Short communication

Vulnerability and Colorectal screening during the pandemic

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ABSTRACT

Objective: Disparities in colorectal cancer (CRC) screening prevalence across United States neighborhoods may reflect social inequities that create barriers to accessing and completing preventive health services. Our objective was to identify whether neighborhood social vulnerability was associated with a change in CRC screening prevalence in Boston neighborhoods during the COVID-19 pandemic.
Methods: Adults ages 50–74 years due for CRC screening who received primary care at one of 35 primary care practices affiliated with Massachusetts General Hospital or Brigham and Women's Hospital (Boston, MA), 3/1/2020 to 3/1/2022. The Social Vulnerability Index (SVI) is an aggregate measure of neighborhood social factors often used by public health authorities to examine neighborhood susceptibility to many health outcomes.
Results: In 2020, 74.9 % of eligible individuals were up to date with CRC screening and this fell to 67.4 % in 2022 (p < 0.001). In 2020, 36.2 % of eligible patients lived in a neighborhood above the 80th percentile of SVI, consistent with high social vulnerability, while the same value was 35.1 % in 2022. There was no association between the change in screening prevalence and SVI: a decrease of 5.5 % screened in neighborhoods with SVI ≤ 80 compared to a decrease of 3.6 % in neighborhoods with SVI > 80 (p = 0.79).
Conclusions: The COVID-19 pandemic equalized the prevalence of CRC screening across Boston-area neighborhoods despite pre-existing geographic disparities in screening prevalence and SVI. Strategies to ensure equitable participation in CRC screening to promote health equity should be considered to promote equitable pandemic recovery.

1. Background

Colorectal cancer (CRC) is the second leading cause of cancer death in the United States (US). CRC screening can reduce mortality, yet screening participation varies by patient socioeconomic status, health insurance status, education, gender, and race and ethnicity. (Siegel et al., 2023).

In 2020, Massachusetts had one of the highest CRC screening rates in the US with 70 % of eligible individuals up to date. (Siegel et al., 2023) However, important geographic disparities exist between adjacent Massachusetts counties. (Methodology for the Model-based Small Area Estimates of Cancer Risk Factors and Screening Behaviors. https://sae.cancer.gov/nhis-brfss/methodology.html. Accessed March 26, 2023) Although Boston and its surrounding areas have some of the highest CRC screening rates in Massachusetts, (Methodology for the Model-based Small Area Estimates of Cancer Risk Factors and Screening Behaviors. https://sae.cancer.gov/nhis-brfss/methodology.html. Accessed March 26, 2023) neighborhood screening rates vary by social factors and differences in social vulnerability were magnified by the COVID-19 pandemic. (Bauer et al., 2022; Dooling, 2020).

To elucidate and support the most vulnerable communities during public health emergencies, the Centers for Disease Control developed the Social Vulnerability Index (SVI). (Glance, 2022) SVI is an aggregate measure of 16 US census variables, including socioeconomic status (below 150 % federal poverty level, unemployed, housing cost burden, no high school diploma, no health insurance), household characteristics (aged 65 or older, aged 17 or younger, civilian with a disability, single-parent household, English language proficiency), racial and ethnic minority status, and housing type and transportation. Each census tract in the US is ranked on these social factors such that higher SVI indicates higher social vulnerability.

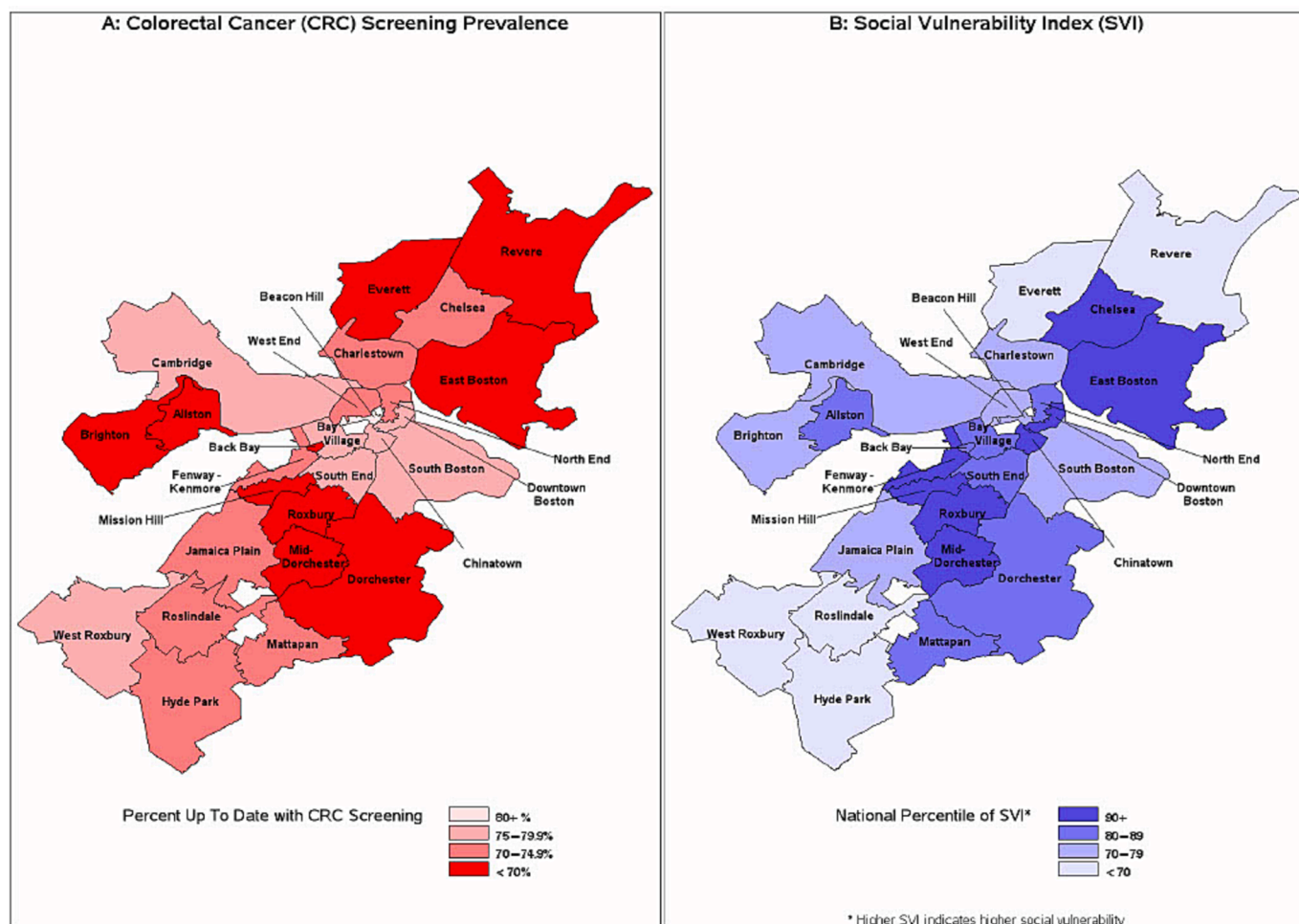Previous research has examined the relationship between SVI and

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Fig. 1. Colorectal Cancer Screening Prevalence and Social Vulnerability Index in March 2020 by Boston-Area Neighborhood.

CRC screening at the county-level, (Bauer et al., 2022) but the combined effect of the pandemic and SVI on CRC screening in smaller geographic units such as neighborhoods is unknown. During the pandemic, the City of Boston observed profound differences in COVID-19 incidence by neighborhood. (Dooling, 2020) The objective of this study was to identify whether the social vulnerability of neighborhood of residence was associated with a change in CRC screening prevalence in Boston-area neighborhoods during the pandemic.

2. Methods

Electronic health records (EHR) were used to identify individuals who received primary care at one of 35 primary care practices affiliated with Massachusetts General Brigham (MGB), a large integrated delivery system in the Boston area. CRC screening completion was calculated for adults ages 50–75 at two timepoints: 3/1/2020 (the start of pandemic) and 3/1/2023 (during pandemic). (Museum, 2023) The study was approved by the MGB Human Subjects Committee. For eligible individuals, up to date with CRC screening was defined as completion of a fecal immunochemical test (FIT) within 1 year, FIT-DNA within 3 years, sigmoidoscopy within 5 years, or colonoscopy within 10 years. Individuals newly eligible for CRC screening (ages 45–49) due to the 2021 USPSTF screening recommendations (US Preventive Services Task Force, 2021) were not included in this study to maintain similar population estimates.

The 5-digit ZIP code associated with each individual's home address was cross-walked to a Zip Code Tabulation Area and then mapped to one of 27 neighborhoods (historical Boston neighborhoods (Neighborhoods.

https://www.boston.gov/neighborhoods. Accessed March 23, 2023) and Boston-adjacent neighborhoods). Data from the COVID-19 Healthcare Coalition's SVI dashboard were used to characterize each neighborhood. (Population, 2023) The association of SVI on change in CRC screening prevalence from before to during the COVID-19 pandemic was determined by testing the interaction between time and SVI in a logistic regression model. A Generalized Estimating Equations approach was used to account for repeated measures from the same subjects. The figures were created using Proc GMAP from SAS and the categories of SVI and CRC screening were determined based on the distributions.

3. Results

Pre-pandemic disparities in CRC screening prevalence by neighborhood were apparent (Fig. 1a). The up-to-date rate in 3/2020 ranged from 65.8 % (mid-Dorchester) to 84.5 % (Beacon Hill). Across Boston neighborhoods, SVI ranged from 40.9 (Roslindale) to 97.7 (mid-Dorchester), with a median SVI of 74.0 (Fig. 1b). In 3/2020, 36.2 % of eligible patients lived in a neighborhood above the 80th percentile of SVI, consistent with high social vulnerability, while the same value was 35.1 % in 3/2023. Of the 29,187 eligible patients in 3/2020, 21,074 (72.2 %) were up to date with CRC screening. Of the 33,692 eligible patients in 3/2023, 22,708 (67.4 %) were up to date.

Table 1 shows the changes in screening prevalence between 3/2020 and 3/2023 by neighborhood. The overall change in screening prevalence from 3/2020 and 3/2023 was significant (72.2 % to 67.4 %, p < 0.001). However, there was no significant relationship between the change in screening prevalence and SVI: a decrease of 5.5 % screened in

Table 1
Social Vulnerability and Colorectal Cancer Screening in Boston-Area Neighborhoods, 2020 to 2023.

Neighborhood	Social Vulnerability Index (percentile)*	March 2020		March 2023		Change in CRC Screening Prevalence (%)
		Number eligible for screening	CRC Screening Prevalence (%)	Number eligible for screening	CRC Screening Prevalence (%)	
Roslindale	40.9	1,749	72.8	2,006	68.9	−3.8
West Roxbury	44.1	1,859	76.3	2,124	71.5	−4.8
Everett	54.8	1,467	68.6	1,729	63.6	−5.0
Hyde Park	66.4	1,606	72.4	1,821	66.4	−6.0
Revere	67.7	2,975	69.7	3,377	64.6	−5.2
Charlestown	73.5	1,528	70.5	2,135	58.9	−11.6
Beacon Hill	73.6	330	84.5	370	80.3	−4.3
Brighton	73.9	574	67.8	653	63.9	−3.9
Jamaica Plain	74	2,022	73.3	2,263	69.9	−3.4
Cambridge	75.3	2,205	76.2	2,545	72.5	−3.8
West End	77.7	794	74.7	908	71.7	−3.0
South Boston	78.3	909	76.8	1,047	73.0	−3.8
North End	79.2	614	72.3	877	60.1	−12.2
Back Bay	81.8	69	66.7	69	72.5	5.8
Dorchester	86.2	2,190	69.7	2,479	67.4	−2.3
Allston	86.9	157	67.5	167	68.9	1.3
Mattapan	87.8	624	71.5	742	66.4	−5.0
South End	87.9	705	75.9	789	70.6	−5.3
Bay Village	87.9	946	77.1	1,052	73.8	−3.3
Downtown Boston	91.4	220	75.0	282	64.9	−10.1
Chinatown	93.9	202	77.7	221	71.0	−6.7
East Boston	93.9	889	69.1	1,022	65.6	−3.5
Fenway - Kenmore	94.6	583	72.2	658	68.4	−3.8
Chelsea	96	2,033	71.3	2,208	68.2	−3.2
Roxbury	96.4	907	67.6	1,005	62.9	−4.7
Mission Hill	96.7	338	68.6	373	65.7	−3.0
Mid-Dorchester	97.7	692	65.8	770	61.4	−4.3
Overall	74.9	29,187	72.2	33,692	67.4	−4.8

*Higher SVI indicates higher vulnerability.

neighborhoods with SVI ≤ 80 compared to a decrease of 3.6 % in neighborhoods with SVI > 80 (p = 0.79).

4. Discussion

Our findings reveal that the COVID-19 pandemic uniformly depressed CRC screening prevalence across Boston-area neighborhoods despite geographic disparities in CRC screening prevalence and SVI. While previous research has shown that US counties with higher social vulnerability had significantly lower rates of cancer screening (Bauer et al., 2022) and that communities with higher SVI were disproportionately affected by the pandemic, (Gray et al., 2020) our results indicate that there was no association between social vulnerability and change in CRC screening prevalence during the first two years of the pandemic. This suggests that there may be neighborhood characteristics which are not captured in SVI that contribute to changes in CRC screening disparities during this period.

Health system data may not accurately estimate neighborhood CRC screening rates as it does not capture individuals who seek care through other health systems or do not seek care at all. Earlier work showed that these data provide population-based estimates for tobacco use in the Boston area comparable to those derived from the Behavioral Risk Factor Surveillance Survey with more timely availability. (Linder et al., 2013) Public health agencies are increasingly using EHR data to do public health surveillance. (Klompas et al., 2017; Tatem et al., 2017).

As health systems and communities recover from the pandemic, effective strategies should be implemented to ensure more equitable participation in screening regardless of neighborhood social vulnerability. The US Department of Health and Human Services has set the 2030 target for CRC screening at 74.4 %. (People, 2030)As of March 2023, only 1 of the 27 Boston-area neighborhoods meet this target. To reach screening targets and avoid variations in CRC screening rates by

neighborhood in the future, population characteristics not included in SVI, such as access to a primary care physician, food insecurity, neighborhood safety, and the spread of CRC screening information within neighborhoods should be considered.(Mayhand et al., 2021; Layne et al., 2023) Public health measures that address neighborhood-level barriers to cancer screening, particularly for neighborhoods that demonstrated lower screening rates prior to the pandemic, are essential to address the impact of the COVID-19 pandemic on CRC screening.

CRediT authorship contribution statement

Roopa S. Bhat: Writing – review & editing, Writing – original draft, Visualization, Conceptualization. **Suzanne Brodney:** Writing – review & editing, Supervision, Project administration. **Yuchiao Chang:** Writing – review & editing, Software, Formal analysis, Conceptualization. **Meghan Rieu-Werden:** Writing – review & editing, Visualization, Software, Formal analysis, Data curation. **Folasade P. May:** Writing – review & editing, Funding acquisition, Conceptualization. **Jennifer S. Haas:** Writing – review & editing, Supervision, Resources, Project administration, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Data availability

The data that has been used is confidential.

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