

The Relationship between Social Determinants of Health (SDOH), Cancer Screening Behavior and Cancer Stage at Diagnosis among Black Individuals: A Systematic Literature Review

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Abstract

Background: Adverse outcomes of cancer can be mitigated if tumors are identified and managed early; thus, cancer screening is crucial. This review examined the relationship between social determinants of health (SDOH), cancer screening behavior, and cancer stage at diagnosis, specifically focusing on Black individuals.

Methods: A systematic literature search was conducted for articles published up to 1st July 2023. PubMed, Scopus, ScienceDirect, and Google Scholar index databases were used. The identified studies were subjected to the study selection process.

Results: 3,897 articles were identified from the databases; however, only 19 were included in this systematic review.

The SDOH factors influencing screening adherence were grouped into themes. (1) Healthcare access and quality: Health insurance, proper provider communication, knowledge about screening procedures, and recommendations for screening from doctors were found to influence the intention to undergo screening positively. (2) Education access and quality: the higher the level of educational attainment, the higher the likelihood of undergoing screening. (3) Economic stability: A higher income level is associated with higher screening rates. (4) Neighborhood and built environment: High rates of racial segregation negatively impact the intention to screen, whereas high levels of perceived neighborhood safety and community satisfaction improve screening behavior. (5) Social and community context: Having family support, religious beliefs, and supportive social networks leads to increased cancer screening rates.

Conclusion: Several SDOH factors affect cancer screening adherence in Black individuals. These social, economic, and cultural factors can be leveraged to improve cancer screening rates and ultimately reduce adverse cancer outcomes among Black individuals.

Keywords: Social Determinants of Health; Cancer; Systematic Review

Introduction

Health disparities among communities have long been a concern in public health studies, with considerable differences in health outcomes revealed [1]. The concept of Social Determinants of Health (SDOH) is a critical lens through which these disparities can be examined. The term "social determinants of health" refers to the multifaceted factors encompassing an

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individual's birth, growth, life experiences, occupational situations, and aging processes, collectively contributing to their overall well-being [2]. SDOH comprises several health-related societal, economic, and environmental factors that can be categorized into groups of healthcare resources and access, education quality and access, economic stability, social and community context, and neighborhood and built environments [2-4]. Social determinants of health (SDOH) significantly impact health outcomes [3], [5], [6].

Multiple studies have explored the relationship between social determinants of health cancer screening habits, and cancer stage upon detection. Current research indicates that SDOH substantially impacts an individual's propensity towards cancer screening and overall trajectory throughout the diagnostic process [7-9]. Studies have shown that a person's income, education, and other socioeconomic factors can affect their ability to access cancer screening programs and follow-up care [10-11]. Additionally, the availability of healthcare facilities and access options in their community can play a significant role in timely screening [10], [12], [13]. Furthermore, research has emphasized the importance of social determinants of health in affecting the stage at which cancer is diagnosed [7]. Differences in exposure to risk factors, access to healthcare, and health awareness can contribute to disparities in cancer diagnosis across different communities [7], [12], [13].

This systematic review builds on reports of racial disparities in cancer diagnosis and outcomes, especially within the Black community [7], [9], [14]. Despite advancements in medicine and healthcare infrastructure, these disparities persist, highlighting the need for a comprehensive investigation of the underlying reasons [7], [15]. Reports show that black people experience higher rates of late-stage cancer diagnosis and lower survival outcomes than other racial groups [9], [16], [17]. In a study by Haque et al. [16], black men and women reported the highest incidences of cancer deaths at 298.2 per 100,000 for men and 206.5 per 100,000 for women. This systematic review aimed to analyze the existing literature on the relationship between social determinants of health cancer screening behavior, and cancer stage at diagnosis, specifically focusing on Black/African-American individuals. By examining the role of social determinants in cancer screening behavior and stage at diagnosis, this review intends to shed light on the nature of this relationship.

Methods

This systematic review followed the guidelines outlined in the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) statement [18].

Information Sources and Study Selection

A systematic literature search was conducted for articles published up to 1st July 2023. PubMed, Scopus, ScienceDirect, and Google Scholar index databases were used. Topic keywords were used to generate search strings that contained text words and mesh terms. The search strings used are listed in Table 1 in the Appendix. Only the first ten pages of Google Scholar results were assessed. The identified studies were subjected to the study selection process.

Inclusion and exclusion criteria

Articles considered eligible for inclusion had to be original research articles written in English. The race of the population of the study had to be Black. Apart from race, no other population attributes were considered eligible. This study examined the relationship between SDOH, cancer screening behavior, and cancer stage at diagnosis.

The exclusion criteria included non-original research articles, such as systematic reviews, meta-analyses, editorials, article comments, and literature reviews. Studies that did not meet the required study objectives were also excluded.

Review of methodological quality

The included studies were assessed using the Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies, developed by the National Heart, Lung, and Blood Institute [19]. SDOH variables were used as the exposure variables for the assessment, and cancer screening was used as the outcome variable.

Data Extraction

Each article included in the review is summarized in a table, including basic study characteristics. The extracted attributes were the study author, publication year, study design, participants' demographics, type of cancer under study, and SDOH variables under study.

Results

Search results

The initial search identified 3,897 articles from the databases. One 3,380 articles were obtained from Scopus, 142 from ScienceDirect, 2,275 from PubMed, and 100 from Google Scholar. Eighty-seven duplicates were excluded from the analysis. During title and abstract screening, 3,734 articles were excluded following the eligibility criteria, and the remaining 76 articles were subjected to full-text review. Fifty-seven articles were excluded because they did not fully satisfy the inclusion criteria. Only 19 articles were included in this systematic review. The reasons for exclusion are shown in the PRISMA flowchart in Figure 1.

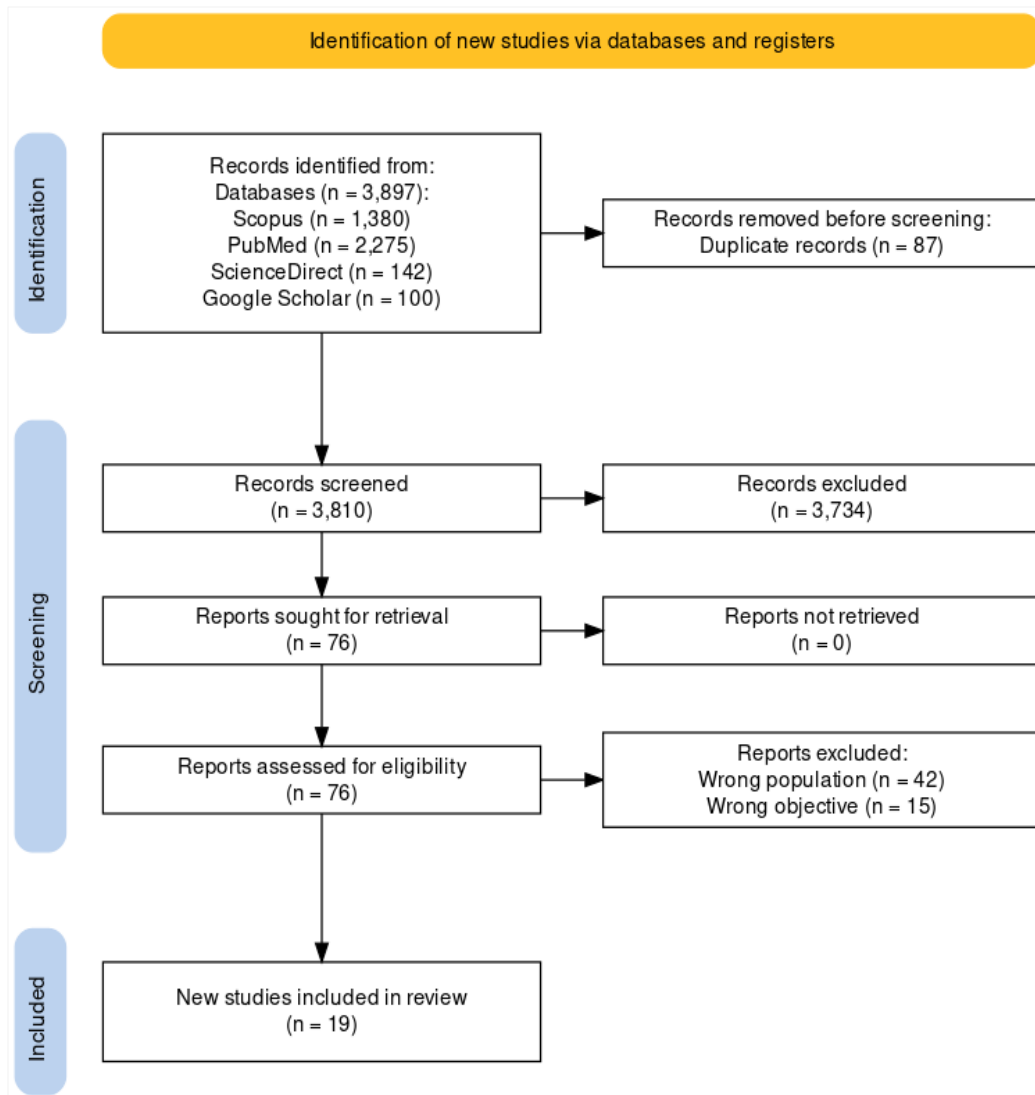


Figure 1: PRISMA flow diagram showing the study selection process.

Data extraction results

Check Table 2 in the Appendix.

Quality assessment results

All the cross-sectional studies scored ‘Fair,’ and the cohort study scored ‘Good’ for overall quality. For Item 6: ‘For the analyses in this study, were the exposure(s) of interest measured prior to the outcome(s) being measured?’ and Item 7: ‘Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?’ all cross-sectional studies scored ‘N/A’ since exposure and outcome data in all cross-sectional studies were collected simultaneously.

Characteristics of included studies: a summary

This systematic review included 18 cross-sectional studies and 1 cohort study. The total population was 13,813.

Colorectal cancer (CRC) is the most studied type of cancer. This review aimed to examine how SDOH affects cancer screening and stage at diagnosis; however, only studies on cancer screening have been found. This limits the scope of this study. SDOH variables differed broadly across studies. The results of this review are presented thematically. SDOH variables were defined according to groups developed by the U.S. Department of Health and Human Services [2].

Results of included studies

Healthcare access and quality

Buehler et al. [21] found that cancer screening percentages were significantly higher among insured than uninsured. Uninsured people had an adjusted Risk Ratio (aRR) of 1.30 (95%CI, 1.22–1.39) for being unscreened for CRC. Buehler et al. [21] reported that uninsured women are less likely to

be screened for cervical cancer. Being uninsured had an aRR of 1.39 (95%CI, 1.22–1.59) for being unscreened. In Palmer et al. [32], being insured led to a likelihood of CRC screening, with an OR of 2.816 (95%CI, 1.53-5.17). Lehto et al. [29], Patel et al. [34], and Patel et al. [35] found that health insurance was a predictor of screening. According to Mitchell et al. [31], health insurance (correlational value = 0.334, $p < 0.001$) was a positive predictor of CRC screening. Earl et al. [23], Ford et al. [24], Patel et al. [35], Patel et al. [36], and Palmer et al. [33] identified significant determining factors for not undergoing screening. However, Halbert et al. [26] and Kim and Alhassan [28] found that being insured did not significantly affect screening. Griffith [25] reported that insured people were 3.25 (95%CI, 1.14-9.31) times more likely to screen than uninsured.

The roles of doctors and physicians have also been examined in several studies. In Halbert et al. [26], the likelihood of screening increased with good healthcare provider communication (OR = 10.78, 95 %CI = 4.85, 29.94, $p = 0.0001$). In Katz et al. [27], having good patient-provider communication meant a 1.95 times (95%CI, 1.29-2.94) likelihood of being screened. Brittain and Murphy [20] reported a significant relationship between having a primary care provider and a colonoscopy (CRC screening). Brittain and Murphy [20], Christie et al. [22], Mitchell et al. [31], and Patel et al. [35] reported that having a regular health provider is a determinant for undergoing screening. Patel et al. [35] and Kim and Alhassan [28] showed that annual health checkups were significantly related to prostate cancer screening behaviors. In Patel et al. [35], participants who did not make at least one medical visit in the previous 12 months were 0.27 times as likely to have been screened compared to those who did. Receiving a doctor's recommendation for screening was also found to increase the likelihood of screening by 3.90 times (95%CI, 1.37-7.93) [32]. Palmer et al. [33] also reported that access to CRC screening services is crucial for participants undergoing screening.

Some studies have examined how participants and patients interact with healthcare facilities. These studies have examined patient trust and knowledge about cancer screening. Palmer et al. [33], Rogers et al. [37], and Sanchez et al. [38] reported medical mistrust as a significant screening barrier. Brittain and Murphy [20], Palmer et al. [33], and Sanchez et al. [38] found that participants had a positive belief in screening procedures, indicating a greater likelihood of undergoing the procedure. Brittain and Murphy [20] found a small, negative, and significant relationship between beliefs about CRC and colonoscopy ($r = -.25$, $p < .01$). Palmer et al. [33] reported that participants who believed they were at an increased risk of CRC were adherent.

Christie et al. [22], Earl et al. [23], Patel et al. [36], Palmer et al. [33], and Sanchez et al. [38] found that patients who

underwent screening were more knowledgeable about CRC screening, including the purpose of screening, types of CRC screening tests, and appropriate testing intervals. In Katz et al. [27], having adequate CRC Knowledge resulted in an OR of 1.82 (1.14, 2.89) for getting screened. Adequate knowledge was, in turn, associated with a higher level of education, a higher level of income, and health insurance. In Ford et al. [24], a lack of knowledge regarding cancer and confusion between prostate cancer screening and prostate cancer diagnostic tests were barriers to screening. Patel et al. [34] and Patel et al. [35] reported that not knowing where to go for screenings and not having enough information about screenings was an obstacle to screening.

Education access and quality

The highest level of education was a predictor of the intention to get screened for cancer [26], [32], [35]. In Palmer et al. [32], education, i.e., college graduate or postgraduate, was a predictive factor for CRC screening with an odds ratio of 1.31 (95%CI, 0.56-3.07). In Halbert et al. [26], being educated, i.e., above high school level, meant a higher likelihood of screening OR= 1.26 (95%CI, 0.65, 2.45). Patel et al. [35] found that participants with more than a high school education were 2.47 times as likely to have been screened than those with less than a high school education.

Buehler et al. [21] found that colorectal cancer screening percentages were highest among patients living where a greater proportion of residents had a bachelor's degree.

Economic stability

Kim and Alhassan [28] reported that annual household income is significantly related to prostate cancer screening behaviors. In Earl et al. [23] and other studies, insufficient finances were mentioned as a reason for not undergoing CRC screening. The income amount was different across studies, but it was clear that the more income a person earned, the higher the chance of undergoing screening. In Halbert et al. [26], having an annual income level of >\$20,000 meant an OR of 2.09 (95%CI, 1.07- 4.06) for being screened. In Mitchell et al. [31], having an annual household income below \$20,000 was negatively associated with CRC screening (correlation value = - 0.186, $p < 0.001$). Palmer et al. [32] reported that an annual household income of >\$65,000 was a predicting factor for CRC screening. According to Patel et al. [34], having a higher income was a predictor for screening. In Patel et al. [36], participants with annual household incomes of \geq \$15,000 were 2.15 times more likely to have been screened for breast cancer in the past two years compared to participants who had annual household incomes <\$15,000.

Employment status also plays a role in screening behavior. In some studies, being employed was a predictive factor for screening [26], [30]. Lozano et al. [30] reported that unemployment was a significant factor for not being screened,

and Halbert et al. [26] reported that being employed meant a higher likelihood of screening OR= 1.40 (95%CI, 0.68-2.92). In some studies, however, being employed became an obstacle [31], [32], [34]–[36] under some conditions. According to Mitchell et al. [31], employment is a negative predictor of screening. However, the association was positive (encouraging screening) if employment offered paid sick leave. Palmer et al. [32] found that employment type affected the intention to undergo screening, as the study showed that caregivers were less likely to undergo CRC screening. In Patel et al. [36], difficulty getting time off from work was cited as an obstacle to screening by 52% of the participants. In Patel et al. [34] and Patel et al. [35], participants who were not employed were 3.46 times and 2.09 times as likely to have screened compared to those who were employed.

Neighborhood and built environment

Buehler et al. [21] reported that participants living in the most racially segregated neighborhoods were 10% more likely than others to not be screened for colorectal cancer. The adjusted OR for screening was 0.91 (95%CI, 0.84-0.99) for those living in the most racially segregated neighborhoods. Additionally, women living in areas with higher racial segregation were less likely to be screened for cervical cancer [21]. Having a racial segregation index, z score of ≤ 1.96 , an aRR of 0.97 (0.86–1.10) for being screened, and a racial segregation index, z score of > 1.96 used as a reference.

Brittain and Murphy [20] reported that women living in census tracts with the highest levels of perceived neighborhood safety had lower cervical cancer screening percentages than those residing in tracts perceived as least safe.

Lozano et al. [30] reported that higher levels of community disadvantage, such as neighborhood insecurity, housing cost burden, household poverty, violent crime, limited food access, and vacant housing, were associated with a lower likelihood of CRC screening, even after controlling for individual-level factors. In Halbert et al. [26], the likelihood of screening increased with greater neighborhood satisfaction (OR = 1.38, 95%CI, 1.01-1.90).

Social and Community contexts

In Brittain and Murphy [20], being religious or having a future orientation toward a particular religion positively correlated with colorectal cancer screening. According to Mitchell et al. [31], being religious, that is, church membership (correlation value = 0.136, $p < 0.01$), was a positive predictor of CRC screening.

Ford et al. [24] and Rogers et al. [37] found that support from family members or social networks was the most consistent facilitator of screening decisions. Brittain and Murphy [20] reported a positive correlation between family and family influence and screening for colorectal cancer.

Family support was a predictive factor for colorectal cancer screening among men in a study by Earl et al. [23]. In the study, 91.6% of respondents found the statement “Get screened for your family” to be persuasive [23]. Lehto et al. [29] found that men who had undergone screening were more likely to be married than those who did not undergo prostate cancer screening. According to Mitchell et al. [31] and Patel et al. [35], being married is a positive predictor of CRC screening. Patel et al. [35] found that participants who were single and had never been married were 0.37 times as likely to have been screened compared to those who were married or living with a partner.

Discussion

Healthcare access and quality impact on cancer screening behavior cannot be overstated. Several studies have consistently shown that health insurance is linked to higher screening rates [21], [23], [24], [29], [31], [32], [34], [35], [36]. These findings emphasize the importance of having health insurance and developing policies to resolve insurance problems in black communities. Furthermore, the role and communication of healthcare providers is crucial [26], [27], [35]. It is worth noting that access to healthcare professionals may vary by location, which could affect the observed relationships.

Educational attainment is a crucial factor that affects cancer screening practices. Based on studies conducted by Palmer et al. [32] and Patel et al. [35], individuals with higher education levels (higher than high school) are more likely to undergo cancer screening. This may support the belief that higher education enhances health literacy and awareness, emphasizing the need for educational access and ensuring that tertiary education is easily attainable in Black communities.

The impact of economic stability on screening has been a recurring topic in many studies. Several studies have reported that higher income is a predictor of increased screening rates [28], [32], [36]. However, the relationship between screening and employment status is complex. While some studies have suggested that being employed leads to better screening rates [26], other studies have highlighted work-related obstacles, such as the lack of paid sick leave [31] and difficulty getting time off from work [36]. The effect of employment status on screening behavior can be seen as individual- and situation-based since it is difficult to generalize it. Nevertheless, it can be suggested that a good working environment coupled with a deserving income level leads to an improved likelihood of screening.

The influence of neighborhood and built environment on cancer screening behavior is significant. Buehler et al. [21] reported that racial segregation presents a substantial obstacle to screening, as individuals residing in such neighborhoods exhibit lower screening rates. This underscores the far-

reaching impact of structural inequality. Moreover, perceptions of neighborhood safety and community satisfaction also contributed to screening decisions [20], [26]. Mitigating disparities within neighborhoods and creating safe and supportive environments could potentially increase screening rates, thereby enhancing overall healthcare outcomes.

Various social and community contexts influence cancer screening behaviors, including family support and religious beliefs. Ford et al. [24] and Brittain and Murphy [20] found that family support and social networks can encourage screening decisions, whereas religious affiliation and beliefs are positively correlated with CRC screening [20], [31]. These study findings highlight the socioeconomic and cultural factors that can be leveraged to improve cancer screening practices and, in turn, reduce negative cancer outcomes among Black individuals. This review also highlights the importance of addressing disparities within neighborhoods and creating safe and supportive environments to increase screening rates and improve overall healthcare outcomes.

Study limitations

It is important to note that the findings may be inconsistent due to the heterogeneity arising from different methodologies, sample sizes, and demographics across studies. Additionally, all except one of the studies had a cross-sectional design, which limited the ability to establish causal relationships.

Conclusion

This systematic review aimed to examine how social determinants of health (SDOH) are linked to cancer screening behaviors in Black individuals. The results indicate that having access to healthcare services, receiving good-quality care, and having insurance coverage are all critical factors that affect screening rates. Studies suggest that insured individuals are more likely to undergo screenings [21], [33], [35]. It is essential to consider geographic disparities in access to healthcare services, but healthcare providers' effective communication and advice also exert a significant influence [26], [27], [35]. Increasing access to education and developing health literacy is crucial in promoting cancer screening behaviors, as identified by studies conducted by Palmer et al. [32], Halbert et al. [26], and Patel et al. [35]. Additionally, higher income and employment levels are associated with higher screening rates, as highlighted by Kim and Alhassan [28], Halbert et al. [26], Palmer et al. [32], and Patel et al. [36]. However, the relationship between job status and screening is complex and influenced by factors such as workplace circumstances and leave regulations [31], [36]. Neighborhood and built environments play a significant role in determining cancer screening rates. Factors such as racial segregation, perceived safety, and community satisfaction

can affect screening decisions [20], [21], [26]. Creating supportive environments and addressing structural disparities may help increase screening rates among Black individuals. Social and community circumstances also impact screening practices, with family support, religious views, and social networks identified as favorable drivers of cancer screening by Ford et al. [24], Brittain and Murphy [20], and Mitchell et al. [31]. To promote cancer screening and reduce cancer-related inequities in Black communities, the identified social, economic, and cultural factors can be leveraged to improve screening rates. This systematic review emphasizes the crucial role of healthcare access, socioeconomic factors, and community dynamics in shaping cancer screening behaviors among Black individuals. The insights gained from this review can be used to create targeted interventions and policies to improve screening rates and healthcare equity and ultimately reduce the burden of cancer in the Black community.

Declarations

Conflict of Interest declaration:

The authors declare that they have NO affiliations with or involvement in any organization or entity with any financial interest in the subject matter or materials discussed in this manuscript.

Author Contributions

SM solely contributed to the design and implementation of the research, analysis of the results, and the writing of the manuscript.

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Appendix

Table 1: Search strings

Database	Search string
Scopus, PubMed	("social determinants of health" OR SDOH OR "health disparities" OR "health inequalities" OR "social factors" OR socio-economic factors OR "health care access" OR "education access" OR "economic stability") AND (cancer OR malignancy OR tumor OR carcinoma OR oncology) AND (black OR African- American OR "African American")
ScienceDirect, Google Scholar	("social determinants of health" OR SDOH OR "socio-economic factors") AND (cancer OR tumor) AND (black OR African-American OR "African American")

Search in ScienceDirect was limited to title, abstract, and keywords.

Table 2: Study Descriptor table

Study	Study design	Number of participants	Age (years) and % sex	type of cancer	S.D.O.H variables
Brittain and Murphy [20]	CCS	129	50% male, at least 50 years of age, mean age of 58.5 years	Colorectal	cultural identity, social support, CRC beliefs, informed decision
Buehler et al. [21]	CCS	6703	92% female	cervical and colorectal	levels of racial segregation, levels of poverty, perceived neighborhood safety
Christie et al. [22]	CCS	159	76.1% female, mean age of 57.0 years	Colorectal	education level, regular visits to healthcare professionals, had a previous recommendation for screening
Earl et al. [23]	CCS	135	100% male	Colorectal	CRC knowledge, income level, family relations, regularly seeing a doctor
Ford et al. [24]	CCS	21	100% men, age range of 55-87 years	prostate	cancer knowledge, fear of cancer, social support, intergenerational transfer of health information, lack of health insurance
Griffith [25]	CCS	492	172 males	Colorectal	Education, employment, insurance, and healthcare provider access.
Halbert et al. [26]	CCS	262	56% female, mean age of 57.2 ±5.0 years	Colorectal	marital status, education level, employment status, income, health insurance status, neighborhood satisfaction
Katz et al. [27]	CCS	397	74% female, mean age of 63±9.7 years	Colorectal	CRC knowledge, patient-provider communication
Kim and Alhassan [28]	CCS	304	100% male	prostate	cultural mistrust for health providers, prostate cancer knowledge, annual household income, annual health check-up, health insurance
Lehto et al. [29]	CCS	60	100% male, mean age of 54.8 ± 10.13 years	prostate	marital status, presence of health insurance, education, health values and behaviors, physician trust
Lozano et al. [30]	CS	2,836	52.8% male, age range of 50–75 years	Colorectal	community safety, community crime, household poverty, community unemployment, housing cost burden, housing vacancies, low food access
Mitchell et al. [31]	CCS	558	100% male, mean age of 54.3 years	Colorectal	health insurance, marital status, having a regular doctor, social support, education, household income, employment status
Palmer et al. [32]	CCS	504	50% male, age more than 50 years	Colorectal	level of education, relationship status, annual household income, healthcare insurance
Palmer et al. [33]	CCS	36	50% male, aged more than 50 years	Colorectal	level of education, relationship status, annual household income, healthcare insurance
Patel et al. [34]	CCS	308	100% female, 40 years and older	cervical, breast, and colorectal	income, education, marital status, employment status, health insurance coverage, health care access, and utilization
Patel et al. [35]	CCS	460	51% male, 50 years and older	Colorectal	Medical visit in past 12 months, family history of cancer, income, education, employment status, health insurance coverage
Patel et al. [36]	CCS	334	100% female, 40 years and older	breast	Medical visit in past 12 months, family history of cancer, income, education, employment status, health insurance coverage
Rogers et al. [37]	CCS	84	100% male, mean age of 59.34 ±7.43 years	Colorectal	education level, employment status, annual household income, health insurance, having a primary care physician, visiting with a doctor, doctor advice for screening, family history of cancer, attending religious functions
Sanchez et al. [38]	CCS	31	100% male, age range of 40-70 years	prostate	education level, annual household income

CRC- Colorectal cancer; CCS-cross-sectional study; CS-cohort study