

# Gaps in Prevention: Trends and Regional Variation in Cancer Screening in Illinois

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## ABSTRACT

Geographic inequities in cancer screening continue to undermine cancer prevention efforts in the United States. Using weighted data from the 2020–2023 Illinois County Behavioral Risk Factor Surveys, this study evaluated regional variation in adherence to U.S. Preventive Services Task Force screening guidelines for breast, cervical (HPV), colorectal, and prostate cancers across six Illinois public health regions. Substantial disparities were identified, with screening participation varying widely by cancer type and geography. Mammography uptake was moderate overall but showed notable regional differences, while cervical cancer screening exhibited the greatest deficit, with more than half of eligible women never screened, and particularly low participation in the Peoria and Rockford regions. Colorectal cancer screening rates were more consistent across regions, yet remained below optimal levels statewide, and prostate cancer screening rates were uniformly low. Regions with poorer screening performance were consistently associated with socioeconomic disadvantages and limited access to healthcare. These findings highlight pronounced and uneven gaps in cancer screening across Illinois, underscoring the need for regionally tailored interventions, such as improved access to care, community-based outreach, and the expanded use of home-based screening, to advance equity in cancer prevention.

**KEYWORDS:** Cancer Screening; Cancer Disparities; Social Determinants of Health.

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## Introduction

Cancer remains a leading cause of morbidity and mortality worldwide, with an estimated 35.3 million new cases projected by 2050 (Bizuayehu et al., 2024). In the United States (U.S.), these inequities are pronounced across states and within regions, where differences in healthcare infrastructure and socioeconomic context influence adherence to national screening guidelines. Illinois (IL), for instance, exhibits higher-than-average cancer incidence (470.1 per 100,000) and mortality (150.2 per 100,000) compared with national figures (American Cancer Society, 2025). Early detection through evidence-based screening significantly reduces cancer-related deaths and healthcare costs (Bretthauer et al., 2023; Hallgren et al., 2023; Mosquera et al., 2024; Philipson et al., 2023). Yet, disparities in screening uptake persist, driven by social determinants of health such as income, education, and access to care (Korn et al., 2022). Despite the inclusion of targeted screening goals in the 2022–2027 Illinois Comprehensive Cancer Control Plan, (Illinois Department of Public Health, n.d.-a), there is still a need for a broader understanding of regional variation in adherence to recommended screening for breast, cervical (HPV), colorectal, and prostate cancers, four of the most preventable malignancies through timely detection. This study analyzes population-based data to quantify regional differences in adherence to national screening guidelines across Illinois. By identifying gaps in participation and regions of persistent underperformance, the findings aim to inform targeted interventions and policy actions that advance equitable cancer prevention statewide.

## Materials and Methods

This analysis utilized data from Round 7 (2020–2023) of the Illinois County Behavioral Risk Factor Surveys (ICBRFS), a statewide, population-based

surveillance system administered by the Illinois Department of Public Health (IDPH) (Illinois Department of Public Health, n.d.-b). The ICBRFS provides weighted, county-level estimates of health behaviors, preventive services, and healthcare access among adults aged 18 years or older. A stratified random sampling approach was employed to ensure representative estimates across all participating counties. Survey weights were adjusted for selection probability and household composition, and post-stratified by age, sex, and race/ethnicity, ensuring that estimates reflect the adult population of IL. Prevalence estimates, confidence intervals, and totals presented in this study are based on weighted data. Analyses were conducted by the six IDPH-designated public health regions: Westchester, Champaign, Marion, Metro East, Peoria, and Rockford. For each cancer type, regional estimates were compared with statewide averages to identify disparities and performance gaps.

Screening eligibility and "up to date" status were operationalized according to U.S. Preventive Services Task Force (USPSTF) recommendations in effect during the 2020–2023 data collection period. For breast cancer, women aged  $\geq 40$  years were considered up to date if they reported mammography within the past 2 years, consistent with USPSTF biennial screening recommendations. Cervical cancer screening compliance was assessed among women aged 30–65 years, with up-to-date status defined as HPV testing within the past 5 years, aligning with 2018 USPSTF guidelines for primary HPV screening. For colorectal cancer, adults aged 50–75 years were evaluated using two definitions: (1) colonoscopy within 10 years, and (2) any USPSTF-recommended modality within guideline-concordant intervals (colonoscopy within 10 years, sigmoidoscopy within 5 years, FIT/FOBT within 1 year, or stool DNA testing within 3 years). Prostate cancer screening was assessed among

men aged  $\geq 40$  years, with two metrics reported: ever screened (any PSA test) and recently screened (PSA within 2 years). Given the evolution of PSA screening guidelines from routine recommendation to individualized shared decision-making (USPSTF 2018, Grade C for ages 55-69), and the absence of specific interval recommendations, both metrics were included to capture the full spectrum of screening behavior across age groups. All age-based eligibility criteria were applied at the time of survey completion, with screening status determined by self-reported receipt and timing of the most recent screening test. Weighted prevalence estimates account for survey design and population demographics to ensure representative statewide and regional estimates.

Demographic characteristics were derived from the 2020 U.S. Census to provide context for

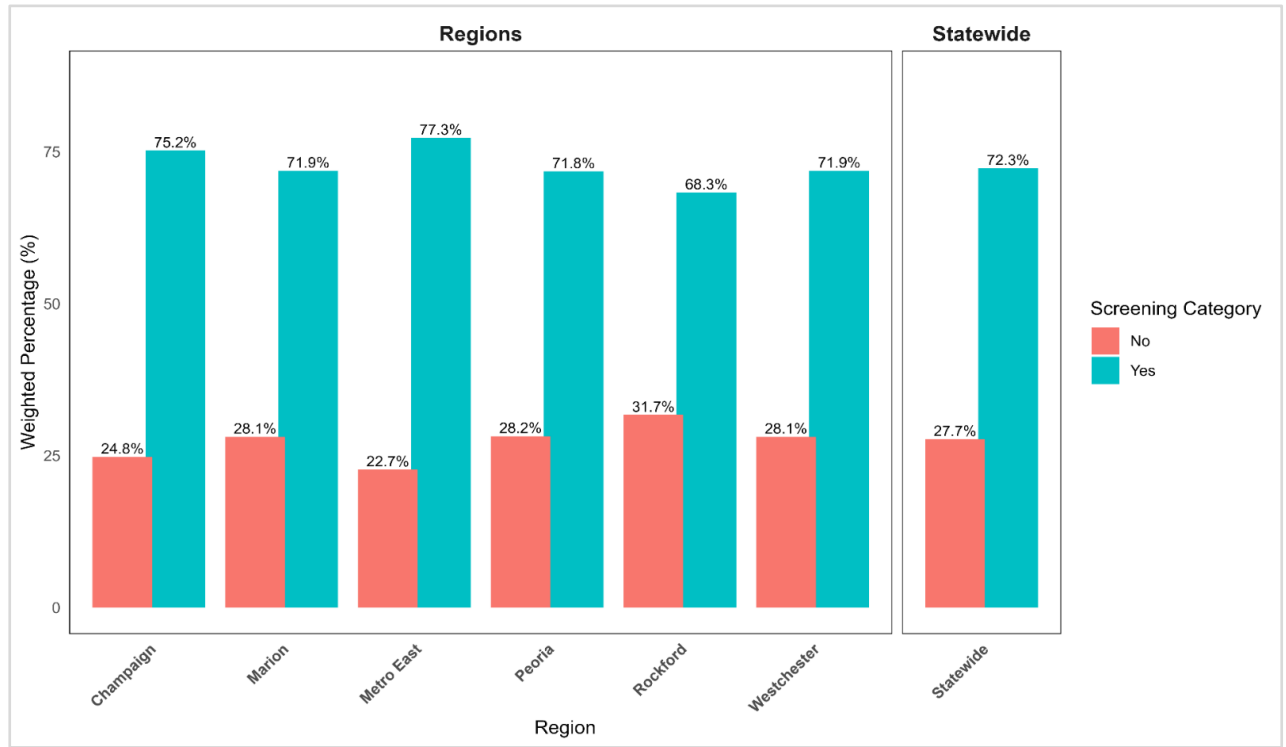
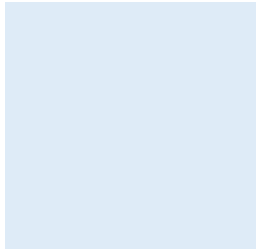
population diversity across regions. IL has approximately 12.8 million residents, 78% of whom are aged 18 or older. The state's racial and ethnic composition includes 58.3% White (non-Hispanic), 18.2% Hispanic or Latino, and 13.9% Black residents. The population has a near-equal gender distribution (49.4% male, 50.6% female), a median household income of \$83,211, and 39.2% of adults with a bachelor's degree or higher (United States Census Bureau, n.d.-a, n.d.-b).

## Results

Significant geographic disparities were observed across all cancer screening modalities in IL. Among women aged  $\geq 40$  years, 72.3% [95% confidence interval (CI): 70.2 – 74.4] were up to date with mammography screening, leaving 27.7% [95%CI:25.6-29.8] non-compliant (Table 1, Figure 1).

Table 1. Mammogram Screening Rates by Statewide and Region (Women 40+)

Region	Yes				No			
	Estimated Population	Weighted (%)	95% CI	Respondents	Estimated Population	Weighted (%)	95% CI	Respondents
Statewide	2,261,399	72.3	70.2-74.4	10,700	864,842	27.7	25.6-29.8	4,250
Westchester	1,516,615	71.9	68.8-74.8	1,494	593,222	28.1	25.2-31.2	588
Champaign	140,648	75.2	70.8-79.1	1,805	46,332	24.8	20.9-29.2	746
Marion	95,861	71.9	68.9-74.7	1,953	37,473	28.1	25.3-31.1	800
Metro East	203,755	77.3	71.2-82.3	1,919	60,005	22.7	17.7-28.8	699
Peoria	189,159	71.8	68.9-74.6	2,414	74,148	28.2	25.4-31.1	897
Rockford	115,200	68.3	62.9-73.2	1,111	53,558	31.7	26.8-37.1	519

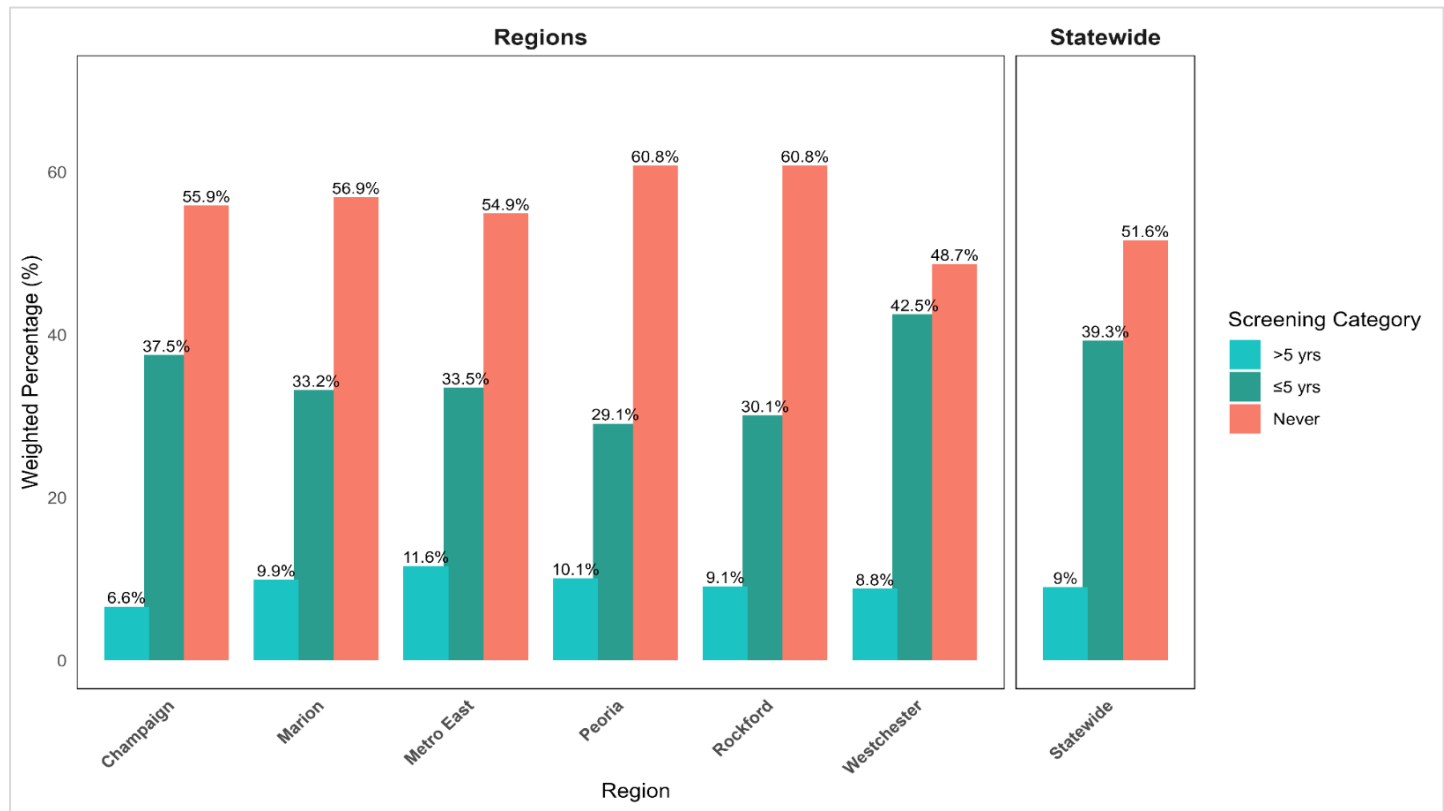
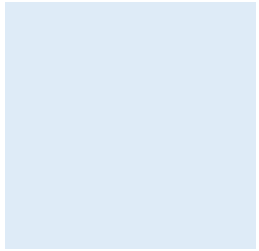


**Figure 1.** Mammogram Screening Rates by Region and Statewide (Women 40+)

Regional rates ranged from 68.3% [95% CI: 62.9-73.2] in the Rockford region to 77.3% [95% CI: 71.2-82.3] in the Metro East region, representing an 8.9 percentage-point gap. Regions with higher socioeconomic indicators, such as the Metro East and Champaign regions, demonstrated stronger compliance than those with limited healthcare access, such as the Rockford region.

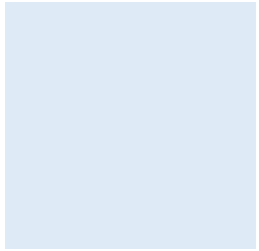
HPV screening showed the lowest overall compliance and the widest geographic disparity. Statewide, only 39.3% (95%CI:36.9-41.8) of eligible women were up to date, while more than half (51.6% [95%CI:49.2-54.1]) had never been screened (Table 2, Figure 2).

Table 2. HPV Screening Rates by Statewide and Region												
Region	Est. Pop (≤5 yrs)	Weighted %	95% CI	Respondents	Est. Pop (5+ yrs)	Weighted %	95% CI	Respondents	Est. Pop (Never)	Weighted %	95% CI	Respondents
Statewide	1,625,556	39.3	36.9-41.8	3,869	372,936	9.0	7.9-10.3	1,584	2,134,834	51.6	49.2-54.1	9,738
Westchester	1,192,036	42.5	39.2-45.9	794	245,802	8.8	7.3-10.5	254	1,365,761	48.7	45.4-52.0	1,268
Champaign	103,027	37.5	31.0-44.6	640	18,113	6.6	5.2-8.3	266	153,311	55.9	49.2-62.3	1,660
Marion	56,232	33.2	28.7-38.2	579	16,663	9.9	8.2-11.8	290	96,260	56.9	52.5-61.2	1,891
Metro East	114,066	33.5	27.0-40.8	675	39,526	11.6	7.4-17.8	282	186,795	54.9	47.4-62.1	1,667
Peoria	97,089	29.1	26.0-32.3	761	33,738	10.1	8.2-12.4	343	203,291	60.8	57.4-64.1	2,168
Rockford	63,098	30.1	25.4-35.1	419	19,093	9.1	6.1-13.3	149	127,737	60.8	55.5-66.0	1,075



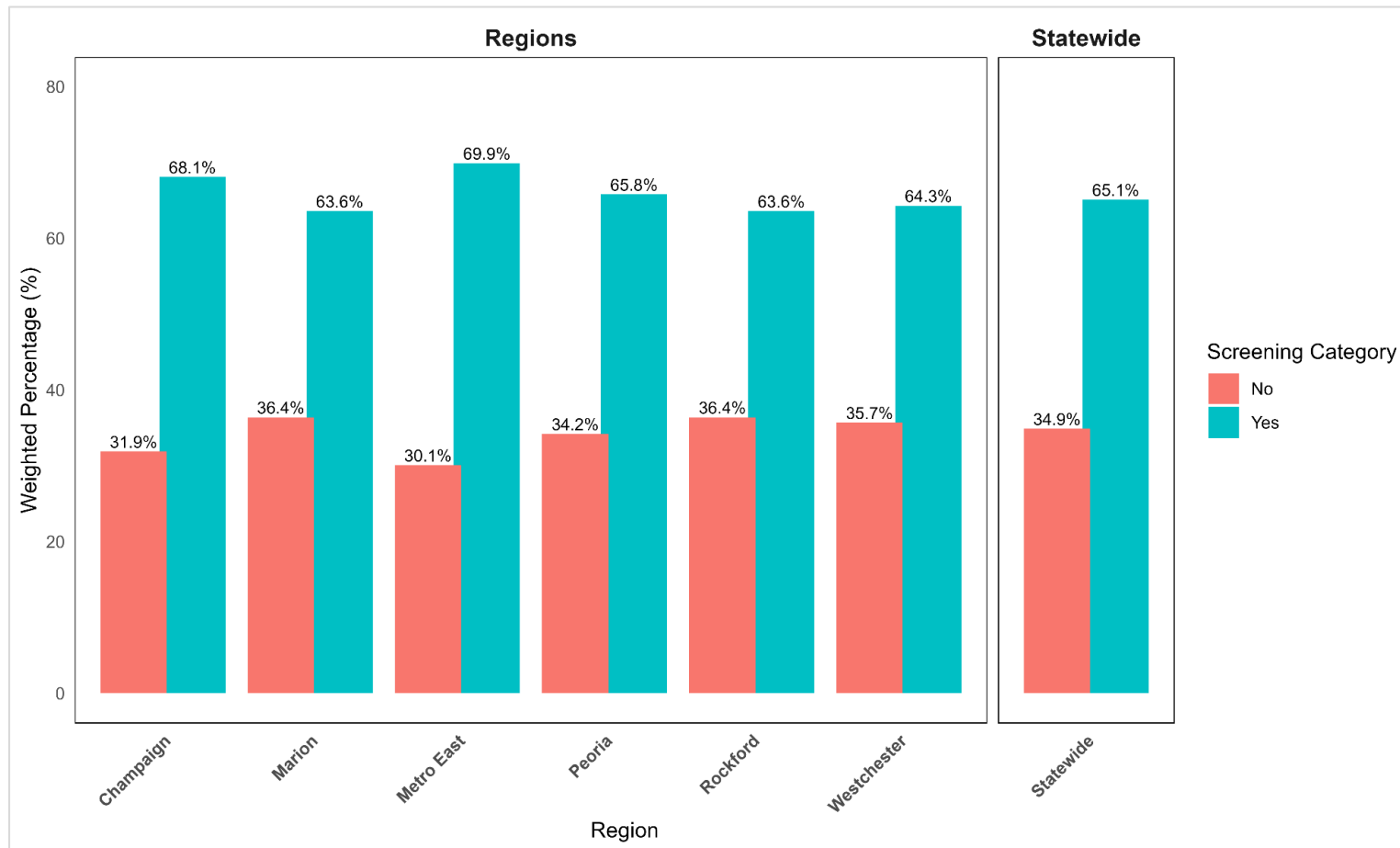
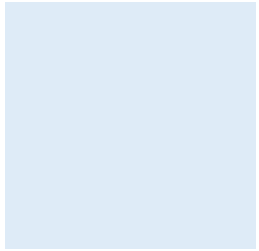
**Figure 2.** HPV Screening Rates by Region and Statewide.

Rates ranged from 29.1%[95%CI:26.0-32.3] in Peoria and 30.1%[95%CI:25.4-35.1] in Rockford to 42.5%(95%CI:39.2-45.9) in Westchester, a 13.4-point regional gap. Peoria and Rockford also had the highest proportions of women who had never been screened (60.8%), highlighting persistent barriers to access and engagement. The Westchester region demonstrated the highest uptake of HPV screening over the past five years (42.5% [95% CI: 39.2-45.9]) and the lowest rate of individuals who had never been screened (48.7%[95%CI:45.4-52.0]).



The statewide average rate of colonoscopy screening within the past 10 years was reported at 65.1%[95%CI:62.8-67.3] among adults aged 50–75 years, with modest regional variation (63.6–69.9%) (Table 3, Figure 3).

Table 3. Colonoscopy Screening Rates by Statewide and Region: Had Colonoscopy in the Past 10 Years (Aged 50-75)								
Region	Yes				No			
	Estimated Population	Weighted (%)	95% CI	Respondents	Estimated Population	Weighted (%)	95% CI	Respondents
Statewide	2,329,168	65.1	62.8-67.3	11,485	1,249,302	34.9	32.7-37.2	5,738
Westchester	1,528,205	64.3	61.1-67.4	1,475	847,950	35.7	32.6-38.9	745
Champaign	148,259	68.1	63.8-72.1	1,875	69,404	31.9	27.9-36.2	996
Marion	101,850	63.6	60.5-66.5	2,076	58,381	36.4	33.5-39.5	1,177
Metro East	224,253	69.9	63.9-75.3	2,182	96,523	30.1	24.7-36.1	968
Peoria	201,141	65.8	63.0-68.5	2,630	104,505	34.2	31.5-37.0	1,291
Rockford	125,246	63.6	58.0-68.8	1,244	71,768	36.4	31.2-42.0	560

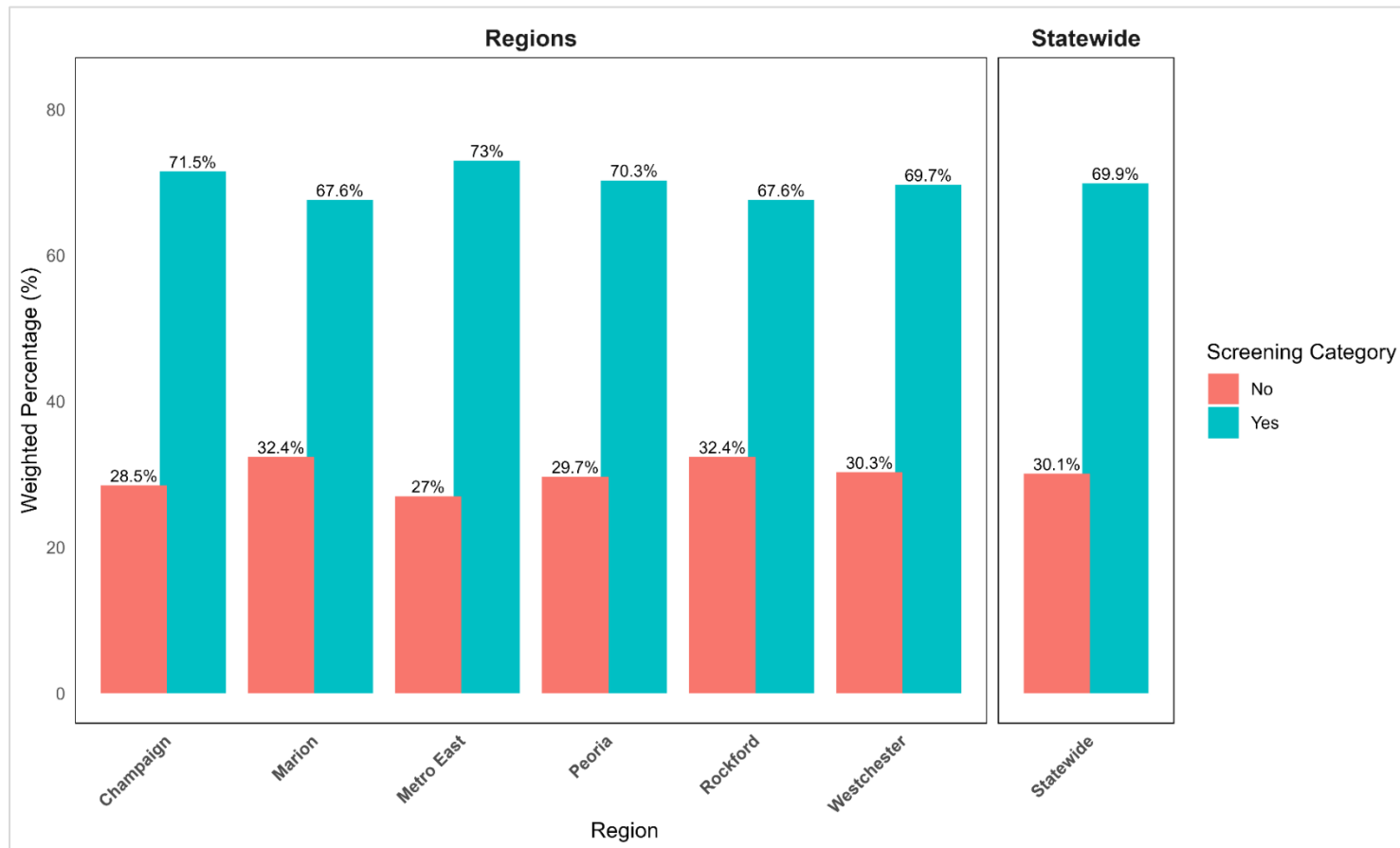
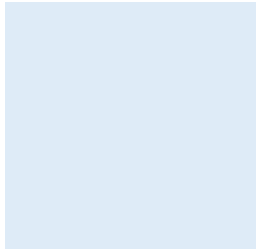


**Figure 3.** Colonoscopy Screening Rates by Region and Statewide

The Rockford and Marion regions are reporting the highest non-screening rates, while the Metro East and Champaign regions are reporting the highest screening rates, at 69.9% [95%CI: 63.9-75.3] and 68.1% [95%CI:63.8-72.1], respectively, which are significantly above the state average rate.

When all U.S. Preventive Services Task Force-approved screening options were considered, statewide adherence increased to 69.9% [95% CI: 67.8–72.0], narrowing the regional gap to 5.4 percentage points (67.6–73.0%). The Metro East and Champaign regions achieved the highest compliance rates (73%[95%CI:67.0–78.3] and 71.5%[95%CI:67.4–75.4], respectively), suggesting broader access to screening alternatives beyond colonoscopy (Table 4, Figure 4).

Table 4. Compliance with the 2016 USPSTF CRC Screening Recommendation by Statewide and Region								
Region	Yes				No			
	Estimated Population	Weighted (%)	95% CI	Respondents	Estimated Population	Weighted (%)	95% CI	Respondents
Statewide	2,508,154	69.9	67.8-72.0	12,188	1,078,050	30.1	28.0-32.2	5,066
Westchester	1,660,493	69.7	66.6-72.7	1,587	721,446	30.3	27.3-33.4	638
Champaign	156,031	71.5	67.4-75.4	2,001	62,083	28.5	24.6-32.6	876
Marion	108,585	67.6	64.7-70.4	2,209	52,024	32.4	29.6-35.3	1,047
Metro East	234,651	73.0	67.0-78.3	2,292	86,772	27.0	21.7-33.0	863
Peoria	214,961	70.3	67.5-72.8	2,793	90,980	29.7	27.2-32.5	1,137
Rockford	133,219	67.6	62.0-72.7	1,303	63,975	32.4	27.3-38.0	504



**Figure 4.** 2016 USPSTF Colorectal Cancer Screening Recommendations by Region and Statewide

Prostate cancer screening had the lowest participation. Fewer than half of eligible men (48.6% [95% CI: 45.7-51.5]) reported ever receiving a PSA test, and only 39.4%[95%CI:36.6-42.2] had done so within the past two years. Non-compliance was as high as 60.8%[95%CI:57.8-63.4], indicating both limited engagement and inconsistent adherence to evolving national screening recommendations. (Table 5, Figure 5).

Table 5. Prostate Cancer Screening Rates by Statewide

PROSTATE CANCER SCREENING	Yes				No			
	Estimated Population	Weighted (%)	95% CI	Respondents	Estimated Population	Weighted (%)	95% CI	Respondents
Ever Had PSA Test (Males Age 40+)	1,378,453	48.6%	45.7- 51.5	6,911	1,457,825	51.4	48.5- 54.3	5,066
Men 40+ Who Have Had PSA Test in past 2 Years*	1,093,535	39.4%	36.6- 42.2	5,412	1,681,863	60.6	57.8- 63.4	6,373

*\*Respondents who reported never having a PSA test are included as No.*

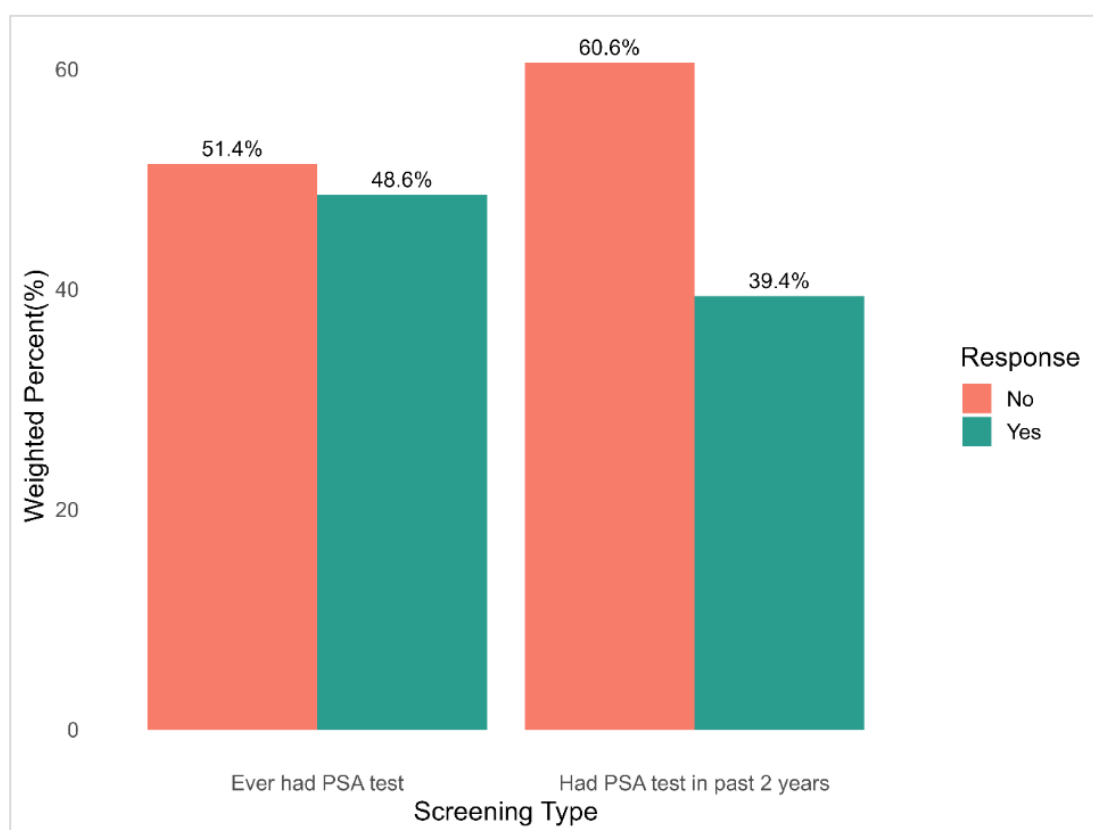


Figure 5. Statewide Prostate Screening Rates

Across all modalities, the Metro East and Champaign regions consistently outperformed other regions, with some modalities' rates exceeding state averages. In contrast, Rockford

lagged behind in multiple screening types, and Peoria performed suboptimal, particularly in mammography and HPV screening. The magnitude of variation was most pronounced for

HPV screening and least for colorectal cancer screening under USPSTF guidelines. Regional performance was closely aligned with socioeconomic indicators and healthcare access, indicating that geographic and structural determinants continue to shape preventive screening behaviors across IL.

## Discussion

This study identified clear and persistent regional disparities in adherence to USPSTF-recommended cancer screening across Illinois that were magnified during the COVID-19 pandemic. While overall statewide screening levels were moderate, substantial geographic variation was observed, particularly in HPV and breast cancer screening. These findings highlight meaningful differences in preventive care engagement across the six public health regions and underscore opportunities for targeted intervention.

The degree of variation differed by screening modality; the widest gaps occurred in HPV screening, followed by mammography, while colorectal cancer screening showed relatively consistent performance due to the availability of home-based options such as the Fecal Immunochemical Test (FIT). Prostate cancer screening remained lowest overall, reflecting both pandemic-related care disruptions and ongoing uncertainty around national screening recommendations. Furthermore, regions with stronger healthcare infrastructure and socioeconomic resources, particularly the Metro East and Champaign areas, demonstrated higher screening adherence and faster recovery from pandemic-related declines. In contrast, Rockford and Peoria performed poorly across multiple modalities, reflecting pre-existing structural disadvantages, including higher uninsurance, workforce shortages, and limited access to preventive services. These findings underscore the

impact of social and geographic determinants on cancer prevention behaviors and how crises, such as COVID-19, and health workforce shortages exacerbate underlying inequities (SIU Medicine Department of Population Science and Policy, n.d.)

National trends mirror IL state challenges. Mammography and cervical screening declined sharply during the pandemic, and recovery has been uneven, especially in medically underserved areas (Cairns et al., 2022; Tsapatsaris et al., 2022). HPV screening exhibited the lowest statewide uptake (39.3%[95%CI:36.9-41.8]) and the widest geographic disparity (>13 % points), with over half of eligible women never screened. This alarming pattern, diverging sharply from other modalities, suggests the pandemic critically disrupted an already fragile screening pathway. Cervical cancer screening, which requires in-person clinic visits, faced profound barriers during COVID-19 due to clinic closures, patient fears of exposure, and the reallocation of resources (Miller et al., 2021)

Colorectal screening proved more resilient in states with organized mailed FIT programs, highlighting the value of decentralized, home-based approaches. The exceptionally low HPV screening rates in Illinois underscore a missed opportunity to leverage self-sampling programs, which have shown effectiveness and scalability in other regions (Issaka et al., 2019; Roy et al., 2021). The narrow variation and improved compliance observed when multiple screening options were considered underscore a critical lesson that screening modalities that offer decentralized, patient-controlled options (e.g., FIT) can maintain equity during healthcare disruptions (Burki, 2021; Charlton et al., 2014) The pandemic likely accelerated a necessary shift toward multimodal screening strategies, although one-third of eligible adults remain unscreened, indicating a significant backlog and a missed prevention opportunity.

Prostate cancer screening via PSA testing presented the lowest recent engagement (39.4% within two years). The pandemic's impact here is nuanced. While access to primary care for routine testing was undoubtedly disrupted, the ongoing decline in PSA screening also reflects the sustained effect of guideline shifts toward shared decision-making (US Preventive Services Task Force et al., 2018). The pandemic may have intensified this trend by forcing a prioritization of acute over preventive care, making discussions about discretionary screenings, such as PSA tests, less likely to occur (Drazer et al., 2015).

Through a socio-demographic lens, the pandemic acted as a "disparities multiplier." Regions like Rockford and Peoria, which consistently underperformed across multiple modalities, entered the pandemic with structural vulnerabilities, higher poverty rates, uninsurance, and provider shortages that rendered them less able to absorb the shock. For instance, Rockford faces greater residential segregation and lower primary care physician density compared to Chicago-area counties, creating a cascade of barriers to preventive care (County Health Rankings & Roadmaps, n.d.-b, n.d.-a; National Institute on Minority Health and Health Disparities, n.d.-b). Within this region, Boone (16%) and DeKalb (14.2%) counties stand out for having very high proportions of uninsured residents in the state (National Institute on Minority Health and Health Disparities, n.d.-a). Similarly, while Peoria hosts major healthcare systems, its sprawling surrounding rural areas face compounded challenges, including longer travel distances and fewer specialists, which reduce the utilization of preventive services (Coughlin et al., 2019).

Conversely, regions with stronger healthcare ecosystems, proximity to higher academic centers, and favorable socioeconomic indicators, such as

the Champaign and Metro East regions, were better equipped to implement safety protocols and recover screening volumes more rapidly. This aligns with ecological models of health behavior, which emphasize that individual choices are enabled or constrained by the environmental context (Glanz et al., 2008). Importantly, these structural determinants are modifiable through policy. States that have expanded Medicaid, invested in rural health infrastructure, and implemented provider incentives have demonstrated measurable improvements in screening equity (Aaronson et al., 2024). Although Illinois is one of these states, a trigger law to end Medicaid expansion is in place, which could lead to the termination of Medicaid expansion if there is a federal funding cut, potentially further worsening the screening rate.

Situating Illinois within the national context of the pandemic is crucial. The state's mammography rate (72.3%) still falls below the Healthy People 2030 target (80.3%), mirroring a national decline and stalled recovery in many states (Office of Disease Prevention and Health Promotion, n.d.). Illinois' intermediate performance suggests it faced challenges similar to, but not exceptional compared to the national average.

For colorectal screening, Illinois' USPSTF compliance rate (69.9% [95% CI: 67.8-72.0]) nearly meets but still falls short of the national goal (72.8%). Notably, states with organized, mailed FIT programs (e.g., Utah, New York) demonstrated greater resilience in screening rates during the pandemic by reducing reliance on in-person visits (Health Resources and Services Administration, n.d.; Lee et al., 2023). Illinois' performance highlights a missed opportunity to leverage such decentralized models more aggressively during the crisis.

Illinois' profoundly low HPV screening rate (39.3%[95%CI:36.9-41.8]) is a critical concern. Internationally, countries with organized, population-based cervical screening programs that incorporate self-sampling have seen less dramatic declines during the pandemic, as self-collection kits could be mailed directly to patients (Landy et al., 2020; Montealegre et al., 2025; Reiter et al., 2025). The absence of such a statewide program in Illinois and most of the U.S. left cervical screening uniquely vulnerable to disruptions in healthcare access.

Although the ICBRFS does not capture reasons for non-adherence, the findings suggest that limited access to primary care and preventive services may contribute to regional differences. Taken together, the observed patterns reinforce that screening participation in Illinois is shaped by geographic and structural contexts. While the survey design does not permit causal inference, the alignment between lower screening rates and regions with higher uninsurance and fewer healthcare resources indicates that underlying structural factors warrant attention. Expanding access through mobile services, leveraging home-based options (e.g., FIT, potential HPV self-sampling), and supporting primary care engagement may help reduce the identified gaps.

This study has limitations. A cross-sectional design prevents the assessment of temporal changes or causal pathways. All outcomes are self-reported and subject to recall or social desirability bias, although such bias is consistent with national surveillance systems. The absence of individual-level socioeconomic and demographic data limits the ability to examine specific determinants of screening behavior. Despite these limitations, the use of weighted, regionally representative data strengthens the validity and relevance of the findings. Future research could adopt multivariate

models to examine factors that may drive screening disparities, accounting for both geographic and individual-level social-demographic factors.

## Conclusion

This study highlights substantial and preventable regional disparities in cancer screening across Illinois, driven largely by structural and socioeconomic inequities that were intensified during the COVID-19 pandemic. Screening gaps were widest for HPV and mammography and narrowest for colorectal cancer, underscoring modality-specific barriers and the importance of accessible, home-based options. Achieving equitable cancer prevention will require targeted, regionally tailored approaches that expand access to screening, incorporate self-collection and home-based modalities, strengthen outreach in underserved communities, and support informed, shared decision-making in primary care. These disparities represent avoidable morbidity and mortality; addressing them is essential to ensuring that residents' cancer outcomes are not determined by geography.

Screening disparities, especially in the Rockford and Peoria regions, require targeted interventions. In Rockford, where mammography rates are lower than in the Metro East, initiatives should include establishing fixed and mobile mammography services in collaboration with UW SwedishAmerican Hospital, with a focus on low-use, underserved communities. Also, implementing a patient navigation program with bilingual navigators for the Latino community and partnering with the Rockford Mass Transit District to provide free or subsidized transportation to screenings will be a laudable initiative.

For HPV screening, with rates above 60% for never-screened individuals in both regions, self-

collection kits should be made available at local pharmacies (e.g., CVS, Walgreens) and health centers, supported by community health worker outreach. In Peoria, collaboration with OSF HealthCare and local health departments can lead to HPV clinics in underserved neighborhoods, including evenings and weekends.

Colorectal screening efforts should include organized FIT mailing programs through health departments, modeled after Kaiser Permanente's successful approach. These interventions should be supported by statewide policy reforms, including enhanced Medicaid reimbursements for practices that achieve screening equity, increased funding for Federally Qualified Health Centers in both regions, and mandates for annual public reporting of county-level screening rates. Illinois has the opportunity and obligation to implement interventions that close these gaps and advance statewide health equity.

## Acknowledgement

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## Conflicts of interest

The authors declare no conflict of interest.

## Authors' contributions

BO and SD were involved in the study concept, design, data interpretation, manuscript writing, critical revision, and correction of the manuscript.

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