Disparities in Accessing Screening Mammography: Opportunities for Improving Diagnostic Outcomes

Nila Alsheik¹ MD, Zhaohui Su² PhD, Anna Lafontant², Gregory Donadio², Kathleen Troeger³, Scott Pohlman³, Melinda Talley⁴ MD, Vandana Menon² MD, PhD, Emily Conant⁵ MD ¹Advocate Health Care, Park Ridge, IL 60068, ²OM1, Inc., Boston, MA 02199, ³Hologic, Inc., Marlborough, MA 01752, ⁴Sanford Health, Sioux Falls, SD 57104, ⁵University of Pennsylvania Medical Center, Philadelphia, PA 19104



Introduction

Screening mammography is a key component of secondary prevention programs targeting reductions in breast cancer mortality. The early detection of cancers facilitates treatment at a more curable, locoregionally limited stage. We describe characteristics and outcomes of women who had only one screening mammogram versus those who had annual or biennial screens.

Methods

A cloud-based big data platform is being used to integrate and transform data from electronic medical records, radiology management systems, and tumor registries to create a learning health system. This analysis includes data from 229,530 women, aged 40-79 years, who underwent screening mammograms between January 2015 and June 2018, at 64 imaging facilities within 3 large, geographically diverse healthcare organizations. Patients with breast cancer history or implants were excluded. Women were defined as having one screen if they had evidence of only one screen (index screen), and >24 months of follow-up after the screen. Women were defined as having more than one screen if they had 2 or more screens that were at least 9 months apart between the first two screens. For women with more than one screen, the second screen was the index screen. Patient characteristics and interval cancer outcomes were based on the index screens for both screen modalities. Recall rate was defined as the proportion of BIRADS 0 over BIRADS 0, 1, 2, 3, 4 and 5 exams. Interval cancer was defined as a breast cancer in the 12 months following the negative index screen (BIRADS 1 and 2). The Wilcoxon rank sum test and Chi-square test were used to test for differences between cohorts.

Results

Of 229,530 women, 19.1% (n=43,771) met criteria for one screen (1-screen) and 80.9% (n=185,759) for two screens (2-screens) [Table 1]. There were significant differences between the groups in age (39.9% 60-79 years in the 1-screen cohort vs 49.1% in 2-screens, p<0.001) [Figure 1], race (25.9% African American and 5.6% Asian in the 1-screen cohort and 18.4% and 3.6% in 2-screens, p<0.001) [Figure 2], and lifetime risk of breast cancer (6.8% in the elevated risk category in the 1-screen cohort and 9.3% in 2-screens, p<0.001) [Figure 3]. Recall rate for the 1-screen cohort was 16.8% compared to 7.6% for the second screen for the 2-screens (p<0.001) [Figure 4]. The interval cancer rate was significantly higher (p<0.001) for the 1-screen cohort (2.80 per 1000 women) as compared to the second screen for the 2-screens (0.78 per 1000 women) [Figure 5].

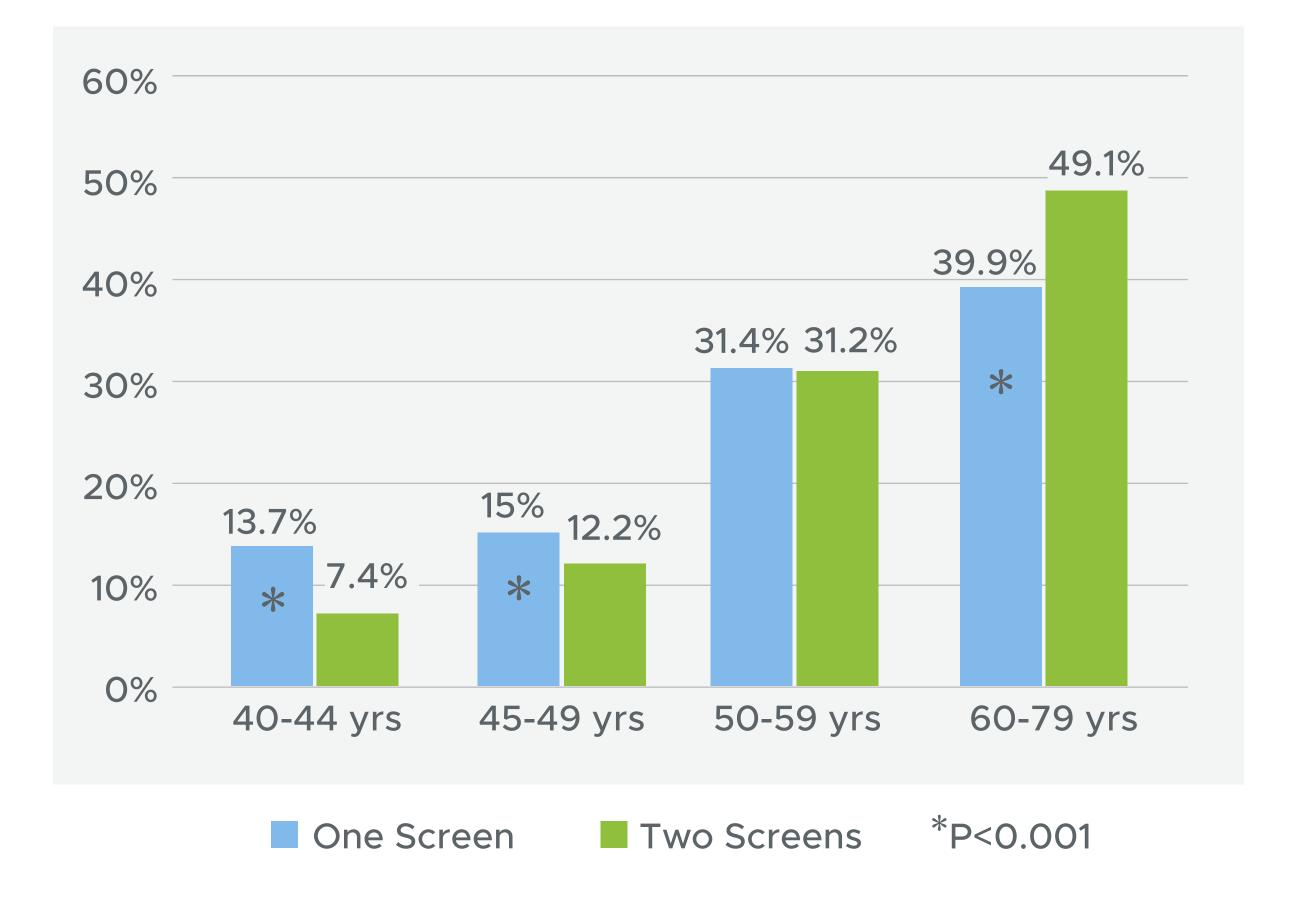
Table 1. Baseline characteristics by screening frequency

		Screening Frequency		
		One screen (N=43,771)	Two screens (N=185,759)	P-Value
Age (Years)	Mean (s.d.) Median (Q1-Q3)	57.3 (10.9) 56 (48-65)	59.3 (9.9) 59 (52-67)	<.001*
Age Categories	40-44 ▲ 45-49 ▲ 50-59 60-79 ▲	5,998 (13.7%) 6,576 (15.0%) 13,751 (31.4%) 17,446 (39.9%)	13,716 (7.4%) 22,746 (12.2%) 58,005 (31.2%) 91,292 (49.1%)	<.001**
Race Categories	African American ▲ Asian ▲ Caucasian ▲ Other ▲ Unknown	10,387 (25.9%) 2,226 (5.6%) 24,365 (60.8%) 3,121 (7.8%) 3,672	32,823 (18.4%) 6,379 (3.6%) 131,743 (73.9%) 7,438 (4.2%) 7,376	<.001**
Hispanic Ethnicity	Yes No Unknown	708 (6.7%) 9,819 (93.3%) 33,244	7,937 (5.8%) 128,912 (94.2%) 48,910	<.001**
Menopause Status	Post-menopause Pre-menopause Unknown	25,966 (90.8%) 2,637 (9.2%) 15,168	115,760 (79.0%) 30,751 (21.0%) 39,248	<.001**
Breast Density	Almost entirely fatty Scattered fibroglandular densities Heterogeneously dense Extremely dense Unknown	3,828 (8.8%) 19,820 (45.3%) 17,588 (40.2%) 2,493 (5.7%) 42	11,719 (6.3%) 89,489 (48.2%) 72,023 (38.8%) 12,298 (6.6%) 230	<.001**
Risk Categories [Gail or Tyrer- Cuzick]	Elevated Low Unknown	2,466 (6.8%) 33,822 (93.2%) 7,483	11,045 (9.3%) 107,766 (90.7%) 66,948	<.001**
Recall	Yes No	7,342 (16.8%) 36,429 (83.2%)	14,174 (7.6%) 171,585 (92.4%)	<.001**
Site	AHC UPMC Sanford	36,180 (82.7%) 1,550 (3.5%) 6,041 (13.8%)	110,753 (59.6%) 44,715 (24.1%) 30,291 (16.3%)	<.001**



^{**} Chi-Square Test

Figure 1. Age distribution by screening frequency



American

60.8%

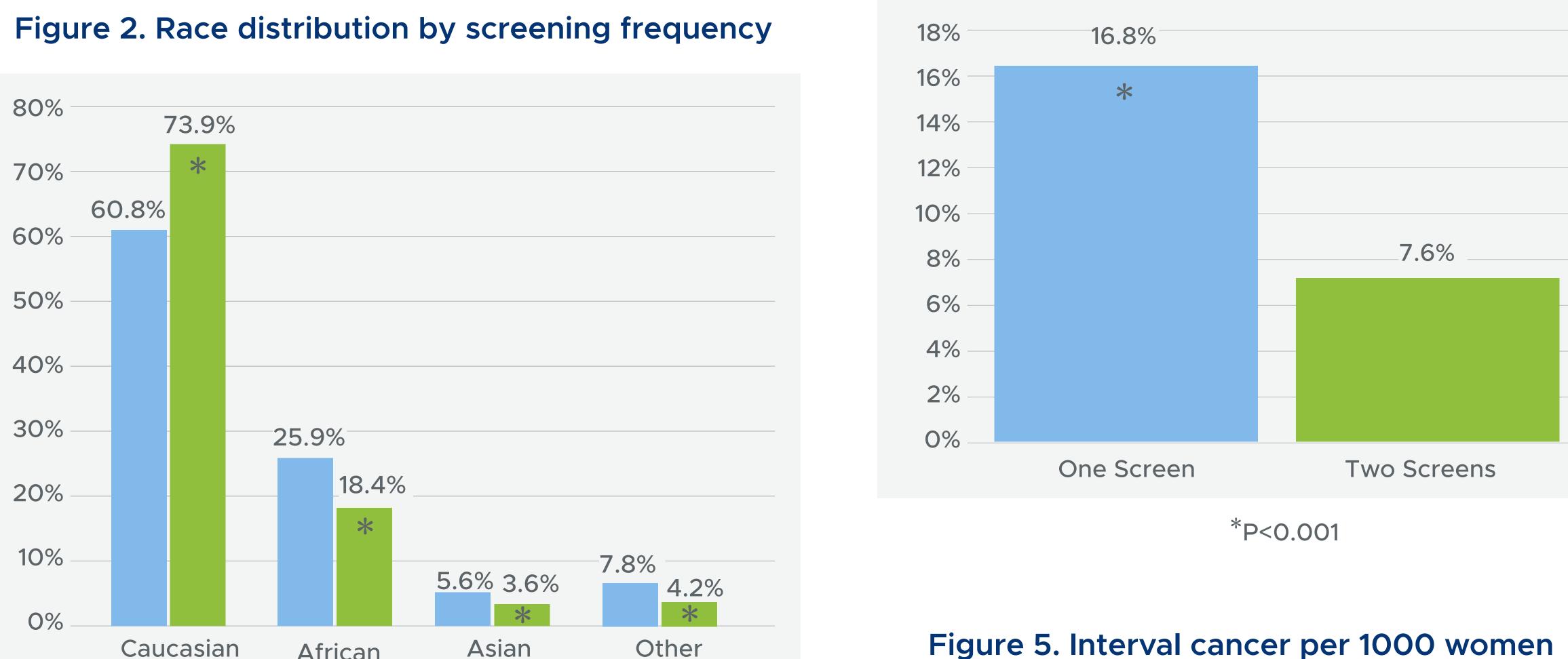
40%

30%

20% -

10% -

Figure 4. Recall rate by screening frequency



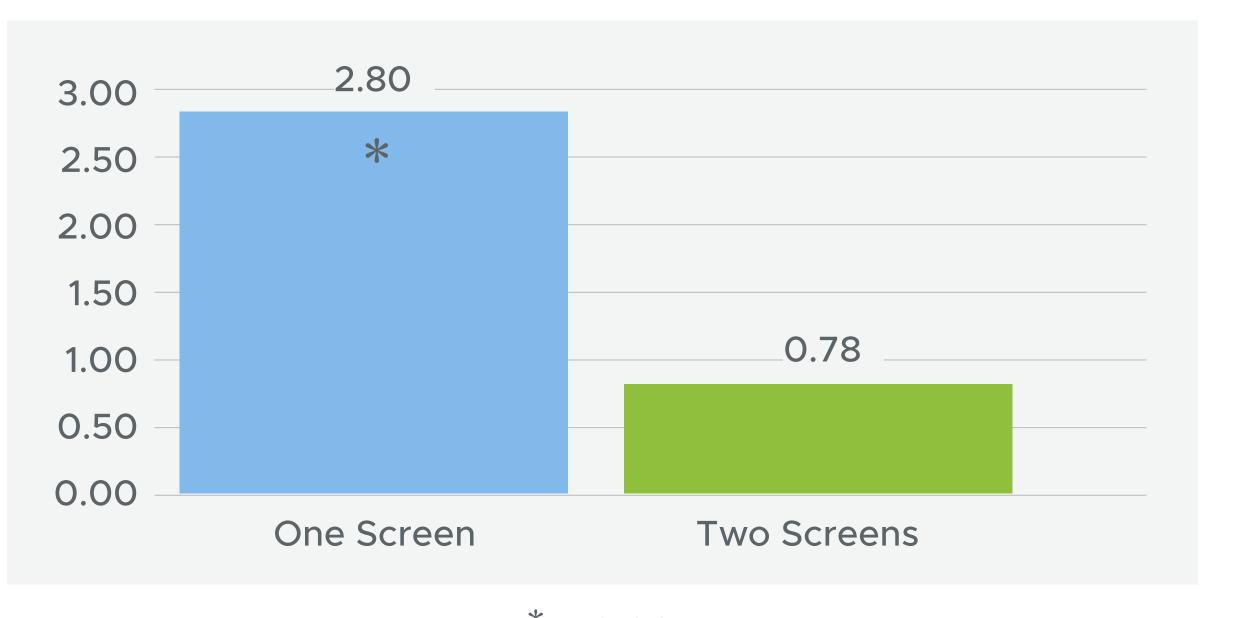
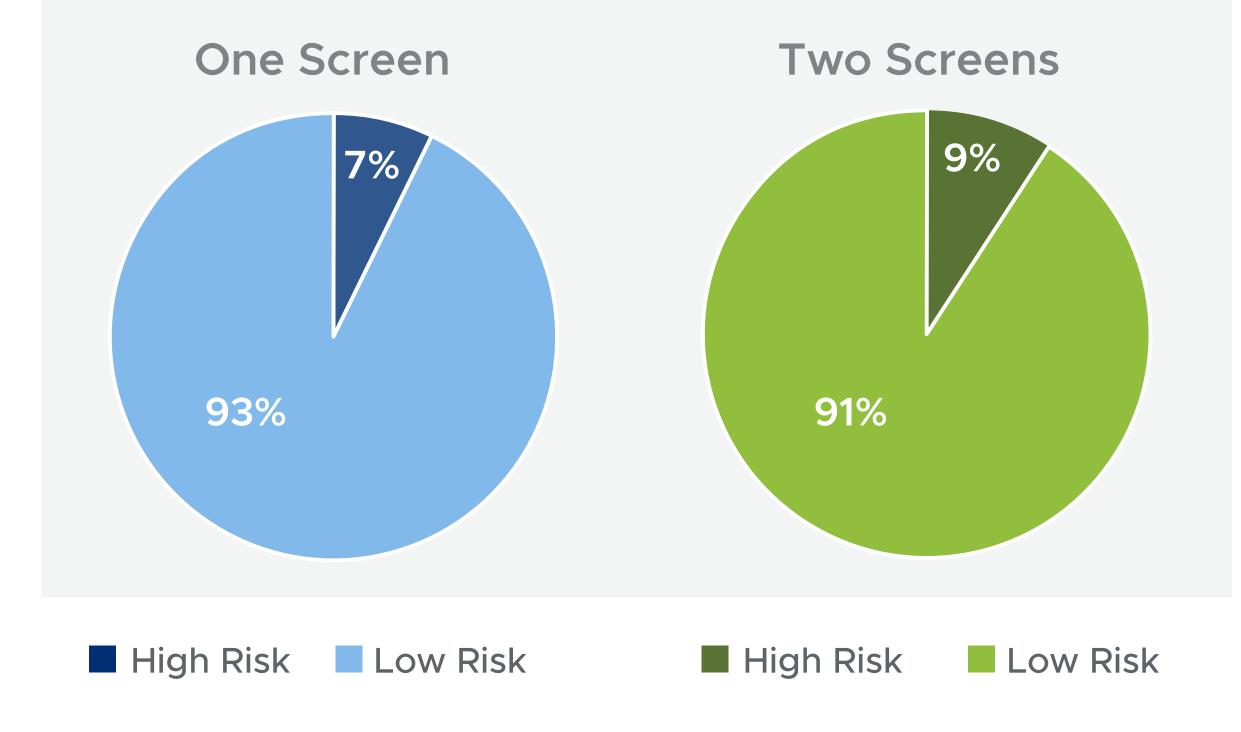
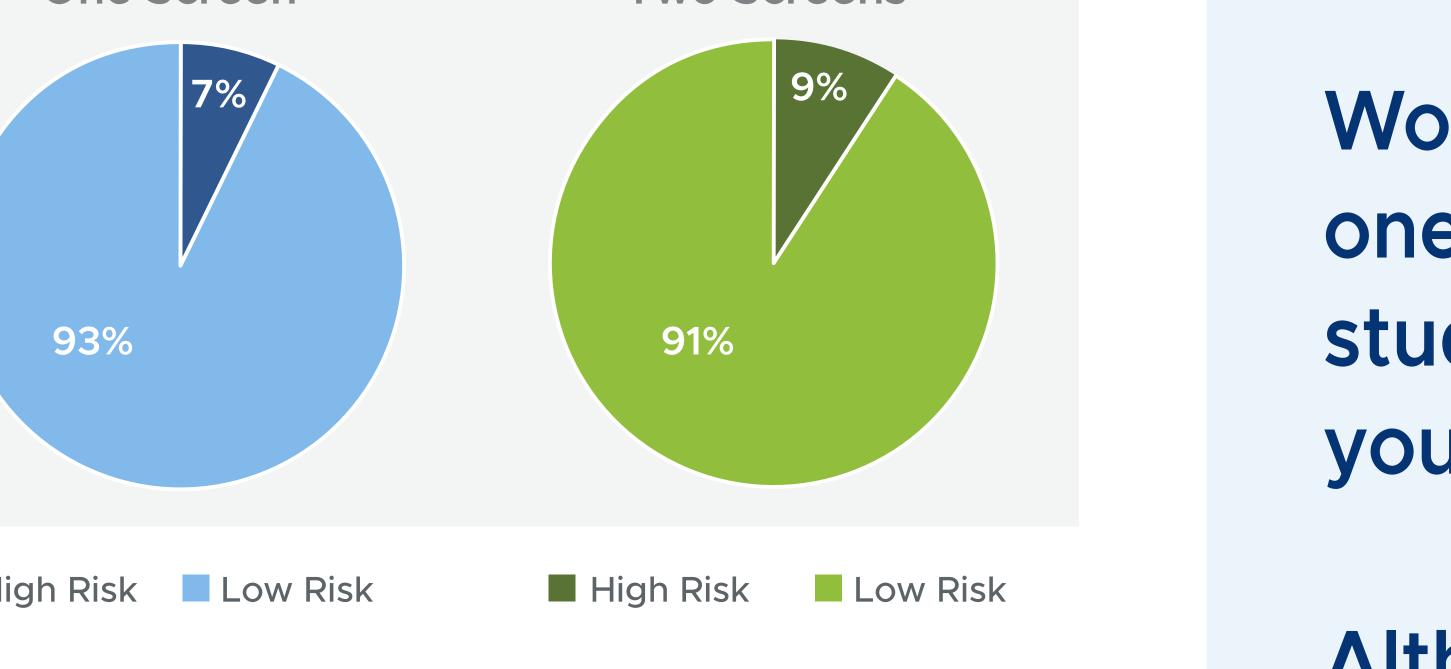
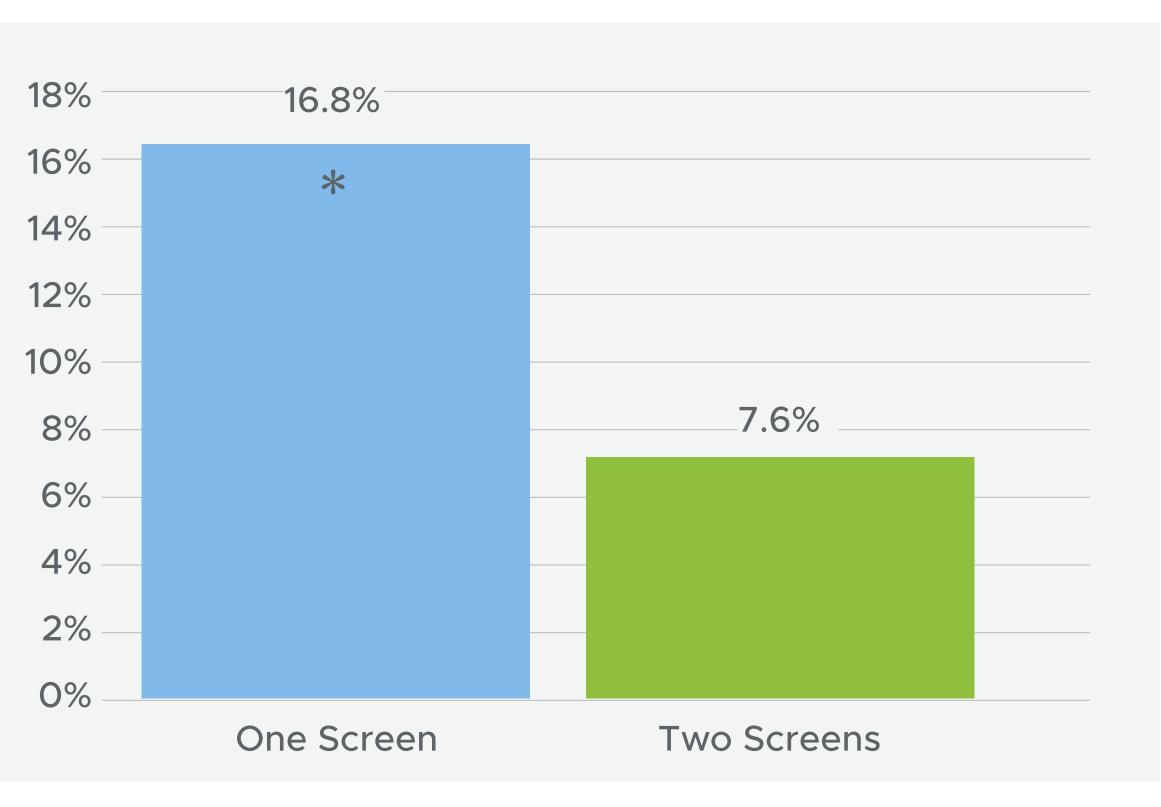


Figure 3. Lifetime risk of breast cancer by screening







Conclusions

Women with evidence of only one screen during the 3.5-year study period tended to be younger and non-White.

Although having lower scores for lifetime risk of breast cancer, recall rates were 2-fold higher and interval cancer rates were 3-fold higher in the one screen cohort.

Targeted initiatives are needed to improve adherence to screening in women at risk of noncompliance.

[▲] Statistically Significant at P-value<0.001