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Mammography use and breast cancer incidence among older U.S. women

Sara D. Turbow[1], **Mary C. White**[2], **Erica S. Breslau**[3], **Susan A. Sabatino**[2]

[1]Division of Preventive Medicine, Department of Family and Preventive Medicine and Division of General Internal Medicine, Department of Medicine, Emory University School of Medicine, 49 Jesse Hill Jr Dr. SE, Atlanta, GA 30303, USA

[2]Division of Cancer Prevention and Control, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention (CDC), Atlanta, GA, USA

[3]Division of Cancer Control and Population Sciences, National Cancer Institute, National Institutes of Health, Bethesda, MD, USA

Abstract

Purpose—The death rate for female breast cancer increases progressively with age, but organizations differ in their mammography screening recommendations for older women. To understand current patterns of screening mammography use and breast cancer diagnoses among older women, we examined recent national data on mammography screening use and breast cancer incidence and stage at diagnosis among women aged ≥ 65 years.

Methods—We examined breast cancer incidence using the 2016 United States Cancer Statistics dataset and analyzed screening mammography use among women aged ≥ 65 years using the 2018 National Health Interview Survey.

Results—Women aged 70–74 years had the highest breast cancer incidence rate (458.3 cases per 100,000 women), and women aged ≥ 85 years had the lowest rate (295.2 per 100,000 women). The proportion of cancer diagnosed at distant stage or with unknown stage increased with age. Over half of women aged 80–84 years and 26.0% of women aged ≥ 85 years reported a screening mammogram within the last 2 years. Excellent/very good/good self-reported health status (p = .010) and no dependency in activities of daily living/instrumental activities of daily living (p < .001) were associated with recent mammography screening.

Conclusion—Breast cancer incidence rates and stage at diagnosis vary by age. Many women aged ≥ 75 years receive screening mammograms. The results of this study point to areas for further investigation to promote optimal mammography screening among older women.

✉Sara D. Turbow, sara.turbow@emory.edu.

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Code availability SAS and SUDAAN code will be made available upon reasonable request.

Keywords

Older adults; Mammogram; Breast cancer; Incidence

Introduction

Since 2009, the United States Preventive Services Task Force (USPSTF) has recommended biennial breast cancer screening with mammography for average-risk women aged 50–74 years [1]. Based on the lack of inclusion of women aged ≥ 75 years in key breast cancer screening trials and unanswered questions about reductions in advanced breast cancer and treatment morbidity from mammography screening, the USPSTF concluded that there was insufficient evidence to balance the benefits and harms of screening for women aged ≥ 75 years [1]. Uncertainty about the benefits of routine mammography screening at older ages is reflected in guidelines created by specialty societies with differing recommendations for older women [2]. For example, the American Cancer Society recommended women in good health and with life expectancy of at least 10 years continue screening [3], and the American College of Radiology recommends that screening can be individualized considering life expectancy, comorbidities, and intention to undergo treatment if cancer is diagnosed [4], and the American College of Physicians stated that average-risk women aged ≥ 75 years and those with life expectancy ≤ 10 years should discontinue screening [5]. These differences in recommendations could confuse patients and providers alike [6]. The complexity of decisions around breast cancer screening in older women is compounded by the fact that breast cancer incidence is high in this age group and the highest breast cancer mortality rates occur among women aged ≥ 75 years [7].

In light of the increasingly nuanced guidance for breast cancer screening among older women, the goals of this analysis are first, to examine recent incidence data for breast cancer among older women using a national database, and second, to describe mammography screening use among women near and beyond the upper USPSTF screening age range. These data can be used to inform future research and policy discussions regarding breast cancer screening among older women.

Methods

Data sources

This was an analysis of the 2016 United States Cancer Statistics Database (USCS) [8] and the 2018 National Health Interview Survey (NHIS) [9], each the most recent year of data available at the time of study initiation. USCS is a national database covering 100% of the U.S. population that combines information from two federally funded cancer registry programs: the Centers for Disease Control and Prevention’s National Program of Cancer Registries (NCPR) and the National Cancer Institute’s Surveillance, Epidemiology, and End Results Program (SEER) dataset [10, 11]. For 2016, all participating registries met USCS publication criteria [11].

NHIS is a yearly, cross-sectional, household, in-person survey that collects data on the health and health behaviors of a nationally representative sample of the US civilian, noninstitutionalized, population (https://www.cdc.gov/nchs/nhis/about_nhis.htm). For 2018, information was collected about the household and each family in the household, as well as a randomly selected sample child and adult in each family. The 2018 final sample adult response rate was 53.1% [12].

Incidence

All data for the incidence analysis were obtained from the 2016 USCS. Women with invasive breast cancer diagnosed at age ≥ 65 years in 2016 were included. Women aged ≥ 65 years were included so that the incidence of breast cancer among older women, both within the USPSTF screening age range and beyond it, could be examined. Incident breast cancers were defined by the International Classification of Diseases for Oncology third edition (ICD-O-3) codes (C500-C506, C508-C509) [13]. Race was categorized into four major racial groups (White, Black, American Indian and Alaska Native (AIAN), Asian/Pacific Islander), and ethnicity was categorized as Hispanic/Latino or non-Hispanic/Latino. Information about race and Hispanic ethnicity was collected separately in USCS. More information about classification of race and ethnicity in USCS is available elsewhere [14]. Stage was categorized as localized (confined to the primary site), regional (spread directly beyond the primary site or to regional lymph nodes), and distant (spread to other organs or remote lymph nodes) based on the SEER Summary Stage 2000 [15]. Receptor status was defined as estrogen receptor and/or progesterone receptor positive (ER + and/or PR +) or negative (ER− and PR−). ER/PR borderline cases were included with positive cases [16, 17].

Mammography use

Population—Data on mammography use among women aged ≥ 65 years were obtained from the 2018 NHIS. Participants were asked “have you ever had a mammogram?” but not asked about the type of mammogram, such as digital mammography or tomosynthesis. An age range beginning at 65 years was chosen to examine mammography use among older women who were within the USPSTF screening age range compared to mammography use among women past this age range. Exclusions included women who reported ever having breast cancer (n = 419), women with missing information about mammography history or mammography use/timing (n = 150), and women who reported their most recent mammogram was not for screening (defined as answering “because of a problem,” “other reason,” “refused,” “not ascertained,” or “don’t know”) (n = 198).

Sociodemographic, access to care, and health factors—Age was categorized as 65–69, 70–74, 75–79, 80–84, and ≥ 85 years. NHIS top-codes ages of participants over 85 years old to protect confidentiality; these respondents were combined into a ≥ 85 years category. Race was categorized into five categories: White, Black, AIAN, Asian, and multiple race. Educational attainment was categorized as less than high school, completed high school/some college, college/associate degree, and graduate/professional degree.

Insurance status was categorized as any private (including Medicare with private supplemental coverage), Other Medicare (Medicare only, Medicare Advantage, or Medicare/

Medicaid), and other/uninsured/unknown. Having a usual source of care was categorized as yes (clinic, health center, hospital outpatient department, and doctor's office/HMO, "some other place," "more than one place") or no (no usual source of care or hospital emergency department only).

Functional status was assessed with two questions: "Because of a physical, mental, or emotional problem, do you need the help of other persons with personal care needs, such as eating, bathing, dressing, or getting around inside this home?" assessed dependency in activities of daily living (ADLs), and "Because of a physical, mental, or emotional problem, do you need the help of other persons in handling routine needs, such as everyday household chores, doing necessary business, shopping, or getting around for other purposes?" assessed dependency in instrumental activities of daily living (IADLs) [18]. Self-reported health status was categorized as "excellent/very good/good" or "fair/poor."

Analysis

Breast cancer incidence analyses were conducted in SEER*Stat Version 8.3.6 (https://seer.cancer.gov/seerstat/). Incidence rates per 100,000 women were age adjusted to the 2000 U.S. standard population [14]. Rates are presented by age group as well as by race, ethnicity, stage, and hormone receptor (estrogen and progesterone receptor) status.

For all NHIS analyses, SAS-callable SUDAAN version 11.0 (Research Triangle Institute, Research Triangle, NC) was used with survey weights and design variables to account for the complex sample design. Findings are reported as weighted proportions and 95% confidence intervals. Proportions with a relative standard estimate ≥ 30% or denominator < 50 were suppressed. Mammography use was defined by time since most recent mammogram and categorized as ≤ 2 years ago, > 2–5 years ago, > 5 years ago, or never. We report mammography use for all women aged ≥ 65 years by age group.

To identify groups of women who received recent mammograms beyond the upper USPSTF screening age range, we also examined mammography use among women aged ≥ 77 years. This analysis was restricted to women aged ≥ 77 years to capture mammograms done within the prior two years but after age 74 years, the upper USPSTF screening age range. For example, if a 77-year-old woman reported on the NHIS that her last mammogram had been ≤ 2 years ago, she would have received that mammogram when she was at least 75 years old—timing that would put her beyond the upper age recommendation offered by USPSTF. We performed this sub-analysis to obtain more granular information about mammography use among older women past the USPSTF-recommended screening age limit. Differences in mammography use by sociodemographic, health, and access-to-care factors among these women were examined using chi-squared tests. Statistical significance was set at $p < 0.05$.

Results

Table 1 displays the incidence and 95% confidence interval of breast cancer across demographic categories and tumor characteristics in 2016. Women aged 70–74 years had the highest incidence of breast cancer (458.3 cases per 100,000 women) and women aged ≥ 85 years the lowest (295.2 per 100,000 women). Within age categories, most cancers

were diagnosed at a localized stage; the proportion from highest to lowest by age group was 71.9% for ages 70–74, 70.4% for ages 75–79, 70.1% for 65–69, 67.7% for 80–84, and 62.0% for ≥ 85 (data not shown). The incidence rates for distant stage cancer and cancer of unknown stage also varied by age group; the highest incidence rates for both occurred in age groups above 74 years. The proportion of breast cancer diagnosed at distant stage increased with age and was 2.2% for 65–69, 2.3% for 70–74, 2.7% for 75–79, 3.4% for 80–84, and 6.6% for ≥ 85 years (data not shown). The pattern of rates of ER + and/or PR + cancers by age group was similar to that of breast cancer overall. As for stage at diagnosis, rates of unknown ER/PR status increased with age.

Characteristics of women in the analysis of mammography use overall and by age group are shown in Table 2. Of these women, 31.2% (n = 1085) were aged 65–69 years, 25.8% (n = 898) were 70–74 years old, 18.2% (n = 635) were 75–79 years old, 12.5% (n = 434) were 80–84 years old, and 12.3% (n = 429) were 85 years old or older. Greater percentages of women aged 65–74 years reported higher educational attainment and at least good health status.

Regarding mammography use, 64.4% (n = 2,226) reported having a mammogram within 2 years, 14.7% (n = 506) more than 2 but less than 5 years, 15.8% (n = 558) over 5 years ago, and 5.2% (n = 191) reported never having a mammogram. The percentage of women reporting a mammogram within the prior 2 years decreased with increasing age (Fig. 1).

Table 3 displays demographic and clinical variables by time since mammography among women aged ≥ 77 years. Overall, 46.8% of women aged ≥ 77 years had a mammogram within the last 2 years. The proportion who reported their last mammogram occurred less than 2 years ago decreased with age, from over half of women aged 77–84 years to 26.0% of women aged ≥ 85 years. There was no difference in time since last mammography by race, ethnicity, or region. Women who reported Medicare coverage versus private insurance, not completing high school, fair or poor health, or dependency in one or more ADLs or IADLs had lower use of recent mammography than other women.

Discussion

This analysis of national data on breast cancer incidence and screening mammography use in older women reveals several points. This analysis found that more than 70% of women aged 65–74 years–for whom the USPSTF recommends routine screening—have received it. Although breast cancer incidence decreased with age from its peak among women aged 70–74 years, incidence remained high among women aged 75–79 years, beyond the upper USPSTF screening age range for recommended routine screening. Many women received screening mammograms at ages ≥ 75 years. However, approximately one quarter of women aged 65–74 years, for whom routine screening is recommended by multiple expert organizations, had not received a mammogram in the prior 2 years. Thus, many women may not be up-to-date with recommended screening as they approach the age at which screening may not be encouraged.

Mammography use declined with increasing age, as did breast cancer incidence after age 74 years. In contrast, the incidence rate of distant stage disease at diagnosis was highest in the 75–79 and 80–84-year-old age groups. Findings of high breast cancer incidence rates and increased risk of advanced disease at diagnosis for some after age 74 years may suggest a potential benefit from continued screening for some older women. Hartman et al. examined screening-detected breast cancer among women aged ≥ 75 years at one institution and reported a favorable cancer detection rate and a high proportion of early stage cancers [6]. A recent review also concluded that screening performance metrics improved with age [7]. However, a study of Medicare beneficiaries concluded that annual mammography screening after age 75 years did not reduce breast cancer mortality over an 8-year time period [19]. Whether newer screening technologies will improve the balance of benefits and harms for older women is uncertain [20].

Our findings of recent screening among women aged ≥ 77 years are consistent with previous work reporting continued screening at older ages after the USPSTF had set an upper age limit [21]. Torke and colleagues reported that some older adults felt stopping cancer screening would “require a major decision,” whereas continuing screening would not. They also found that patients felt mistrustful of panel recommendations about screening cessation, and that a recommendation to stop screening from their physician might threaten their trust [22].

Our study suggests that for some women, neither age nor overall health are considered reasons to stop screening. Among women aged ≥ 77 years who self-reported their health as “fair” or “poor,” 39.1% had a mammogram within the last two years. Mammography’s potential benefit to an individual patient has been based largely on her life expectancy, and there is an estimated 10-year lag time for survival benefit from mammography [23, 24]. Several studies have suggested that comorbidities and life expectancy are associated with mammography screening among older women [25–27], but many women in their 70 s and 80 s with shorter life expectancies receive mammograms [26, 28]. In 2004, prior to the USPSTF recommendation of an upper screening age limit, Schonberg et al. reported that over 50% of women aged ≥ 80 years had received a screening mammogram in the previous 2 years, including 43.9% of women with two or more significant diseases [25]. Lee et al. recently summarized the available evidence on screening after age 74 years and concluded that more than age alone should be considered, including overall health status [7]. As Brawley has proposed, breast cancer screening recommendations for older women in the future are likely to be tailored to the individual woman rather than based on age, to identify women who are at risk for breast cancer and in good health and therefore likely to benefit from screening [29].

In our study, women who reported dependency in one or more ADLs or IADLs were more likely to have had a mammogram > 5 years ago or never (59.1% for ADLs, 54.8% for IADLs), which is consistent with previous work by Warner and colleagues who reported that women with complex multimorbidity were less likely to have had a screening mammogram. However, women who thought they might live another 10–15 years were more likely to have a screening mammogram, even if their health status or advanced age suggested otherwise [30].

Information about healthcare provider discussions with women who had a mammogram after age 74 years was not collected on the 2018 NHIS and therefore not examined in this study. Schoenborn and colleagues suggest that communication about the benefits and risks of screening and shifted health priorities could be preferable to discussions about life expectancy for both primary care providers and older adults [31]. A recent study showed that some clinicians hold negative opinions about the value of life expectancy predictions for cancer screening decisions. Others have underscored the importance of considering a woman's goals and values in individualizing screening decisions [32]. Decision aids may be useful when engaging older women in conversations about screening [32].

We found that the incidence rate of "unknown" stage disease—possibly suggesting no or limited further workup done after diagnosis—increased with increasing age. The highest rates of unknown stage (6.6% of incident cases) and missing both ER and PR status (8.9% of incident cases) occurred among women aged ≥ 85 years. This raises questions as to whether diagnostic workup or data reporting for breast cancer among women at the oldest ages differs from that of women at younger ages. Many women, particularly those in the oldest age groups, may not receive additional workup after their diagnosis of breast cancer, which may be consistent with a decision not to treat.

Limitations

This analysis has several important limitations. First, both datasets only report specific ages up to age 85 years. The NHIS relies on patient self-report for its data; medical records are not accessed to confirm the accuracy of an individual's statements. Although women who responded that their mammogram was performed because of a problem were excluded from the analysis, women may not have accurately understood the reason for their mammogram. Thus, the proportion of women who received a screening mammogram may have been overestimated. Information was not obtained on family history, whether a provider had discussed screening recommendations, or a woman's perceived life expectancy. The sensitivity of recall of timing of last screening mammogram declines with increasing time intervals and is reported to be around 80% at one year post-mammogram [33]. Categorizing mammography use into multi-year groups may reduce misclassification of screening dates due to imprecise recall. The overall response rate for the 2018 NHIS was 53%, so non-response bias remains a possibility. It is unknown whether response rates vary with age, however, survey weights are adjusted for non-response [12].

Conclusions

This study provides updated incidence rates of breast cancer by age and stage at diagnosis among women aged ≥ 65 years using national data covering 100% of the U.S. population; it also describes differences in breast cancer incidence and screening mammography use by age as women approach and live beyond the upper USPSTF screening age range. Our findings suggest that many women received a recent screening mammogram at ages ≥ 75 years, even women who self-reported "fair" or "poor" health. In addition, the proportion of breast cancers diagnosed at later stages increased with age, raising questions about possible missed opportunities for early diagnosis through screening for some older women. These findings point to potential problems with over-screening for some older women

and underscreening for others. To promote optimal mammography screening among older women, future studies could investigate the systemic reasons why older women are or are not screened. In addition, the quality of provider communications with older women about screening use could be examined.

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Conflict of interest

Dr. Turbow has received grant support from Gilead Sciences, Inc. and Merck for research unrelated to this work. No other financial or personal conflicts exist. No other authors reported conflicts of interest.

Data availability

All data is free and available online at the links included in the manuscript and references.

References

1. Nelson HD, Cantor A, Humphrey L, Fu R, Pappas M, Daeges M, Griffin J (2016) Screening for Breast Cancer: A Systematic Review to Update the 2009 U.S. Preventive Services Task Force Recommendation. Ann Intern Med. 10.7326/M15-0970
2. Centers for Disease Control and Prevention. Breast Cancer Screening Guidelines for Women. https://www.cdc.gov/cancer/breast/pdf/breast-cancer-screening-guidelines-508.pdf
3. Oeffinger KC, Fontham ET, Etzioni R, Herzig A, Michaelson JS, Shih YC, Walter LC, Church TR, Flowers CR, LaMonte SJ, Wolf AM, DeSantis C, Lortet-Tieulent J, Andrews K, Manassaram-Baptiste D, Saslow D, Smith RA, Brawley OW, Wender R, American Cancer S (2015) Breast Cancer Screening for Women at Average Risk: 2015 Guideline Update From the American Cancer Society. JAMA 314(15):1599–1614. 10.1001/jama.2015.12783 [PubMed: 26501536]
4. Monticciolo DL, Newell MS, Hendrick RE, Helvie MA, Moy L, Monsees B, Kopans DB, Eby PR, Sickles EA (2017) Breast Cancer Screening for Average-Risk Women: Recommendations From the ACR Commission on Breast Imaging. J Am Coll Radiol 14(9):1137–1143. 10.1016/j.jacr.2017.06.001 [PubMed: 28648873]
5. Qaseem A, Lin JS, Mustafa RA, Horwitch CA, Wilt TJ, Clinical Guidelines Committee of the American College of P (2019) Screening for Breast Cancer in Average-Risk Women: A Guidance Statement From the American College of Physicians. Ann Intern Med 170(8):547–560. 10.7326/M18-2147 [PubMed: 30959525]
6. Sharma R, Pannikottu J, Xu Y, Tung M, Nothelle S, Oakes AH, Segal JB (2018) Factors Influencing Overuse of Breast Cancer Screening: A Systematic Review. J Womens Health (Larchmt) 27(9):1142–1151. 10.1089/jwh.2017.6689 [PubMed: 29708809]
7. US Cancer Statistics Working Group U.S. Cancer Statistics Data Visualizations Tool, based on November 2018 submission data (1999–2016): U.S. Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute Accessed 5 September 2019

8. National Program of Cancer Registries and Surveillance, Epidemiology, and End Results SEER*Stat Database: NPCR and SEER Incidence – U.S. Cancer Statistics Public Use Research Database, Nov 2018 submission (2001–2016). United States Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute Released June 2019, based on November 2018 submissions. www.cdc.gov/cancer/public-use.
9. National Center for Health Statistics (2019) National Health Interview Survey, 2018. Public-use data file and documentation https://www.cdc.gov/nchs/nhis/data-questionnaires-documentation.htm.
10. Singh S, Henley S (2013) Ryerson A (2017) Surveillance for Cancer Incidence and Mortality-United States. MMWR Surveill Summ 66(4):1–36
11. US Cancer Statistics Working Group (2019) United States Cancer Statistics: 1999–2016. Incidence and Mortality Web-Based Report. U.S. Department of Health and Human Services, CDC, National Cancer Institute https://nccd.cdc.gov/uscs.
12. National Center for Health Statistics (Hyasttsvile, Maryland. 2019) Survey Description, National Health Interview Survey, 2018.
13. Dickie LJ, Adams S, Negoita S (2019) Solid Tumor Rules. National Cancer Institute, Rockville, MD
14. National Program of Cancer Registries (NPCR) and Surveillance Epidemiology & End Results NPCR and SEER Incidence -- US Cancer Statistics 2001–2016 Public Use Database Data Standards and Data Dictionary. www.cdc.gov/cancer/uscs/public-use.
15. Young JL, Roffers SD, Ries LAG, Fritz AG, Hurlbut AA (2001) SEER Summary Staging Manual - 2000: Codes and Coding Instructions. National Cancer Institute, NIH, Bethesda, MD
16. Kohler BA, Sherman RL, Howlader N, Jemal A, Ryerson AB, Henry KA, Boscoe FP, Cronin KA, Lake A, Noone AM, Henley SJ, Eheman CR, Anderson RN, Penberthy L (2015) Annual Report to the Nation on the Status of Cancer, 1975–2011, Featuring Incidence of Breast Cancer Subtypes by Race/Ethnicity, Poverty, and State. J Natl Cancer Inst. 10.1093/jnci/djv048
17. Shoemaker ML, White MC, Wu M, Weir HK, Romieu I (2018) Differences in breast cancer incidence among young women aged 20–49 years by stage and tumor characteristics, age, race, and ethnicity, 2004–2013. Breast Cancer Res Treat 169(3):595–606. 10.1007/s10549-018-4699-9 [PubMed: 29445940]
18. Schonberg MA, Hamel MB, Davis RB, Griggs MC, Wee CC, Fagerlin A, Marcantonio ER (2014) Development and evaluation of a decision aid on mammography screening for women 75 years and older. JAMA Intern Med 174(3):417–424. 10.1001/jamainternmed.2013.13639 [PubMed: 24378846]
19. Garcia-Albeniz X, Hernan MA, Logan RW, Price M, Armstrong K, Hsu J (2020) Continuation of Annual Screening Mammography and Breast Cancer Mortality in Women Older Than 70 Years. Ann Intern Med. 10.7326/m18-1199
20. Bahl M, Pinnamaneni N, Mercaldo S, McCarthy AM, Lehman CD (2019) Digital 2D versus Tomosynthesis Screening Mammography among Women Aged 65 and Older in the United States. Radiology 291(3):582–590. 10.1148/radiol.2019181637 [PubMed: 30938625]
21. Fedewa SA, de Moor JS, Ward EM, DeSantis CE, Goding Sauer A, Smith RA, Jemal A (2016) Mammography Use and Physician Recommendation After the 2009 U.S. Preventive Services Task Force Breast Cancer Screening Recommendations. Am J Prev Med 50(5):e123–e131. 10.1016/j.amepre.2015.10.010 [PubMed: 26699245]
22. Torke AM, Schwartz PH, Holtz LR, Montz K, Sachs GA (2013) Older adults and forgoing cancer screening: “I think it would be strange.” JAMA Intern Med 173(7):526–531. 10.1001/jamainternmed.2013.2903 [PubMed: 23478883]
23. Lee SJ, Boscardin WJ, Stijacic-Cenzer I, Conell-Price J, O’Brien S, Walter LC (2013) Time lag to benefit after screening for breast and colorectal cancer: meta-analysis of survival data from the United States, Sweden, United Kingdom, and Denmark. BMJ (Clinical research ed) 346:e8441. 10.1136/bmj.e8441
24. Braithwaite D, Demb J, Henderson LM (2016) Optimal breast cancer screening strategies for older women: current perspectives. Clin Interv Aging 11:111–125. 10.2147/CIA.S65304 [PubMed: 26893548]

25. Schonberg MA, Breslau ES, McCarthy EP (2013) Targeting of mammography screening according to life expectancy in women aged 75 and older. J Am Geriatr Soc 61(3):388–395. 10.1111/jgs.12123 [PubMed: 23414437]

26. Bynum JP, Braunstein JB, Sharkey P, Haddad K, Wu AW (2005) The influence of health status, age, and race on screening mammography in elderly women. Arch Intern Med 165(18):2083–2088. 10.1001/archinte.165.18.2083 [PubMed: 16216997]

27. McPherson CP, Swenson KK, Lee MW (2002) The effects of mammographic detection and comorbidity on the survival of older women with breast cancer. J Am Geriatr Soc 50(6):1061–1068. 10.1046/j.1532-5415.2002.50261.x [PubMed: 12110066]

28. Walter LC, Lindquist K, Covinsky KE (2004) Relationship between health status and use of screening mammography and Papanicolaou smears among women older than 70 years of age. Ann Intern Med 140(9):681–688. 10.7326/0003-4819-140-9-200405040-00007 [PubMed: 15126251]

29. Brawley O (2020) On mammography screening for women older than 70 years. Ann Intern Med 172(6):427–428. 10.7326/m20-0429 [PubMed: 32092765]

30. Warner DF, Koroukian SM, Schiltz NK, Smyth KA, Cooper GS, Owusu C, Stange KC, Berger NA (2019) Complex Multimorbidity and Breast Cancer Screening Among Midlife and Older Women: The Role of Perceived Need. Gerontologist 59(Suppl 1):S77–S87. 10.1093/geront/gny180 [PubMed: 31100139]

31. Schoenborn NL, Huang J, Sheehan OC, Wolff JL, Roth DL, Boyd CM (2019) Influence of Age, Health, and Function on Cancer Screening in Older Adults with Limited Life Expectancy. J Gen Intern Med 34(1):110–117. 10.1007/s11606-018-4717-y

32. Schonberg MA, Kistler CE, Pinheiro A, Jacobson AR, Aliberti GM, Karamourtopoulos M, Hayes M, Neville BA, Lewis CL, Wee CC, Fagerlin A, Nekhlyudov L, Marcantonio ER, Hamel MB, Davis RB (2020) Effect of a Mammography Screening Decision Aid for Women 75 Years and Older: A Cluster Randomized Clinical Trial. JAMA Intern Med. 10.1001/jamainternmed.2020.0440

33. Craig BM, Quinn GP, Vadaparampil ST (2009) Sensitivity of self-report mammography use in older women. Am J Prev Med 37(5):441–444. 10.1016/j.amepre.2009.07.007 [PubMed: 19840700]

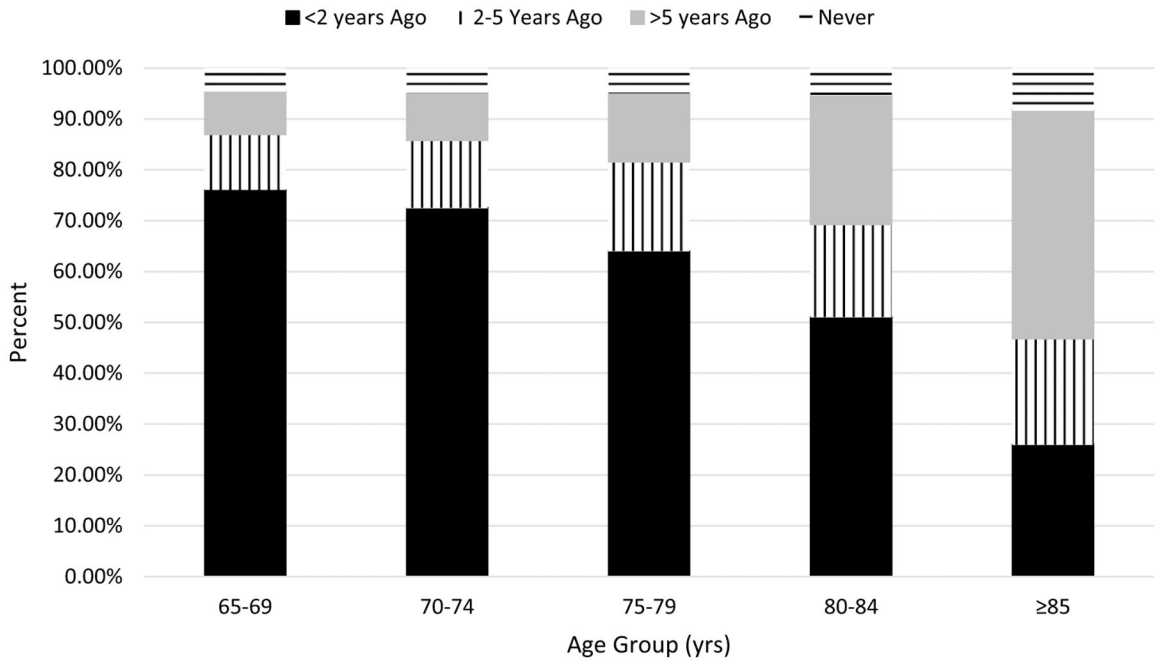

Fig. 1.

Timing of Most Recent Screening Mammogram among Women ≥ 65 Years Old, United States 2018

Table 1

Age-Adjusted Incidence of Invasive Breast Cancer among Women Aged ≥ 65 Years by Age Group, 2016

	Age group (years)				
	65–69	**70–74**	**75–79**	**80–84**	**≥ 85**
	Incidence rate[d] (95% CI) (*n* = 8,889,353)	**Incidence rate[d] (95% CI) (*n* = 6,360,203)**	**Incidence rate[d] (95% CI) (*n* = 4,647,676)**	**Incidence rate[d] (95% CI) (*n* = 3,413,802)**	**Incidence rate[d] (95% CI) (*n* = 4,154,029)**
Overall	417.7 (413.4–421.9) N = 37,127	458.3 (453.0–463.6) N = 29,147	442.7 (436.7–448.8) N = 20,575	393.5 (386.9–400.2) N = 13,433	295.2 (290.0–300.5) N = 12,263
Race					
White	423.3 (418.6–428.0) N = 31,174	468.9 (463.2–474.8) N = 25,109	452.8 (446.2–459.5) N = 17,797	400.3 (393.1–407.6) N = 11,677	296.4 (290.8–302.0) N = 10,744
Black	406.3 (393.8–419.1) N = 3,992	418.4 (402.8–434.5) N = 2,705	413.7 (395.4–432.6) N = 1,918	383.0 (362.0–405.0) N = 1,243	301.1 (283.1–319.9) N = 1,045
AIAN[a]	273.5 (238.2–312.5) N = 216	267.5 (224.4–316.4) N = 136	265.6 (213.6–326.5) N = 90	207.3 (151.2–277.4) N = 45	141.2 (95.3–201.6) N = 30
API[b]	282.2 (267.1–297.9) N = 1,305	293.0 (274.3–312.8) N = 904	254.0 (233.3–276.0) N = 558	206.5 (184.2–230.7) N = 311	178.7 (158.6–200.6) N = 287
Ethnicity					
Hispanic/Latino	328.2 (315.5–341.2) N = 2,534	333.6 (318.4–349.3) N = 1,804	310.7 (293.4–328.8) N = 1,204	259.5 (240.7–279.4) N = 12,729	205.5 (189.2–222.9) N = 586
Non-Hispanic/Latino	426.1 (421.7–430.7) N = 34,591	469.9 (464.3–475.5) N = 27,343	454.7 (448.3–461.1) N = 19,370	405.1 (398.0–412.2) N = 704	301.8 (296.4–307.3) N = 11,677
Stage					
Localized	292.9 (289.3–296.4) N = 26,034	329.7 (325.3–334.2) N = 20,970	311.9 (306.8–317.0) N = 14,496	266.6 (261.1–272.1) N = 9,100	182.9 (178.8–187.1) N = 7,598
Regional	93.4 (91.4–95.4) N = 8,303	94.5 (92.2–96.9) N = 6,012	91.4 (88.7–94.2) N = 4,250	85.6 (82.5–88.7) N = 2,921	67.8 (65.3–70.4) N = 2,817
Distant	22.0 (21.0–23.0) N = 1,955	23.4 (22.3–24.6) N = 1,490	27.5 (26.0–29.0) N = 1,277	27.9 (26.1–29.7) N = 952	24.9 (23.4–26.5) N = 1,036
Unknown	9.4 (8.7–10.0) N = 833	10.6 (9.8–11.4) N = 675	11.9 (10.9–12.9) N = 552	13.4 (12.2–14.7) N = 459	19.5 (18.2–20.9) N = 811
Receptor Status					
ER + or PR +	352.3 (348.4–356.2) N = 31,317	387.8 (383.0–392.7) N = 24,664	371.7 (366.2–377.3) N = 17,275	325.6 (319.6–331.8) N = 11,117	231.7 (227.1–236.4) N = 9,625
ER and PR−	51.7 (50.2–53.2) N = 4,595	54.6 (52.8–56.5) N = 3,475	51.9 (49.8–54.0) N = 2,411	48.8 (46.5–51.2) N = 1,667	36.9 (35.1–38.8) N = 1,533

	Age group (years)				
	65–69	**70–74**	**75–79**	**80–84**	**≥ 85**
	Incidence rate[d] (95% CI) (*n* = 8,889,353)	**Incidence rate[d] (95% CI) (*n* = 6,360,203)**	**Incidence rate[d] (95% CI) (*n* = 4,647,676)**	**Incidence rate[d] (95% CI) (*n* = 3,413,802)**	**Incidence rate[d] (95% CI) (*n* = 4,154,029)**
Unknown	13.7 (12.9–14.5) N = 1,197	15.8 (14.9–16.9) N = 1,002	19.1 (17.9–20.4) N = 887	19.0 (17.6–20.5) N = 644	26.6 (25.1–28.2) N = 1,095

[a] AIAN = American Indian/Alaska Native, b. API = Asian/Pacific Islander, c. ER = Estrogen Receptor, PR = Progesterone Receptor

[b] Data Source: NPCR and SEER Incidence – U.S. Cancer Statistics Public Use Research Database, Nov 2018 submission (2001–2016), United States Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute. Released June 2019, based on November 2018 submissions. Available at www.cdc.gov/cancer/public-use

[c] Data are from population-based registries that participate in CDC's National Program of Cancer Registries and/or NCI's Surveillance, Epidemiology, and End Results Program and meet high-quality data criteria. These registries cover approximately 100% of the United States population

[d] Rates are per 100,000 women and are age adjusted to the 2000 U.S. standard population (19 age groups – Census P25–1130)

Table 2

Demographics of Women Aged ≥ 65 Years, United States, 2018

	Age group (years)					
	Overall Weighted % (95% CI) (n = 3,481)[a]	**65–69 Weighted % (95% CI) (*n* = 1,085)[a]**	**70–74 Weighted % (95% CI) (n = 898)[a]**	**75–79 Weighted % (95% CI) (n = 635)[a]**	**80–84 Weighted % *(95% CI)* (*n* = 434)[a]**	**≥ 85 Weighted % (95% CI) (n = 429)[a]**
Race						
White	83.0% (81.0–84.8) (*n* = 2,889)	82.2% (79.1–88.0) *n* = 882	82.3% (78.9–85.3) *n* = 744	83.4% (79.5–86.6) *n* = 531	84.6% (79.7–88.4) *n* = 363	84.4% (79.2–88.5) *n* = 369
Black	9.5% (8.4–10.8) (*n* = 373)	9.8% (7.8–12.0) *n* = 122	10.2% (8.0–12.9) *n* = 99	10.3% (7.9–13.3) *n* = 73	*	*
AIAN[b]	*	*	*	*	*	*
Asian	5.1% (4.1–6.4) (*n* = 133)	*	*	*	*	*
Multiracial	1.5% (1.1–2.2) (*n* = 54)	*	*	*	*	*
Ethnicity						
Non-Hispanic Latino	90.6% (89.1–92.0) (*n* = 3201)	90.0% (87.3–92.3) *n* = 988	90.7% (88.0–92.8) *n* = 827	90.8% (87.6–93.3) *n* = 590	90.4% (86.3–93.3) *n* = 395	92.4% (88.6–94.9) *n* = 401
Hispanic/Latino	9.4% (8.0–10.9) (*n* = 280)	10.0% (7.8–12.7) *n* = 97	9.3% (7.2–12.0) *n* = 71	9.2% (6.7–12.5) *n* = 45	9.7% (6.7–13.7) *n* = 39	7.7% (5.1–11.4) *n* = 28
Insurance Status						
Any Private	39.9% (37.8–42.1) (*n* = 1461)	42.9% (39.6–46.3) *n* = 482	40.5% (36.5–44.7) *n* = 371	34.9% (30.6–39.4) *n* = 242	38.8% (33.5–44.4) *n* = 179	38.9% (33.2–44.9) *n* = 187
Other Medicare[c]	52.6% (50.4–54.8) (*n* = 1789)	49.2% (45.7–52.6) *n* = 531	54.1% (49.9–58.3) *n* = 480	55.8% (51.3–60.3) *n* = 346	55.2% (49.7–60.7) *n* = 227	51.3% (45.3–57.3) *n* = 205
Other/Uninsured/ Unknown		8.0% (6.0–10.5) *n* = 72	5.4% (3.9–7.4) *n* = 47	9.3% (6.6–12.4) *n* = 47	6.0% (3.9–9.0) *n* = 28	9.9% (6.9–13.9) *n* = 37
Educational Level						
Less than High School	15.9% (14.4–17.6) (*n* = 564)	10.9% (8.9–13.4) *n* = 121	16.0% (13.3–19.1) *n* = 140	13.8% (12.7–19.4) *n* = 101	23.7% (19.1–28.9) *n* = 99	22.0% (17.8–26.8) *n* = 103
High School/Some College	46.5% (44.4–48.6) (*n* = 1651)	42.2% (38.7–45.7) *n* = 464	44.6% (40.8–48.4) *n* = 410	51.2% (46.7–55.7) *n* = 329	48.9% (43.3–54.6) *n* = 213	53.3% (47.3–59.3) *n* = 235
College/ Associate's Degree	26.2% (24.5–28.0) (*n* = 886)	32.3% (29.0–35.7) *n* = 350	26.5% (23.4–29.9) *n* = 237	23.6% (20.0–27.7) *n* = 144	19.7% (15.8–24.4) *n* = 86	18.7% (14.0–24.6) n = 69
Advanced Degree	10.5% (9.3–11.8) (*n* = 364)	13.4% (11.3–25.8) *n* = 144	12.4% (9.9–15.5) *n* = 109	8.1% (6.0–11.0) *n* = 57	7.7.% (5.1–11.4) *n* = 36	4.4% (2.6–7.6) *n* = 18

	Age group (years)					
	Overall Weighted % (95% CI) (n = 3,481)[a]	**65–69 Weighted % (95% CI) (*n* = 1,085)[a]**	**70–74 Weighted % (95% CI) (n = 898)[a]**	**75–79 Weighted % (95% CI) (n = 635)[a]**	**80–84 Weighted % *(95% CI)* (*n* = 434)[a]**	**≥ 85 Weighted % (95% CI) (n = 429)[a]**
Region						
Northeast	20.0% (18.4–21.7) (*n* = 635)	21.7% (18.3–25.6) *n* = 207	17.9% (15.2–21.0) *n* = 145	17.6% (14.4–21.3) *n* = 104	20.2% (16.2–25.0) *n* = 85	23.5% (18.8–29.0) *n* = 94
Midwest	22.0% (20.2–23.8) (*n* = 826)	20.6% (17.8–23.7) *n* = 242	21.7% (18.6–25.2) *n* = 213	23.7% (20.1–27.6) *n* = 153	22.0% (17.5–27.2) *n* = 99	24.1% (19.4–29.5) *n* = 119
South	35.4% (33.4–37.5) (*n* = 1259)	35.3% (32.0–38.8) *n* = 391	38.0% (34.1–42.0) *n* = 346	37.5% (33.3–42.0) *n* = 251	33.4% (28.4–38.8) *n* = 151	28.8% (23.8–3 4.4) *n* = 120
West	22.6% (20.6–24.7) (*n* = 761)	22.3% (19.4–25.6) *n* = 245	22.4% (19.0–26.4) *n* = 194	21.2% (17.6–25.4) *n* = 127	24.5% (19.3–30.5) *n* = 99	23.6% (18.7–29.3) *n* = 96
Usual Source of Care						
Yes	96.1% (95.2–96.8) (*n* = 3341)	95.1% (93.1–96.6) *n* = 1029	95.9% (94.0–97.2) *n* = 862	97.1% (95.1–98.2) *n* = 616	96.8% (94.6–98.1) *n* = 418	96.9% (94.3–98.4) *n* = 416
No	3.9% (3.2–4.8) (*n* = 140)	4.9% (3.4–6.9) *n* = 56	4.1% (2.8–6.0) *n* = 36	3.0% (1.8–4.9) *n* = 19	3.2% (1.9–5.4) *n* = 16	*
Perceived Health Status						
Excellent/Very Good/Good	78.2% (76.3–79.9) (*n* = 2763)	81.9% (78.4–85.0) *n* = 899	80.9% (77.9–83.6) *n* = 723	76.3% (72.0–80.1) *n* = 494	73.7% (68.0–78.7) *n* = 330	68.8% (63.1–73.9) *n* = 317
Fair or Poor	21.8% (20.1–23.7) (*n* = 718)	18.1% (15.1–21.6) *n* = 186	19.1% (16.4–22.1) *n* = 175	23.7% (19.9–28.0) *n* = 141	26.3% (21.3–32.0) *n* = 104	31.2% (26.1–36.9) *n* = 112
Functional Status						
Dependency ≥ 1 ADL[d]						
No	92.4% (91.1–93.5) (*n* = 3241)	96.8% (95.4–97.8) *n* = 1046	95.0% (92.9–96.5) *n* = 855	91.2% (88.0–93.6) *n* = 583	89.1% (83.9–92.8) *n* = 397	78.7% (72.7–83.8) *n* = 360
Yes	7.6% (6.5–8.9) (*n* = 240)	3.2% (2.2–4.6) *n* = 39	5.0% (3.5–7.1) *n* = 43	8.8% (6.4–12.0) *n* = 52	10.9% (7.2–16.2) *n* = 37	21.3% (16.3–27.3) *n* = 69
Dependency ≥ 1 IADL[e]						
No	87.1% (85.7–88.4) (*n* = 3013)	94.8% (93.2–96.0) *n* = 1020	89.7% (87.0–91.9) *n* = 804	86.8% (83.5–89.5) *n* = 549	80.2% (75.0–84.5) *n* = 345	66.6% (60.9–71.9) *n* = 295
Yes	12.9% (11.6–14.3) (*n* = 468)	5.2% (4.0–6.8) *n* = 65	10.3% (8.1–13.0) *n* = 94	13.2% (10.5–16.5) *n* = 86	19.8% (15.5–25.0) *n* = 89	33.4% (28.1–39.1) *n* = 134

[a] Unweighted numbers reported

[b] AIAN = American Indian/Alaska Native

[c] Medicare includes Medicare only, Medicare Advantage, and dual eligible (Medicare/Medicaid)

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[d] ADL = Activities of Daily Living

[e] IADL = Instrumental Activities of Daily Living

[*] Estimate suppressed because it did not meet reliability criteria

Data Source: National Health Interview Survey, 2018

Table 3

Time Since Most Recent Mammography in Women 77 Years Old and Older, 2018

Screening Group	Screened ≤ 2 Years Ago Weighted % (95% CI) (*n* = 562)	Screened > 2- ≤ 5 Years Ago Weighted % (95% CI) (*n* = 233)	Screened > 5 Years Ago or Never Screened Weighted % (95% CI) (*n* = 407)	p
Age (years)				
77–79	63.0% (56.6–69.0) (*n* = 214)	18.8% (14.4–24.2) (*n* = 66)	18.2% (13.7–23.9) (*n* = 59)	< **0.001**
80–84	51.1% (45.5–56.6) (*n* = 227)	18.2% (14.2–23.0) (*n* = 81)	30.7% (25.7–36.2) (*n* = 126)	
≥85	26.0% (21.4–31.3) (*n* = 121)	20.8% (16.1–26.4) (*n* = 86)	53.2% (47.4–58.9) (*n* = 222)	
Race				
White	46.1% (42.7–49.6) (*n* = 476)	19.5% (16.7–22.7) (*n* = 196)	34.4% (30.9–38.0) (*n* = 336)	0.346
Black	51.7% (41.8–61.5) (*n* = 61)	15.3% (9.7–23.3) (*n*-22)	33.0% (24.1–43.3) (*n* = 42)	
AIAN[a]	*	*	*	
Asian	*	*	*	
Multiracial	*	*	*	
Ethnicity				
Non-Hispanic Latino	45.9% (42.6–49.3) (*n* = 518)	19.0% (16.3–22.0) (*n* = 215)	35.1% (31.8–38.5) (n = 376)	0.822
Hispanic/Latino	42.9% (33.7–52.6) (*n* = 44)	21.9% (13.3–33.9) (*n* = 18)	35.2% (26.3–45.2) (n = 31)	
Insurance Status				
Any Private	51.5% (46.4–56.6) (*n* = 256)	19.7% (15.9–24.2) (*n* = 98)	28.8% (24.4–33.5) (*n* = 144)	**0.017**
Other Medicare	42.1% (37.7–46.5) (*n* = 265)	18.6% (15.1–22.7) (*n* = 117)	39.3% (34.8–44.1) (*n* = 227)	
Uninsured/Other/Unknown	41.6% (31.5–52.5) (*n* = 41)	21.4% (13.1–32.8) (*n* = 18)	37.0% (27.0–48.3) (*n* = 36)	
Educational Level				
Less than High School	35.9% (29.5–42.8) (*n* = 104)	22.4% (16.6–29.5) (*n* = 52)	41.7% (34.3–49.6) (*n* = 106)	**0.016**
High School/Some College	46.8% (42.3–51.5) (*n* = 294)	16.3% (13.3–19.8) (*n* = 111)	36.9% (32.5–41.6) (*n* = 221)	
College/Associate's Degree	49.2% (40.8–57.6) (*n* = 113)	22.2% (15.6–30.5) (*n* = 49)	21.9% (16.1–36.4) (*n* = 63)	
Advanced Degree	52.9% (40.4–65.0) (*n* = 47)	23.8% (14.1–37.3) (*n* = 19)	23.4% (13.9–36.6) (*n* = 16)	
Region				
Northeast	42.0% (36.0–48.2) (*n* = 102)	19.5% (13.8–26.8) (*n* = 43)	38.5% (31.9–45.6) (*n* = 91)	0.562
Midwest	45.6% (39.3–51.9) (*n* = 145)	22.1% (17.1–28.0) (*n* = 69)	32.4% (26.7–38.6) (*n* = 94)	
South	48.8% (43.3–54.4) (*n* = 204)	18.2% (14.2–23.2) (*n* = 70)	32.9% (27.6–38.7) (*n* = 134)	
West	44.4% (37.5–51.5) (*n* = 111)	17.6% (12.7–23.8) (*n* = 51)	38.1% (31.3–45.3) (*n* = 88)	
Usual Source of Care				

Screening Group	Screened ≤ 2 Years Ago Weighted % (95% CI) (*n* = 562)	Screened > 2- ≤ 5 Years Ago Weighted % (95% CI) (*n* = 233)	Screened > 5 Years Ago or Never Screened Weighted % (95% CI) (*n* = 407)	p
Yes	46.7% (43.5–50.0) (*n* = 556)	19.4% (16.8–22.3) (*n* = 227)	33.9% (30.8–37.2) (*n* = 380)	**< 0.001**
No	*	*	*	
Perceived Health Status				
Excellent/Very Good/Good	48.1% (44.3–52.0) (*n* = 436)	20.4% (17.4–23.8) (*n* = 182)	31.4% (28.0–35.2) (*n* = 288)	**0.010**
Fair or Poor	39.1% (32.8–45.7) (*n* = 126)	16.2% (12.0–21.6) (*n* = 51)	44.7% (37.8–51.8) (*n* = 119)	
Functional Status				
Dependency in ≥ 1 ADL[b]				
No	50.2 (46.8–53.6) (*n* = 535)	18.6 (16.0–21.5) (*n* = 206)	31.2 (28.0–34.6) (*n* = 327)	**< 0.001**
Yes	17.4% (11.3–25.9) (*n* = 27)	23.5% (15.1–34.6) (*n* = 27)	59.1% (48.4–69.0) (*n* = 80)	
Dependency in ≥ 1 IADL[c]				
No	51.2 (47.5–54.9) (*n* = 482)	19.5 (16.6–22.8) (*n* = 182)	29.3 (26.0–33.0) (*n* = 268)	**< 0.001**
Yes	26.7% (21.1–33.1) (*n* = 80)	18.5% (13.5–24.8) (*n* = 51)	54.8% (47.4–62.0) (*n* = 139)	

Boldface indicates statistical significance $p < 0.05$

Percentages shown are weighted percentages. Unweighted numbers reported

*Estimate suppressed because it did not meet reliability criteria

[a]AIAN = American Indian/Alaska Native

[b]ADL = Activities of Daily Living

[c]IADL = Instrumental Activities of Daily Living

Data Source: National Health Interview Survey, 2018