipt of consecutive biennial mammograms in waves 4 and 5 (1998 and 2000) measured as a binary variable (1 = received mammogram in 1998 and 2000, 0 = did not receive a mammogram in 1998 and 2000 or in only 1 of the years). The predictor variables and covariates included in this model were the same as those in the first 2 HLM models.

RESULTS

Sample Description

The final sample consisted of 1782 African American women, with a total of 3709 observations over time. Table 2 displays descriptive statistics of the sample and self-reported mammography screening rates by birth cohort. Additionally, this table shows mammography screening rates of the subsample of women who were interviewed in more than 1 wave, thus capturing mammography screening adherence. The sociodemographic information for the sample is in Table 1. Baby boomers had a mean annual income of \$46 828 (SD, \$54 373) and mean age of 54 years (SD, 2.5 years) in 2004. In contrast, the non-baby boomers had a lower mean income of \$27 149 (SD, \$33 163) and, naturally, a higher mean age of 71 years (SD, 8.8 years) in 2004. Also, more baby boomers had access to health insurance compared to non-baby boomers in all 3 waves analyzed.

Cohort and Age Effects

Interestingly, in the Figure, the results show that between the ages of 50 and 55 years, mammography screening rates for non-baby boomers were significantly higher than the screening rates for baby boomers ($p < .01$). However, between the ages of 50 and 60 years, the non-baby boomer screening rates declined significantly with age, while screening rates for baby boomers slightly increased with age. The Figure also suggests that the age range of 56 to 60 years is a critical period for both cohorts; screening rates of the 2 cohorts started to converge. At ages greater than 60 years, only non-baby boomer observations were available since the baby boomers had not yet reached age 60. This prevented us from making inferences about screening trends of baby boomers at those ages. Nevertheless, the trend for the non-baby boomers showed that beginning at age 60 years, there was a significant decrease in screening rates ($P < .001$), a result that is consistent with previous studies and national statistics on African American women older than 60 years. Results of the HLMs support this result as well.

The HLM analysis of the whole sample revealed that while mammography screening rates decreased with age (OR, 0.957; 95% CI, 0.947–0.968), cohort effects partially reversed the age effect, with non–baby boomers having an increased likelihood of receiving a mammogram compared to baby boomers (OR, 1.697; 95% CI, 1.278–2.254).

Table 3 presents detailed results of the hierarchical linear models depicting cohort and age effects on mammography screening. First are the findings for the whole sample, which included 3084 observations after missing observations were deleted during the analysis, and, second, a subsample of observations with matching ages between 53 and 58 inclusive for both birth cohorts. Finally, Table 3 shows results of the logistic regression using the third subsample, which only included women who were followed up in consecutive waves 4 and 5 (1998 and 2000), where the dependent variable was the receipt of mammogram in both waves (a proxy for adherence to mammography screening over time).

Direct comparison between cohorts when their ages were the same (53 to 58 years) corroborated the result that there were significant cohort effects (OR, 1.958; 95% CI, 1.222–3.137), with the non–baby boomers having an increased likelihood of receiving a mammogram in the last 2 years compared to the baby boomers. Age was not significant in the second model, suggesting that within that narrow age range of 53 to 58 years, the cohort effect was more important in predicting a woman's mammography screening behavior. A covariate that was significant in both models was health insurance status; as expected, women with health insurance were more likely to receive a mammogram in the last 2 years. Similarly, women who had visited a doctor in the last 2 years were approximately twice as likely to have received a mammogram in the last 2 years as women who had not visited a doctor. While health-related quality of life was included in both models, it was not statistically significant at the .05 level, suggesting that the level of an aging woman's health-related quality of life did not influence whether she received a mammogram in the last 2 years or not.

When adherence to consecutive mammography screenings was analyzed, it was found that few women received mammograms in all the 3 waves; only 63.2% of the baby boomers reported receiving 3 consecutive mammograms over the course of the 3 waves, as compared to 64.0% for non–baby boomers. Approximately 72.4% (74.3%) of the baby boomers (non–baby boomers) followed up in 1998 and 2000 received 2 consecutive mammograms during the 2 waves. The modal number of mammograms received over the course of the 3 waves was calculated to be 1 mammogram for baby boomers compared to 2 for the non–baby boomers. This result suggested that, while few women adhered to receiving mammograms in each of the 3 waves, regardless of their birth cohort, non–baby boomers had slightly better adherence than baby boomers.

The lower sections of Tables 1 and 3 show detailed results on adherence behaviors for those women who were followed through 2 consecutive waves or the 3 waves. In table 3, the logistic regression results show that doctor's/physician visit was the only significant predictor of receiving consecutive screenings ($P < .001$), a result that is consistent with previous studies,^{30–32} showing physician recommendation as the main predictor of receipt of recent mammograms. The other covariates in this model turned out not to be significant at the .05 level, suggesting that while there were cohort effects on receipt of a mammogram (as shown by the HLM models) physician recommendation was the strongest predictor of adherence to mammography screening guidelines.

DISCUSSION

By using national data and providing more in-depth analysis, this study extends the body of knowledge regarding aging African American women's mammography screening practices. We have examined 2 distinct cohorts of African American women aged 50 or more years—the baby boomers and non-baby boomers at 3 time points. Additionally, to corroborate our findings we elected to compare the cohorts when they were at the same age. Originally, we had expected that the age-adjusted screening rates for the baby boomer cohort would be higher than the non-baby boomer cohort. This proved not to be the case. Although mammography use significantly declined with age (OR, 0.957; 95% CI, 0.947–0.968), we found that cohort effects among the non-baby boomer cohort partially reversed the age effect (OR, 1.697; 95% CI, 1.278–2.254). This finding would have been masked had we not divided the sample into cohorts (Figure). Controlling for age, women in the non-baby boomer cohort were more likely to receive a mammogram than women in the baby boomer cohort.

Cohort Comparison

We found that when we compared both cohorts of women when they were aged 53 to 58 years, the non-baby boomers had a significantly higher screening rate (OR, 1.958; 95% CI, 1.222–3.137). Our findings indicate that in a somewhat age-restricted sample (age 53–58 years), the cohort effect was stronger than the age effect in predicting mammography screening for women. A plausible explanation could be the fact that the nation's health care system has changed. With the onset of health maintenance organizations, women in the baby boomer cohort were less likely to continuously see the same physician as their older counterparts when they were at the same age. This would likely reduce the positive effects of physician recommendation on their mammography screening practices and thus lead to lower screening rates. This explanation is consistent with previous research that indicates that having a regular physician is associated with increased mammography screening.^{30–32} Additionally, women in both cohorts who had a physician visit in the last 2 years were more likely to be screened than women who did not have a physician visit (OR, 7.52; 95% CI, 3.35–16.90). Other studies have also indicated that not having a physician's recommendation for mammography screening is a critical barrier for older women.^{30,33,34}

Another possible reason for the difference in levels of mammography screening between the 2 cohorts is health insurance. Having health insurance is a predictor of screening because it provides access to the health care system and access to a regular physician. During the three waves that we analyzed in this study (1998, 2000, and 2004), the older non-baby boomer women were more likely to have some type of health insurance, albeit basic Medicare or a combination of public and private insurance, than the baby boomers (78.6% of baby boomers in year 2004 compared to 95.1% of non-baby boomers in the same year, $P < .001$). Therefore, the fact that insurance proved to be significant as a predictor of mammography use may partially explain the higher screening rates among non-baby boomers.

Adherence to Mammography Screening

Examining the data at 3 time points/waves provided us with a real perspective of aging African American women's breast cancer screening practices, particularly adherence. The results indicated that of the total sample of 1782 women, 73% answered yes they had a mammogram at least once during the 3 waves. When we investigated further, only 63.2% (64.0%) of the baby boomers (non-baby boomers) interviewed in all 3 waves indicated they had received a mammogram in each of the three waves (1998, 2000, and 2004). At first glance, it would be easy to conclude that this solely demonstrates an adherence problem. However, it is important to note that the current guidelines indicate that women aged 40

years or more should get yearly mammograms until about age 70 years,³⁵ thus leaving out non-baby boomers older than 70 years. Also, there was a time when the screening guidelines were not as clear,³⁶ causing confusion for women and their clinicians. Additionally, we need to consider other factors that might account for the nonadherence. For example, once people are beyond a certain age, there will be some decline in their memory. Older women may tend to have more difficulty in remembering to take preventive health actions such as going for a mammogram or remembering past events. Therefore, when asking women to recall their screening habits, they may or may not be accurate,³⁷ making adherence difficult to measure.³⁸ Studies have found memory to be an issue in the reporting of mammography screening regardless of age.³⁹

With physician recommendation being a strong predictor of mammography screening and perception of risk also being a known predictor of breast screening, one could argue that in many instances these are dependent on each other. While women may think they are not at risk as they get older, causing them not to get screened, comorbidity can cause many women to see a physician(s) more than once per year. Therefore, it is at 1 or more of these visits that the physician could be reviewing a woman's risks for getting breast cancer and the importance of mammograms; thus, her perception of her risk can be influenced.

It has only been in recent years that aging African American women have been using the Internet to get information regarding health. Prior to 2004, the last year of data collection in this study, we would assume that few older African American women were using the Internet as a source of health information, especially if they were non-baby boomers and if they had a regular physician. If, in fact, non-baby boomers were less likely to use the Internet than baby boomers and were more likely to visit a physician, the effect of the physician recommendation to receive a mammogram would likely be greater for non-baby boomers than baby boomers.

On the other hand, screening adherence with these women would not have to be solely based on physician recommendation and risk perception, but on the women's family history of cancer.¹¹ This would confirm work by Calvocoressi et al⁴⁰ that women who believed that they were more susceptible to getting cancer were more likely to get screened regardless of family history or discussion with their physician.

Clinical Implications

This study empirically demonstrates that there are cohort differences in mammography screenings among aging African American women. Given that physicians have the greatest influence, to date, on women getting breast screening, they will want to engage their patient regarding her mammography screening habits, make sure she knows that she needs to do this every year, and not make assumptions that because she is a baby boomer with more education, income, and more access to information than her non-baby boomer sister or mother, that she is adhering to the screening guidelines. With the prospects of the nation's health care system undergoing another change, it will be important to monitor the cohort effect as it relates to mammography use among aging African American women (particularly as more baby boomers join the aging population).

Limitations

Because we used an existing database, we were limited by the questions asked. Ideally we would have liked to combine both clinical breast examination with mammograms to obtain a clearer picture of breast cancer screening, given that they are both part of the recommended screening guidelines,³⁵ but clinical breast examinations were not part of the questionnaires. Also, the unbalanced nature of the dynamic longitudinal HRS data, due to changing target

population per survey wave, prohibited us from following a large number of the same aging African American women over time to assess their adherence. The fact that the HRS data are collected biennially also prevented us from adequately evaluating adherence in terms of consecutive annual mammograms. Despite these limitations, this study uncovered important age-adjusted cohort differences in mammography screening among aging African American women and showed that African American women in the baby boomer cohort were less likely to adhere to mammography screening than women in the non-baby boomer cohort. As more baby boomers become part of the aging population it will be critical to account for cohort differences when encouraging them to adhere to mammography screening guidelines. Annual assessments of women's adherence to breast cancer screening guidelines in both baby boomer and non-baby boomer cohorts are needed, and future longitudinal studies must collect balanced data on both clinical breast exams and mammography use on a regular annual basis to provide a more informative picture of adherence.

Acknowledgments

We would like to thank Dr Jacqui Smith at the University of Michigan for her consultation.

Funding/support: This study was funded by the National Institutes of Health Michigan Center for Urban African American Aging Research grant 5P30AG015281-13.

REFERENCES

- Espey DK, Wu X, Swan J, et al. Annual report to the nation on the status of cancer, 1975–2004, featuring cancer in American Indians and Alaska Natives. *Cancer*. 2007; 110:2119–2153. [PubMed: 17939129]
- National Cancer Institute. [Accessed July 20, 2009] SEER Cancer Statistics Review 1975–2006: Cancer of the Breast (Invasive). 2009. http://seer.cancer.gov/csr/1975_2006/browse_csr.php?section=4&page=sect_04_table.10.html#table3table3.
- National Cancer Institute. [Accessed July 20, 2009] SEER Cancer Statistics Review 1975–2005. 2009. http://seer.cancer.gov/csr/1975_2005/results_merged/sect_04_breast.pdf.
- Jemal A, Clegg LX, Ward E, et al. Annual report to the nation on the status of cancer, 1975–2001, with a special feature regarding survival. *Cancer*. 2004; 101:3–27. [PubMed: 15221985]
- Smith-Bindman R, Kerlikowske K, Gebretsadik T, et al. Is screening mammography effective in elderly women? *Am J Med*. 2000; 108:112–119. [PubMed: 11126304]
- Ayanian JZ, Kohler BA, Abe T, et al. The relation between health insurance coverage and clinical outcomes among women with breast cancer. *N Engl J Med*. 1993; 329:326–331. [PubMed: 8321261]
- McWilliams JM, Zaslavsky AM, Meara E, et al. Health insurance coverage and mortality among the near-elderly. *Health Aff (Millwood)*. 2004; 23:223–233. [PubMed: 15318584]
- Mandelblatt JM, Yabroff KR. Breast and cervical cancer screening for older women: recommendations and challenges in the 21st century. *J Am Med Womens Assoc*. 2000; 55:210–215. [PubMed: 10935354]
- Saywell RM Jr, Champion VL, Zollinger TW, et al. The cost effectiveness of 5 interventions to increase mammography adherence in a managed care population. *Am J Manag Care*. 2003; 9:33–44. [PubMed: 12549813]
- Roetzheim RG, Fox SA, Leake B. Physician-reported determinants of screening mammography in older women: the impact of physician and practice characteristics. *Am J Geriatr Soc*. 1995; 43:1398–1402.
- Williams KP, Sheppard VB, Todem D, et al. Family matters in mammography screening among African American women 40 and older. *J Natl Med Assoc*. 2008; 100:508–515. [PubMed: 18507203]

12. Fox SA, Stein JA, Sockloskie RJ, et al. Targeted mailed materials and the medicare beneficiary: increasing mammography screening among the elderly. *Am J Public Health*. 2001; 91:55–61. [PubMed: 11189826]
13. Mandelblatt JS, Schechter CB, Yabroff KR, et al. Toward optimal screening strategies for older women: costs, benefits, and harms of breast cancer screening by age, biology, and health status. *J Gen Intern Med*. 2005; 20:487–496. [PubMed: 15987322]
14. Sykes LL. Income rich and asset poor: a multilevel analysis of racial and ethnic differences in housing values among baby boomers. *Popul Res Policy Rev*. 2003; 22:1–20.
15. Ekerdt, DJ.; Applebaum, RA.; Holden, K., et al. *Encyclopedia of Aging*. New York: Macmillan Reference USA; 2002.
16. Easterlin RA, Schaeffer CM, Macunovich DJ. Will the baby boomers be less well off than their parents? Income, wealth and family circumstances over the life cycle in the United States. *Popul Dev Rev*. 1993; 19:497–522.
17. Rosenstock IM. Historical origins of the Health Belief Model. *Health Educ Monogr*. 1974; 2:328–335.
18. Kirscht JP. The Health Belief Model and illness behavior. *Health Educ Monogr*. 1974; 2:387–408.
19. Jones, IR.; Higgs, P.; Ekerdt, DJ. *Consumption and generational change: the rise of consumer lifestyles and the transformation of later life*. New Brunswick, NJ: Transaction Books; 2009.
20. Lusardi A, Mitchell OS. Baby boomer retirement security: the roles of planning, financial literacy, and housing wealth. *J Monetary Econ*. 2007; 54:205–224.
21. Ostbye T, Greenberg GN, Taylor DH, et al. Screening mammography and Pap tests among older American women 1996–2000: results from the Health Retirement Study (HRS) and Asset and Health Dynamics Among the Oldest Old. *Ann Fam Med*. 2003; 1:209–214. [PubMed: 15055410]
22. Hauser RM, Willis RJ. Screening mammography and pap tests among older American women 1996–2000: results from the Health Retirement Study (HRS) and Asset and Health Dynamics among the Oldest Old. *Popul Dev Rev*. 2005; 30:209–235.
23. Jenkins KR, Ofstedal MB, Weir D. Documentation of health behaviors and risk factors measured in the Health and Retirement Study (HRS/AHEAD). HRS Documentation Report DR-010. 2008
24. Servais MA. Overview of HRS public data files for cross-sectional and longitudinal analysis. 2009 <http://hrsonline.isr.umich.edu/sitedocs/dmgt/OverviewofHRSPublicData.pdf>.
25. Servais MA. An elementary cookbook of data management using HRS data with SPSS, SAS, and Stata examples. 2004 <http://hrsonline.isr.umich.edu/sitedocs/dmgt/ElementaryCookbook.pdf>.
26. Heeringa S, Connor J. Technical description of the health and retirement study sample design. HRS/AHEAD documentation report DR-002. 1995
27. Juster F, Suzman R. An overview of the Health and Retirement Study. *J Hum Resources*. 1995; 30:S7–S57.
28. SPSS Inc.. *SPSS Software Version 17.0*. Chicago, IL: SPSS Inc; 2009.
29. SSI Inc.. *Hierarchical Linear Model Version 6.06*. Lincolnwood, IL: SSI Inc; 2008.
30. Lane DS, Zapka JG, Breen N, et al. A Systems Model of Clinical Preventive Care: The Case of Breast Cancer Screening among Older Women. *Prev Med*. 2000; 31:481–493. [PubMed: 11071828]
31. Lambrew JM, DeFries GH, Carey TS, et al. The effects of having a regular doctor on access to primary care. *Med Care*. 1996; 34:138–151. [PubMed: 8632688]
32. Zapka JG, Stoddard AM, Costanza ME, et al. Breast cancer screening by mammography: utilization and associated factors. *Am J Public Health*. 1989; 79:1499–1502. [PubMed: 2817160]
33. Weinick, RM.; Zuvekas, SH.; Drilea, S. Rockville, MD: Agency for Healthcare Research and Quality; 1997. MEPS Research Findings No. 3: Access to health care—sources and barriers, 1996. AHCPR Publication No. 98-0001. www.meps.ahrq.gov/mepsweb/data_files/publications/rf3/rf3.shtml. [Accessed July 20, 2009]
34. Rimer BK. Improving the use of cancer screening for older women. *Cancer*. 1993; 72:1084–1087. [PubMed: 8334662]

35. American Cancer Society. [Accessed July 20, 2009] American Cancer Society Guidelines for the Early Detection of Cancer. 2009. www.cancer.org/docroot/PED/content/PED_2_3X_ACS_Cancer_Detection_Guidelines_36.asp.
36. Pasick RJ, Hiatt RA, Paskett ED. Lessons learned from community-based cancer screening intervention research. *Cancer*. 2004; 101:1146–1164. [PubMed: 15316912]
37. Armstrong K, Long JA, Shea JA. Measuring adherence to mammography screening recommendations among low-income women. *Prev Med*. 2004; 38:754–760. [PubMed: 15193895]
38. Armstrong K. Leading the way in breast cancer screening and prevention. *J Gen Intern Med*. 2004; 19:390–391. [PubMed: 15061749]
39. Burgess DJ, Powell AA, Griffin JM, et al. Race and the validity of self-reported cancer screening behaviors: development of a conceptual model. *Prev Med*. 2009; 48:99–107. [PubMed: 19118570]
40. Calvocoressi L, Kasl S, Lee C, et al. A prospective study of perceived susceptibility to breast cancer and nonadherence to mammography screening guidelines in African American and White women ages 40 to 79. *Cancer Epidemiol Biomarkers Prev*. 2004; 13:2096–2105. [PubMed: 15598767]

Figure.
Mammography Screening Rates by Birth Cohort Over 5-Year Age Intervals

Table 1

Sociodemographic Characteristics of the Sample

	Baby Boomers	Non-Baby Boomers	P Value (²)^a
Age (2004)	Mean, 54 y; SD, 2.5; Median, 54 y	Mean, 71 y; SD, 8.8 Median, 69 y	<.001 ^b
Income (2004)	Mean, \$46 828; SD, \$59 373 Median, \$30 089	Mean, \$27 149; SD, \$33 163 Median, \$15 834	<.001 ^b
Health-Related Quality of Life Index ^c (2004)	Mean, 2.03; SD, 2.23; Median, 1.00	Mean, 1.98; SD, 2.15; Median, 1.00	.914 ^b
Education in 2004			
Less than high school	28.4%	45.9%	<.001
High school graduate/general education development	37.1%	30.2%	
Some college	17.3%	13.9%	
College and above	17.3%	10.1%	
Marital status			
Married (2004)	44.1%	34.3%	<.001
Married (2000)	61.7%	35.3%	<.001
Married (1998)	58.2%	37.8%	<.001
Health insurance			
Had insurance (2004)	78.6%	95.1%	<.001
Had insurance (2000)	87.1%	93.0%	.009
Had insurance (1998)	85.2%	91.5%	.020
Doctor's visit in last 2 years			
Had visited doctor (2004)	92.1%	94.4%	.081
Had visited doctor (2000)	98.0%	95.0%	.104
Had visited doctor (1998)	90.8%	94.3%	.117
1998 wave (n ₁)	91	252	
2000 wave (n ₂)	163	1487	
2004 wave (n ₃)	472	1244	

^a ² Test was performed to test for categorical association between birth cohort (baby boomer/non-baby boomer) and the categorical sociodemographic variables.

^b The *p* value is based on a ² test that first categorized the continuous variable.

^c The health-related quality of life measure ranges from 0–8, with 8 representing the lowest quality of life while 0 represents the highest quality of life.

Table 2

Description of Data Waves and Mammography Screening Rates by Birth Cohort

Survey Target Group	Sample Size		Mammography Screening Rate			² Test (p Value) ^a
	Born in...	Baby Boomers	Non-Baby Boomers	Baby Boomers	Non-Baby Boomers	Total Sample
Wave 4 (1998)	1924–1930 and 1942–1947	91	252	68 (74.7%)	205 (81.3%)	273 (79.6%)
Wave 5 (2000)	1947 or before	163	1487	129 (79.1%)	1069 (72.4%)	1198 (72.6%)
Wave 7 (2004)	1953 or before	472	1244	367 (77.8%)	879 (71.3%)	1246 (72.6%)
Subsample interviewed in:						
Waves 4 and 5 (1998 and 2000)		76	202	55 (72.4%)	150 (74.3%)	205 (73.7%)
Waves 4, 5 and 7 (1998, 2000, and 2004)		68	161	43 (63.2%)	103 (64.0%)	146 (63.8%)
						.179
						.067
						.007
						.7497
						.9152

^aThe 2-sided ² test was performed to test categorical association at the 95% significance level between the screening (yes/no) and the birth cohort (baby-boomer/non-baby boomer).

Table 3**Cohort and Age Effects on Mammography Screening**

Fixed Effect	Coefficient	Odds Ratio	Confidence Interval
Whole sample (N = 3084 observations)			
Intercept	0.207	1.230	(0.560–2.701)
Birth cohort	0.529	1.697 ^b	(1.278–2.254)
Education	0.079	1.082 ^a	(1.004–1.166)
Age	−0.044	0.957 ^b	(0.947–0.968)
Health-related quality of life	−0.007	0.993	(0.955–1.033)
Visited doctor	1.778	5.918 ^b	(4.264–8.215)
Health insurance	0.608	1.836 ^b	(1.374–2.452)
Income	0.217	1.242 ^b	(1.079–1.429)
Subsample of women age (53–58 y, N = 651 observations)			
Intercept	−0.355	0.701	(0.001–651.696)
Birth cohort	0.672	1.958 ^b	(1.222–3.137)
Education	0.079	1.083	(0.908–1.292)
Age	−0.039	0.963	(0.850–1.090)
Health-related quality of life	−0.157	0.984	(0.891–1.088)
Visited doctor	2.018	7.522 ^b	(3.348–16.900)
Health insurance	0.833	2.301 ^b	(1.315–4.025)
Income	0.089	1.093	(0.793–1.507)
Subsample of women interviewed in 1998 and 2000 waves (N = 278)			
Birth cohort	−0.2951	0.744	(0.213–1.442)
Education	0.0963	1.101	(0.843–1.438)
Age	−0.052	0.949	(0.900–1.002)
Health-related quality of life	−0.025	0.975	(0.809–1.175)
Visited doctor	3.650	38.456 ^a	(3.880–381.180)
Health insurance	1.073	2.923	(0.629–13.597)
Income	−2.57E−6	1.000	(1.000–1.000)

^aSignificant at .05 level.^bSignificant at .01 level.