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A National Quality Improvement Study Identifying and Addressing Cancer Screening Deficits Due To the COVID-19 Pandemic

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Abstract

BACKGROUND: Cancer-related deaths over the next decade are expected to increase due to cancer screening deficits associated with the COVID-19 pandemic. While national deficits have been quantified, structured response to identifying and addressing local deficits has not been widely available. Our objectives are to share preliminary data on monthly screening deficits in breast, colorectal, lung, and cervical cancers across diverse settings and provide online materials from a national quality improvement (QI) study to help other institutions address local screening deficits.

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METHODS: This prospective national QI study on Return-to-Screening enrolled 748 accredited cancer programs in the US from April through June 2021. Local pre-pandemic and during-pandemic monthly screening test volumes (MTV) were used to calculate relative percent change in MTV to describe monthly screening gap.

RESULTS: The majority of facilities reported monthly screening deficits (colorectal, 80.6% (n=104/129); cervical, 69.0% (n=20/29); breast, 55.3% (n=241/436); lung, 44.6% (n=98/220)). Overall, the median relative percent change in MTV ranged from −17.7% (IQR, −33.6% to −2.8%) in colorectal, −6.8% (IQR, −29.4% to 1.7%) in cervical, −1.6% (IQR, −9.6% to 7.0%) in breast, and 1.2% (IQR, −16.9% to 19.0%) in lung. Geographic differences were not observed. There was statistically significant differences in percent change in MTV between institution types for colorectal cancer screening (p=.02).

CONCLUSION: Cancer screening is still in need of urgent attention and the screening resources made available online may help facilities close critical gaps and address 2020 missed screenings.

Precis

A national Return-to-Screening quality improvement study including 748 cancer facilities found that the majority have local screening deficits due to the COVID-19 pandemic, most notably in colorectal cancer. Cancer screening is still in need of urgent attention and the screening resources made available online may help close critical gaps and address 2020 missed screenings.

Keywords

Cancer screening and prevention; Quality Improvement; COVID-19 pandemic; Screening deficits; Breast cancer screening; Colorectal cancer screening; Lung cancer screening; Cervical cancer screening; Screening disparities

INTRODUCTION

The COVID-19 pandemic abruptly and markedly disrupted health care, causing swift diversion of resources and delays of nonessential services, including cancer screening. There have been an estimated 9.4 million missed cancer screening tests across the United States in 2020 alone.[1] Additionally, the director of the National Cancer Institute projected that there may be 10 000 additional cancer deaths from breast and colorectal cancers due to screening that went missed during the pandemic.[2] The American Cancer Society (ACS) recognized early the seriousness of the cancer risk and launched a national “Get Screened” campaign complete with ACS Guidelines and Toolkits on cancer screening during the COVID-19 pandemic.[3] The American College of Surgeons (College) Cancer Programs joined this effort and collaboratively developed a Return-to-Screening Plan-Do-Study-Act study[4] to offer to all cancer facilities accredited by the Commission on Cancer (CoC) or the National Accreditation Program of Breast Centers (NAPBC) of the College Cancer Programs. The objective of this report is to share preliminary results and the online materials from this national quality improvement (QI) study to help other institutions identify and address local screening deficits.

METHODS

This is a national quality improvement study to promote and increase cancer screening using various evidence-based interventions recommended by the Community Preventive Services Task Force (e.g., patient reminders, provider assessment, reduce structural barriers).[5] An invitation to participate was issued from April 8th 2021 through June 1st 2021 to all 1 456 CoC- and 582 NAPBC-accredited facilities that treat nearly 70 percent of recently diagnosed U.S. cancer patients annually. Accredited facilities are categorized based on the type of facility, program structure, services provided, and yearly patient case volume.[6,7] Per the CoC definition, an academic facility is defined as an institution that must have more than 500 newly diagnosed cancer cases per year and are associated either with a National Cancer Institute-designated comprehensive cancer center or provide postgraduate medical education. Comprehensive Community Cancer Program have more than 500 newly diagnosed cancer cases per year, while Community Cancer Program have 100 to 500 newly diagnosed cancer cases per year. An Integrated Network Cancer Program is a network of multiple facilities providing integrated cancer care, with at least one facility being a hospital and a CoC-accredited cancer program. NAPBC-accredited breast centers must meet compliance with set standards and provide comprehensive breast cancer care. All other programs without minimum caseload requirements (Free Standing Cancer Center Program, Hospital Associate Cancer Program, and Veterans Affairs Cancer Program) are categorized as “Other Program”.

The Plan-Do-Study-Act (PDSA) method is widely accepted and utilized in healthcare quality improvement.[8] The details and steps of the Return-to-Screening PDSA protocol and a full list of screening interventions are attached (Supplementary Material). In brief, facilities were instructed to participate in one or multiple independent QI projects in breast, colon, lung, and cervical cancer screening. QI teams involving key stakeholders were assembled for each projects at each facilities. Monthly screening test volume (MTV), which is an absolute count measure of the number of screening tests performed per month, were collected for each project. Each facility specified which screening test(s) were measured from a list of recommended screening tests for each disease site (Table 1). Pre-pandemic and during-pandemic MTV were compared by using the average of the number of screening tests performed in September 2019 and January 2020, and September 2020 and January 2021, respectively. These months were pre-selected to represent two different seasons after the start of the COVID-19 pandemic in the U.S. that did not include the initial months of the pandemic with facility closures and recommendations to refrain from non-essential healthcare. Relative percent change in MTV = [100 x ($MTV_{pandemic} - MTV_{pre\text{-}pandemic}$) / $MTV_{pre\text{-}pandemic}$] was calculated for each project to describe differences in monthly screening between the two time periods. Screening deficit is defined as any negative change in monthly screening during the pandemic period compared to the pre-pandemic period.

During the intervention period (June through November 2021), the primary goal is for all participants to restore monthly screening test volume (MTV) to pre-pandemic MTV by the final month. For facilities with a screening deficit of less than 10%, a secondary goal is to increase their MTV by a minimum of 10% of their during-pandemic MTV. This

secondary goal will allow facilities that have minimal or no comparative screening deficits to participate in this QI effort and work towards addressing missed screenings from 2020. The minimum 10% increase was selected as it was considered an attainable goal within the 6 month study timeframe. An estimate of the number of potential additional monthly screening tests was calculated as the sum of additional monthly tests with achievement of target goals.

Differences between groups were tested using the Kruskal-Wallis test followed by Dunn's multiple comparison test. Statistical significance was set at $P<.05$, and all tests were two-tailed. All analyses were performed using STATA SE version 16.1 (StataCorp). This study was found exempt from IRB oversight given the absence of patient-level identifiers.

RESULTS

Overall, 748 facilities (488 CoC and 260 NAPBC) electively enrolled in the Return-to-Screening national quality improvement study, resulting in 34% (488/1 456) and 45% (260/582) participation from all CoC- and NAPBC-accredited facilities, respectively. Characteristics of participating facilities are detailed in Table 2. From 748 facilities, 814 independent, validated PDSA projects were submitted, consisting of 436 for breast, 220 for lung, 129 for colorectal, and 29 for cervical cancer. Of 748 facilities, 697 facilities submitted projects for one disease site, 41 facilities submitted projects for two disease sites, 7 facilities submitted projects for three disease sites, and 3 facilities submitted projects for all four disease sites.

The percentage of facilities with screening deficits in colorectal cancer was 80.6% (n=104/129), 69.0% (n=20/29) in cervical, 55.3% (n=241/436) in breast, and 44.6% (n=98/220) in lung cancer. Overall, the median relative percent change in MTV ranged from −17.7% (Interquartile range [IQR], −33.6% to −2.8%) in colorectal, −6.8% (IQR, −29.4% to 1.7%) in cervical, −1.6% (IQR, −9.6% to 7.0%) in breast, and 1.2% (IQR, −16.9% to 19.0%) in lung. There were no statistically significant differences in percent change in MTV across regions for all disease sites (Figure 1). There was, however, wide variation in the percent change in MTV across institution types, with statistically significant differences among institution types for colorectal cancer screening ($P=.02$), specifically between integrated network cancer programs (median, −8.2%; IQR, −19.8% to −2.3%) and other programs (median, −43.8%; IQR, −51.3 to −10.0; $P=.02$) (Figure 2).

The results of the changes in MTV with initiation of interventions are pending. However, the estimated number of potential additional screening tests if all participating facilities reach their target goals is 57 141 for breast, 6 079 for colorectal, 4 280 for cervical, and 1 744 for lung cancer.

DISCUSSION

In 8 weeks, 748 CoC and NAPBC accredited cancer facilities enrolled in a national QI study to evaluate and respond to a pandemic-related national crisis in cancer screening. The sum of these local efforts could provide 70 000 additional screening tests if monthly targets are achieved. We do not yet have data on the association of the PDSA interventions on screening

volumes, but key insights from this preliminary report may help institutions effectively focus their efforts towards restoring local cancer screening volumes.

Consistent with prior literature reporting promising recovery in patients undergoing screening tests for cancer by July 2020,[1,9] we found that the median relative percent change in MTV was minimal for breast (−1.6%) and lung cancer (1.2%). However, our findings also demonstrate that most facilities still have screening deficits when comparing the average for September 2020 and January 2021 to the same months in the preceding year. More notably, we identified wide variability in screening deficits across facilities, suggesting that though the median monthly screening reduction may not appear to be consequential, some facilities and their communities may be underestimating their local screening deficits. In addition, we found statistically significant differences in median percent change in MTV among institution types for colorectal cancer screening, specifically between integrated network cancer programs (median, −8.2%; IQR, −19.8% to −2.3%) and other programs (median, −43.8%; IQR, −51.3 to −10.0; P=.02). Cancer programs within the CoC are designated a specific category based on the type of facility, program structure, services provided, and the number of cases accessioned each year.[6] Facilities categorized under “other programs” include cancer programs that do not have a minimum caseload requirement or have limited range of diagnostic and treatment services available. In contrast, facilities categorized as Integrated Network Cancer Program offer integrated and comprehensive cancer care services. Thus, one can postulate that differences in hospital infrastructure and resources may be associated with the magnitude of the negative impact of the COVID-19 pandemic on cancer screening.

While geography and regional positive COVID-19 case rates may have played a role in curtailing cancer screening early in the pandemic, there were no significant differences in monthly screening deficits across geographic regions by the fall/winter of 2020–2021. In contrast, we did find that screening deficits were highly variable across disease sites.

The most notable screening deficits occurred in colorectal cancer. Similar findings have been observed by Chen et al. that reported colorectal cancer screening rates that remained 13.1% lower in July 2020 compared with 2019 while monthly screening rates for breast and prostate cancers saw a near complete recovery.[1] The delayed recovery in colorectal cancer screening may be due to barriers in performing aerosol-generating procedures (eg, colonoscopies) compared to radiographic studies for breast and lung cancer screening. Additionally, despite national guidance on the safety of resuming routine cancer screening, patients may have higher reluctance on obtaining invasive procedures during the pandemic. Our findings and the work of others suggest that home-based stool tests may be the most appropriate alternative to accelerate recovery in colorectal cancer screening.[10–13] That said, it must be recognized that a positive fecal immunochemical test (FIT) will require a timely follow-up colonoscopy, as delays in colonoscopies after positive FIT will lead to increased incident and later-stage colorectal cancer diagnosis.[14] Thus, it will be important to ensure effective communication between providers and patients, and development of infrastructure and pathways to safely conduct necessary in-person procedural screening tests.

Our findings also highlight some important challenges. For example, despite known racial, gender, and socioeconomic disparities in cervical cancer screening,[15–17] out of the 814 independent projects, only 29 are related to cervical cancer screening. While our data does not allude to the reason for the low participation, we know from other studies that interventions aimed at improving cervical cancer screening are especially effective in underscreened, low-literacy, and minority populations.[18] Similar to colorectal cancer screening, there are options for at-home patient-collected screening tests, such as patient-collected Human Papillomavirus (HPV) swabs.[19] Use of self-collected tests has been shown to be especially effective in promoting cervical cancer screening in vulnerable populations.[20–22] With ongoing surges of COVID-19 cases, we have an opportunity to halt any further delays in care by engaging our communities and hospitals to participate in quality improvement efforts, such as this, to implement targeted interventions to improve screening and address worsening health disparities.

Additionally, although lung cancer was the second-most common disease site selected, the projected impact will be less than all the other sites, likely owing to the fact that screening for lung cancer is relatively new with low uptake.[23] Lastly, while some may think that missing annual breast screening may not pose problems, each year roughly 40% of eligible people miss routine screening, and the screening deficit associated with the COVID-19 pandemic could potentially exacerbate this disparity.[24–27]

Our study has several limitations. First, these preliminary results from accredited cancer programs may not represent the broader national experience, despite the fact it represents a large sample size. Also, even though our online resources are widely available, we recognize that the speed and ease of its implementation may not be generalizable to facilities lacking the cancer infrastructure, standards, and communication channels available to CoC and NAPBC accredited facilities. Furthermore, we were not able to calculate each institution's total 2020 missed screenings, so efforts to address the 2020 missed screenings are more aspirational than based on data. However, we know from other population-based studies and national estimates that there is a deficit in total screenings from 2020 from disruption of routine screening for at least 6 months in 2020, with projected long-term consequences without implementing "catch-up" screening interventions.[1,28–30] Thus, we strongly believe that any efforts to increase screening will help address the backlog of delayed and missed screenings and reduce late-stage cancer diagnoses and preventable deaths.

While the COVID-19 pandemic disrupted many aspects of cancer care, the overwhelming affirmative response to, and participation in this Return-to-Screening QI study suggests that now is the time for a call to action. Missed screenings from 2020 and ongoing delays in screening recovery will likely lead to delays in cancer diagnosis with inevitable presentation at more advanced stages and poorer clinical outcomes. However, these preliminary findings and the wide availability of the details and steps of this Return-to-Screening PDSA protocol and online resources including a full list of evidence-based screening interventions may provide an opportunity to address the negative impact of COVID-19 pandemic on cancer screening. Future findings from this study may give further insight on the potential impact of various screening interventions on increasing cancer screening. Furthermore, the presence

of a collaborative nationwide QI effort may provide a footprint and stimulus for other such national initiatives to address other gaps in cancer care.

CONCLUSION

The availability of a Return-to-Screening PDSA protocol, screening guidelines and toolkits, prompted 748 cancer programs to initiate 814 local QI projects in breast, colorectal, lung, and cervical cancer screening, with the potential to add 70 000 additional screening tests among the participating facilities by the end of 2021. Though our preliminary data suggests variability in screening deficits across cancer sites, most hospitals in this study still have deficits in their monthly screening test volume, most notably with colorectal cancer. It is our hope that these findings and online resources will encourage others to identify and address screening deficits due to the COVID-19 pandemic and prevent unnecessary cancer-related deaths.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Lay Summary

Question:

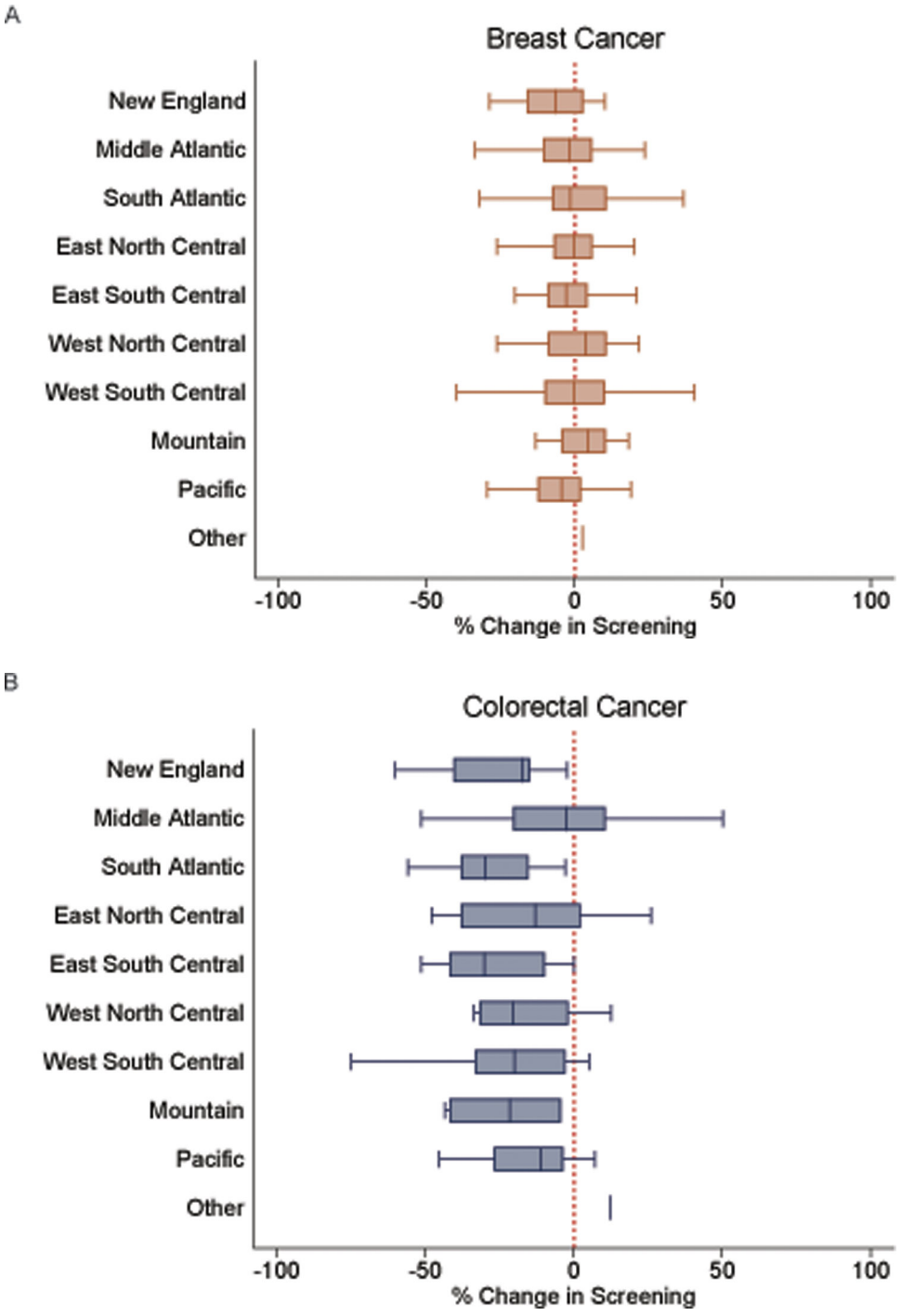
How can the consequences of the COVID-19 pandemic on cancer screening be mitigated?

Findings:

When national resources were provided, including methods to calculate local screening deficits, 748 cancer programs promptly enrolled in a national Return-to-Screening study and the majority identified local screening deficits, most notably in colorectal cancer. Using these results, 814 quality improvement projects were initiated, with the potential to add 70 000 screening tests per month in 2021.

Meaning:

Cancer screening is still in need of urgent attention and the online resources we provide may help close critical screening deficits.



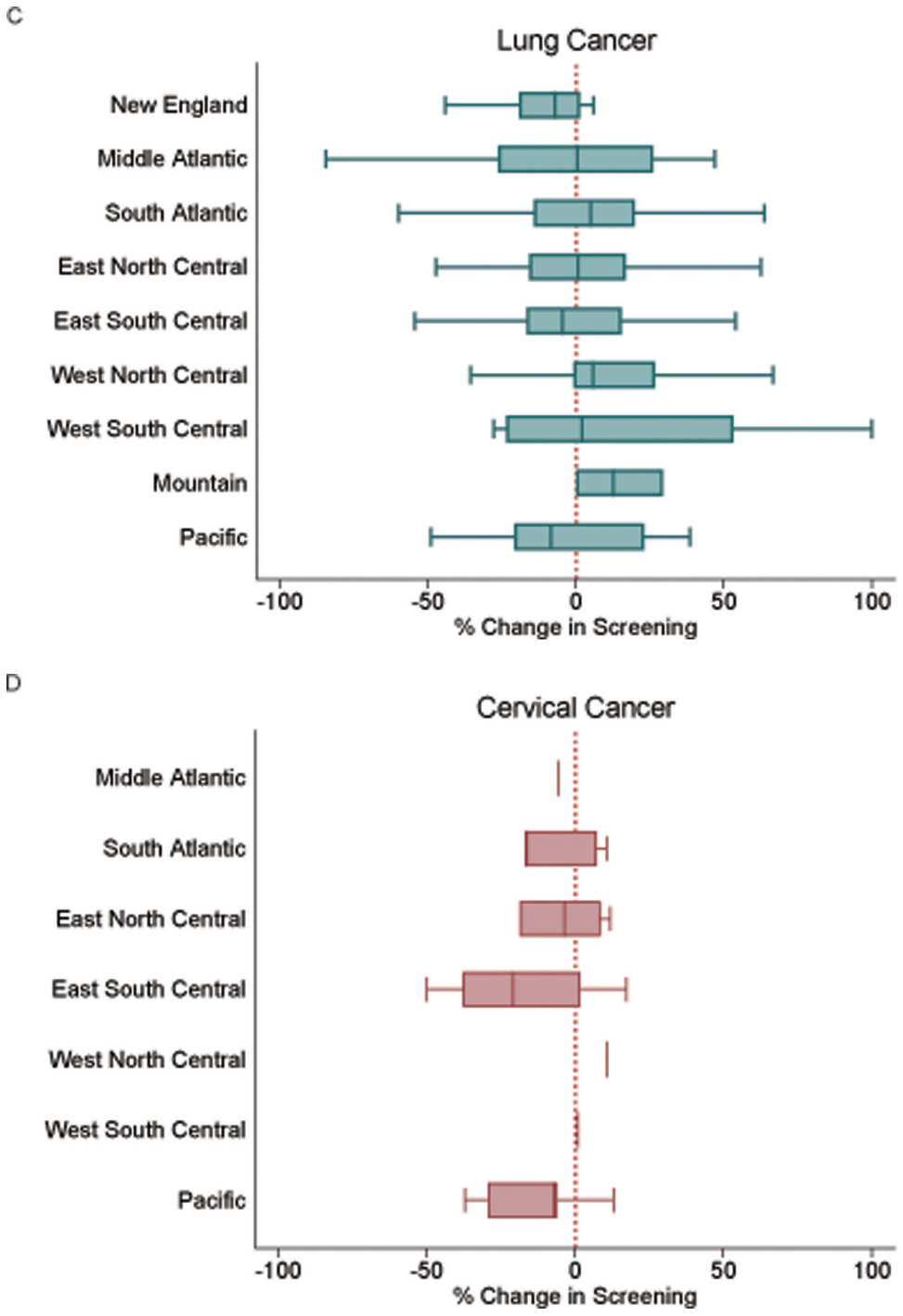
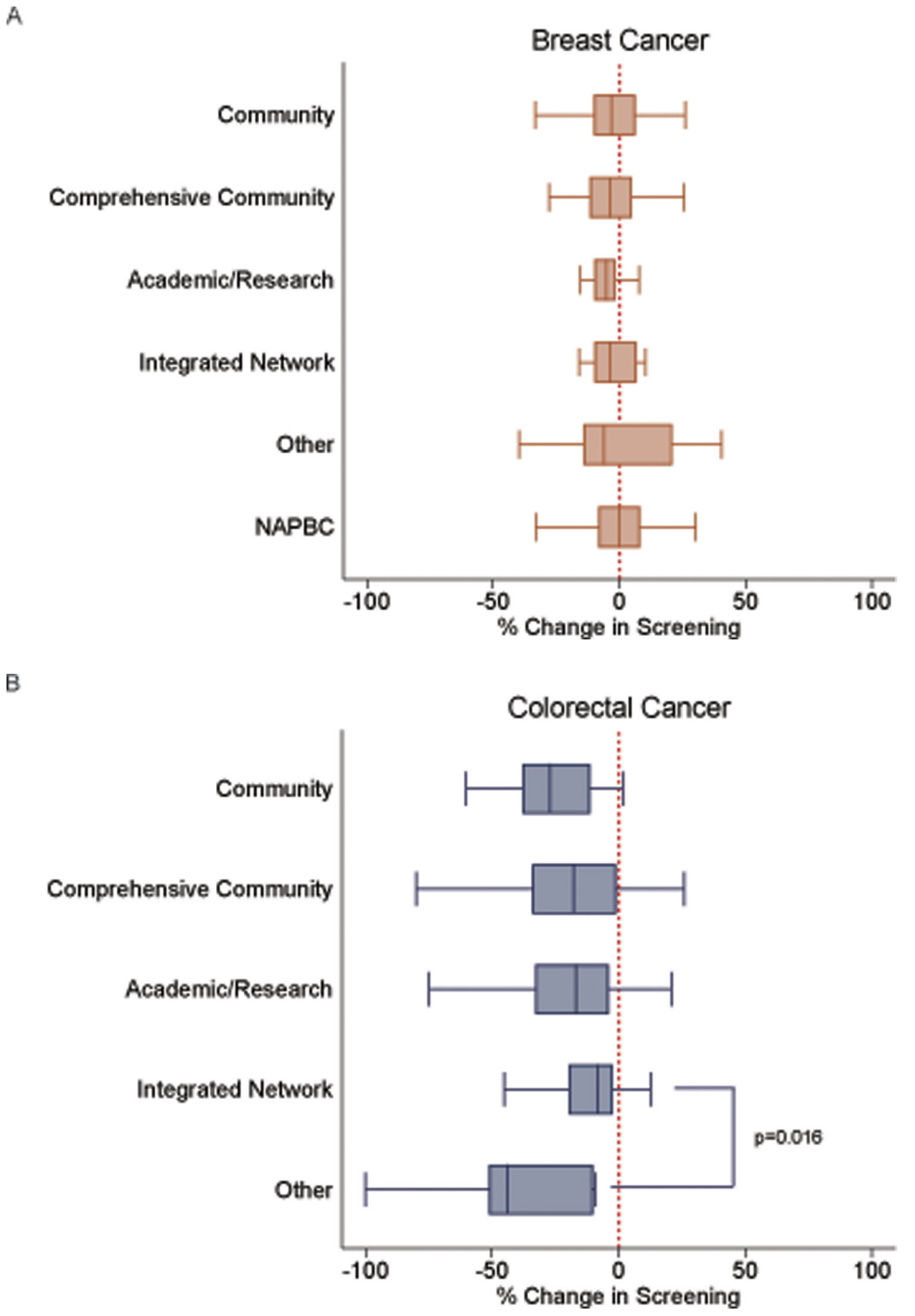


Figure 1. Relative Percent Change (%) in Monthly Screening Test Volume (MTV) by Facility Location and Disease Site

Relative percent change in MTV across various geographic regions. Negative indicates screening deficit, positive indicates screening excess. Boxes encompass the 25–75th percentile. Whiskers are ± 1.5 IQR. No statistically significant differences between facility locations were identified for any of the four disease sites (a) Breast, (b) Colorectal, (c) Lung, (d) Cervical



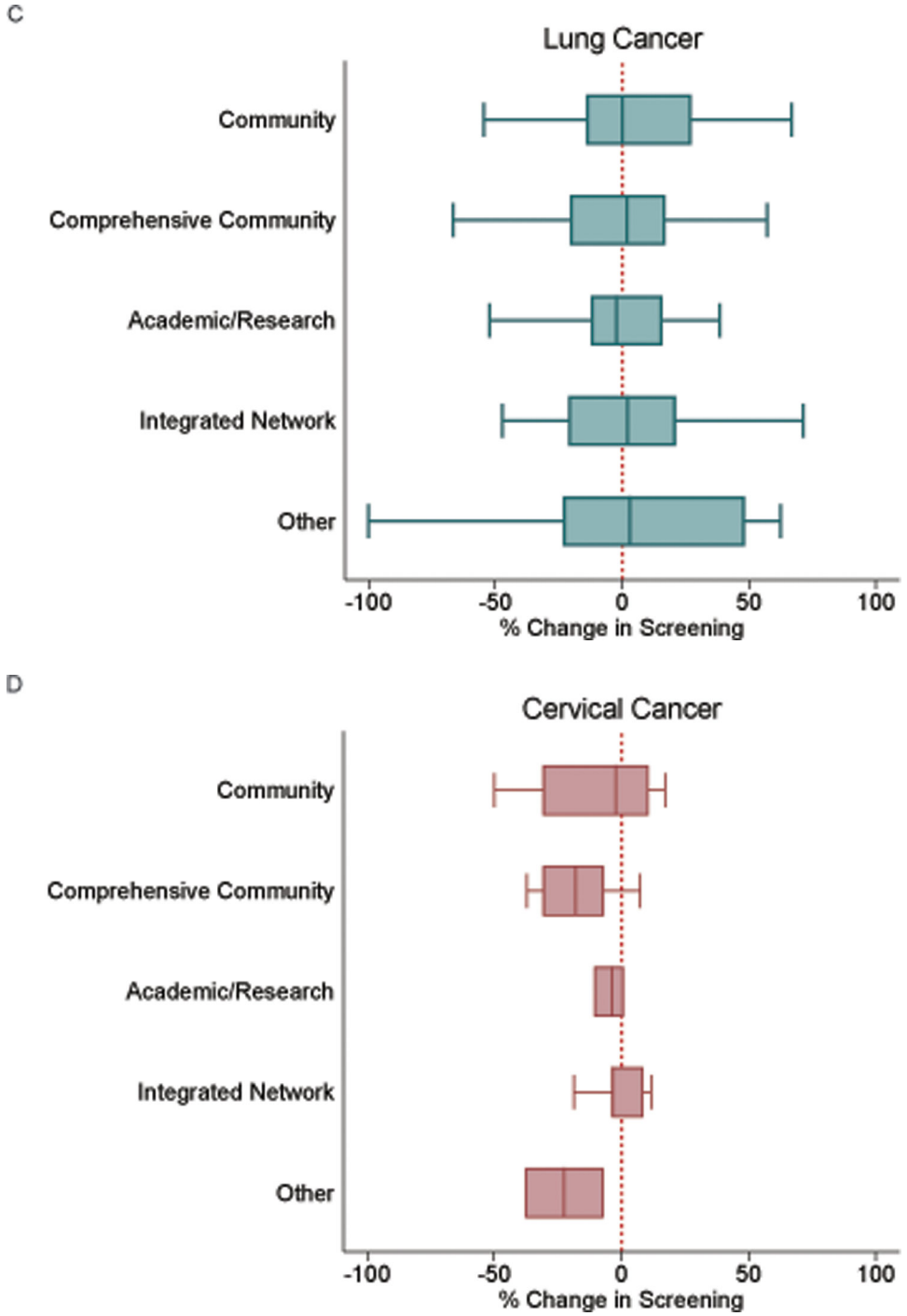


Figure 2. Relative Percent Change (%) in Monthly Screening Test Volume (MTV) by Type of Institution and by Disease Site

Relative percent change in MTV across types of institutions (calculated as described in Figure1). Boxes encompass the 25–75th percentile. Whiskers are ± 1.5 IQR. Statistically significant difference in the percent change in colorectal cancer screening tests between integrated network programs (median, −8.2%; IQR, −19.8% to −2.3%) compared to other

programs (median, −43.8%; IQR, −51.3% to −10.0%), p=.02. (a) Breast, (b) Colorectal, (c) Lung, (d) Cervical

Table 1.

Screening Tests by Disease Site

Disease Site	List of Screening Tests
Breast	• Screening Mammography • Screening Breast MRI
Lung	• Low-dose CT scan
Colorectal	• Screening Colonoscopy • Screening Flexible Sigmoidoscopy • Screening CT Colonography • Screening Stool-Based Tests • Screening Barium Enema
Cervical	• Human Papillomavirus (HPV) Test • Papanicolaou Test (Pap smear)

Table 2.

Characteristics of Cancer Programs Participating in a National Return-to-Screening Quality Improvement Study

	Participating Cancer Programs	Non-Participating Cancer Programs
Overall, No.	**748**	**1 287**
Region, No. (%)		
New England (CT, MA, ME, NH, RI, VT)	44 (5.9)	95 (7.4)
Middle Atlantic (NJ, NY, PA)	119 (15.9)	161 (12.5)
South Atlantic (DC, DE, FL, GA, MD, NC, SC, VA, WV)	149 (19.9)	252 (19.6)
East North Central (IL, IN, MI, OH, WI)	146 (19.5)	299 (23.2)
East South Central (AL, KY, MS, TN)	59 (7.9)	62 (4.8)
West North Central (IA, KS, MN, MO, ND, NE, SD)	50 (6.7)	106 (8.2)
West South Central (AR, LA, OK, TX)	59 (7.9)	99 (7.7)
Mountain (AZ, CO, ID, MT, NM, NV, UT, WY)	28 (3.7)	67 (5.2)
Pacific (AK, CA, HI, OR, WA)	94 (12.6)	146 (11.3)
Type of Institution, No. (%)		
Community Cancer Program	122 (16.3)	178 (13.9)
Comprehensive Community Cancer Program	206 (27.5)	317 (24.7)
Academic/Research Program	55 (7.4)	168 (13.1)
Integrated Network Cancer Program	79 (10.6)	275 (21.5)
Other Program[a]	26 (3.5)	24 (1.9)
NAPBC[b]-accredited Breast Center	260 (34.8)	319 (24.9)

[a]Other Programs: Free Standing Cancer Center, Hospital Associate Cancer Program, Veterans Affairs Cancer Program

[b]NAPBC: National Accreditation Program for Breast Centers