

## Preplanned Studies

## Breast Cancer Screening Rates Among Women Aged 20 Years and Above — China, 2015

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### Summary

#### What is already known about this topic?

Breast cancer is the most common cancer in women in China and around the world. By 2019, 121 countries have instituted a national screening program as a secondary prevention measure for breast cancer.

#### What is added by this report?

Breast cancer screening rates in China were 18.9% in women aged 20 years and above, and 25.7% in women aged 35–64 years in 2015. The screening rate for women aged 20 years and above was significantly higher in urban areas than in rural areas (24.6% *vs.* 15.0%), and in the eastern region than in the central and western regions (24.0% *vs.* 15.1% and 15.3%).

#### What are the implications for public health practice?

Continued efforts should be made to strengthen national and local policy initiatives and financial support for population-based, organized screening programs for breast cancer. Health education and accessibility of screening services to women across the country should be strengthened, especially for women aged 50 years and above.

Breast cancer is the most common cancer in women in China and around the world. Age-standardized incidence and mortality by Chinese standard population were 31.54/100,000 population and 6.67/100,000, respectively, in China in 2015 (1). The breast cancer screening rate in China reached 21.7% in women aged 18 years and above in 2010 (2) and 22.5% in women aged 35–64 years in 2013 (3). To understand the latest screening coverage in China, this study estimated screening rates in 2015 based on nationally and provincially-representative survey data, and Rao Scott chi-squared tests and logistic regression models were conducted to analyze key demographic and geographic factors. This study showed improving but still low levels of breast cancer screening coverage

of women in China. Continued efforts should be made to strengthen national and local policy initiatives and financial support for population-based, organized screening programs for breast cancer. Health education and accessibility of screening services to women across the country should be strengthened, especially to women aged 50 years and above.

In 2020, breast cancer age-standardized incidence rates by world standard population ranged from 30/100,000 in East Africa to above 95/100,000 in Australia and New Zealand (4). Since the 1990s, breast cancer mortality notably declined in the developed world, which according to evidence of randomized controlled trials was largely due to breast cancer screening, though the actual amount of reduction attributable to screening was subject to controversy (5). By 2019, 121 countries have instituted a national screening program as a secondary prevention measure for breast cancer (6). To reduce the burden of breast cancer, China launched a national breast cancer screening program for rural female residents aged 35–59 years old in 2009 (extended to 35–64 years after 2012), as well as for urban female residents aged 40–69 years old in 2012 (later changed to 45–74 years after 2016) (7).

This study estimated the latest breast cancer screening rates in China based on nationally and provincially representative survey data. The survey was conducted in 2015 using a multistage, cluster-randomized sampling method. Female respondents aged 18 years and above were randomly selected from 298 districts/counties that were randomly selected from over 2,400 districts/counties across 31 provincial-level administration divisions (PLADs). Respondents answered a set of questionnaires on chronic diseases and related behaviors, which were recorded by trained professionals from the local CDCs (8). With regard to breast cancer screening, all participants were asked whether they have ever had breast cancer screening, the time of the most recent screening, and the method of

screening.

In 2015, of 88,250 households sampled, 100,543 female participants completed the survey from August to December, which yielded a 95.4% response rate. Several participants who did not meet criteria were excluded including 612 female participants who were less than 20 years, 7,902 participants who were unclear whether they have been screened, and 3,150 participants with missing data. The study was approved by the Ethical Committee of the National Center for Chronic and Non-Communicable Disease Control and Prevention, China CDC. All participants provided written informed consent.

Weighting was applied to all statistical analyses for both national and regional-specific estimates and the weighted proportion was reported. Chi-squared tests and logistic regression models were used to examine differences in unordered categorical variables and trends in ordered categorical variables, respectively. Taylor linearization methods with a finite population correction were used to estimate standard errors (SE). Statistical significance was determined as a two-sided  $p < 0.05$ . All statistical analyses used SAS (version 9.4, SAS Institute Inc., Cary, USA).

The final sample of 88,879 female participants aged 20 years and above were 51.4 years of mean age, 59.0% from rural areas, and 41.3% with primary school or less education (Table 1).

The national breast cancer screening rate was 18.9% in women aged 20 years and above, and 25.7% in women aged 35–64 years. For women aged 20 years and above, the urban screening rate was significantly higher than the rural screening rate (24.6% vs. 15.0%,  $p < 0.0001$ ). The eastern region showed a significantly higher screening rate than the central and western regions (24.0% vs. 15.1% and 15.3%,  $p < 0.0001$ ). The 40–49 age group had the highest screening rate (29.2%), whereas the 60–69 age group (12.3%) and the 70 years and above age group (5.0%) had much lower screening rates. Overall, 16.7% of women aged 20 years and above were screened within the past 2 years (Table 2). Moreover, 55.1% of women were screened by ultrasound, 14.5% by X-ray, 12.8% by only clinical examination, while 15.0% of women were unaware of their screening method.

Women with college or above education and with high school education (28.0% and 24.7%, respectively) had significantly higher screening rates than women with lower education levels ( $p < 0.0001$ ). Women with higher income showed significantly higher screening

TABLE 1. Sociodemographic characteristics of female participants aged 20 years and above — China, 2015.

Characteristics	No. of participants (N=88,879)	Weighted proportion (%) (95% CI)*
Age (years)		
20–29	8,121	23.5 (22.5–24.5)
30–39	11,438	21.1 (20.3–21.9)
40–49	20,519	22.6 (22.0–23.2)
50–59	21,888	15.5 (15.0–16.1)
60–69	18,765	9.6 (9.1–10.1)
70 and above	8,148	7.7 (6.9–8.5)
Area type		
Urban	38,829	41.0 (35.3–46.6)
Rural	50,050	59.0 (53.4–64.7)
Region		
East	33,603	42.5 (38.6–46.5)
Central	25,669	32.2 (28.5–35.9)
West	29,607	25.2 (22.5–28.0)
Education		
Primary or less	49,062	41.3 (39.0–43.5)
Junior high	23,615	30.0 (28.7–31.3)
Senior high	9,688	14.2 (13.0–15.3)
College or above	6,514	14.5 (12.7–16.3)
Household income per capita (CNY)		
Q1 (<7,200)	14,572	12.5 (11.4–13.7)
Q2 (7,200–14,999)	15,480	15.6 (14.5–16.7)
Q3 (15,000–24,999)	19,233	21.3 (20.3–22.3)
Q4 (25,000 and above)	24,168	32.5 (30.2–34.9)
Don't know/refused	15,426	18.0 (16.5–19.6)
Employment status		
Employed	57,792	67.1 (65.0–69.2)
Housework	18,927	19.8 (18.0–21.7)
Retired	7,961	5.7 (4.7–6.6)
Unemployed	4,199	7.4 (6.6–8.1)
Health insurance coverage		
No	2,476	4.1 (3.7–4.6)
Yes	86,403	95.9 (95.4–96.4)
Health examination in the past 3 years		
No	52,565	59.6 (57.6–61.5)
Yes	36,314	40.4 (38.5–42.4)
Self-assessed health status		
Poor or fair	53,296	55.4 (54.0–56.8)
Good	35,583	44.6 (43.2–46.0)

\* Proportions are weighted to represent the national total population with poststratification for age gender, and urban/rural residence.

TABLE 2. Breast cancer screening rates among Chinese women aged 20 years and above by sociodemographic factors — China, 2015\*

Item	Ever screened (%) (95%CI)			Rural	p-value	Screened in 1 year (%) (95% CI)	Screened in 2 years (%) (95% CI)	Screened in 3 years (%) (95% CI)
	Total	Urban	Rural					
Total	18.9 (17.5–20.4)	24.6 (22.3–26.8)	15.0 (13.2–16.9)	<0.0001	14.2 (13.0–15.4)	16.7 (15.4–18.0)	17.5 (16.1–18.8)	
Age (years)								
20–29	8.5 (7.3–9.7)	10.6 (8.8–12.5)	6.9 (5.4–8.3)	0.0019	7.0 (6.0–8.0)	8.1 (6.9–9.2)	8.2 (7.1–9.4)	
30–39	25.3 (23.0–27.6)	32.0 (28.3–35.7)	20.0 (17.4–22.5)	<0.0001	20.1 (18.2–21.9)	22.8 (20.9–24.8)	23.8 (21.8–25.8)	
40–49	29.2 (26.9–31.6)	38.1 (34.6–41.7)	23.6 (20.6–26.6)	<0.0001	22.3 (20.3–24.4)	26.3 (24.0–28.5)	27.4 (25.1–29.6)	
50–59	22.2 (20.4–24.0)	28.5 (25.9–31.1)	18.1 (15.4–20.9)	<0.0001	14.9 (13.6–16.2)	18.4 (16.7–20.0)	19.7 (17.9–21.5)	
60–69	12.3 (11.0–13.5)	17.8 (15.5–20.1)	8.8 (7.4–10.3)	<0.0001	7.5 (6.5–8.5)	9.3 (8.2–10.3)	10.1 (9.0–11.2)	
70 and above	5.0 (4.1–6.0)	8.9 (7.1–10.8)	2.5 (1.6–3.3)	<0.0001	3.4 (2.7–4.2)	3.9 (3.1–4.7)	4.2 (3.4–5.0)	
p-value for trend	0.5242	0.1591	0.0890		<0.0001	0.0025	0.0193	
Geographic Region								
East	24.0 (22.0–26.1)	29.7 (26.8–32.7)	18.4 (15.3–21.5)	<0.0001	18.6 (16.8–20.4)	21.7 (19.7–23.6)	22.5 (20.6–24.5)	
Central	15.1 (12.6–17.7)	20.2 (16.9–23.5)	12.9 (9.6–16.2)	0.0047	11.1 (9.3–12.9)	13.1 (10.9–15.3)	13.8 (11.5–16.1)	
West	15.3 (13.2–17.3)	17.9 (14.3–21.5)	13.5 (10.7–16.3)	0.0865	10.9 (9.1–12.6)	12.9 (10.9–14.9)	13.7 (11.7–15.8)	
p-value for difference	<0.0001	<0.0001	0.0295		<0.0001	<0.0001	<0.0001	
Education								
Primary or less	13.2 (11.7–14.7)	14.7 (12.3–17.1)	12.7 (10.9–14.6)	0.2483	9.4 (8.3–10.5)	11.1 (9.8–12.5)	11.8 (10.5–13.2)	
Junior high	19.7 (17.7–21.8)	25.1 (21.6–28.6)	16.8 (14.2–19.4)	<0.0001	14.3 (12.6–15.9)	17.2 (15.3–19.1)	18.0 (16.1–20.0)	
Senior high	24.7 (22.6–26.7)	28.4 (25.5–31.2)	19.3 (16.3–22.2)	<0.0001	18.7 (16.4–20.9)	21.8 (19.7–24.0)	22.8 (20.6–24.9)	
College or above	28.0 (25.4–30.6)	30.4 (27.2–33.7)	19.4 (15.8–22.9)	<0.0001	23.4 (21.0–25.8)	26.5 (23.8–29.1)	27.3 (24.6–30.0)	
p-value for trend	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	
Household income per capita (CNY)								
Q1 (<7,200)	10.5 (9.0–12.1)	13.1 (10.4–15.7)	9.8 (7.9–11.8)	0.0922	7.4 (6.4–8.5)	8.9 (7.7–10.0)	9.5 (8.3–10.7)	
Q2 (7,200–14,999)	14.0 (12.6–15.4)	14.5 (12.1–17.0)	13.8 (12.0–15.6)	0.2316	11.0 (9.8–12.1)	13.1 (11.8–14.4)	13.8 (12.5–15.2)	
Q3 (15,000–24,999)	18.5 (16.8–20.2)	21.9 (18.6–25.1)	16.4 (14.3–18.4)	0.0007	14.3 (12.9–15.7)	17.1 (15.6–18.5)	18.1 (16.5–19.7)	
Q4 (25,000 and above)	26.9 (25.2–28.6)	30.3 (28.1–32.5)	21.7 (18.6–24.9)	0.0002	22.2 (20.5–23.8)	25.5 (23.7–27.3)	26.5 (24.7–28.3)	
Don't know/refused to answer	15.3 (13.2–17.3)	22.1 (18.6–25.5)	11.7 (9.4–14.0)	<0.0001	11.4 (9.8–12.9)	13.5 (11.7–15.3)	13.9 (12.1–15.7)	
p-value for trend †	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	

TABLE 2. (Continued)

Item	Ever screened (%) (95%CI)			p-value	Screened in 1 year (%) (95% CI)	Screened in 2 years (%) (95% CI)	Screened in 3 years (%) (95% CI)
	Total	Urban	Rural				
Employment status							
Employed	20.7 (19.1–22.3)	27.0 (24.4–29.6)	16.6 (14.7–18.5)	<0.0001	16.0 (14.7–17.3)	18.6 (17.1–20.0)	19.3 (17.9–20.8)
Housework	13.6 (11.5–15.6)	17.4 (14.4–20.5)	11.9 (9.2–14.6)	0.0161	9.8 (8.3–11.3)	11.6 (9.8–13.4)	12.2 (10.3–14.1)
Retired	26.9 (24.2–29.6)	27.4 (24.5–30.3)	22.8 (15.3–30.2)	0.3039	16.7 (14.1–19.2)	21.0 (18.4–23.5)	22.7 (20.2–25.3)
Unemployed	11.4 (8.4–14.4)	14.7 (10.3–19.0)	8.2 (4.5–11.9)	0.0350	8.4 (5.7–11.1)	10.2 (7.2–13.2)	10.7 (7.7–13.6)
p-value for difference	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001
With health insurance coverage							
No	8.5 (6.8–10.2)	9.1 (7.0–11.3)	7.4 (4.5–10.3)	0.3808	6.8 (5.1–8.4)	7.7 (6.0–9.4)	8.1 (6.4–9.8)
Yes	19.4 (17.9–20.9)	25.6 (23.3–28.0)	15.2 (13.4–17.1)	<0.0001	14.5 (13.3–15.7)	17.1 (15.7–18.4)	17.9 (16.5–19.3)
p-value for difference	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001
Health examination in past 3 years							
No	10.8 (9.6–12.0)	12.3 (9.9–14.8)	10.1 (8.8–11.4)	0.1153	7.4 (6.3–8.5)	8.9 (7.8–10.1)	9.4 (8.3–10.6)
Yes	31.0 (29.1–32.9)	35.3 (32.9–37.7)	25.9 (22.7–29.0)	<0.0001	24.3 (22.7–25.9)	28.1 (26.3–29.9)	29.4 (27.5–31.2)
p-value for difference	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001
Self-assessed health status							
Poor or fair	19.8 (18.3–21.3)	25.9 (23.6–28.1)	15.8 (13.8–17.7)	<0.0001	14.4 (13.2–15.7)	17.1 (15.7–18.4)	18.0 (16.6–19.4)
Good	17.9 (16.3–19.4)	23.0 (20.5–25.6)	14.1 (12.0–16.2)	<0.0001	14.0 (12.6–15.3)	16.2 (14.7–17.8)	16.9 (15.3–18.4)
p-value for difference	0.0018	<0.0001	0.0340		0.3733	0.1496	0.0633

\* Screening rates were all weighted proportions.

† Participants answering “don't know/refused to answer” were not included in the trend test.

participation despite the fact that 15% of the participants did not reveal their income level. Retired women (26.9%) had a significantly higher screening rate than employed women, women doing housework, and unemployed women ( $p < 0.0001$ ).

Women with health insurance had significantly higher screening participation than women without health insurance (19.4% vs. 8.5%,  $p < 0.0001$ ). Women with health check-ups in the past 3 years had significantly higher screening rates than women

without health check-ups (31.0% vs. 10.8%,  $p < 0.0001$ ). Women with self-assessed poor or fair health status had statistically significantly higher screening rates than women with self-assessed good health status (19.8% vs. 17.9%,  $p = 0.0018$ ).

Provincial data revealed disparities in screening rates across the 31 PLADs. The screening rates in Beijing and Shanghai exceeded 40%, whereas Xizang (Tibet), Anhui, and Hebei had the lowest screening rates of less than 10% (Figure 1).

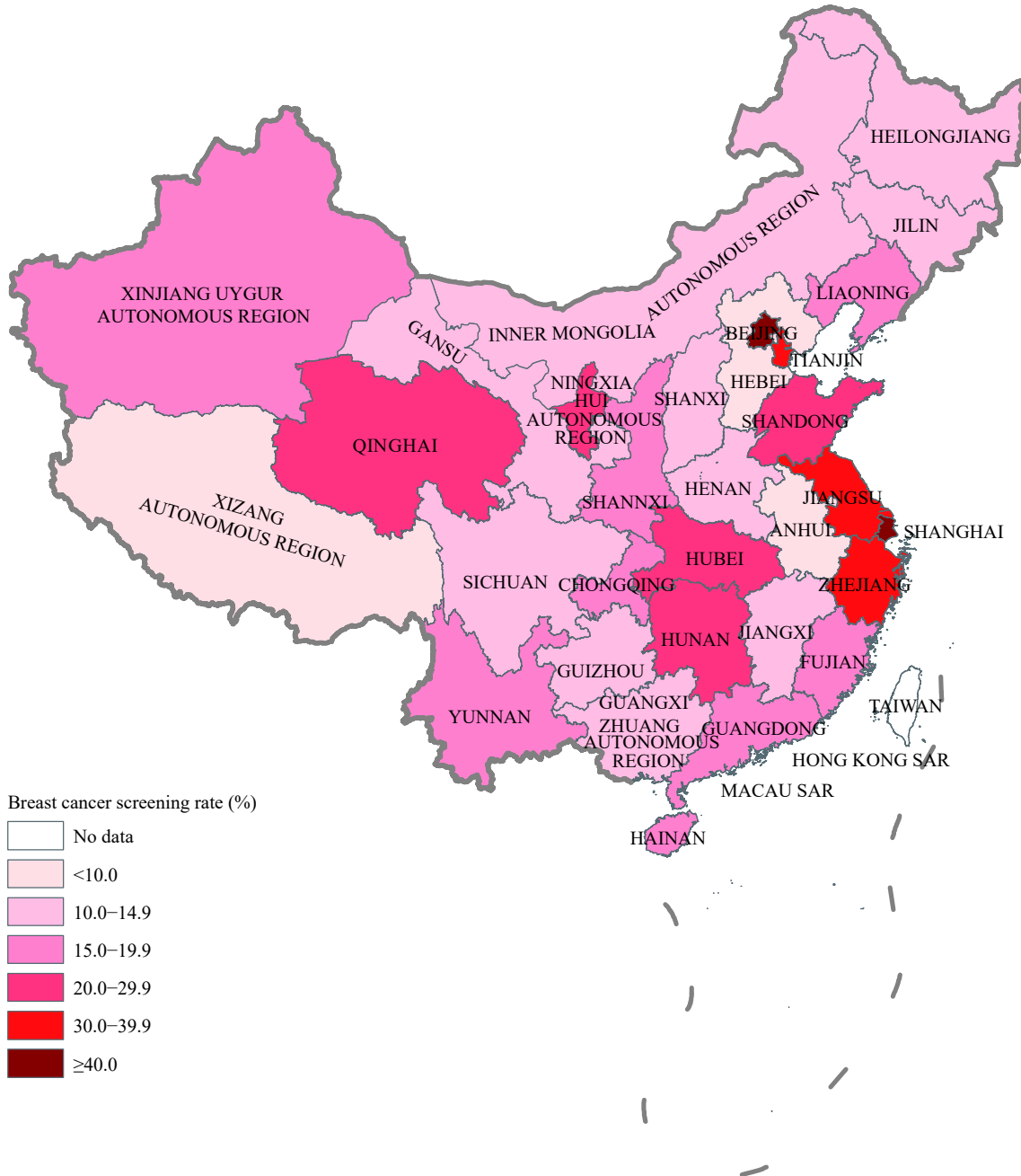


FIGURE 1. Breast cancer screening rates among Chinese women aged 20 years and above at the provincial level in China, 2015.

## DISCUSSION

This study showed that breast cancer screening rates in China in 2015 reached 18.9% and 25.7% for women aged 20 years and above and women aged 35–64 years, respectively. While the screening uptake for all adult women declined about 3% from 2010 to 2015 (2), the screening rate for women aged 35–64 years increased about 3% from 2013 to 2015 (3), which indicated positive influence of the national breast cancer screening program. Nevertheless, screening uptake remained low compared to screening rates of above 50% in developed countries (6). Continued efforts should be made to strengthen breast cancer screening uptake in China.

This study found that the group aged 30–49 years had the highest screening rates, whereas the 60 years and above age groups had ever screening rates of lower than 15% and screening in the past two years lower than 10%. Such age distribution of screening peaked earlier than recommended. While most international breast cancer screening guidelines recommended biennial screening for the 50–74 years age group, the latest guidelines released in 2019 in China based on Chinese women's risk profile recommended biennial screening for the 45–69 years age group of common risk, as well as for women aged 40–44 years and women aged 69 years and above with more than 10 years of life expectancy of common risk upon individual will, whereas women under 40 years old were not recommended for regular screening (9).

This study also found that the rural areas and the central and western regions still lagged far behind the urban areas and the eastern region in breast cancer screening uptake, despite national free provision of screening services to women in rural areas. In addition, women with lower education and lower income levels had significantly lower screening participation. These findings were consistent with existing literature that individual and area socioeconomic status (SES) were positively associated with cancer screening participation (10). Moreover, the results revealed that participation in breast cancer screening was significantly lower than cervical cancer screening (8) upon free screening services. The results highlighted the importance to identify barriers to breast cancer screening, such as embarrassment, as well as the importance of strengthening health education for low SES groups to improve breast cancer screening participation.

This study further found that health insurance was

positively associated with screening uptake, which echoes existing literature that health insurance coverage improves access to cancer screening.

This study was subject to some limitations. The absence of some data due to lack of subpar attendance limited the conclusions of the analysis. Moreover, this study was limited by response bias as 7.8% of the initial respondents were excluded from the final analysis, who were unclear of their screening history and were slightly older, more rural, and less educated than the final sample. Assuming that these respondents were all unscreened, it would lower final screening rates by about 1%–2%, which would not change the conclusion. Recall bias may also occur as the respondents might incorrectly recall their screening history.

In conclusion, this study provides the largest nationwide and population-based self-reported history of breast cancer screening in China in 2015. Nearly one-fifth of Chinese women ever had breast cancer screening. Continued efforts should be made to strengthen national and local policy initiatives and financial support for population-based, organized screening programs for breast cancer, and strengthen health education and accessibility of screening services to women across the country, especially women aged 50 years and above.

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