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Structural Racism in Cervical Cancer Care and Survival Outcomes: A Systematic Review of Inequities and Barriers

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Abstract

Purpose of Review Despite cervical cancer (CC) being a cancer that can be eliminated, CC disparities persist such that minoritized populations shoulder a disproportionate mortality burden. This may reflect upstream, fundamental drivers of health that impede equitable access to prevention, screening, early detection, and treatment among some groups. This systematic review summarizes evidence on the relationships between structural racism and CC care across the continuum.

Recent Findings Following PRISMA guidelines, we conducted a comprehensive search for peer-reviewed, English-language studies relevant to our research question that were published from 2012–2022 using PubMed, CINAHL, Web of Science, and Embase. Of 8,924 articles identified, 4,383 duplicates were removed, and 4,541 underwent screening, with 206 articles meeting eligibility criteria for inclusion in our data synthesis. Among reviewed studies, 60.2% (n = 124) compared CC outcomes by race and ethnicity, often as proxies for upstream racism. Key findings included evidence of lower CC screening rates among Asian American and Pacific Islander women and higher rates among Black and Hispanic/Latinx women. Barriers to healthcare access and socioeconomic status (SES) factors contributed to delayed follow-up, later-stage CC diagnoses, and poorer outcomes, particularly for Black and Hispanic/Latinx women and those residing in low-SES neighborhoods.

Summary This review underscores associations between race, ethnicity, SES, and outcomes across the CC continuum. Most studies examined racial and ethnic disparities in the outcomes of interest rather than directly evaluating measures of structural racism. Future research should refine measures of structural racism to deepen our understanding of its impact on CC across the care continuum.

Keywords Systematic review · Cervical cancer · Structural racism · Cancer disparities · Fundamental drivers of health · Health equity

Introduction

Cervical cancer (CC) is one of the few examples of a cancer that is highly preventable through effective screening and early detection of precancerous lesions. Additionally, availability of prophylactic vaccines against human papillomaviruses (HPV) – a major cause of CC – creates an opportunity to eliminate CC in our lifetime [1]. With the integration of regular screenings, CC incidence and mortality rates in the United States (US) have drastically declined since the 1970s. However, over 4,000 women die of this malignancy each year, with stark inequities by race and ethnicity [2]. For example, American Indian/Alaskan Native (AIAN) and Hispanic/Latinx women have the highest CC incidence rates (11.4 and 9.7 per 100,000 women, respectively) compared to their non-Hispanic/Latinx White (NHW) counterparts (7.2 per 100,000). Further, non-Hispanic/Latinx Black (NHB) and AIAN women have the highest mortality rates (3.3 and 3.3 per 100,000, respectively) [3]. Persistent racial inequities in CC outcomes are the result of upstream factors, including structural racism, that drive downstream trends, such as racial and ethnic differences in late-stage diagnosis and suboptimal screening and/or follow-up rates among certain

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sociodemographic groups [4, 5]. Compared to NHWs, Asian American and Pacific Islander (AAPI) women, AIAN women, Hispanic/Latinx women, and women who self-identify as other non-Hispanic/Latinx races are less likely to receive a Pap test [6]. Evidence also shows that healthcare factors such as having to self-pay or coverage through government-funded insurance (vs. private insurance) or being limited English proficient are statistically significantly associated with poor adherence to timely follow-up after initial screening [7]. Exploration of the causes of persistent CC inequities in the United States (US) may only be accomplished by investigating the root cause of health inequities: structural racism [8]. This is critical as it will enable clinicians and public health professionals to plan and prioritize interventions at points along the continuum, while identifying research gaps, resource needs, and collaboration opportunities to address inequities [9].

Structural racism is the totality of ways in which societies foster racial discrimination through mutually reinforcing systems of housing, education, employment, earnings, benefits, credit, media, health care, and criminal justice operating at multiple levels: micro (individual-level), mezzo (area- and community- level), and the macro (healthcare system, policy, and societal-level) [10]. It is critical to examine how measures of structural racism at each of these levels impact CC prevention, treatment, and survival. Healthy People 2030 categorizes social drivers of health (SDOH) into five domains: economic stability, education access and quality, health care access and quality, neighborhood and built environment, and social and community context [11]. Structural racism is intertwined with all five SDOH domains and specifically restricts access to quality education and timely healthcare, exerting effects on social and community context. For example, government-sponsored discriminatory mortgage lending processes (e.g., neighborhood redlining) resulted in residential segregation that persists across many areas of the US [12, 13]. One study found that residence in redlined census tracts was markedly associated with lower odds of meeting CC screening targets (OR 0.21, 95% CI: 0.16, 0.27) compared with residence in census tracts that were deemed as the "best or most desirable" census tracts (i.e., those where mortgage lending was more likely) [13]. This association was notably mediated by poverty, lower levels of educational attainment, and limited English proficiency at the population-level [13]. Thus, residential and intergenerational social segregation affects long-standing adverse health outcomes including cancer incidence and mortality and lack of participation in health-promoting behaviors [4].

There is a lack of standardized measures for assessing the relationship between structural, systemic racism and its contribution to CC inequities. While evidence supports associations between individual-level factors, including SES, insurance status, age, race and ethnicity, prior abnormal screening tests, health literacy [14–19], and area-level factors including neighborhood deprivation [14, 20] and segregation, with suboptimal CC screening uptake and follow-up care, recent research, including ours [20–22], indicate a need to examine the contribution of structural racism at the community- and health system-levels [23]. The goal of this review is to examine the extent of empirical evidence regarding structural racism and CC and to identify phases across the care continuum where this relationship may be understudied.

Methods

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines and was registered on PROSPERO (https://www.crd.york.ac.uk/PROSPERO/view/CRD42023469925).

Eligibility Criteria and Search Strategy

A health sciences librarian (ML) ran a comprehensive search on September 27, 2022, in PubMed, CINAHL (EBSCO), Web of Science, and Embase (ELSEVIER) using keywords relating to racism and CC. We limited results to publication years 2012 to 2023 and only articles published in English were included. The full search terms and search strings are provided in Supplementary Table 1.

Study Selection

In total, 8924 references were retrieved and uploaded into Covidence where they were deduplicated, leaving 4541 references for initial screening. Using Covidence, the titles and abstracts of each reference were independently screened by two reviewers and 3701 were removed due to irrelevance. Of the remaining 840 references, an additional 551 were removed due to ineligibility (e.g., wrong setting, outcome, exposure, being a review paper, etc.), resulting in 289 references included in the full-text review. Full-text articles were reviewed by two independent reviewers, resulting in the exclusion of 83 additional references. Conflicts were resolved through discussion among the three project leads (AAML, JT, and JYI) to ensure a third perspective. Ultimately, 206 references were selected for data synthesis (Fig. 1).

Data Extraction and Risk of Bias Evaluation

Data were extracted using a structured form designed in Covidence, downloaded, and then categorized into data matrix tables across the CC care continuum: screening and early detection, diagnosis and treatment, and

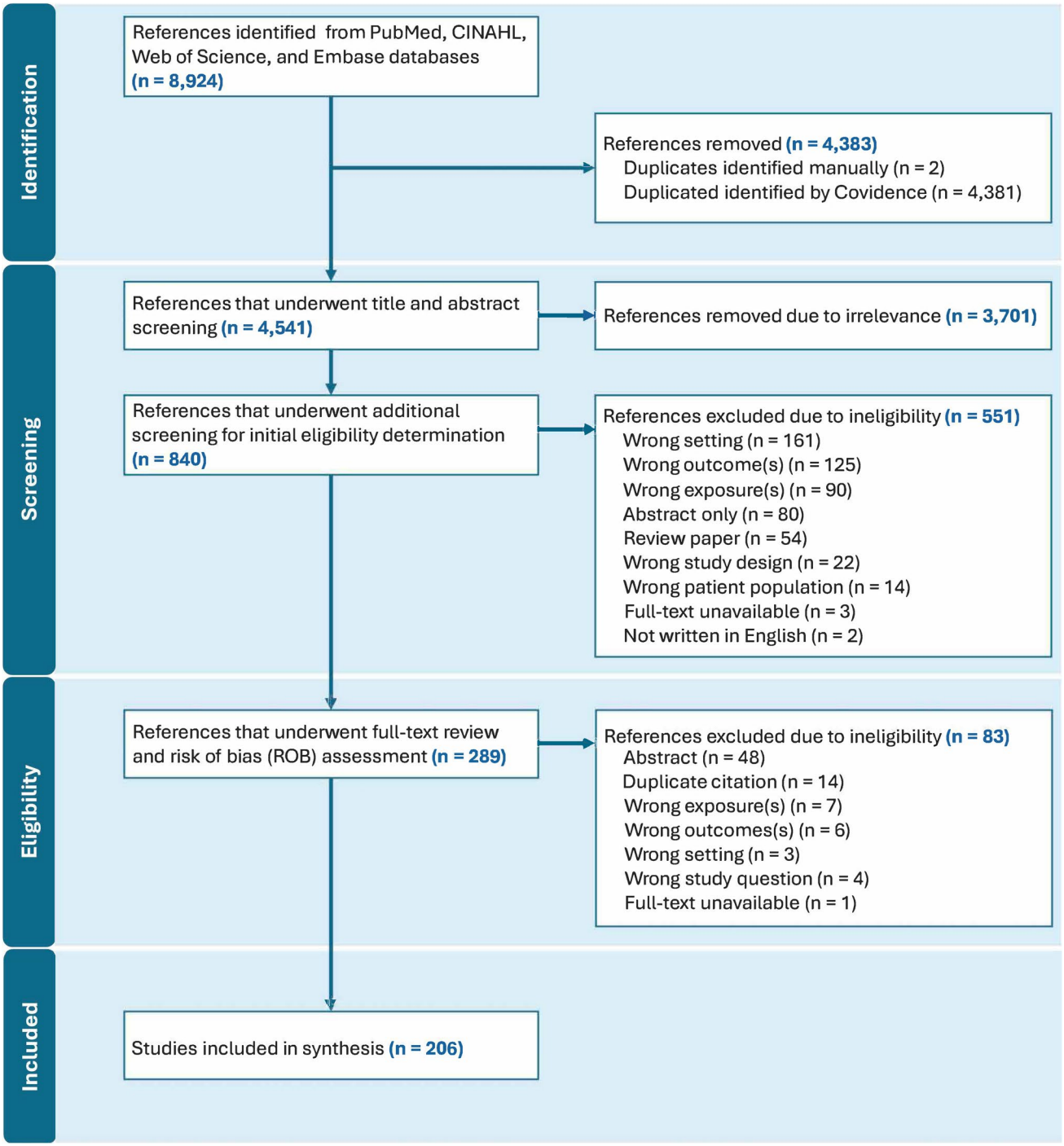

Fig. 1 PRISMA Diagram

palliative care and survivorship (Table 1 and Table 2). To mitigate bias, each study was evaluated by two independent reviewers and conflicts were discussed and resolved by consensus. Risk of bias (ROB) was then systematically evaluated in Covidence using structured forms developed using critical appraisal tools from Joanna Briggs Institute (JBI), a global organization that promotes and supports evidence-based decisions to improve health and healthcare delivery [24–30]. A risk of bias summary rating scale was created for each study design (e.g., cross-sectional and ecological, case–control, cohort, prevalence, case series, and qualitative) based on the number of questions in the respective JBI appraisal tool [24–30]. Each study was assigned a summary rating based on the

Table 1 Summary of studies investigating relationships between measures of structural racism and cervical cancer screening, early detection, diagnosis, treatment, and/or survivorship outcomes

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
SCREENING AND EARLY DETECTION							
Adams 2020	Cohort	SC	■ Neighborhood ■ Travel distance to the health center	■ Ever screened ('screening for malignant neoplasm of the cervix', 'Papanicolaou smear', 'Pap smear', or 'routine gynecological examination') ■ Screened in the last year	Risk Ratio/ Relative Risk	Age, race, marital status, residential area	Two FQHCs primarily served patients from urban locations, and one primarily served rural patients. The mean distance was 10.3 miles with cervical cancer screenings rates within 1 year (21.8–35.1%) varying greatly between centers ($p < 0.01$). At center 1 and 2, patients living further from the health center were more likely to be screened meaning the association between distance to the health center and cervical cancer screening varied by whether the patient lived at a rural or urban address. At two health clinics, rural residents living the furthest away from the clinic (~9 miles difference between quartile 4 and quartile 1) were more likely to be ever screened (RRs = 1.05 and 1.03, p-values < 0.05), while urban residents living the furthest away were less likely to be ever screened (RR = 0.85, p-value < 0.05). At the third center, only urban residents living the furthest away were more likely to be ever screened (RR = 1.02, p-value < 0.05)
Adegboyega 2017	Qualitative	Lexington, KY	■ Country of origin ■ Educational attainment ■ Annual household income ■ Insurance status ■ Employment status ■ Duration of residence in US	■ Cervical cancer screening practices	None (e.g., descriptive study)	N/A	The study provides insights into the barriers and motivators regarding Pap screening among sub-Saharan African immigrant patients. Key barriers include lack of knowledge and low awareness of cervical cancer screening tests, cost of screening, poor communication with healthcare providers, and impaired cultural competence of the US healthcare system. Main motivators for cervical cancer screening were found to be providers' recommendations, as well as community and family support
Agénor 2014	Ecological	USA	■ Race and ethnicity	■ Pap test use (In the past 12 months, have you received a Pap smear)	Odds Ratio	Age, place of residence, relationship status, religious affiliation, language, nativity, educational attainment, household poverty level, employment status	Among White patients, the odds of Pap were significantly lower for those with only female sexual partners compared to those with male sexual partners. A similar trend for Black patients was observed but not statistically significant. The odds of receiving a Pap smear were significantly lower for patients with no sexual partners in the past year. Health care indicators, such as health insurance status, receiving contraception, and sexually transmitted infection services use, explained Pap test use disparities for certain groups, such as patients with only female sexual partners among White patients

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Akinlotan 2018	Cross-sectional	TX	■ County poverty level ■ Percentage of Black and Hispanic population ■ Number of health centers, primary care physicians, and office-based obstetrician-gynecologists ■ Race and ethnicity ■ Education level ■ Household income ■ Insurance status	■ Recent Pap Testing (within past 3 years)	Odds Ratio	Individual- and county-level characteristics	Screening rates varied by individual characteristics, with higher rates among Whites, married patients, those with higher education and income, and those with health insurance. There was significant variation in Pap testing rates between Texas counties, with county-level characteristics, including poverty levels, racial composition, and healthcare provider availability, explaining approximately 40% of the remaining variation in Pap testing rates between counties. Thus, county- and individual-level characteristics help explain disparities in Pap screening rates
Amuta-Jimenez 2022	Cross-sectional	USA	■ Health insurance ■ Immigrant status	■ Knowledge of cervical cancer and cervical cancer ■ Screenings ■ Cervical cancer screening behaviors and barriers ■ Family history of cervical cancer ■ Provider and family advising	Odds Ratio	Sociodemographics	Black immigrant women (BIW) had significantly lower knowledge of cervical cancer compared to Black women (AAW). AAW were more likely to visit a gynecologist, have well-woman exams every 3 years or less, and have had a Pap smear in the last 3 years when compared to BIW. BIW reported not getting Pap smear tests due to no symptoms or fear of bad results. AAW reported barriers such as inconvenience, lack of trust in doctors, lack of access to a gynecologist, and not having any symptoms. Health insurance was positively associated with having a regular gynecologist, well-woman exam, and Pap smear, particularly among AAW
Azhar 2022	Cross-sectional	New York, NY	■ Perceived discrimination ■ Spiritual health locus of control	■ Receipt of Pap test	Odds Ratio	Age group, English spoken fluency, education, and health insurance	In this study population, individuals ages 40–49 had 3.94 times greater odds and those ages 50–59 had 2.57 times greater odds of receiving an up-to-date Pap test compared to those age 60–75. Those with less than a high school education and those with less than a college education had higher odds of an up-to-date Pap test compared to college graduates. Those with higher degrees of Exclusion/Rejection and lower degrees of Spiritual Life/Faith were significantly more likely to obtain an up-to-date Pap test

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Benavidez 2021	Cross-sectional	USA	■ Race and ethnicity ■ Annual income ■ Education ■ Location of residence ■ Health insurance status ■ Avoidance of medical care due to cost in the past year	■ Meeting US Preventive Services Task Force (USPSTF) cervical cancer screening guidelines	Prevalence Ratio	Age	Compared with NHW women, NHB women (adjusted PR = 1.06; 95% CI, 1.04–1.08) and Hispanic (adjusted PR = 1.05; 95% CI, 1.03–1.07) women had a higher prevalence of meeting cervical cancer screening guidelines. Women at any annual household income level < $50,000 had a lower prevalence ranging from 3 to 6%. Compared with women with a college degree, women with some college (adjusted PR = 0.97; 95% CI, 0.94–0.99) and women with a high school diploma (adjusted PR = 0.95; 95% CI, 0.92–0.97) had a lower prevalence. Retired women (adjusted PR = 0.96; 95% CI, 0.94–0.98) had a lower prevalence compared with employed women, but we observed no difference between unemployed women and employed women. Women reporting having no form of health insurance had a 17% lower prevalence (adjusted PR = 0.83; 95% CI, 0.79–0.88) compared with women with some form of health insurance. Women who reported avoiding medical care because of cost had a 6% lower prevalence (adjusted PR = 0.94; 95% CI, 0.92–0.97) than those not avoiding medical care. We observed no significant difference in the adjusted model for women residing in micropolitan (adjusted PR = 0.98; 95% CI, 0.95–1.02) or rural counties (adjusted PR = 0.97; 95% CI, 0.94–1.00) compared with metropolitan counties
Bennefield 2015	Cross-sectional	Southwest USA	■ Race and ethnicity	■ Time last screened for cervical cancer	Ordinary Least Squares	Age, education	The effect of education on health awareness is not equal across racial/ethnic lines. White patients reported higher levels of awareness of HPV and cervical cancer than patients of color. Patients of color had longer times passed since their last cervical cancer screening. 68% of minority respondents reported never being screened for cervical cancer compared to 63% of Whites, and only 20% of minorities had been screened less than a year prior to the study compared to 25% of Whites. Race and awareness do not fully explain the variation in preventative screening practices among highly educated women

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Biddell 2021	Cross-sectional	NC	■ Race and ethnicity ■ Education level ■ Health insurance status	■ Perceived financial barriers to cervical cancer screening ■ Perceived cost burden	Descriptive study	Age, health insurance, employment status, education	Among a sample of low-income patients in North Carolina, U.S. overdue for cervical cancer screening, the majority (72%) perceived one or more financial barriers to screening. Participants most reported the clinic appointment's perceived cost as a barrier and attributed the highest perceived out-of-pocket screening costs to this component. Non-medical costs, such as transportation, care giving expenses, and lost wages due to time off work, were less often perceived as barriers. The higher perceived financial barriers among White women compared with Black patients observed in this analysis, viewed in light of comparable reported cervical cancer screening rates among Black (85.6%) and White (85.0%) individuals in the United States, may suggest that other nonfinancial barriers to screening are more potent or immediate for Black (vs. White) patients. Racial identity and not receiving social assistance were also associated with reporting screening and future treatment costs as perceived barriers to screening
Bynum 2016	Cross-sectional	USA	■ Perceived Healthcare discrimination ■ Health care access ■ Race and ethnicity	■ Cervical Cancer Screening Engagement	Odds Ratio	Education, income, relationship status	Despite the high prevalence of screening, about 20% did not meet the annual screening recommendation. Healthcare access, transportation access, perceived HIV stigma and healthcare discrimination, and source of care did not consistently predict cervical cancer screening engagement across screening behaviors. Patients who reported having low access to healthcare were four times more likely to report meeting the annual screening recommendation
Caldwell 2016	Cross-sectional	USA	■ Rural versus urban area	■ The cervical cancer screening (most recent Pap test)	Odds Ratio	Age, gender, educational attainment, household income relative to the FPL, whether the respondent was employed, and family size, poverty level in area, healthcare supply in area	Cervical screening showed less variation, with rates varying between 81 and 86% among rural patients, and 87% and 91% among urban patients. Blacks in rural areas had lower odds of cervical screening (OR 0.48; 95% CI = 0.29, 0.80) than those in urban areas. Whites in rural areas had lower odds of cervical cancer screening (OR 0.76; 95% CI = 0.62, 0.95) than their urban counterparts. After adjustment, in rural areas, rates of cervical screening were similar for Blacks and higher for Hispanics (OR 1.65; 95% CI = 1.07, 2.55), relative to Whites in urban area

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Chawla 2015	Cross-sectional	CA	■ Asian nationality ■ Acculturation ■ English proficiency ■ Health care access	■ Pap test receipt in past 3 years	None (e.g., descriptive study)	Survey year, Asian nationality, age, marital status	Pap testing rates remained stable over time, but all rates were below the recommended level of screening, ranging from 77.3% in 2001 to 80.8% in 2007. In 2007, Chinese (77.5%) and Korean (78%) patients had the lowest rates of Pap test receipt, whereas Japanese patients had the highest (85.5%). Asian Americans between 21 and 29 years old had the lowest rates of Pap testing compared to other age groups. AAPI patients who were aged 30 to 39 years and 40 to 49 years were significantly more likely to have Pap tests compared with those aged 21 to 29 years for all AAPI ethnic groups except Korean patients. Unmarried patients from all AAPI ethnic groups, except Korean patients, were significantly less likely to receive Pap tests compared with their married counterparts. AAPI patients with less than a college degree were less likely to receive Pap tests compared with college graduates. Those who spent more time in the US were more likely to report having Pap test with US-born Asian patients reporting the highest screening rates. AAPI patients with fewer physician visits also had lower Pap test rates. Uninsured Asian women in aggregate and uninsured South Asian and Chinese patients were less likely to report receiving a Pap test compared with their insured counterparts, but this finding was not consistent for the other Asian nationalities
Chen 2012	Cross-sectional	USA	■ Race ■ Education level ■ Annual household income ■ Health insurance status	■ The last time the respondent had a Pap test	Odds Ratio	Sociodemographic factors	Between 1993 and 2010, 81.3% of respondents reported they had a Pap test within 3 years; 6.2% were never screened. Patients aged 18–20 years were most likely to report never having a Pap test (37.3%). Hispanic and other race patients were more likely (11.1% and 14.7%, respectively) to never have a Pap test than White patients (5.0%) or Black patients (5.8%). Patients with less than a high school education were about two times more likely (11%) to have never been screened than women who had completed high school (6.8%). Increasing annual household income levels were inversely associated with never being screened. Among respondents who were currently insured, 5.4% reported never having a Pap test while those who were not currently insured had about two times higher prevalence (11%) of near being screened

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Clark 2014	Cross-sectional	Boston, MA	■ Insurance Type ■ Race and ethnicity ■ Date of birth ■ Annual household income ■ primary language ■ Education level	■ Differences in cervical cancer screening from pre-reform (defined as the 3-year period from January 1, 2004, to December 31, 2006) compared to postreform (defined as the period from September 1, 2007, through August 31, 2010)	Odds Ratio Generalized estimating equations (GEE) models	Age, race, diabetes, hypertension, household income, and insurance payer	Most NHW participants received recommended screenings, but there were differences in use by insurance type. Patients with state-subsidized insurance saw an increase in mammography screening, while those with unsubsidized insurance or Medicare saw a decline in Pap smear use. Overall, 31% of women required state safety-net funds for screening tests, highlighting persistent barriers to preventive care for low-income patients
Cowburn 2013	Cross-sectional	OR, CA	■ Race and ethnicity ■ Insurance status	■ Receipt of Pap smear	Prevalence Ratio	Age, race/ethnicity, household income as a percentage of the FPL	Findings revealed insurance status is a significant predictor of cervical cancer screening, with variations by race, ethnicity, and age. Being continuously insured throughout the study period improved the likelihood of receiving a Pap smear for many patients. Uninsured NHW patients were less likely to receive a Pap smear than uninsured patients of other races. Young, uninsured Hispanic patients were more likely to receive a Pap smear than fully insured Hispanic patients
Datta 2022	Cross-sectional	USA	■ Race and ethnicity ■ Primary care provider ■ Health insurance status ■ Income ■ Education level	■ Never screened for cervical cancer ■ Not receiving recent cytologic screening (in recent 3 years) or HPV test (in recent 5 years)	Prevalence Ratio	Age, race, marital status, educational attainment, having a primary care physician, health care coverage, and household income, education	-A larger proportion of racial/ethnic minorities were never screened compared to White patients. 4.5% White patients, 21.1% Asian patients, 9.4% Hispanic patients, 8.3% Black patients, 7.9% Native American/Alaskan Native patients were never screened for cervical cancer −19.3% White patients were not recently screened compared to 12.1% Asian patients, 12.5% Black patients, 12.9% Hispanic patients −12.8% of patients without health insurance coverage were never screened compared to 6.1% patients with coverage −26.1% of patients without health insurance coverage were not recently screened compared to 15.7% of patents with coverage -a gradient according to income was observed: 10.9% of patients with a household income of less than $15,000 were never screened compared to just 4.7% of patients with a household income of $50,000 + -a gradient according to educational attainment was observed: 8.8% of patients with less than high school education were never screened compared to 4.9% of college graduates

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Falk 2022	Cross-sectional	TX	■ Race and ethnicity ■ County-level poverty	■ Receipt of Pap screening	Odds Ratio	Age, race, education, region, reason for attending FTF, patient navigation participant	Residents of counties with more than 19.5% of adults living in poverty represented the largest portion of the sample and had the highest screening prevalence rates for Pap screening 56.2%. Pap screening prevalence rates observed similar trends for Spanish-speaking Latina (SSL) patients, who experienced more than double the rates of non-Latina White (NLW) patients at 61.1%. Lower educated women had higher prevalence rates for Pap screening at 59.3% compared with those with some college or more who only had a prevalence rate of 32.5%. Differences in prevalence rates were even more pronounced for Pap screening comparing patients who attended due to cost and participated in PN. Patients who attended due to the cost of screening had more than double the prevalence rates of screening at 59.8% compared with those who did not attend due to cost, while patients who participated in Patient Navigation (PN) had more than triple the rates at 56.5% compared with their counterparts
Fang 2013	Qualitative	CA	■ Lack of information about causes of cervical cancer ■ Linguistic barriers ■ Embarrassment/stigma surrounding cervical cancer ■ Lack of time for health care and prevention ■ Structural barriers	■ Cervical cancer screening	None (e.g., descriptive study)	N/A	The patients described multiple barriers to screening for cervical cancer. In all groups, "stories from the community" were important sources of information about women's health. Sociocultural barriers included a lack of accurate knowledge about the causes of cervical cancer, language barriers, stigma, fear, lack of time and embarrassment. Structural barriers included attitudes and practices of health care providers, lack of insurance, and quality of service provision at clinics for the uninsured. In addition to identifying barriers, focus group participants provided specific suggestions to improve cervical cancer screening in their communities. The patients suggested peer to peer teaching, enhanced outreach, improved accessibility, and health care provider education to overcome barriers among this population

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Fedewa 2017	Cross-sectional	USA	■ Employment status ■ Occupational characteristics	■ Guideline-recommended cervical cancer screening—having a Pap test in the past three years	Prevalence Ratio	Age, survey year; FPL, educational attainment, insurance status, visiting a primary care physician (PCP) in the past year	Cervical cancer screening prevalence among US workers was 84.0%. Unadjusted prevalence ratios for cervical (PR = 0.92, 95%CI 0.90, 0.94) were lower among workers in small (< 25 employees) compared to large organizations (≥ 500 employees). People in food service, construction, production, and sales occupations were 13–26% less likely to be up to date with cervical cancer screening compared to healthcare professionals. Adjustment for socioeconomic factors and insurance status eliminated most associations. Disparities in cancer screening by occupational characteristics were mostly attributed to lower socioeconomic status and lack of insurance
Ford 2021	Cohort	USA	■ Race and ethnicity	■ Report of a Pap test within the past three years ■ Pap test was based on health provider recommendation ■ Respondent received the results of the screening ■ Results received were abnormal ■ Health provider recommended follow-up tests/treatment following an abnormal test ■ Respondent followed the provider recommendations	Odds Ratio	Age, education, marital status, insurance coverage	The study analyzed data from 7509 patients and found that Black patients had lower rates of awareness about HPV (71% vs 83%, OR = 0.42, 95% CI = 0.36–0.49) and were less likely to report that they received a recommendation for Pap screening (59% vs 64%, OR = 0.76, 95% CI = 0.66–0.88). They were also less likely to recall receiving their Pap test results (92% vs 94%, OR = 0.64, 95% CI = 0.49–0.83). However, after accounting for other factors, the researchers found that Black patients were more likely to have had a recent Pap test (84% vs 77%, OR = 1.7, 95% CI = 1.42–2.03), but were less likely to receive a follow-up recommendation after an abnormal test result (78% vs 87%, OR = 0.54, 95% CI = 0.31–0.95)
Forney-Gorman 2016	Cross-sectional	USA	■ Race and ethnicity	■ Pap test receipt within the past 3 years	Odds Ratio	Income, age, education, health insurance, and marital status	Black patients were over 3 times more likely to have a current Pap test compared to African-born women (OR = 3.37, 95% CI: 1.89, 5.96). Lack of health insurance was associated with lower odds of having a current Pap smear among Blacks (OR = 0.34; 95% CI: 0.25, 0.46) and African-born patients (OR = 0.17; 95% CI: 0.04, 0.70). Higher levels of education were significantly associated with higher odds of having a current Pap test for Black (OR = 1.28; 95% CI: 1.04, 1.56)
Frazier 2016	Cross-sectional	USA	■ Race and ethnicity ■ Poverty level ■ Country of birth	■ Receipt of a Pap test in the past year	Prevalence Ratio	N/A	Older age (≥ 50 years), having an income above the FPL, having no sexual activity, depression, no HIV care from an obstetrician/gynecologist, and no documented STD tests, were factors associated with lack of receipt of a Pap test in the past year ($p < 0.05$)

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Freund 2019	Cross-sectional	Boston, MA Philadelphia, PA Columbus, Appalachian counties, OH	■ Insurance status ■ Insurance stability	■ Pap test in the last 3 years	Fisher's exact test	Gender, age, race/ethnicity, preferred language, annual household income, education, has regular primary care provider	Lack of health insurance coverage and being non-White have been attributed to lower screening rates and later cancer detection. Self-reported screening rates for cervical cancer were 69.7% and 80.0% among currently insured and currently uninsured individuals, respectively, and 73.4% and 67.2% among individuals with stable insurance and unstable insurance, respectively. Current insurance status and insurance stability were not significantly associated with up-to-date cervical cancer screenings
Gall 2012	Cross-sectional	Boston, MA	■ Birthplace ■ Type of health insurance ■ Have primary care provider ■ Satisfaction with the quality of relationship with primary care provider ■ Satisfaction with the quality of communications with primary care provider	■ Ever having a Pap smear ■ Age at first Pap smear ■ Having a recent (< 12 months) Pap smear	Odds Ratio	Education, age	US-born Black patients were significantly more likely to report ever having had a Pap smear than foreign-born Black patients (p = < .001). Health insurance status was associated with ever having had a Pap smear for US-born patients. Ever having had a Pap smear was positively associated with free care (OR = 7.04, 95% CI 1.47, 33.83 p = .015) in comparison to public insurance and private insurance for US-born women. US-born patients with a PCP were significantly more likely to report ever having had a Pap smear (n = 624, $\chi 2 = 28.14$, df = 1, p = .000) than those without a PCP. Foreign-born patients with a PCP were significantly more likely to report ever having had a Pap smear (n = 265, $\chi 2 = 32.71$, df = 1, p = .000) than those without a PCP. Patients who reported having a recent Pap reported greater satisfaction with the quality of communications as measured by a mean score of 13.65 in comparison to those less satisfied with a mean score 12.92 (n = 544 df = 542, t = 3.48, p = .001)
Haas 2021	Cross-sectional	Boston, MA	■ Insurance Status ■ Access to care ■ Provider financial incentives for care ■ Clinic ability to manage care for limited English proficient patients	■ Having a Pap test in the prior 3 years ■ Having a co-test in the prior 5 years for those age 30–65 years	Odds Ratio	Patient characteristics—age, race, insurance, continuity of care: from hospital clinical and administrative data Provider characteristics and clinic characteristics	Overall, 66.6% of patients were up-to-date. Patients were less likely to be up-to-date with cervical cancer screening if they were younger and were more likely to be screened if they were Black, Hispanic or Asian vs. White. Patients with greater continuity of primary care or with a female PCP were more likely to be up-to-date (1.52; 1.33–1.75); those who received care in a clinic that was less prepared to manage language translation were less likely to be up-to-date (0.78; 0.65–0.95). Patient, provider, and clinic factors all influence use of cervical cancer screening. Systems interventions like improving continuity of care, promoting translation services, or enhanced efforts to track screening among patients of male PCPs may improve delivery

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Hall 2018	Cross-sectional	NC	■ Medical mistrust	■ Pap testing behaviors	Odds Ratio	Age, education, employment, and income	Nearly all Blacks reported having had a Pap test and their White peers answered similarly. With regard to having a Pap test in the past three years, 84.0% of Blacks stated "yes" compared with 80.6% of Whites. Regarding their plan to have a Pap test in the next 12 months, 70.2% of Blacks were planning on having the test completed, and 61.2% of Whites had the same response. There were no statistically significant differences across these responses. Analyses indicated that Whites were more dissatisfied with the health care system than Blacks. For Blacks, neither negative nor positive correlations were identified regarding medical mistrust and Pap testing behaviors
Hall 2022	Cross-sectional	USA	■ Education Level ■ English proficiency	■ Cervical Cancer Screening	Prevalence Ratio Predictive margins calculated from multivariable logistic regressions models	Age, education, marital status, health insurance coverage, time in U.S., and survey year	Hispanic adults comfortable speaking English were less likely than NHW adults to have a usual source of care, use preventive services, including cervical cancer screening, and healthcare services. However, after adjustment cervical cancer screening exceeded that of NHW adults. After adjustment, the use of all cancer screening tests was similar. Eliminating disparities for Hispanic adults will require a multi-pronged approach to address access to healthcare and other social determinants of health, including poverty, employment discrimination, and educational inequities
Harcourt 2014	Cross-sectional	MN	■ Race and ethnicity ■ Duration of US residency	■ Pap smear receipt	Odds Ratio	Age, level of education, ethnicity, employment status, duration of years lived in the US, and preferred language to discuss health matters	The study showed that African immigrant patients who resided in the United States for less than 5 years were less likely to have had a Pap test done. Fifty-two percent (220/441) of the participants reported ever having had a Pap smear. Duration of residence in the US and ethnicity were significant determinants associated with non-screening. Participants who were Somalis, and/or had lived in the United States for no more than 5 years were less likely to have a Pap smear done

Table 1 (continued)

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Harper 2020	Cross-sectional	USA	■ Education level ■ Rurality/urbanicity ■ Education level	■ Cervical cancer screening rates	Prevalence Ratio	Race, education insurance, and geolocation	All three surveys show that cervical cancer screening rates in patients 45–65 years are insufficient to reduce cervical cancer incidence. Insurance is the major positive predictor of screening, followed by younger age and more education. Race/ethnicity are variable predictors depending on the survey. In the BFRSS, compared to NHW women, NHB women were equally likely to screen, but women of other NH races were 10% less likely to report screening (aPR 0.90, 95% CI: 0.83–0.98), and Hispanic women were 11% more likely to report screening (aPR 1.11, 95% CI: 1.06–1.17). Contrary to BRFSS, HCPS showed that NHB were 35% more likely (95% CI: 9–68%), Hispanic 48% more likely (95% CI: 25–76%) and women of other NH races 47% more likely (95% CI: 16–86%) compared to NHW women to be screened
Harper 2022	Cross-sectional	MI	■ Demographic predictors ■ Health care descriptors ■ Race and ethnicity	■ Cervical cancer screening	Odds Ratio	Length of time in the US, marital status, occupational status, BMI, chronic conditions, religion, primary care provider ethnicity	Middle Eastern and North African (MENA) patients screened less often if time in the US was less than ten years (aOR 0.24 (0.05, 0.76)) compared to more than ten years and if single (aOR 0.27 (0.07, 0.97)) compared to married. Those of all races without insurance screened significantly less often than those with insurance
Heintzman 2018	Cohort	OR	■ Safety-net setting women in the OCHIN data set (low income), Hispanic	■ Receipt of a Pap test during the study period	Odds Ratio	Age at the start of the study period, number of community health center visits during the study period, and pregnancy during the study period	Hispanic patients had greater odds of receiving a Pap test, regardless of insurance status, when compared to NHW patients. However, Hispanic patients had lower odds of receiving an HPV vaccination. Patients who were uninsured, regardless of race, had lower odds of receiving the HPV vaccination
Hendryx 2018	Ecological	USA	■ Residing in an expansion state (yes or no) in the expansion period	■ Receipt of cervical cancer screening	Odds Ratio	Sex, age, race and ethnicity, education, percent state urban population, and time period	Medicaid expansion under the Affordable Care Act was associated with a significant increase in cervical cancer screening among low-income women aged 18–64. The study found no significant improvements in cancer screening associated with Medicaid expansion among the Medicare population (aged 65 and above) or among a higher-income population. The findings suggest that Medicaid expansion had a positive impact on cancer screening rates among low-income adults, particularly for cervical cancers

Table 1 (continued)

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Holden 2015	Cross-sectional	USA	■ Race and ethnicity ■ Poverty level ■ Education ■ Location of usual source of care	■ Pap test screening within the past 3 years	Odds Ratio	Age category, gender, education level, marital status, region of residence in U.S., perceived physical and mental health status, SF-12 assessed physical and mental health, interview language, location of usual source of care	Uninsured Blacks had higher odds of receiving Pap tests (OR 1.82, 95% CI = 1.51, 2.19) compared to uninsured Whites. Uninsured Hispanics had higher odds of receiving Pap tests (OR 1.37, 95% CI = 1.11, 1.69) compared to uninsured Whites. Stratified by household income, the odds of Pap test receipt were significantly greater in uninsured Hispanics than in uninsured Whites at incomes < 200% FPL (FPL) (OR 1.45 at < 100% FPL and 1.49 at 100–199% FPL) and significantly greater in uninsured Blacks at incomes < 400% FPL (OR 2.03 at < 100% FPL and 2.11 at 100–199% FPL)
Huguet 2019	Cohort	CA, HI, MD, NM, OH, OR, RI, WA, WI, FL, KS, MO, NC	■ Race and ethnicity ■ Insurance status ■ Medicaid expansion	■ Receiving cervical cancer screening	Prevalence Ratio A difference-in-difference analysis—a quasi-experiment study	Age, race/ethnicity (for the overall sample), FPL, payer type, urban/rural status, and number of ambulatory visits	Patients had 19% increased odds of receiving cervical cancer screening post- relative to pre-ACA in expansion states [adjusted odds ratio (aOR) = 1.19, 95% confidence interval (CI) = 1.09–1.31] and 23% increased odds in non-expansion states (aOR = 1.23, 95% CI = 1.05–1.46): the greatest increase was among uninsured patients in expansion states (aOR = 1.36, 95% CI = 1.16–1.59) and privately-insured patients in non-expansion states (aOR = 1.43, 95% CI = 1.11–1.84)
Ibekwe 2021	Cohort	Houston, TX	■ Racism (experiences of racial discrimination and living in a racially segregated neighborhood)	■ Receipt of cervical cancer screening	Odds Ratio	Age, educational attainment, marital status, annual household income, insurance status, neighborhood poverty, educational attainment, intervention status	The study found a significant positive association between perceived racial discrimination and cervical cancer screening completion. Patients who experienced racial discrimination were 2.79 times more likely to complete cervical cancer screening compared to those who did not experience discrimination. The study also found a possible inverse association between residential segregation and cervical cancer screening completion, but this relationship was not statistically significant
Jacobs 2014	Cohort	USA	■ Race and ethnicity ■ Perceived racial and ethnic discrimination	■ Receipt of cervical cancer screening	Odds Ratio	Model 1: age Model 2: age, race, education, income, insurance status, marital status, and report of stressful money problems Model 3: age, race, education, income, insurance status, marital status, report of stressful money problems, number of hospitalizations, and times spoken to a physician in the past year	Racial discrimination was not significantly related to receipt of Pap smears or mammography in any of the models presented in this article. The odds of having had a Pap smear in the 2 years of the study were significantly greater for Black patients and significantly less for Chinese patients when compared with Caucasian patients. The odds ratios for receipt of preventive services for Hispanic patients were similar to those for Caucasian patients. Compared to Caucasian patients, Japanese patients had significantly reduced odds of receipt of Pap smears. Having less education was associated with lower odds of receipt of Pap smear. There were no significant interactions between race and ethnicity and reporting discrimination

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Kue 2017	Cross-sectional	Columbus, OH	■ English proficiency ■ Post-migration living difficulties	■ Ever had a Pap smear ■ Pap smear beliefs	Odds Ratio	Age, marital status, number of children, religion, home ownership, perceived barriers	Data reveals that patients aged 25–44 are more likely to have undergone cervical cancer screening than those aged 18–24 or 45 or older, with a screening rate of 55.6% compared to 38.1% and 22.7%, respectively. Furthermore, patients who can read/speak/write English well are more likely to have undergone screening than those who do not know English at all, with a screening rate of 43.4% compared to 23.1%. Despite the low screening rates, patients reported various barriers to getting a Pap smear, including lack of time (20.2%), shyness (57.1%), and fear of the procedure (51.2%). However, having a healthcare provider, family member, or friend recommend them to get a Pap smear was associated with a significantly higher screening rate of 86.7%. Additionally, patients who experienced post-migration living difficulties, such as communication/language difficulties, were more likely to have undergone cervical cancer screening
LaFrinere-Sandoval 2022	Cross-sectional	USA	■ Perceived neighborhood social cohesion	■ Pap test utilization	Odds Ratio	Age, marital status, race/ethnicity, SES variables	Those who had lower income or lacked health insurance had lower odds of having had a Pap test. Among immigrants, those who had lived in the United States for less than 10 years also had lower odds than those living in the United States for more than 15 years. Among U.S.-born patients, those who were Black or had less than a college education also had lower odds. Immigrant patients had a lower rate of Pap test utilization (76%) than U.S.-born patients (82%). Both U.S.-born and immigrant Hispanic patients and U.S.-born Black patients had higher odds of having a Pap test than their White counterparts. Immigrant Asian patients had lower odds of Pap test use than immigrant White patients. Neighborhood social cohesion was not associated with Pap test utilization among either immigrant or U.S.-born patients

Table 1 (continued)

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Leader 2013	Cross-sectional	Pennsylvania NJ	■ Social capital ■ Race ■ Education ■ Poverty level ■ Regular source of care ■ Health insurance	■ Cervical cancer screening adherence (report of a Pap smear in the past 2 years among 18–70-year-old females)	Odds Ratio	Age, education, marital status, poverty, regular source of care, health insurance	Younger adults (ages 18–39), Black patients, and those with health insurance were more likely to have been screened for cervical cancer. Patients who were screened for cervical cancer within the recommended time period had a higher mean social capital score compared to patients who were not screened; however, the differences were not significant. The logistic regression model for adherence to cervical cancer screening identified statistically significant differences by age, race, poverty level and insurance status. Compared to Black patients, White patients were 62% less likely to be screened for cervical cancer, and those living above the poverty line were 54% more likely to be screened. Patients with some form of health insurance were almost 4 times more likely to be screened for cervical cancer than those who were uninsured. After controlling for age, race, education, marital status, poverty, and health insurance status, social capital was not statistically significant for cervical cancer screening
Lee 2019	Cross-sectional	USA	■ Race and ethnicity ■ Nativity	■ Cervical cancer screening receipt	Odds Ratio	Age, nativity, father's education, knowledge of Pap test, HPV vaccine completion, number of OB/GYN visits, family history of cancer, number of sexual partners	Patients from non-Latina White backgrounds were more likely to have received cervical screening information from multiple sources and had a higher Pap test receipt rate (31.2%) compared to AAPI patients (17.9%). Additionally, NLW patients had a higher percentage of accurate knowledge about the purpose and age guidelines of Pap tests, indicating a knowledge gap between the two groups. However, foreign-born AAPI patients were more likely to receive a Pap test compared to those born in the US. These findings suggest that systemic racism contributes to disparities in cervical cancer screening and receipt among different racial groups
Lee 2020	Cross-sectional	USA	■ Race and ethnicity ■ Education level ■ Insurance Status	■ Receipt of Pap test in the past 3 years	Odds Ratio	Age, education level, weight and tobacco use, health insurance status and usual source of care, and personal history of cancer	Unadjusted models for Pap tests showed minorities had higher odds than that of NHW. After adjusting for potential confounders, statistically significant racial differences were found between NHW and Black. Blacks had higher odds than Whites (OR 1.92, 95% CI: 1.44–2.55, $p < 0.001$) of receiving Pap tests. Similar findings were noted between NHWs and Hispanic/Latinos, with higher odds among Hispanic/Latinos than Whites (OR 1.53, 95% CI: 1.09–2.15, $p < 0.05$). Patients who were currently insured were more likely to receive a Pap test (OR 1.68, 95% CI: 1.32–2.14, $p < 0.001$)

Table 1 (continued)

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Luque 2018	Cross-sectional	SC	■ Country of origin ■ Duration of Residency in US ■ Language acculturation	■ Guideline-adherent cervical cancer screening (Pap test)	Prevalence Ratio	Presence of a chronic condition, having a regular healthcare provider	Patients originally from Mexico reported a lower percentage of cervical cancer screening receipt in the last 3 years (83%) compared to women from other Latin American countries (88%). Other most frequent countries of origin reported by our participants included Guatemala (7%), Honduras (6%), and Colombia (5%). The mean value for the cervical cancer screening barriers scale was 4.1 (SD = 0.8), indicating moderately low endorsement of the list of barriers. The exposures receiving the high levels of endorsement were not having health insurance (3.0), and not speaking English (3.5)
MacDonald 2022	Cohort	Tampa, FL	■ Race and ethnicity	■ Cancer screening adherence (Pap smear)	Odds Ratio	Age, gender, salary, employment status, and household size	There was no statistically significant difference in the proportion of patients with a history of cancer undergoing cervical cancer screening than patients without any history of cancer. There is a significant disparity among uninsured patients who completed cervical cancer screenings compared to the insured population. These uninsured patients demonstrated a lower than the national average of age-appropriate cervical cancer screening of 59% for patients with commercial insurance and 47% for patients with Medicaid insurance. NHW patients were more likely to have been screened for cervical cancer than NHB patients
Malhotra 2017	Cross-sectional	USA	■ Patient-provider race concordance ■ Race and ethnicity ■ Employment status ■ Insurance status ■ Income	■ Pap smear within the past year	Odds Ratio	Gender concordance, age, marital status, self-reported physical and mental condition, history of chronic disease, survey year, rural/urban	Patients' adherent to cancer screening were more likely to be non-Hispanic, better educated, employed, wealthier, and to have private insurance. Racial and/or ethnic discordance between patients and providers was associated with higher odds of cervical cancer screening (OR 1.11, 95% CI: 1.01–1.23). Analysis stratified by the language of survey completion showed no significant interaction of language (English or Spanish) with the effect of ethnic discordance on cervical cancer screening. After adjusting for confounders including race and ethnicity concordance between patients and providers, gender-discordant pairs had lower odds of cervical cancer screening (OR 0.83, 95% CI, 0.76–0.91)
Martínez-Donate 2013	Cross-sectional	Dane County, WI	■ sHas regular health care provider	■ 12-month Pap smear receipt	Odds Ratio	Age, knowledge on screening recommendations, has used PPWI services	Multivariate logistic regression models showed that having a regular health care provider (AOR = 2.86, 95% CI = 1.59, 5.15) was a positive and significant predictor of the likelihood of reporting last 12-month receipt of a Pap smear

Table 1 (continued)

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McDaniel 2021	Cross-sectional	USA	■ Race and ethnicity ■ Health insurance status ■ Income ■ Education Level	■ Self-reported Pap testing (yes/no)	Odds Ratio	Geographic region, metropolitan status, veteran status, general health status, age, marital status, employment	Among the 538,218 females included, 88.81% (95% CI: 88.60–89.03) reported receiving a Pap test. Compared to White patients, Asians (OR 0.169, 95% CI: 0.149–0.191), Native Hawaiians/other Pacific Islanders (OR 0.339, 95% CI: 0.249–0.462), American Indians or Alaskan Natives (OR 0.664, 95% CI: 0.532–0.829), Hispanics (OR 0.726, 95% CI: 0.670–0.786), and other non- Hispanic races (OR 0.439, 95% CI: 0.323–0.598) were significantly less likely to receive Pap test. Patients were significantly less likely to screen with Pap test if they were younger (18–34 years old), had lower educational status (less than college graduate), were not married, or did not have health insurance
Miles-Richardson 2012	Descriptive – prevalence/incidence survey	GA, NC, SC	■ Race and ethnicity	■ Pap test within the past 3 years	None (e.g., descriptive study)	N/A	In all 3 states, Black patients were slightly more likely to have received a Pap test within the last 3 years compared to White patients. In Georgia, 89.7% of Black patients and 86.6% of White patients aged 18 years and over reported having a Pap test within the past 3 years. In North Carolina, 89.4% of Black patients and 86.6% of White patients aged 18 years and over reported having a Pap test within the past 3 years. In South Carolina, 90.4% of Black patients and 84.5% of White patients aged 18 years and over reported having a Pap test within the past 3 years
Miranda 2017	Cross-sectional	USA	■ Immigration status ■ Citizenship status ■ Race and ethnicity ■ Education ■ Household income-to-poverty ratio ■ Usual source of care	■ Pap smear in past 3 years	Odds Ratio	Age, race/ethnicity, education, income, insurance, usual source of care, self-reported health	Cervical cancer screening rates among immigrant citizens were not significantly different from U.S.-born citizens in this study. Short-term non-citizens were observed as having lower odds of screening for cervical cancer (OR = 0.65 [0.54–0.78]). Long-term immigrants living in the U.S. had higher odds of screening for cervical cancer among both citizens (OR = 1.17 [1.06–1.29]) and non-citizens (OR = 1.23 [1.09–1.38]). Although causal claims could not be made, data analyzed in this study suggest that additional years of residence in the US may substantially increase immigrant patients' probabilities of receiving guideline-concordant cervical cancer screening
Mishuris 2014	Cross-sectional	USA	■ Race and ethnicity	■ Receipt of Pap smear	Odds Ratio	Patient age, patient income, reason for visit, new/established patient, expected payment source, region of country	There was no difference in the odds of cervical cancer screening among non-White patients relative to White patients (OR 1.20, 95% CI: 0.99—1.30)

Table 1 (continued)

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Moise 2021	Cross-sectional	FL	■ Employment status ■ Occupational characteristics	■ Underwent a Pap smear before	Odds Ratio	Age, marital status, previous Pap smear	Logistic regression results indicated women who reported US citizenship (OR = 3.22, 95% CI = 1.52–6.84), access to routine care (OR = 2.11, 95%CI = 1.04–4.30), and spent more years in the US (OR = 1.01, 95%CI = 1.00–1.03) were significantly more likely to report previous screening
Moss 2021	Cross-sectional	PA	■ Residential segregation ■ Annual household income ■ Education level ■ Insurance status	■ Up to date for cervical cancer screening with a Pap test or HPV test in past 5 years	Odds Ratio	Age, self-rated health, annual household income, educational attainment, marital status, insurance status, check-up in the last year, and history of hysterectomy	A significant proportion of participants, 88.9%, were up-to-date with cervical cancer screening, with 85.9% among those who had undergone a hysterectomy. However, travel time played a role in screening uptake, with participants with high travel times showing a decline in screening rates from 98 to 56% as their fatalism increased. Compounding barriers, such as insurance status and healthcare mistrust, significantly reduced the odds of screening (p = 0.02). Qualitative findings identified three main barriers: privacy concerns, logistical issues, and lack of trust in healthcare services. Despite high screening rates in rural and segregated counties, patients facing both environmental and personal barriers showed lower uptake
Moss 2022	Cross-sectional	PA	■ Metropolitan status ■ Level of racial segregation ■ County type ■ Number of primary care providers per 10 k people per county ■ Travel time to primary care provider's office ■ Insurance status ■ Educational attainment ■ Race and ethnicity	■ Up-to-date on cervical cancer screening (American Cancer Society guidelines: Pap test within 3 years or HPV test within 5 years)	Odds Ratio	Self-rated health, cancer-specific screening barriers, health self-efficacy, cancer prevention recommendations	The study found that 82.8% of patients who had not undergone a hysterectomy were up-to-date with cervical cancer screening. This percentage was not significantly associated with metropolitan status or segregation level, indicating that the likelihood of being up-to-date with cervical cancer screening was similar across different metropolitan and segregated areas. However, it was found to be associated with certain health-related beliefs and barriers to screening. Specifically, patients who reported higher levels of healthcare trust (reverse coded, aOR = 1.54, 95% CI: 1.00–2.37), lower levels of cancer fatalism (aOR = 2.44, 95% CI: 1.59–3.74), and reporting cost as a barrier to screening (aOR = 0.36, 95% CI: 0.15–0.84) were more likely to be up-to-date with cervical cancer screening. The study also found that patients who reported being afraid of the results they might receive were less likely to be up-to-date with cervical cancer screening. Additionally, the study found that patients who reported that it is embarrassing to get screened for cervical cancer were also less likely to be up-to-date with the screening

Table 1 (continued)

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Patel 2020	Cross-sectional	Nashville, Chattanooga, and Memphis, TN	■ Education level ■ Employment status ■ Household annual income ■ Insurance status	■ Pap test in the past 3 years	Odds Ratio	City, age, marital status, self-rate health, medical visit in past 12 months, family history of cancer, BMI, smoking, alcohol use	Black patients aged 40 + in Tennessee who were unemployed (OR 3.46, 95% CI: 1.53–7.85), had higher education levels (OR 2.31, 95% CI: 0.85–6.27), and household incomes above $15,000 per year (OR 3.44, 95% CI: 1.43–8.31) were more likely to be compliant with cervical cancer screening. Additionally, patients who had health insurance had significantly higher odds of being cervical cancer screening compliant (OR 5.0, 95% CI: 2.07–12.03)
Pope 2021	Cross-sectional	USA	■ Race and ethnicity	■ Utilization of cervical cancer screening services (women aged 21–64 years who received a Pap smear every 3 years or (2) women aged 30–64 years who received a Pap smear with HPV co-testing or HPV testing alone every 5 years)	Odds Ratio	Age group, military service branch	When compared to White, active-duty patients, Black (1.05 OR,1.03–1.08 CI), Native American/Alaskan Native (1.26 OR, 1.15–1.39 CI), and Other (1.12 OR, 1.06–1.18 CI) active-duty patients were more likely to receive cervical cancer screenings. When examining the likelihood of 5-year compliance by race in patients aged 30–64 years, Native American/Alaskan Native patients had the highest proportion of compliance (31.7%) and were more likely to meet compliance guidelines (1.38 OR, 1.03–1.84 CI) compared to White patients. Overall, 50.0% of eligible active-duty women in our cohort received cervical cancer screenings in the direct care system during the study period
Pratte 2018	Cross-sectional	CT	■ Race and ethnicity	■ HPV co-testing uptake	None (e.g., descriptive study)	Only unadjusted associations	Overall, it was determined that co-testing percentages were significantly different between race/ethnicity groups. Hispanic patients were most likely to receive co-testing (68.2%), followed by Non-Hispanic Other or Multiracial (67.9%), NHW (58.2%), and finally NHB women (49.1%). The race/ethnicity groups that were least likely to receive HPV co-testing were NHB and NHW patients
Roman 2014	Cross-sectional	Detroit, MI	■ Race and ethnicity ■ System risks score	■ Cervical cancer screening (every 3 years)	Odds Ratio	N/A	Racial/ethnic patients in underserved urban communities had low cervical cancer screening rates. Most Latinas had inadequate cervical cancer screening. Although most Black patients had a high school education or greater (90%), less than half had adequate cervical cancer screening. In sum, characteristics associated with cervical cancer screening behaviors differ among Black, Latina, and Arab underserved patients. Systems risk score was not associated with cervical cancer screening history

Table 1 (continued)

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Sackey 2022	Cohort	Davidson County, TN	■ Insurance status ■ Race and ethnicity ■ History of homelessness ■ History of incarceration	■ Cervical cancer screening history	Odds Ratio	Date at cancer diagnosis, cancer stage, any symptoms reported during diagnostic work-up, smoking status, and any immunocompromising conditions, address, poor English language proficiency, addiction/substance use disorder, morbid obesity or documented body mass index > 40 kg/m2, diagnosis of a serious mental health disorder	The study analyzed the medical records of 318 potential invasive cervical cancer events and found that 212 were eligible for analysis after excluding cases with incomplete or missing records. Of the eligible patients, 28% had a history of underinsurance in the five years prior to diagnosis, with 18% having no documented public or private insurance at the time of the diagnostic procedure. These patients were more likely to present with symptoms at diagnosis, with 93% reporting vaginal bleeding compared to 75% of patients without a history of underinsurance. Patients with a history of underinsurance were also more likely to have one or more potential barriers to cervical cancer screening, including poor English proficiency, which was documented in 23% of these patients compared to 7% of those without underinsurance. The study found that patients with a history of underinsurance were significantly more likely to have a "no screening/no follow-up" screening history compared to patients with no documented history of underinsurance, indicating a delay or lack of screening tests. Non-white race (aOR 2.73; 95% CI 0.98–7.61), was also associated with increased likelihood of "no screening/no follow-up"
Schuttner 2021	Cohort	USA	■ Race and ethnicity ■ Percentage with HS diploma by county ■ Median household income ■ copayment status	■ Receipt of low-value cervical cancer screening	Odds Ratio	Comorbidity, frailty, clinic type, PCP FTE per clinic, average panel size, region	The study found that among patients screened for cervical cancer, 65,511 patients were screened, with 630 tests classified as low value (1.0% of average risk and 1.0% of screened women). NHB patients were less likely to receive low-value tests (OR, 0.38; 95% CI, 0.27–0.53; P < 0.001) compared to NHW patients. Patients with higher comorbidity burden (OR, 2.11; 95% CI, 1.65–2.71; P < 0.001) and copays (OR, 2.33; 95% CI, 1.56–3.48; P < 0.001) were more likely to receive low-value tests. Frailty was also associated with a higher likelihood of receiving low-value tests (OR, 1.56; 95% CI, 1.27–1.92; P < 0.001). After adjusting for differences in ordering clinicians, NHB patients remained less likely to receive low-value tests (OR, 0.33; 95% CI, 0.16–0.66; P = 0.002)
Seay 2015	Cross-sectional	Miami, FL	■ Insurance status ■ Source of preventative care	■ Pap smear within the last 3 years	Odds Ratio	Usual site of routine/preventive care, cervical cancer knowledge	When controlling for insurance status, preventative care source, and cervical cancer knowledge, women living in Little Haiti were less likely to be screened for cervical cancer than patients living in Hialeah (AOR, 0.41; 95% CI, 0.19–0.92). Having a usual source of care was significantly associated with having had a Pap smear within 3 years (aOR = 6.00, 95% CI: 2.77–12.84)

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Shelton 2012	Cross-sectional	New York, NY AR	■ Social capital ■ Education ■ Insurance	■ Pap test adherence	Odds Ratio	Program location, age, education, and insurance	76.8% of Mexicans and 67.7% of Central/South Americans reported understanding "a little or not at all" of what their healthcare providers told them. Additionally, 73.9% of Mexicans lacked health insurance compared to 11.8% of Dominicans and 6.06% of Puerto Ricans. 25.1% of Mexicans felt they were treated worse than other racial/ethnic groups in healthcare settings
Shelton 2012	Cross-sectional	Buffalo and New York City, NY AR	■ Country of origin ■ Ethnic treatment ■ Insurance type	■ Receipt of Pap test within the last 3 years	Odds Ratio	Age, language preference, married, live with partner, years in US, language problem, time barrier, transportation barrier, doctors know what is best, understand provider, fear provider, fear results, location	The study found that the highest percentage of women receiving Pap tests was among Dominicans (81.6%), followed by Mexicans (77.5%), Central/South Americans (71.2%), and Puerto Ricans (69.3%). Interestingly, despite being the longest-residing group in the US and having the highest likelihood of health insurance, Puerto Rican women had the lowest Pap test adherence rate. This suggests that factors beyond access to healthcare, such as age, may play a significant role in determining screening rates. In particular, the high proportion of women past childbearing age among Puerto Ricans may be an important contributing factor to this disparity
Shelton 2016	Cross-sectional	Buffalo and New York, NY	■ Social capital	■ Cervical cancer screening adherence	Odds Ratio	Age, language preference, country of origin, program location, years in the U.S., race/ethnicity, marital status, insurance status, and education	In multivariable logistic regression, a one-unit increase in social capital index score was associated with greater adherence to Pap test (OR = 1.61). In the Pap test multivariable model, participants who reported feeling free to speak out if they disagreed had 1.80 (95% CI: 1.08, 2.99; p = .02) times greater odds of being adherent to recommended Pap tests than participants who did not feel free to speak out, controlling for covariates. In a bivariate model, perceiving that you can get help from your friends when needed was associated with Pap test adherence (p = .004).Participants reporting getting help from friends had greater odds of being adherent for Pap test screening (OR: 2.25; 95% CI: 1.19, 4.28; p = .01) than participants who were not able to get help from friends, controlling for key covariates

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Stanley 2014	Cross-sectional	USA	■ Race and ethnicity ■ Education level ■ Insurance status	■ Never being screened for cervical cancer	Prevalence Ratio	Age, sex, health belief model, barriers, cues to action, self-efficacy, and education level	Specifically, 4.1% of women living in metropolitan statistical areas (MSAs) reported never being screened, compared to 2.9% of those living in non-MSAs. Furthermore, the study discovered that women living in MSAs who reported never being screened were more likely to be from racial and ethnic minority populations, such as non-Hispanic Asian/Native Hawaiian/Pacific Islanders and those with a high school diploma. Additionally, women who reported never being screened were more likely to have poor general health, be current smokers, have no health coverage, and not have a personal doctor or healthcare provider. The study also found that women who reported never being screened had lower levels of social and emotional support and satisfaction with their lives
Stenzel 2022	Cross-sectional	USA	■ Race and ethnicity	■ Pap test receipt	Odds Ratio	Age, partner status, education, health insurance status, annual household income	Those identifying as both Hispanic and sexual minority (SM) had the lowest odds of ever undergoing Pap testing compared to NHW heterosexual individuals. NHW SMs also had reduced odds of Pap testing (OR 0.62; 95% CI, 0.42–0.91). In contrast, those identifying as Hispanic and heterosexual (OR 0.84; 95% CI, 0.68–1.04) or NHB and SM (OR 0.64; 95% CI, 0.25–1.60) did not have significantly different odds of Pap testing compared to NHW heterosexual individuals. However, NHB heterosexuals were more likely to have undergone Pap testing than NHW heterosexuals (OR 1.32; 95% CI, 1.01–1.73). Almost all SM individuals, regardless of ethnicity, had lower odds of Pap testing compared to NHW heterosexual individuals
Suk 2022	Cross-sectional	USA	■ Race and ethnicity	■ Guideline-concordant cervical cancer screening	Prevalence Ratio	Age and sociodemographics	Patients of Asian race and those without insurance are more likely to have delayed or foregone screening, with adjusted probabilities of 36.0% and 41.2%, respectively. NHW patients, on the other hand, had the lowest rate of overdue screening at 20.1%. Furthermore, Hispanic patients were more likely to report not knowing they needed screening, while NHW patients were more likely to report lack of access as a reason for not receiving screening. Additionally, patients without insurance were significantly more likely to report lack of access as a reason for not receiving screening compared to those with private insurance. These findings highlight the need to address systemic racism and inequities in healthcare to improve cervical cancer outcomes

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Thompson 2014	Cross-sectional	CA	■ Race and ethnicity ■ Primary language	■ Receipt of guideline-concordant screening	Odds Ratio	Sex, degree, specialty, Asian language capability Patient-level covariate: sex, age, detailed race/ethnicity, enrolled in "My health online," primary language concordance with provider, use of interpreter, PCP visits in the past 2 years	Aggregation of Asian subgroups masked heterogeneity in screening rates. Asian Indians and native Hawaiians and Pacific Islanders had the lowest rates of screening in our sample, well below that of non-Hispanic whites. In multivariable analyses, screening completion was positively associated with patient–provider gender concordance for cervical cancer screening (OR 1.66; CI, 1.51–1.82). In addition, patient enrollment in online health services increased cervical cancer screening (OR 1.31; CI, 1.24–1.37)
Trinh 2016	Cross-sectional	USA	■ Race and ethnicity	■ Pap test within the past 3 years	Odds Ratio	Age at the time of the survey, residence location, marital status	Asian-Americans (AAPI) had lower odds of being screened (OR 0.45, 95% CI 0.36–0.55) as compared to NHWs. Predictors of undergoing Pap smear testing in the general cohort and NHWs include higher level of education, higher level of income, urban/suburban residence, having insurance (public/private) and having access to a HCP. Within AAPI, higher odds of being screened occurred with higher income, urban/suburban residence, and having access to a HCP (OR 2.35, 95% CI 1.51–3.67). Having insurance did not increase the odds of screening in AAPI (OR 1.1, 95% CI 0.62–1.95)
Valdovinos 2016	Cross-sectional	Bronx, NY Chicago, IL Miami, FL San Diego, CA	■ Perceived discrimination ■ Exclusion/rejection ■ Stigmatization ■ Discrimination at work/school	■ Receipt of Pap smear	Odds Ratio	Age group, nativity, field center, annual household income, insurance status	Among patients, 72.1% (95% CI 69.2, 74.7%) received a Pap smear within the recommended time frame. Brief Perceived Ethnic Discrimination Questionnaire-Community Version (PEDQ) score was not significantly associated with odds of being screened for cervical cancer (OR 0.99, 95% CI 0.97, 1.02). There was no association between nativity and cancer screening adherence for cervical cancer screening. Not having health insurance was a significant independent predictor of not adhering to guidelines on Pap smear testing (OR 1.06, 95% CI (0.65, 1.73)
VanManh 2020	Cross-sectional	New York, NY	■ Country of origin ■ Native language ■ English fluency	■ Ever had a Pap exam	Odds Ratio	Age	Overall, cancer screening rates were lower for the African born (54%), Asian born (23.9%) and US born (22%) participants than those of the rest of New York. Individuals from immigrant communities in NYC were less likely to access Papanicolaou smear (PS) testing compared to both the overall NYC and national screening rates. English language proficiency was a barrier for participants to get a PS (OR = 0.24, CI = 0.14–0.41)

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Walsh 2015	Cross-sectional	USA	■ Race and ethnicity	■ Cervical cancer screening utilization	Odds Ratio	Age, educational attainment, marital status, geographic region, access to usual source of care, income, insurance status	In the 12-month period, Black patients had higher screening utilization (66.25%) than Whites (60.22%) and Hispanics (58.36%). Disparities are also greater for White patients across education and insurance status. Lower-educated Blacks (57.96%) and Hispanics (54.32%) had greater 12-month utilization than similar Whites (42.22%). Annual utilization rates are high in the United States (60.15%) and greatest among Black women (66.25%). Disparities, as measured by concentration indices (CIs), are large in the United States, with the largest being for White patients (CI, 0.179) relative to Black (CI, 0.103) and Hispanic (CI, 0.081) patients. Screening differences across income, education and insurance status are also greater amongst White patients
Wharam 2014	Cohort	USA	■ Census block group ■ Poverty ■ Education levels ■ Race and ethnicity	■ Presence of at least one Pap test per 3-year interval	Annual percent change	Age, region of country residence	Estimated disparities by low–high neighborhood poverty level were 3.1% and 2.0% in 2001 to 2003 and 2008 to 2010, respectively, a non-significant decline. Estimated disparities between patients from low and middle poverty neighborhoods were small in 2008 to 2010 (low-middle 2: 0.5% and low-middle 1: 0.1%) Initial White-Black disparities were 4.0% and declined significantly from 2005 to 2007 to 2008 to 2010 to 2.8% at an APC of 0.65% (P = 0.021). White-Hispanic disparities declined from 4.3% to 0.8% over the decade, a 0.50% APC (P = 0.024). Among women ages 30 to 64 years, estimated 3-year Pap testing rates trended down from 76.1% to 71.8% over the decade [−0.94% APC (P < 0.001) until 2005–2007]. This pattern was similar among women from most categories of poverty and race/ethnicity
Wilson 2022	Cross-sectional	Nashville, TN	■ Race and ethnicity ■ Primary language	■ Cervical cancer screening within last 3 years	None (e.g., descriptive study)	N/A	There were no significant differences in cervical cancer screening completion rates (SCR) by race and ethnicity (Black: SCR 75%, 95% CI: 47–92%; Hispanic: SCR 88%, 95% CI: 80–95%; White: SCR 81%, 95% CI: 60–100%; Other: SCR 57%, 95% CI: 14–100%). Spanish-speaking patients were more likely than English-speaking patients to be up to date on cervical cancer screening (SCR 91%, 95% CI: 84–97% vs. SCR 72%, 95% CI: 57–86%)

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Xie 2023	Cross-sectional	USA	■ Limited English proficiency ■ Patient-provider language concordance	■ Received Pap test within the last 3 years	Odds Ratio	Age, sex, Hispanic, family income level, education, US born, marital status, employment, census region, insurance status, current smoking status, obese, health status, number of comorbidities, and number of visits to care	Compared to Asian Americans with no limited English proficiency (LEP), respondents with LEP and without patient-provider language concordance (PPLC) were less likely to have an up-to-date Pap test (Adjusted OR 0.44, 95% CI = 0.26–0.75). Among Asian Americans with LEP, those with PPLC were more likely to report up-to-date Pap test (adjusted OR 1.68, 95% CI = 1.12–2.51)
ABNORMAL SCREENING RESULTS AND/OR FOLLOW-UP AFTER ABNORMAL SCREENING							
Boitano 2022	Cohort	Birmingham, AL	■ Race and ethnicity ■ Insurance status	■ Adherence to colposcopy follow-up	Rate of adherence to follow-up	None	Overall, 39.1% were adherent to follow-up for colposcopy after abnormal cervical cancer screening, 18.6% were delayed in follow-up, and 42.3% were not adherent Compared with NHW women, there was a significant difference between race/ethnicity and timing of follow-up ($p = 0.03$). Black patients were more likely to be not adherent (45.9%; $p = 0.03$), and Latina and Black patients were the most likely to be delayed (35.7% and 21.1%; $p = 0.03$). Private insurance patients were more likely to be adherent for care compared with un-/underinsured patients (78.9 vs 27.8%, $p = 0.0001$)
Brackney 2020	Cross-sectional	New Haven, CT	■ Race and ethnicity ■ Insurance status ■ Area-based measures: percent Black, percent Hispanic, percent poverty	■ The proportion of CIN2 + lesions with HPV 16/18 detected	Odds Ratio	Age	Among patients aged 21 – 24 years and 25 – 29 years, significant declines in the proportion of lesions with HPV 16/18 were observed. Among patients aged 21 – 24 years, declines began earlier and were greater in magnitude in areas of lower poverty (OR = 0.55, 95% CI = 0.36, 0.85 for 2010 – 2012 vs 2008 – 2009 and OR = 0.30, 95% CI = 0.18, 0.51 for 2013 – 2015 vs 2008 – 2009) compared with higher poverty (OR = 1.66, 95% CI = 0.86, 3.21 and OR = 0.48, 95% CI = 0.19, 1.20). Similar patterns were observed for patients aged 25 – 29 years, and for area-based measures of race and ethnicity

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Carrillo 2021	Cohort	El Paso, TX	■ Education ■ Place of birth ■ Self-report data ■ Acculturation ■ Participation in the NBCCEDP	■ An optimal interval (≤90 days) between the date of an abnormal Pap smear and date of colposcopy	Risk Ratio/ Relative Risk	Age, education, place of birth, participant of NBCCEDP, smoking status, Pap smear result	Of the 270 Hispanic women included in the analysis, 98.5% self-identified as Mexican. 177 of the 270 women (65.6%) received follow-up within an optimal diagnostic interval (within 90 days). When adjusting for age, women who were 30 years of age or older were 32% more likely to have an optimal interval than younger women (adjusted RR = 1.32, P < 0.01). High school graduates were less likely than more educated women to have an optimal interval (adjusted RR = 0.68, P < 0.01). Participation in the NBCCEDP was not associated with receipt of follow-up within an optimal diagnostic interval. Women who had an optimal interval were less likely to be born in the United States than subjects who did not have an optimal interval: 46.3% vs. 59.1% (P = 0.045)
Jodry 2021	Case–control	Atlanta, GA	■ Justice-involvement status ■ Race and ethnicity	■ Cervical cancer screening history (Pap testing, cytology results, and colposcopy or cervical treatment) ■ Loss to gynecologic follow-up (lack of documented gynecologic follow-up for more than 1 year beyond the American Society of Colposcopy and Cervical Pathology (ASCCP) guidelines)	Odds Ratio	Age, primary language, HIV serostatus, smoking history, active diagnosis of severe mental illness	Rates of abnormal Pap tests were significantly higher in justice-involved patients (35.6%) than in controls (18.5%, p < .0001). Compared with controls, justice-involved patients were significantly more likely to have high-grade cervical cytology (OR = 3.89, p < .0005) and be lost to gynecologic follow-up (OR = 8.75, p < .0001) and a history of severe mental illness (29.5% vs 4.3%, p < .0001). Those with abnormal Pap tests were likely to be HIV-positive (OR = 20.7, p < .001) and have a history of incarceration (OR = 2.33, p < .001). Predictors of loss to gynecologic follow-up include Pap tests with high-grade cytology (aOR = 4.98, p < .001), a history of incarceration (aOR 8.47, p < .001), and 10-year increase in age (aOR = 0.43, p < .001)
Lin 2015	Cross-sectional	IL	■ Race and ethnicity	■ HPV positivity (detection of 37 different HPV types)	Odds Ratio	Age, age at first sexual intercourse, total number of lifetime sex partners, total number of sex partners in last 12 months, current smoker	According to the data, the prevalence of HPV positivity among US-born Hispanics was found to be similar to that of NHWs. In contrast, NHBs had the highest rate of HPV positivity. An analysis of the adjusted odds ratio (OR) further confirmed these findings, with NHBs having a significantly higher risk of HPV positivity (OR: 1.36, 95% CI: 1.04–1.78). Hispanics born in Mexico had a lower risk of HPV positivity (OR: 0.82, 95% CI: 0.48–1.40), while those born in the US had a slightly higher risk (OR: 1.38, 95% CI: 0.53–3.56), although this finding was not statistically significant

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Niccolai 2013	Cross-sectional	CT	■ Percentage of population living below poverty level ■ Percentage of population who are Black Percentage of population who are Hispanic Urbanicity	■ Cervical intraepithelial neoplasia grade 2 or higher and adenocarcinoma in situ (CIN2+/AIS) diagnoses	Incidence Rate/ Rate Ratio	Age	Researchers observed significant trends of increasing rates of CIN2+/AIS associated with higher levels of poverty and proportions of Black residents. In adjusted analyses, the rates of CIN2+/AIS were 35% higher among women living in census tracts with 20% or more of the population living in poverty than in tracts with under 5.0% poverty rates. The rates of CIN2+/AIS were 14% and 20% higher among patients living in census tracts with 20% or more and 10.0% to 19.9% of the population Black, respectively, than in tracts with less than 5.0% Black populations
Niccolai 2013	Cohort	New Haven, CT	■ Race and ethnicity ■ Poverty	■ PV 16/18 Prevalence in CIN2/3AIS Lesions	Prevalence Ratio	Health insurance, age, diagnosis, area-level characteristics including proportion Black, proportion Hispanic	Overall, 44.8% of patients had HPV 16/18. In a multivariate model controlled for confounding by age and diagnosis grade, Black race (adjusted prevalence ratio [aPR] = 0.54, 95% confidence interval [CI] = 0.34–0.88), Hispanic ethnicity (aPR = 0.59, 95% CI = 0.40–0.88), and higher area-based poverty (aPR = 0.59, 95% CI = 0.40–0.87) were associated with a lower likelihood of HPV 16/18 positivity. Black and Hispanic patients were less likely to have HPV 16/18 than White patients across all levels of area-based measures
Nolan 2014	Qualitative	Boston, MA	■ Race and ethnicity ■ Health insurance status ■ Education level ■ Household income	■ Cervical cancer screening ■ Healthcare delays	None (e.g., descriptive study)	N/A	Six major themes emerged from conversations with Black women, community leaders, and providers: (a) inadequate education and information for providers and patients create barriers to appropriate screening and treatment practices; (b) emotional barriers and competing priorities prevent health care seeking; (c) culture influences health seeking and health decision making; (d) inadequate or lack of insurance coverage is a barrier to screening and follow-up; (e) challenges in the patient–provider relationship affect screening, treatment, follow-up, and quality of care; (f) and follow-up diagnostic testing after an abnormal Pap test result is a significant challenge Findings from interviews revealed that inadequate information and education of providers and patients create barriers to appropriate screening and treatment practices for Black women. Fear, cultural beliefs, and compounding factors related to poverty, gender roles, and health system barriers create delays to screening and follow-up care. Also, unconscious bias, therapeutic delays, and miscommunication are important factors affecting continuity of care

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Olusola 2019	Cohort	Tyler, TX	■ Race and ethnicity ■ Insurance status	■ HPV/Pap-based testing ■ Colposcopic assessment ■ Cervical cancer follow up treatment and care	Odds Ratio	Age, diagnosis, marital status, smoking, drinking history, family history of cancer, number of pregnancies	African American patients had a higher risk of abnormal Pap outcomes compared to Caucasians (OR 5.31, 95% CI, 0.67–42.0). HPV seemed to be a predictor of abnormal Pap outcome (OR 1.77, 95% CI, 0.48–6.44) in these subjects. Insured patients undergoing periodic checkups were detected early with high-risk HPV infection and abnormal Pap test/colposcopic outcome
Plascak 2014	Cohort	Columbus, OH	■ Neighborhood factors	■ Diagnostic time to resolution	Incidence Rate/ Rate Ratio or Hazard Ratio	Education status, health insurance status, and friend social support	Time to treatment (TTR) increased as neighborhood deprivation increased. After adjustment for age, friend social support, education and healthcare status, the TTR among patients living in a neighborhood with a moderate median household income (between $36,147 and $53,099) was shorter compared to patients living in low median household income neighborhoods (< $36,147) ($p < 0.05$). There is little evidence that unmeasured confounders are geographically patterned. There were no statistically significant differences in TTR by home-to-clinic distance or racial residential segregation (as a continuous variable or as a categorical variable). Tests for interactions between insurance status, race, and racial residential segregation were also not found to be statistically significant
Ramachandran 2015	Cohort	USA	■ Number of unique barriers to care ■ Presence of socio-legal barriers originating from social policy	■ Time to diagnostic follow-up of abnormal cancer screening	Incidence Rate/ Rate Ratio or Hazard Ratio	Age, race/ethnicity, insurance, and language	Among cervical participants, only the presence of 2 or more barriers was associated with less timely resolution. Both types of barriers, socio-legal and other barriers, were associated with delay among breast and cervical participants.
Riggs 2021	Cross-sectional	AZ	■ Race and ethnicity ■ Income ■ Birth origin	■ Prevalence of cervical dysplasia (abnormal Pap smear)	Odds Ratio	Age, smoking status, household size, prior Pap	Lower income was associated with a higher likelihood for an abnormal Pap test (aOR = 1.43, 95% CI = 1.13–1.80) and low-grade squamous intraepithelial lesions (LSIL) (aOR = 1.54, 95% CI = 1.30–1.44). Although an association existed prior, Mexican nativity and ethnicity were no longer associated with a higher likelihood of abnormal Pap tests once the model was adjusted
Tsui 2019	Cohort	NJ	■ Race and ethnicity ■ Country of birth ■ % ZCTA racial ■ Ethnic minority residents ■ % ZCTA unemployed	■ Receipt of any follow-up care after abnormal Pap test result ■ Delayed follow-up care (longer than 90 days) after abnormal Pap tests result ■ Diagnosis of invasive cervical cancer	Odds Ratio	Age, number of screening visits, results of first abnormal Pap, type of screening facility, same county for screening and follow-up	The odds of delays in follow-up care were statistically higher for women screened at FQHCs compared with private physician practices (aOR: 2.77, 95% CI: 1.23, 6.23) and for Central/South American women compared with U.S.-born women (aOR: 1.46,95% CI: 1.12, 1.92). Significant differences by race and ethnicity in the rates of abnormal results and follow-up care were not observed

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Watson 2015	Cohort	USA	■ Race and ethnicity	■ Repeat Pap test (with no HPV test or colposcopy associated with the initial atypical squamous cells of undetermined significance finding) ■ HPV test (all women with HPV test as follow-up to atypical squamous cells of undetermined significance, regardless of other tests) ■ Colposcopy (with no HPV or Pap associated with the initial atypical squamous cells of undetermined significance Pap)	None (e.g., descriptive study)	Age	Of the 45,049 typical squamous cells of undetermined significance (ASC-US) Pap test results examined in this analysis, 28,271 (62.8%) were followed with an HPV test, 3,883 (8.6%) with a repeat Pap test, 6,592 (14.6%) with a colposcopy (i.e., direct to colposcopy without an HPV test), and 6,303 (14.0%) were lost to follow-up. Hispanic patients (21.9%; 95% CI 21.2–22.7) and those of multiple races (18.8%; 95% CI 16.6–21.1) had the highest percent of colposcopy. Asian/Pacific Islander (13.0%; 95% CI 11.5–14.7) and American Indian/Alaska Native (12.6%; 95% CI 11.2–14.2) patients had the highest proportion of repeat Pap tests as follow-up. American Indian/Alaska Native patients had the highest proportion of being lost to follow-up than other racial/ethnic groups. By race, American Indian/Alaska Native patients had the highest proportion of HPV positivity (55.2%)
MULTIPLE CERVICAL CANCER-RELATED OUTCOMES INCLUDING SCREENING							
Abdalla 2021	Ecological	AL	■ Race and ethnicity: (Black or White)	■ Cervical cancer screening ■ How far away in percentage from the Healthy People 2020 US baseline and target is cervical cancer screening in Blacks and Whites aged 18 years and older in Alabama and the US Cervical cancer mortality rates ■ The percentage differences in cervical cancer mortality rates of Blacks and Whites aged 20–64 years in Alabama and the US compared to the Healthy People 2020 US baseline and target rates ■ The percentage differences in cervical cancer mortality rates of Blacks and Whites aged 65 years and older in Alabama and the US compared to the Healthy People 2020 US baseline and target rates	Percentage Differences (PD) Percentage Changes (PC) Annual Percentage Changes (APC)	Age	In Alabama, mortality rates are higher among Black patients (5.3 per 100,000) than White patients (2.4 per 100,000) (specifically for those aged 65 +), although Black patients had higher screening rates than White patients. Cervical cancer screening percentages of Blacks were on average 87.65% always higher than those of Whites, and slightly below the national average of 87.85% which was also higher in Blacks. Black patients in Alabama did not achieve the Healthy People 2020 goal for cervical cancer mortality reduction

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Buehler 2019	Cross-sectional	Philadelphia, PA	■ Poverty ■ Racial segregation ■ Educational attainment	■ Receipt of cervical cancer screening	Risk Ratio/ Relative Risk	Age, insurance status	Among 4,995 patients for whom cervical cancer screening was recommended, screening was up to date for 75%. In univariate analysis, those living in tracts with higher levels of racial segregation were less likely to be screened than those living in tracts with lower levels of racial segregation (78.3%); those living in census tracts with the lowest poverty levels had lower screening percentages than those living in tercile groups with higher levels of poverty (72.9%); Those living in tracts with the 2 highest levels of perceived neighborhood safety had lower screening percentages than those living in tracts that residents perceive as the least safe(78.4%). After controlling for age, sex, insurance coverage, and clinic site, other census tract population attributes were not associated with differences in screening levels for either cancer
Eng 2017	Cohort	San Antonio, TX	■ Race and ethnicity	■ Cancer stage at diagnosis ■ Pap test screening practices ■ Age-adjusted death rates	Percentage comparisons	age at diagnosis, period of diagnosis, sex, marital status, area SES, and rural–urban residence	Hispanics often present with more advanced cervical cancer than the general population. Among the Hispanics, 68% presented with regional disease (vs. 37% SEER) and 46% were stage III or higher disease, with stage IIIB accounting for 30% of total. Compared to SEER data from 2002 to 2011, the overall age-adjusted death rates were higher in Hispanics due to a higher percentage of those patients presenting with advanced disease, whereas survival rates appeared similar for each stage
Kim 2020	Cohort	OH	■ Race and ethnicity ■ Patient income	■ Metastatic disease at diagnosis (“localized only,” “regional by direct extension only,” “regional lymph nodes only,” “regional by both direction extension and lymph node involvement,” and “distant site(s)/node(s) involved.”)	Odds Ratio	Age at diagnosis, marital status	Post-expansion. there were 37% (AOR 0.63, 95% CI: 0.40 – 1.03) decreases in the odds of having metastatic disease compared to pre-expansion for cervical cancer. For breast, cervical, colorectal, and lung cancers, after adjusting for the potential confounders, individuals diagnosed post-expansion had 15% lower odds of having metastatic disease compared to pre-expansion (AOR: 0.85, 95% CI: 0.77 – 0.93)
King 2014	Cross-sectional	USA	■ Race and ethnicity	■ Frequency of Pap smear screening	Odds Ratio	Great recession period, age, marital status, perceived health, comorbidity, education, income, insurance, usual source of care, employment, primary language, urbanity, U.S. region, nativity	Compared to the pre-recession period, patients were less likely to obtain a Pap smear during the recession period (OR = 0.79, $p < 0.001$) Black patients were more likely to have a Pap smear than White patients (OR = 1.78, $p < 0.001$) Compared to the pre-recession period, Hispanic patients were more likely to be screened during the recession period (OR = 1.56, $p < 0.001$) Compared to uninsured patients, patients with private insurance and/or public insurance were more than twice as likely as to be screened (OR = 2.17, $p < 0.001$; OR = 2.15, $p < 0.001$)

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Kurani 2020	Cross-sectional	MN, IA, WI	■ Area deprivation index (area-based indicator composed of 17 US Census indicators spanning 4 domains, including poverty, educational level, housing, and employment)	■ Screening completion (cervical cytology in the past 3 years for women aged 21 to 65 years or cervical cytology and HPV co-testing in the past 5 years for women aged 30 to 65 years)	Odds Ratio	Patient age, comorbidity burden, race	The odds of completing recommended screening decreased for individuals living in the most deprived (highest ADI) census block group quintile compared with the least deprived (lowest ADI) census block group quintile with an odds ratio of 0.58 (95% CI, 0.54–0.62) for cervical cancer. For cervical cancer screening, the ORs were 0.78 (95% CI, 0.71–0.87) and 0.81 (95% CI, 0.79–0.83) for highly rural and rural areas, respectively, compared with urban areas. Non-White patients were approximately half as likely to complete screening as White patients
Miller 2020	Cohort	Baltimore, MD	■ Race and ethnicity	■ Human Papillomavirus (HPV) testing ■ Cytology interpretations ■ Incidence of cervical cancer	Odds Ratio	Age of diagnosis	Black patients were more likely to test positive for human Papillomavirus (HPV) and had higher rates of abnormal cytology results compared to White patients. Specifically, 88.9% of Black patients were HPV-positive, compared to 74.1% of White patients. Furthermore, HPV-16 was more common in White patients (34.4%), while HPV-18 was more frequent in Black women (21.1%). Additionally, a higher percentage of Black patients tested positive for high-risk HPV (hrHPV) compared to White patients, with 35.6% of Black patients testing positive versus 24.5% of White patients. Black patients were also more likely to have high-grade cytology results, including high-grade squamous intraepithelial lesions (HSIL) and adenocarcinoma in situ, compared to White patients. In 2011, the odds ratio (OR) for high-grade cytology in Black patients compared to White patients was 1.65 (95% CI, 1.49–1.83). This suggests that Black patients were almost twice as likely as White patients to have high-grade cytology results in 2011. In contrast, in 2017, the OR for high-grade cytology in Black patients compared to White patients was 1.03 (95% CI, 0.62–1.70), indicating no significant difference between the two groups. In 2011, Black patients were also more likely to have high-grade cytology diagnoses, including HSIL and ASC-H, compared to White patients, with an OR of 1.6 (95% CI, 1.17–2.24; P = .0032). However, this disparity decreased in 2017, with a significant decrease in high-grade lesions in Black patients compared to 2011 (OR, 0.53; 95% CI, 0.48–0.88; P < .01)

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Moss 2021	Ecological Cohort	USA	■ Metropolitan status ■ Racial residential segregation ■ Local density of healthcare providers ■ Household income	■ Cancer incidence ■ Cancer mortality ■ Cancer screening (Pap test within the last 3 years)	Incidence Rate/ Rate Ratio or Hazard Ratio	Age	The mean county-level prevalence of screening for cervical cancer was 72.7% Cervical cancer incidence did not differ by metropolitan status but was higher in highly-segregated counties (RR = 1.07, 95% CI = 1.04–1.10) In effect modification models, we did not find evidence for a statistical interaction between metropolitan status and residential segregation in their relationship with incidence of cervical cancer Late-stage incidence of cervical cancer did not differ by metropolitan status, but was higher in highly-segregated counties (RR = 1.08, 95% CI = 1.04–1.12) Cervical cancer mortality did not differ by metropolitan status or residential segregation level For cervical cancer, residential segregation was not associated with mortality in non-metropolitan or metropolitan counties
Reyes 2015	Cohort	USA	■ Health insurance status ■ Citizenship ■ Education ■ Income	■ Cervical cancer screening (Pap test among women without a hysterectomy)	Incidence Rate/ Rate Ratio or Hazard Ratio	Age, citizenship	The differences in the rate of Papanicolaou tests between the insured and uninsured are only 15–20% lower for uninsured; however, the uninsured still have noticeably lower rates overall than the insured. From 2000 to 2006 U.S.-born natives have the highest rate, followed by the insured foreign-born citizens, and lastly the insured non-citizens. Between 2000 and 2010 the odds of a foreign-born citizen getting a Papanicolaou test declined by 2.5%, natives' odds decline by 4.2% each year, and non-citizens increase slightly
Singh 2017	Cohort	USA	■ Race and ethnicity ■ Education ■ Poverty status	■ Cervical cancer screening ■ Incidence ■ Mortality rates	Risk Ratio/ Relative Risk Incidence Rate/ Rate Ratio or Hazard Ratio	Age at diagnosis, period of diagnosis, sex, marital status, area SES, and rural–urban residence	Individuals in more deprived areas or lower education and income groups had higher mortality and incidence rates than their more affluent counterparts. Education and income inequalities in mortality from cervical cancer increased during 1979–2011. Socioeconomic inequalities in cancer mortality widened as mortality in lower socioeconomic groups/areas declined more slowly. Mortality was higher among Blacks and lower among Asian/Pacific Islanders and Hispanics than Whites. Cancer patient survival was significantly lower in more deprived neighborhoods and among most ethnic-minority groups. Cancer mortality and incidence disparities may reflect inequalities in smoking, obesity, physical inactivity, diet, alcohol use, screening, and treatment

Table 1 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism and/or downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key Findings
Yang 2018	Cohort	USA	■ Race and ethnicity ■ Surveillance ■ End Results ■ Epidemiology	■ Cervical cancer incidence	None (e.g., descriptive study)	Age, stage, Pap smear utilization	The incidence among Black patients decreased from 26.9 to 9.7 cases per 100,000 patients ($P < 0.001$), whereas the incidence among White patients decreased from 13.7 to 8.5 cases per 100,000 patients ($P < 0.001$), and the incidence among patients of other races decreased from 16.0 to 7.4 cases per 100,000 patients ($P < 0.001$).Using a race-specific baseline incidence approach, there were at least 71,000 cases prevented among White patients, 46,000 cases among Black patients, and 6000 cases among patients of other races through the use of Pap testing

Table 2 Summary of studies investigating relationships between measures of structural racism and cervical cancer diagnosis, treatment, and/or survivorship outcomes

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
CERVICAL CANCER INCIDENCE, DIAGNOSIS, AND STAGE AT DIAGNOSIS							
Adegoke 2012	Cohort	Atlanta, GA, CT, Detroit, MI, Hawaii Iowa, NM, San Francisco-Oakland, CA, Seattle-Puget Sound, WA, Utah	■ Race	■ Invasive cervical cancer incidence	Incidence Rate/Rate Ratio or Hazard Ratio	Age	By race, the incidence of invasive cervical cancer among Black patients declined 72.2% from 22.79/100,000 patients to 6.8/100,000 patients over the study period. Among Whites, the decline was slightly less extensive with 54% from an annual incidence rate of 13.07/100,000 to 6.01/100,000 patients. Among Whites, squamous cell incidence decreased 7.7% per year, whereas for Blacks, there was a greater decrease (10.9%) per year; both declines were statistically significant. Among Whites, adenocarcinoma incidence increased by 3.6% per year, and for Blacks, the opposite (a decrease of 2.1% annually) occurred. Similar results were seen in the incidence trends of adenosquamous cell types, with the incidence for White patients increasing by 1.3% annually, and that for Black patients decreasing by 6.1% per year
Benard 2017	Ecological	USA	■ Race (white, black, all races)	■ Summary Stage 2000 (localized, regional, distant, unknown) Survival	Other: 5-year age-standardized net survival (%)	Age, sex, calendar year	Black patients consistently had lower survival rates compared to their White counterparts in both calendar periods (2001–2003 and 2004–2009). The 5-year net survival for Black patients was 55.5% in 2004–2009, compared to 63.5% for all races. Black patients also had a higher proportion of distant-stage cancers compared to White patients

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Chakravarthy 2022	Case-cohort	Nashville, TN	■ Area Deprivation Index	■ Stage at presentation for HPV-related cancer	Odds Ratio	Minority status, age at diagnosis, sex	Each of the ADI components were not found to be significantly associated with stage at diagnosis
Cham 2022	Cross-sectional	New York City, NY	■ Neighborhood SES	■ Cervical Cancer incidence rates	Incidence Rate/Rate Ratio or Hazard Ratio	Age	New York's lowest-SES neighborhoods, populated predominantly by Black and Hispanic residents, had cervical cancer incidence rates 73% higher than the mostly White populations of the city's highest-SES neighborhoods
ElIbrahimi 2015	Cohort	NV and USA	■ Race ■ Insurance status ■ Economic status	■ Advanced stage of cervical cancer at diagnosis	Odds Ratio	Age, marital status, diagnosis period, histology	Race was not found to be a significant determinant of an advanced stage in patients with cervical cancer in Nevada, but Black patients had higher odds of being diagnosed at an advanced stage than White patients in other US regions
Enewold 2012	Cohort	USA	■ Race	■ Tumor stage ■ Age at diagnosis	Odds Ratio	Sex, active-duty status, age at diagnosis, marital status, year of diagnosis, geographic region, military service branch and tumor grade	In this cohort, the percentages of cervical cancers that were localized were significantly higher among Whites (age 18–29 years at diagnosis: 84%, age 30–69 years at diagnosis: 89%) than Blacks (age 18–29 years at diagnosis: 57%, age 30–69 years at diagnosis: 84%). Racial differences in stage for cervical cancer were not significant after adjustment

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Froment 2014	Cohort	CA	■ Race ■ Residence in an ethnic enclave ■ SES Nativity	■ Incidence of cervical cancer	Incidence Rate/Rate Ratio or Hazard Ratio Other: Average percentage change (APC)	Age, tumor pathology, summary stage, age group at diagnosis	Vietnamese, Hispanic, and Korean patients were found to have the highest rates of cervical cancer. US-born Chinese, South Asian, and Japanese patients had lower rates of cervical cancer when compared to NHW patients. Foreign-born patients had higher rates of squamous cell carcinoma compared to US-born patients within each ethnic group, except for Chinese patients. Higher rates of cervical cancer were observed in neighborhoods with high ethnic enclave status, especially among Hispanic (low SES, high enclave: IRR: 12.7 [95% CI: 11.2, 14.3]) and all Asian (low SES, high enclave: IRR: 6.0 [95% CI: 4.9, 7.5]) subgroups
Gauri 2020	Cohort	FL	■ Race and ethnicity ■ Neighborhood SES	■ Cancer stage at diagnosis	Odds Ratio	Ethnicity, SES, smoking status, marital status	Multivariable analysis showed that when adjusting for ethnicity, nSES, marital status, and smoking status, Black patients had higher odds of presenting with advanced stage (OR 1.42, 95% CI: 1.30–1.55, $p < 0.001$) versus their White counterparts. While Hispanic patients did not have statistically significant odds of presenting with an advanced stage when analyzed univariately, they had increased odds (OR 1.15, 95% CI: 1.06–1.25, $p = 0.001$) of being diagnosed at advanced stage versus their non-Hispanic counterparts in the adjusted model

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Islami 2019	Ecological	USA	■ Race and ethnicity	■ Incidence of cervical cancer	Incidence Rate/Rate Ratio or Hazard Ratio	Age	Adenocarcinoma (AC) incidence rates between 1999 and 2015 decreased in Blacks (1.9% annually) and Hispanics (0.9% annually) but remained stable in AAPI. The incidence rate of distant-stage cervical squamous cell carcinoma (SCC) and AC among NHWs increased in several age groups but remained generally stable in non-Whites
Koroukian 2022	Cohort	OH	■ Pre-expansion versus post-expansion ■ Being in the stably enrolled versus the emergently-enrolled group	■ Localized or early stage at diagnosis	Risk Ratio/Relative Risk	Age at diagnosis, race, ethnicity, marital status	Results from the causal mediation analysis showed that there was an indirect effect of Medicaid expansion through being in the stably- (vs. emergently-) enrolled group (RR 1.115, 95% CI: 1.064–1.167) for cervical cancer
Krieger 2018	Cross-sectional	MA	■ Index concentration at the extremes measures for: income, race and ethnicity, race, ethnicity, and income federal poverty line	■ Cervical cancer incidence	Incidence Rate/Rate Ratio or Hazard Ratio	Non-metro, city/town characteristics	The greatest point estimate for the Q1 vs Q5 rate ratio was consistently observed for the Index of Concentration at the Extremes (ICE) for racialized economic segregation, and the lowest point estimate was observed for the poverty measure for which the Q1 vs Q5 rate ratio was greatest at the census tract level for the ICE for racialized economic segregation (RR 3.0 95%, CI: 2.1–4.3) and least for the poverty measure (RR 1.9, 95% CI:1.4-2.6), with null associations at the city/town level. This suggests that the ICE for radicalized economic segregation, at multiple levels, is associated with the incidence of cervical cancer in parts of this population

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Krieger 2020	Cohort	MA	■ Home Owners' Loan Corporation ranking	■ Cancer Stage at diagnosis	Risk Ratio/Relative Risk	Age, sex/gender, race, ethnicity	Cervical cancer cases were most likely (15.9%) to live in historically red-lined areas and least likely (7.5%) to live in areas historically deemed creditworthy
Lee 2021	Cross-sectional	USA	■ Medicaid expansion status ■ Urban and rural location ■ Race and ethnicity	■ Cervical cancer diagnosis ■ FIGO stage at diagnosis	Other: Difference in difference analysis	Age, Charlson-Deyo comorbidity score, insurance status	Compared with those living in non-expansion states, patients residing in expansion states were less likely to be Black (13% vs. 19%) and uninsured and more likely to have Medicaid, a higher median household income, receive care at an academic cancer center, have a shorter distance to the hospital facility, and history of hysterectomy. Treatment within 90 days remained similar from the pre- to post expansion periods in both expansion and non-expansion states, and these changes were not statistically different between the groups (adjusted DID 0.1%, 95% CI: − 1.2–1.4%). The DID ratio comparing the hazard ratios of death in non-expansion to expansion states (DID-HR 0.95, 95%CI: 0.83–1.09) indicates no difference in survival between expansion and non-expansion states

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Melkonian 2022	Cross-sectional	USA	■ Race	■ Rate and trends of cervical cancer over time	Incidence Rate/Rate Ratio or Hazard Ratio	Age	Cervical cancer disparities exist among non-Hispanic AIAN patients by region and compared to NHW patients in urban areas Standardized rate ratios for urban non-Hispanic AIAN patients VS Urban NHW Patients: Overall US: 1.50, Northern Plains: 1.80, Alaska: 1.99, Southern Plains: 1.51, Pacific Coast: 1.59, East: 1.07, Southwest: 1.36
Merrill 2013	Cohort	USA	■ Race and ethnicity	■ Cervical cancer incidence rates	Incidence Rate/Rate Ratio or Hazard Ratio	Age	Incidence rates are significantly greater for NHW compared with Hispanic Whites for cervical cancer (0.57, $p < .0001$). Overall, in the US, Hispanic Whites tend to have lower cancer incidence rates than NHW, and the difference increased for cervical cancer
Moss 2017	Cohort	USA	■ Race and ethnicity ■ Insurance status ■ Median family income ■ Percent of residents below poverty level ■ Medicaid expansion	■ Cervical cancer diagnosis	None (e.g., descriptive study) Other: The rate change	Race, ethnicity, income	Among 181,866 diagnosed with cervical, uterine, or ovarian cancer, there was a significant increase in patients enrolled in Medicaid after 2011. Between 2011 and 2014, there was a significant decrease in the rates of uninsured for all cancer types ($p = 0.001$). Uninsured rates decreased by 25% in cervical cancer (8.9% to 6.7%, $p = 0.001$) after January 2014. Decreases in the rate of the uninsured and associated increases in insurance coverage were only observed in states which expanded Medicaid coverage ($p \leq 0.001$)

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Parada 2021	Cohort	USA	■ Race and ethnicity	■ Mean age at cancer diagnosis	Incidence Rate/Rate Ratio or Hazard Ratio	Age	Hispanic patients (vs. NHW patients) were older on average at diagnosis of cervical cancer (+4.1, 95% CI: 3.3–4.8)
Powell 2018	Cohort	AL	■ Race ■ Rural vs. urban ■ Distance to provider ■ Insurance ■ Income	■ Development of advanced-stage (Stages II-IV) cervical cancer	Odds Ratio	Insurance status, age, urbanicity	In the crude analysis, Black race (OR 1.46, 95% CI: 1.09–1.94) was associated with an increased risk of being diagnosed with advanced-stage cervical cancer
Robbins 2015	Cross-sectional	USA	■ Race	■ Mean age at diagnosis	Incidence Rate/Rate Ratio or Hazard Ratio	Age	Among NHBs and Whites ≤ 84 years, Blacks were statistically significantly older than Whites at diagnosis for cervical cancer (+4.7). When comparing age-specific incidence rates in Blacks with Whites with cervical cancer it was found that there was a higher incidence in Blacks at older ages (incidence rate ratios (IRR)) 1.96 among patients aged 60 years and older) and similar incidences between Blacks and Whites at younger ages

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Roche 2015	Ecological	NJ	■ Race and ethnicity ■ Insurance status ■ Income quartile ■ Proportion with no high school diploma	■ Incidence of invasive cervical cancer	Odds Ratio	Age	The three higher invasive cervical cancer incidence rate areas (HIAs) contain about 8.1% of NJ's population and 7.8% of NJ's patients aged 20 or older. Nearly half the population in each HIA is Black and nearly a third Hispanic, whereas only about 11% and 15% of the population in the rest of the state are Black and Hispanic, respectively. Higher percentages of the populations in the HIAs are foreign born (except HIA 3), speak English less than well, and speak Spanish at home. The multivariate analysis (logistic regression modeling) revealed that the most important case characteristics in HIA 1 (Newark area) were being Black and Hispanic. In the multivariate analysis, Black race was the most significant case characteristic in all three HIAs. Hispanic ethnicity was the second most important case characteristic in HIAs 1 and 3
Rosenfeld 2018	Cohort	USA	■ Race and ethnicity ■ SES ■ Insurance status ■ Hospital location (urban, rural)	■ Cervical cancer Pap care	Odds Ratio	Age, time period, hospital region, hospital location, hospital teaching status, hospital bed size, disposition of the patient at discharge	Blacks had higher rates of Pap care (PC) compared to Whites (OR 1.22, 95% CI: 1.08–1.39, P = .0020)

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Rositch 2014	Prevalence	USA	■ Race	■ Cervical cancer incidence	Incidence Rate/Rate Ratio or Hazard Ratio	Prevalence of hysterectomy, age	Among White patients, peak cervical cancer incidence occurred at 65 to 69 years of age (corrected rate 24.7 per 100,000), at which age the corrected rate was 83% greater than uncorrected rates. Compared to the rapid increase in incidence with age from 20 to 34 years, uncorrected rates slowly decreased, whereas corrected rates increased with age from 35–85 + years. Among Black patients, hysterectomy corrected incidence increased steadily with age up to 53.0 cases per 100,000 patients aged 65 to 69 years, which was an increase of 126% compared to the uncorrected rates
Saghari 2015	Cohort	CA	■ Socioeconomic status ■ Race	■ Delayed- versus early-stage cervical cancer	Odds Ratio	Age, marital status	Declining odds of delayed- versus early-stage diagnosis were evident for increasing SES quintiles among Asian or other (trend P = .015), NHB (P = .024), Hispanic (P = .001), and NHW (P = .001) patients. These odds ratios depict lower values for higher SES quintiles in each of the race and ethnic groups, except the highest SES among NHBs

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Salihu 2021	Cross-sectional	USA	■ Race and ethnicity	■ Diagnosis of cervical cancer	Odds Ratio	Age, income level, primary payer, hospital location, bed size, teaching status	The prevalence of cervical cancer among NHB patients with HIV who died while admitted (57.8 per 10,000) was almost 1.5 times that of Hispanic patients (43.3 per 10,000) and more than 3.5 times greater than their NHW counterparts (15.7 per 10,000). Blacks also experienced the greatest rates of cervical cancer in each category of discharge status. All racial and ethnic groups experienced a decline in rates of cervical cancer. Only NHB had an average annual percent decline (0.6%) that was less than the overall (0.9%), but this was not statistically significant. Statistical significance was achieved only in NHW with a decline of nearly 6% (−5.8 [−9.7, −1.8])

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Silva 2020	Cohort	KY	■ Race ■ Rurality	■ Cervical cancer incidence	Incidence Rate/Rate Ratio or Hazard Ratio	Age	A significant difference in the change in incidence rate across time was found between Black and White patients (p-interaction = 0.0002). The incidence of cervical cancer among Black patients was significantly higher than that of White patients from 1995 through 2007 with no significant difference by race after 2008. The age-adjusted mortality in both Black and White patients has decreased since 1995. Mortality in Black patients has decreased more rapidly compared to White patients, with a trend toward statistical significance (p-interaction = 0.0684), and since 2012 there has not been a significant difference in mortality between Black and White patients
Simard 2012	Cohort	Atlanta, GA, CT, Detroit, MI, Hawaii Iowa, NM, San Francisco-Oakland, CA, Seattle-Puget Sound, WA, Utah	■ Race and ethnicity	■ Cervical cancer incidence	Incidence Rate/Rate Ratio or Hazard Ratio	Age, stage, histology	In patients < 50 years, cervical cancer incidence rates were twice as high in Black than White patients between 1975–1979 (RR 1.9, 95% CI: 1.7–2.1) and became lower among Black patients than White patients in 2005–2009 (5.0 vs. 5.5 per 100,000 population, respectively; RR 0.9, 95% CI: 0.8–1.0). Declines in cervical cancer rates were noted during 1992–2009 for all women, except AIAN women < 50 years and ≥ 65 years

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Smith 2022	Cohort	USA	■ Race ■ Insurance status	■ Stage at diagnosis and guideline-concordant treatment	Risk Ratio/Relative Risk	Year, living in a rural area, household income, education attainment, distance traveled for treatment, patient comorbidities	Black race was associated with a lower likelihood of being diagnosed with early-stage cervical cancer in the population. For patients with AC, Black patients were 16% less likely to be diagnosed with early-stage disease than white patients (RR 0.84, 95% CI: 0.79–0.89). For both patients with AC and SCC, there were minimal differences by race in receipt of guideline-concordant treatment. Black patients with SCC were slightly less likely to receive guideline-concordant treatment than White patients with SCC (RR 0.98, 95% CI: 0.95–1.00)
Steele 2020	Cohort	USA	■ Race and ethnicity	■ Clinical stage at diagnosis	Odds Ratio	Age, Carlson comorbidity score, year of diagnosis	Black race was associated with an elevated risk of being diagnosed with advanced disease (OR 1.16 $p < 0.001$) while Hispanic persons had decreased risk (OR 0.79 $p < 0.001$) relative to White patients
Torres 2018	Cohort	Baltimore, MD	■ Neighborhood-level indicators (i.e. racial diversity index, income < $25 k, vacancy, housing violations, crime, domestic violence, etc.)	■ Cervical cancer incidence	Incidence Rate/Rate Ratio or Hazard Ratio	African American, racial diversity index, female-headed, < 25$k, vacant, housing violations, crime, domestic violence, teen birth, employed, businesses, voted, dirty streets, tree coverage, neighborhood associations	For all cancers, an increased proportion of Black residents within a Community Statistical Area as well as a decrease in the number of businesses were associated with higher cancer incidence. There were no statistically significant associations between neighborhood variables and cervical cancer incidence ($R^2 = 0.108$)

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Waggaman 2014	Cross-sectional	New Haven County, CT	■ Race and ethnicity ■ Poverty ■ Census tract	■ Rates of high-grade cervical lesions	Incidence Rate/Rate Ratio or Hazard Ratio	Age	Black and Hispanic patients had significantly higher rates of high-grade cervical lesions (HGCL) as estimated by the rate ratio (RR) than White patients (RR 1.70, 95% CI: 1.42–1.99 and RR 1.64, 95% CI: 1.40–1.87, respectively). Patients residing in census tracts with 220% Black had significantly higher rates compared to patients in census tracts with < 20% Black (RR 1.23, 95% CI: 1.02–1.47). For Black patients, those residing in census tracts where 220% Black had 56% higher rates (RR 1.56, 95% CI: 1.14–2.12) of HGCL compared to Black patients who lived in census tracts where < 20% Black. A similar but less strong pattern existed for Hispanic patients: those residing in census tracts where 220% Black had 27% higher rates (RR 1.27, 95% CI: 0.98–1.64) of HGCL compared to Hispanic patients who lived in census tracts where < 20% Black. The disparity between Black and White patients was strongest in areas with 220% Black (RR 2.38, 95% CI: 1.82–3.04) compared to all other areas

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Ward 2012	Cohort	USA	■ Race	■ Cervical cancer incidence	Odds Ratio Incidence Rate/Rate Ratio or Hazard Ratio	Stage, age, histology type	Stratifying by race shows that the estimated annual percent change (EAPC) is − 3.8 (95% CI: −4.1- −3.6) for Black patients, − 2.1 (95% CI: − 2.3—− 1.9) for White patients, and − 2.9 (95% CI: − 3.4—− 2.4) for patients of other races. By further breaking down the "other" category, we find that the majority of this category is AAPI, with the remainder being AIAN, or other and unknown. The odds of a newly diagnosed cervical cancer patients being AAPI are 68% higher in the second time period (OR 1.68, 95% CI: 1.56–1.81) than in the first
Yu 2019	Cross-sectional	USA	■ Race and ethnicity	■ Cervical cancer incidence	Incidence Rate/Rate Ratio or Hazard Ratio	Age	Compared to White patients, Hispanic patients had higher rates of cervical cancer at any stage. Black patients had higher rates of regional and distant-stage cancer. Age-Adjusted Cervical Cancer Rate Ratios of All Stages by Race and ethnicity: Localized: NHW: ref, NHB: 1.01 (0.97–1.05), Hispanic: 1.19 (1.15–1.23), NH Other: 0.96 (0.91–1.01); Regional: NHW: ref, NHB: 1.62 (1.56–1.68), Hispanic: 1.57 (1.51–1.63), NH Other: 1.17 (1.10–1.24); Distant: NHW: ref, NHB: 1.73 (1.63–1.83), Hispanic: 1.39 (1.30–1.48), NH Other: 1.01 (0.92–1.11); Unknown: NHW: ref, NHB: 1.75 (1.60–1.92), Hispanic: 1.83 (1.66–2.00), NH Other: 2.04 (1.82–2.28)

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Zahnd 2018	Cohort	USA	■ Rural vs. urban residence ■ Race and ethnicity	■ Cancer rates by stage	Incidence Rate/Rate Ratio or Hazard Ratio	Age	Racial and ethnic stratification showed rural NHWs had higher rates for multiple cancers, including cervical (localized stage: RR 1.10, CI: 1.05–1.14; distant stage: RR 1.20, CI: 1.12–1.29)
Zahnd 2019	Cohort	USA	■ Race and ethnicity ■ Rurality and urbanicity	■ HPV-related cancer age-adjusted incidence rates ■ HPV-related cancer overall annual percentage changes	Incidence Rate/Rate Ratio or Hazard Ratio	Age	Rural females overall had higher rates of HPVa cervical carcinoma (RR = 1.11; 95% CI = 1.08–1.13) than their urban counterparts. Additional rural disparities were found among NHB (cervical-RR = 1.11, 95% CI = 1.03–1.19). Many disparities remained after racial and ethnic stratification. White and Black rural patients were at increased risk of cervical carcinoma. Cervical carcinomas decreased in both rural and urban populations (annual percent changes of −2.17 and −2.36, respectively)
Zhan 2014	Cohort	Texas	■ Race and ethnicity ■ SES ■ Health insurance expenditure ■ Neighborhood sociodemographic ■ Spatial access to primary care physicians	■ Diagnosis of advanced-stage cervical cancer	Odds Ratio	Age, tumor grade	Compared to NHW patients, NHB and Hispanic patients had an elevated risk of advanced-stage cervical cancer diagnosis (OR 1.32, 95% CI: 1.15–1.51 and OR 1.18, 95% CI: 1.08–1.30, respectively). Additionally, there was a significant, inverse relationship between advanced-stage diagnosis of cervical cancer and neighborhood-level SES. Cervical cancer patients from census tracts with the lowest SES were 54% more likely to be diagnosed at an advanced stage (OR 1.54, 95% CI: 1.29–1.85)

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
CERVICAL CANCER TREATMENT AND/OR SURVIVAL OUTCOMES							
Abdalla 2020	Cohort	AL	■ Urbanicity: urban, black belt, other rural ■ Race: Black or White	■ Five-year relative survival	Other: Relative survival ratio	Age, county, staging scheme at diagnosis	Whites diagnosed with localized stages of cervical cancer and living in all three county groups always had higher relative survival ratios, compared to their Black counterparts. The only exception was in Blacks living in the other rural counties and in Whites living in BBC who had the same overall highest relative survival ratios. In the urban counties, Whites diagnosed with localized stage of cervical cancer, had a significantly higher relative survival ratios of 77.8% (95% CI: 70.7–83.3%), compared to Blacks who had a lower relative survival ratios of 72.7% (95% CI: 55.4–84.2). Whites living in the BBC and Blacks living in the other rural counties diagnosed with localized stage of cervical cancer had the same significantly highest relative survival ratios of 83.8% (95% CI: 74.5–89.9) and 83.8% (95% CI: 74.2–90.1) respectively. Whites diagnosed with localized stage of cervical cancer living in the BBC had the significantly highest relative survival ratios of 83.8% (95% CI: 74.5–89.9) compared to Blacks who had a relative survival ratio of 73.2% (95% CI: 47.4–87.8)

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Albright 2021	Cohort	January 2014 Medicaid expansion states (AZ, AR, CO, DE, HI, IL, IA, KY, MD, MA, NV, NM, NY, ND, OH, OR, RI, VT, WV) vs. non-expansion states (AL, FL, GA, ID, KA, ME, MS, MO, NE, NC, OK, SC, SD, TE, TX, UT, VA, WI, WY)	■ Race and ethnicity ■ Medicaid expansion	■ Gynecologic cancer mortality	Other: Mortality Rate	Age	Mortality was consistently highest for Black patients with 10.6 per 100,000 vs. 8.5 per 100,000 for White patients in 2018. In terms of Medicaid, non-expansion states had relatively more Black patients and fewer Asian women
Alimena 2019	Cohort	USA	■ Race	■ Receipt of Brachytherapy ■ Survival rate	Odds Ratio Incidence Rate/Rate Ratio or Hazard Ratio	Age, race, insurance type, income, stage, histology, facility type, distance, and location, education, urban or rural residence, Charlson/Deyo score, clinical nodal status, year of diagnosis	Black patients were significantly less likely to receive brachytherapy (BT) compared to their non-Black counterparts (AOR 0.87, 95% confidence interval [CI] 0.79–0.96, $p=0.007$). Black patients who did not receive BT had a higher risk of all-cause mortality when compared to non-Black patients (median survival 3.9 years [95% CI 3.6–4.6] versus 5.2 years [95% CI 4.9–5.5] for non-black women, $p<0.001$). Survival differences by race were mediated by BT use; Black patients had similar survival to non-Black patients when both groups received BT (AHR 1.04, 95% CI 0.95–1.13, $p=0.42$; p-interaction $=0.005$)

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Alimena 2021	Cohort	USA	■ Race (Black or non-Black)	■ Stage I Disease ■ Optimal treatment ■ Overall survival	Odds Ratio Incidence Rate/Rate Ratio or Hazard Ratio	Age, race, stage, year of diagnosis, histology, Charlson-Deyo comorbidity score, insurance status, facility volume	Black patients aged 39 years were less likely to present with stage I disease, with a significant interaction term between age and race (P = .01 for interaction). Compared with their non-Black counterparts, fewer Black patients presented with stage I disease (37.8% vs 47.8%; P = .01) and received optimal treatment (46.2% vs 58.3%; P = .01). Disparities in overall survival by race were greatest for Black patients aged 39 years (adjusted hazard ratio 1.32, 95% CI: 1.20–1.46, P = .01) but decreased with increasing age interval until no disparity was noted for patients aged 65 years (P = .01 for interaction)
Amini 2019	Cohort	USA	■ Race ■ Insurance status ■ Residence ■ Median household income	■ Two- and five-year overall survival rates	Odds Ratio Incidence Rate/Rate Ratio or Hazard Ratio	Age, race, insurance status, residence, location, comorbidity score, facility type, year of diagnosis, median household income, FIGO stage, histology	Those of Black race (OR 1.45, P = 0.001), patients with government insurance (OR, 1.21; P = 0.019), and those treated at community practices (OR, 1.31; P = 0.001) were more likely to undergo cut-through hysterectomies

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Ashing-Giwa 2013	Cross-sectional	CA	■ Ethnic group ■ Health insurance status ■ Educational attainment ■ Household income	■ Therapeutic care delays	Odds Ratio	Ethnic group, age, education, income, health insurance, stage at diagnosis, reasons for therapeutic delays	Ethnic group, income, education, and health insurance status were significantly related to therapeutic care delays. Limited English-proficient Latina-American cervical cancer survivors were more likely to report delaying therapeutic care ≥ 60 days than EP Latina- and European-Americans. Patients who experienced delays due to healthcare system issues were more likely to report delaying therapeutic care ≥ 60 days. Healthcare system delays are primary contributors to ethnic differences in access to appropriately timed care observed in this study
Beavis 2017	Ecological	USA	■ Race	■ Cervical cancer mortality rates	Other: Mortality rate ratios	Age, year, history of hysterectomy, and state	After correcting for hysterectomy status, age-standardized mortality rates were higher for both Black and White patients. The corrected mortality rate for Black patients stood at 10.1 per 100,000, compared to the uncorrected rate of 5.7, and the corrected rate for White patients was 4.7, compared to the uncorrected rate of 3.2. Without correction, the racial disparity in mortality rates was underestimated by 44%. The correction revealed a larger racial disparity, particularly affecting older Black patients

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Boyce-Fappiano 2021	Cohort	USA	■ Race ■ Insurance	■ Brachytherapy utilization (BT) ■ Overall survival (OS) ■ Disease-specific survival (DSS)	Odds Ratio Incidence Rate/Rate Ratio or Hazard Ratio	Age, AJCC stage	Black (OR 0.68) and unknown versus White race (OR 0.30) were associated with decreased BT utilization. Black versus White race (HR 1.13, 95% CI: 1.02–1.26, P = .001) was associated with inferior DSS-specific survival, whereas the use of EBRT + BT versus EBRT alone (HR 0.61, 95% CI: 0.56–0.66, P = .001) and Other versus White race (HR 0.84, 95% CI: 0.72–0.98, P = .001) was associated with improved DSS. When comparing Black and White patients in this cohort, the 5-year OS was 44.2% versus 50.9% (P = .0001) and the 5-year DSS was 55.6% versus 60.5% (P = .0001) for Black and White patients, respectively. When examining only patients who received combined EBRT + BT, these racial disparities were attenuated with the 5-year OS of 57.3% versus 58.5% (P 5 .24) and the 5-year DSS of 66.3% versus 66.6% (P = .53) for Black and White patients, respectively

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Bruce 2019	Cohort	USA	■ Race and ethnicity ■ Insurance	■ Rate of brachytherapy receipt ■ Overall survival	Odds Ratio	Age, race, insurance status, high school completion, Charlson-Deyo score, residence, year of diagnosis, median household income, facility location, clinical stage	Differences in survival by race were similar regardless of brachytherapy receipt for all stages. In general, Asian and Hispanic patients had the best survival probabilities, whereas NHW and NHB patients had the worst survival probabilities across all stages. NHB patients received brachytherapy at a significantly lower rate than NHW patients (OR 0.93; 95% CI 0.86–0.99; P = .036)
Cantwell 2021	Cohort	USA	■ Race and ethnicity	■ Adherence to NCCN-recommended treatment and ■ Five-year overall survival	Odds Ratio	Age, stage, facility type, SES	There was no difference in adherence to NCCN guidelines between Hispanic-identified patients and their NHW counterparts (p = 0.88). Hispanic-identified patients with cervical cancer had a significantly higher rate of survival compared with their NHW counterparts (aOR: 1.52 [95% CI: 1.44–1.61]). Hispanic patients received NCCN-compliant care for their cervical cancer and did not experience worse outcomes, specifically earlier death, due to the care they received. In addition, this study showed that Hispanic patients have longer mean survival (110.58 months) relative to NHW patients (86.05 months), which suggests they may have some protective factors that contribute to their longer life expectancy after diagnosis and treatment

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Eaglehouse 2021	Cohort	USA	■ Race and ethnicity	■ Receipt of guideline-adherent cervical cancer treatment	Odds Ratio	Age at diagnosis, marital status, active-duty status, military service or sponsor branch, region, comorbid conditions, diagnosis year, tumor site, tumor stage, tumor grade, tumor histology	The percentage of NHB patients receiving guideline-based treatment was lower than other racial groups. NHB patients were less likely to receive recommended cancer treatment compared with NHW patients. Black patients were marginally less likely to receive guideline-adherent treatment compared with NHW patients (aOR 0.73, 95% CI 0.5321.00, P = .011) and significantly less likely to receive guideline-adherent treatment than either Asian (aOR 0.65, 95% CI 0.44–0.97) or Hispanic patients (aOR 0.56, 95% CI 0.34–0.92)
Egiebor-Aiwan 2020	Cross-sectional	AL	■ Race ■ Urbanicity (urban vs rural)	■ Treatment: surgery, radiation, surgery-radiation sequence and chemotherapy	Odds Ratio	Age, race, stage, county	White patients 17–39 years old with regional stage cervical cancer were most likely to receive radiation (65.8%) and surgery-radiation (63.6%), while Black patients aged 40–49 diagnosed with localized stage cervical cancer were most likely to receive surgery (60.0%). In rural counties, Black patients across different age groups and stages of cervical cancer were more likely to receive radiation (OR: 1.12 [95% CI: 0.88–1.42]), surgery-radiation sequence (OR: 1.05 [95% CI: 0.77–1.43]), and chemotherapy (OR: 1.09 [95% CI: 0.86–1.39]) compared to Whites

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Elhussin 2020	Cross-sectional	AL	■ Race ■ Urbanicity (by county: urban, rural black belt, other rural counties)	■ Treatment options (surgery, radiation, surgery and radiation sequence, immunotherapy)	Odds Ratio	Age group, stage at cancer diagnosis, county of residence	Blacks are most likely to be diagnosed for the first time when cervical cancer is already in more advanced clinical stages. The study analysis showed that younger Blacks living in urban counties with advanced stages of cervical cancer were more likely to receive radiation treatment but were less likely to undergo surgical treatment options. Immunotherapy treatment is in most cases likely to be for Blacks living in urban counties, compared to those living in rural BB and other rural counties, regardless of their age whether in early or advanced stages of the disease. Blacks had 2.76 (95% CI: 0.90–8.86) times the odds of receiving immunotherapy compared to Whites. Blacks had 0.74 times adjusted odds (95% CI 0.58–0.95) of undergoing less surgery compared to Whites
Fleming 2014	Cohort	MD	■ Race	■ Cervical cancer treatment	Odds Ratio	Stage	When adjusted for stage and insurance status, Black patients received different treatment than Whites. Black patients had substantially lower odds of receiving surgery (OR 0.51, 95% CI: 0.41–0.65) and higher odds of receiving chemotherapy (OR 1.43, 95% CI: 1.11–1.82), or external beam radiation (OR 1.45, 95% CI: 1.16–1.87)

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Greenwald 2014	Cross-sectional	CT, Detroit, MI, Metropolitan Area, NM, HI	■ Race ■ Economic disadvantage	■ Quality of life	Other: coefficients from regression model	Age, invasive disease, registry, years since diagnosis	Means on SF-36 measures among patients with cervical cancer histories were close to or higher than patients in the general population. In a multiple regression analysis, economic disadvantage negatively predicted physical functioning (B = − 13.4, SE = 2.1), social functioning (B = − 13.2, SE = 2.4), bodily pain (B = − 12.6, SE = 2.5), and general health (B = − 12.8, SE = 2.1). Residence in New Mexico negatively predicted several QOL dimensions. No impact of race was detected when income was controlled. Disease stage did not predict QOL
Grover 2013	Cohort	USA	■ Race and ethnicity ■ Education ■ Income	■ Receipt of surgery as primary treatment ■ Overall survival	Odds Ratio Incidence Rate/Rate Ratio or Hazard Ratio	Region, marital status, tumor characteristics, year of diagnosis	Non-Whites are more likely than Whites to have RT (radiotherapy) as primary treatment (versus surgery) (OR, 1.95; P e 0.001). This suggests that non-White patients may have social/cultural barriers impacting their treatment decision-making or may have a higher likelihood of other comorbidities that limit their surgical options
Hallowell 2019	Ecological	USA	■ Race and ethnicity	■ Cervical cancer mortality rates	Incidence Rate/Rate Ratio or Hazard Ratio	Age	Foreign-born patients had lower cervical cancer mortality rates when compared with U.S.-born patients. However, higher cervical cancer mortality rates were observed in older foreign-born patients and those born in Mexico

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Huepenbecker 2022	Cohort	USA	■ Medicaid expansion in January 2014 ■ Medicaid non-expansion as of 2016 ■ Race and ethnicity ■ Health insurance ■ Zip-code level ■ Median household income ■ Educational attainment	■ Two-year all-cause survival after diagnosis of gynecologic cancer	Other: a difference-in-difference analysis	Year of diagnosis, cancer type, cancer stage, age, race, ethnicity	No improved 2-year survival on adjusted difference-in-difference Cox regressions for patients in cervical cancer sites on the basis of expansion status. Patients with cervical cancer in the South (P = 0.018) had worse 2-year survival in expansion than in non-expansion states after 2014. Cervical cancer had an 11% decreased hazard of death (HR, 0.89; 95% CI, 0.81e0.97) in the post-2014 compared with the pre-2014 study period
Islam 2021	Cohort	USA	■ Race and ethnicity	■ Pap care utilization	Odds Ratio	Age, follow-up time in months from cancer diagnosis to last contact or death, insurance type, median income, comorbidity score, cancer care facility type, census region, year of cancer diagnosis, cancer grade	Among cervical cancer patients, Hispanic (aOR:0.75, 95% CI:0.63–0.88) patients had lower utilization of Pap care when compared to NHW and NHB patients
Islam 2021	Cohort	USA	■ Race	■ Pap care utilization	Odds Ratio	Age, follow-up time from cancer diagnosis to last contact or death, insurance type, median income, comorbidity score, cancer care facility type, census region, year of cancer diagnosis, cancer grade	Inequities in the utilization of Pap care exist among patients with metastatic gynecological cancer, indicating unequal treatment based on race and ethnicity. Hispanic and Asian cervical cancer patients were less likely to utilize Pap care (aOR: 0.65 and 0.74, respectively)
Jalloul 2018	Cohort	USA	■ Race ■ Insurance ■ Type of Facility ■ Median income	■ Treatment (no treatment, CMT alone,Z RT alone, or chemoradiation with or without surgery) Overall survival	Incidence Rate/Rate Ratio or Hazard Ratio	Age, race, insurance, comorbidity index, clinical nodal status, metastatic site at presentation, treatment center, histology, treatment modality	Positive prognostic values that significantly affected overall survival (12 months) included Black and Asian race and insurance status

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Kaur 2023	Cohort	USA	■ Race	■ Median survival ■ Median potential years of life lost	Other: Median potential years of life lost	Age	The most rapid rise in median potential years of life lost (PYLL) noted for cervical cancer compared to other gynecologic malignancies ($p < 0.001$, B1 = 2.68 years) and Hispanic patients with cervical cancer ($p < 0.001$, B1 = 1.92)
Khan 2016	Cohort	CA, NM, CT WA, MI, IA, UT, GA, HI	■ Race and ethnicity	■ Clinicopathologic features ■ Survival time	Incidence Rate/Rate Ratio or Hazard Ratio	Age at diagnosis, marital status, and survival times; and cervical cancer information, including tumor primary site, lymph node involvement, grading, and behavior	There was a major statistical difference observed in the mean survival time for the NHW patients, which was 221.69 months (SD = 118.05), and White Hispanic, which was 190.29 months (SD = 120.28), having a 31.41-month difference, which equates to about a 2.61-year difference. Both NHW and White Hispanic patients had similar patterns of histological characteristics of cervical cancer. White Hispanics had a significantly increased risk of death
Kotha 2022	Cohort	San Diego, CA	■ Race and ethnicity	■ Time to initiation of chemoradiation or radiation ■ Cervical cancer recurrence ■ Cervical cancer survival	Odds Ratio Incidence Rate/Rate Ratio or Hazard Ratio	Smoking status, age, gravida, para, Eastern Cooperative Oncology Group performance status, menopause status, FIGO 2009 stage, pelvic node involvement, paraaortic node involvement, grade, histology, chemotherapy agent	Compared with NHW patients, Hispanic patients were 2.71 (95% CI 1.16–6.35) times more likely to receive delayed time to treatment ($p = 0.04$). There was no interaction between race and ethnicity and FIGO stage in the logistic model
Krieger 2012	Cohort	USA	■ Median family income quantiles ■ County education level ■ Race and ethnicity	■ Cancer mortality	Other: mortality rate ratio, mortality rate difference	Age	The hypothesis that cancer mortality inequities are bound to increase is refuted by long-term data on total and site-specific cancer mortality stratified by socioeconomic position and race and ethnicity

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Lin 2015	Cohort	TX	■ Race and ethnicity ■ SES ■ Spatial access to primary care physicians ■ Insurance expenditure ■ Percentage of Blacks in census tract ■ Urbanization (at the census tract-level)	■ Cervical cancer 5-year survival rates	Incidence Rate/Rate Ratio or Hazard Ratio	Year of diagnosis, age at diagnosis, tumor grade, stage at diagnosis, type of treatment received, contextual-level factors	Blacks had a higher mortality risk (HR 1.19, 95% CI: 1.03–1.38) especially if the stage was unknown (HR 1.72, 95% CI: 1.08–2.75) compared with NHWs. Among patients diagnosed at regional or distant stages, Hispanics had a survival advantage over their NHW counterparts (HR 0.80, 95% CI: 0.69–0.94)
Machida 2018	Cohort	USA	■ Race and ethnicity	■ Receipt of trachelectomy for cervical cancer treatment	Odds Ratio	Age, marital status, registry area, year at diagnosis, stage, histology, grade	Non-Black race was associated with trachelectomy use (adjusted $P < 0.05$)
Markt 2018	Cohort	USA	■ Race and ethnicity	■ Cervical cancer survival	Incidence Rate/Rate Ratio or Hazard Ratio	Age, year at diagnosis, insurance status, marital status, region, county-level measures of income, education, stage at diagnosis, treatment	Patients who were NHB had a statistically significant increased risk of all-cause and cervical cancer-specific mortality, compared with NHW patients (All-cause HR 1.23, 95% CI: 1.09–1.38; cervical cancer-specific mortality HR 1.23, 95% CI: 1.08–1.39). Hispanic patients had a 20% reduced risk of all-cause and cervical cancer-specific mortality, compared with NHW patients. While other race patients also had a reduced risk of mortality, the association was not statistically significant. The estimated proportion of excess cervical cancer mortality for NHB patients relative to NHW patients that were mediated by insurance was 18.6% and by treatment was 47.2%

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Martinez 2022	Cohort	CA	■ Race and ethnicity ■ The change of health insurance	■ Five-year cancer-specific death	Incidence Rate/Rate Ratio or Hazard Ratio	Time-period, race and ethnicity, age, insurance status, marital status, tumor size, lymph node involvement, grade, histology, surgery, neighborhood SES, and diagnosis and/or treatment at an NCI cancer center	Researchers observed a lower risk of death from cervical cancer post-ACA among NHB patients (HRR 0.68, 95% CI: 0.47–0.99)
Mayadev 2018	Cohort	CA	■ Race and ethnicity ■ Socioeconomic status	■ Cause specific survival ■ Overall survival	Incidence Rate/Rate Ratio or Hazard Ratio	Age at diagnosis, stage at diagnosis, histology, tumor grade	Black patients had significantly worse survival from both cervical cancer compared to their NHW counterparts (HR = 1.57, 95% CI 1.24–2.00, p = 0.00002). Hispanic (HR = 0.89, 95% CI 0.76–1.03) and AAPI (HR = 0.86, 95% CI 0.70–1.05) patients had better survival than White patients
McDaniels-Davidson 2022	Cohort	CA	■ Receiving care at a National Cancer Institute-designated cancer center	■ Mortality due to cervical cancer	Incidence Rate/Rate Ratio or Hazard Ratio	Age, race and ethnicity, insurance status, receipt of guideline-concordant treatment	The hazard of CC-specific death was reduced by 20% for those receiving care at NCICCs compared with patients receiving care elsewhere (HR .80; 95% CI: 0.70–0.90). Adjustment for guideline-concordant treatment and other covariates minimally attenuated the association to 0.83 (95% CI: 0.74–0.95), suggesting that the survival advantage associated with care at NCICCs may not be due to receipt of guideline-concordant treatment

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Medina 2021	Cohort	CA	■ Race and ethnicity ■ Education level	■ Cervical cancer mortality rate ratio	Other: Mortality Rate Rates (MRR)	Age, sex, site	The highest cervical cancer mortality was among Native Hawaiian and Other PI and Southeast Asian patients (MRR: 7.4, 95% CI: 5.3–10.2). Native Hawaiian and Other PI patients had 7.1 times higher cervical cancer mortality than NHW patients
Melamed 2018	Cohort	USA	■ Race and ethnicity	■ Open surgery or minimally invasive surgery	Incidence Rate/Rate Ratio or Hazard Ratio	Race, ethnicity, year of diagnosis, facility type, stage of disease, histologic type, tumor size, residence, education, income, insurance status, Charlson comorbidity index	Patients treated with minimally invasive surgery were more often White ($p < 0.001$)
Moss 2022	Ecological	USA	■ Reside in county with persistent poverty ■ Rurality ■ Race	■ Cervical cancer mortality	Risk Ratio/Relative Risk Other: Morality Rates	Age	Mortality rates were highest among Black residents of counties that were both rural and persistent poverty (mean rate: 7.83 [95% CI: 7.55–8.12])
Naik 2019	Cross-sectional	USA	■ Race	■ Length of stay in hospital ■ Post-operative complications in patients who underwent hysterectomy ■ Discharge disposition ■ Mortality in-hospital	Odds Ratio	Age at primary diagnosis, insurance status, residential region, median income of residential area, stage of cancer, modified Deyo comorbidity index, treatment	The length of stay was significantly lower for Whites compared to Black cervical cancer patients when matched on demographic only ($\beta = -0.41$, p-value < 0.0005, presentation + demographic ($\beta = -0.41$, p-value < 0.0006) and treatment + presentation + demographic variables ($\beta = -0.46$, p-value < 0.0001)
Nasioudis 2020	Cohort	USA	■ Race ■ Travel distance from the reporting facility (short = < 12.5 miles, intermediate = 12.5–49.9 miles, long = > 49,9 miles) ■ Insurance status (private, government, uninsured/unknown) Income	■ Receipt of adjuvant external beam radiation therapy within 4 months of hysterectomy among patients with early-stage cervical carcinoma metastatic to regional lymph nodes	Odds Ratio	Travel distance to clinic, year of diagnosis, age, stage, type of hysterectomy	Black patients were less likely to receive EBRT compared with White (64.2% vs. 70.6%, P = 0.037)

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Nghiem 2016	Cohort	USA	■ Race	■ Overall survival	Incidence Rate/Rate Ratio or Hazard Ratio	Marital status, age at diagnosis, stage at diagnosis, histologic classification, treatment, SES, foreign-born, residence population density	Asian American patients had better overall survival than White patients (hazard ratio [HR] 0.77, 95% CI: 0.68–0.86). In addition, patients of Filipino, Chinese, or Southeast Asian origin, but not those of North Asian origin, had better survival compared with White patients, with HRs ranging from 0.62 to 0.82. Among patients younger than 35 years at diagnosis, Asian American patients were approximately twice as likely as White patients to die (HR 2.42, 95% CI: 1.47–4.00). However, among women 55 years or older at diagnosis, Asian American patients consistently had better overall survival than White patients, with HRs ranging from 0.59 to 0.61
Nishio 2018	Cohort	TX	■ Race and ethnicity	■ Overall survival	Incidence Rate/Rate Ratio or Hazard Ratio	Age, tumor diameter, differentiation, histology, hydronephrosis, clinical T stage, metastatic site	After adjusting for extraneous variables, multivariate analysis showed that Black race was significantly associated with poorer overall survival (OS). The hazard ratio for Black vs. patients with other ethnicities was 1.76, (95% CI: 1.18–2.54, P = 0.0063)

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Niu 2013	Cohort	NJ	■ Health insurance status	■ Cancer-specific survival	Incidence Rate/Rate Ratio or Hazard Ratio	Age, race, ethnicity, SES, marital status, stage	Five-year cause-specific survival revealed uninsured and Medicaid-insured patients had statistically significantly lower survival rates than privately insured patients; 5 to 19 and 10 to 22 percentage points lower, respectively, than the analogous privately insured patients' rates. Once adjusted, uninsured patients had the same risk of death from cervical cancer within 5 years (HR 1.00) while Medicaid-insured patients had a non- significantly higher risk of death (HR 1.32) compared with privately insured patients. Five-year survival worsened for cervical cancer (P = 0.09) by 4 percentage points between 1999–2001 and 2002–2004 diagnosis periods for privately insured patients
Osazuwa-Peters 2021	Cohort	USA	■ Race and ethnicity ■ Insurance type	■ Cervical cancer survival ■ Death from HPV-associated cancer (cervical cancer)	Incidence Rate/Rate Ratio or Hazard Ratio	Age, year of diagnosis, sex, marital status, stage, surgery, radiation, chemotherapy,	Compared to NHW, Hispanics had 14% decreased mortality from cervical carcinoma (sdHR .86, 95% CI: 0.81- .93). Non-Hispanic AAPI and AIAN had 12% decreased risk of death from cervical carcinoma (sdHR .88, 95% CI: 0.81-.97); and NHBs had increased risk of death from cervical carcinoma

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Petersen 2018	Descriptive – case series	Detroit, MI	■ Race ■ Insurance type	■ Days to initiate radiation therapy ■ External beam treatment duration ■ Days to external beam completion ■ Days to external beam radiation therapy Plus brachytherapy completion ■ Duration of external beam radiation Therapy plus brachytherapy	None (e.g., descriptive study)	Age, cancer stage at diagnosis, smoking status, date of pathological diagnosis, side effects, tumor board prior to treatment, PET CT prior to treatment, reason for delay	There was no significant difference in time to initiate therapy, duration of external beam treatment, days to EBRT plus brachytherapy completion or duration to EBRT plus brachytherapy between races. The mean number of days from diagnosis to completion of external beam radiation therapy was 70.9 days among White patients and 88.9 days among non-White patients ($p = 0.006$)
Pfaendler 2018	Cohort	CA	■ Race and ethnicity ■ Insurance payer ■ SES ■ Hospital volume	■ Adherence to guideline-concordant treatment ■ Cervical cancer 5-year survival	Odds Ratio Incidence Rate/Rate Ratio or Hazard Ratio	Age at diagnosis, year of diagnosis, health status, clinical stage, histopathologic grade, tumor size, histology	Black race (HR 1.56, 95% CI: 1.08–2.27) was statistically significantly associated with an increased probability of dying from cervical cancer
Pinheiro 2020	Cohort	CA, FL, MN, NY	■ Race and ethnicity	■ Cervical cancer mortality rates	Incidence Rate/Rate Ratio or Hazard Ratio Other	Age	Of the 83,460 cancer deaths analyzed among Blacks, nearly 20% were immigrants. Africans had the lowest all-sites-combined cancer mortality rates (99 per 100,000), African Americans had the highest (163), while Afro-Caribbeans were in between (106). The average Black: White mortality rate ratios (MRR) was significant for cervical (1.56) cancer, ($P < 0.05$). African Americans had highest rates of cervical cancer. Age-adjusted mortality rate ratios showed that African Americans had 27% greater all-cancers-combined mortality risk, respectively, than Whites. Conversely, Afro-Caribbean patients had 18% lower all-cancers-combined mortality and Africans had 22% lower mortality risk than Whites

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Ramey 2018	Cohort	USA	■ Race and ethnicity ■ Insurance type ■ Median household income ■ Education status ■ Distance to reporting facility	■ Time to treatment initiation ■ Overall survival	Risk Ratio/Relative Risk Incidence Rate/Rate Ratio or Hazard Ratio	Year of diagnosis, age, urban/rural, reporting facility type, transition in care, radiation plan type, radiation modality, primary treatment, Charlson-Deyo comorbidity score, clinical stage, tumor size, pelvic lymph node status, paraaortic lymph node status	Time to treatment initiation (TTI) varied significantly by race and ethnicity on MVA with NHB patients having an estimated TTI (eTTI) of 45.2 days vs 38.1 days for NHW patients (relative risk [RR] 1.14, 95% CI: 1.11–1.18). eTTI was also longer for Hispanic patients: 49.4 days vs. 38.1 days for NHW patients (RR 1.19, 95% CI: 1.15–1.24). Demographic factors significantly associated with improved overall survival (OS) included the AAPI race (HR 0.63, 95% CI: 0.40–1.00) and Hispanic ethnicity (HR 0.68, 95% CI: 0.49–0.95)
Rauh-Hain 2013	Cohort	Atlanta, GA, CT, Detroit, MI, Hawaii, Iowa, New Mexico, San Francisco-Oakland, CA, Seattle-Puget Sound, WA, Utah	■ Race	■ Cervical cancer survival	Incidence Rate/Rate Ratio or Hazard Ratio	SEER registry, age, marital status, stage, treatment, grade, histology	For both all-cause mortality and cancer-specific mortality, Black patients had a significantly increased overall and disease-specific hazard of death compared with White patients. The overall HR for Black patients was 1.53 (95% CI: 1.46–1.61), and the disease-specific HR was 1.41 (95% CI: 1.32–1.51). After adjusting for covariates, the Black race remained significantly associated with an increased overall hazard of death (HR 1.17, 95% CI: 1.11–1.23), and CC-related mortality compared to Whites (HR 1.13, 95% CI: 1.05–1.22)

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Rauh-Hain 2018	Cohort	USA	■ Race and ethnicity	■ Receipt of cervical cancer treatment ■ Five-year cervical cancer survival	Odds Ratio	Age, year of diagnosis, comorbidity score, lymphadenectomy status	Among patients with stage IA1–IIA cervical cancer, Black patients diagnosed in 2004–2007 were less likely than patients in the other groups to receive indicated surgery or chemo-radiotherapy (70.1% versus 75.7%; p = 0.006). This disparity abated in subsequent years as the proportion of Black patients who received indicated surgery or chemo-radiotherapy increased to 76.7% by 2011–2014 (p = 0.88). When compared to White patients, the odds of receiving chemoradiotherapy were 35% lower among Black patients (OR 0.65, 95% CI: 0.54–0.79) and 17% lower among White (OR 0.83, 95% CI: 0.69–0.99) compared to Asian patients. Five-year cancer-specific-survival among cervical cancer patients was highest among Hispanic (75.7%, 95% CI: 74.7–76.7) and Asian patients (74.4%, 95%CI: 72.7–76.0), lower among White patients (71.8%, 95% CI: 71.1–72.5), and lowest among Black patients (62.6%, 95% CI: 61.2–64.0)
Robin 2016	Cohort	USA	■ Race ■ Insurance status ■ Median household income ■ Distance to hospital	■ Type of treatment received ■ Overall survival	Odds Ratio Incidence Rate/Rate Ratio or Hazard Ratio	Age, CDCC, stage, tumor size, urban/rural, facility volume, facility type, facility location	Hispanic patients had significantly improved overall survival (HR 0.700, p < 0.001) whereas Black patients had worse overall survival (HR 1.080, p = 0.010). Private insurance and higher incomes were associated with an increased likelihood of receiving SOC, whereas Black patients were less likely to receive SOC

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Sheppard 2016	Cohort	USA	■ Race	■ Cervical cancer mortality	Incidence Rate/Rate Ratio or Hazard Ratio	Marital status, age at diagnosis, stage at diagnosis, histology, radiation and surgery treatment, county poverty rate, county unemployment rate, median household income	In the most adjusted model, the HR for Black patients had been much attenuated compared to the crude rates (HR 1.09, 95% CI: 1.03–1.15), but still, a significant risk of mortality relative to White patients existed. Hispanic patients almost consistently had the highest survival probabilities (range: 0.76–0.86), whereas Black patients had the lowest (range: 0.61–0.79), and Black patients often had statistically significantly lower probabilities than White and Hispanic patients
Sheu 2019	Cross-sectional	USA	■ Race	■ Discharged to hospice or died in-hospital following admission to hospital with diagnosis of cervical cancer	Odds Ratio	Age, length of stay, elixhauser score, region, hospital bedside, admission type, teaching status	Admissions of patients categorized as AAPI (OR 2.24, 95% CI: 1.11–4.49) had higher rates of in-hospital death compared to the reference groups
Simard 2012	Cohort	USA	■ Race and ethnicity Education Insurance status	■ Cervical cancer mortality	Incidence Rate/Rate Ratio or Hazard Ratio	Age, geographic region, histology type	Cervical cancer mortality rates were highest among NHB patients and declined throughout the study period. Declines were 3.2% per year among NHW patients and 6.8% per year among NHB patients

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Singh 2012	Cohort	USA	■ Race and ethnicity Urbanicity	■ Cervical cancer mortality rate	Risk Ratio/Relative Risk	Stage, age	Throughout 1969–2007, both White and Black patients in non-metropolitan areas maintained significantly higher cervical cancer mortality rates than their metropolitan counterparts. Among Black patients, cervical cancer mortality declined at a faster pace in metropolitan than in non-metropolitan areas. In both metropolitan and non-metropolitan areas, Black patients had twice the mortality rate of White patients. During 2000–2008, White, Black, and AI patients in non-metropolitan areas had significantly higher cervical cancer incidence rates than their metropolitan counterparts. Survival rates were significantly lower among rural Black patients. The 5-year survival rate for Black patients diagnosed with cervical cancer was 50.8% in non-metropolitan areas, compared with 60.2% for Black women and 71.0% for White patients in metropolitan areas
Sutaria 2020	Cohort	USA	■ Race and ethnicity ■ Insurance status ■ Income quartile ■ Proportion with no high school diploma	■ Receipt of guideline-adherent fertility-sparing surgery	Odds Ratio	Year of diagnosis, age	After the ACA, AAPI race (OR = 2.81, 95% CI: 1.81–4.36) was independently associated with increased odds of guideline-adherent fertility-sparing surgery receipt

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Tabatabai 2014	Cohort	AL, FL, GA IL, LA, MD MS, NY, NC PA, SC, TN TX	■ Race	■ Cervical cancer mortality rates	Other: Mortality rate	Not reported	In all 13 states, Black patients had higher mortality rates at all times. Both races had declining mortality rates over this period. During the 36 years, the reductions in the mortality rates were 82% for Blacks and 62% for Whites. In 1975, the mortality rate for Blacks was 2.71 times that for Whites; in 2010, this value was reduced to 1.96
Toboni 2022	Cohort	USA	■ Race ■ Insurance status	■ Cervical cancer mortality	Incidence Rate/Rate Ratio or Hazard Ratio	Disease stage, histology, grade, nodal status, treatment facility	When compared with NHW patients, Hispanic patients (HR 0.68, 95% CI: 0.63–0.73, $p<0.0001$) appeared to have a lower risk of cervical cancer mortality in the entire study population; this trend was also realized in those classified as NHW and non-Black termed 'non-Hispanic other' (HR 0.79, 95% CI: 0.72–0.86, $p<0.001$)
Uppal 2017	Cohort	USA	■ Race ■ Insurance status ■ Income	■ Receipt of guideline-concordant treatment	Odds Ratio; Incidence Rate/Rate Ratio or Hazard Ratio	Age, Charlson comorbidity score, tumor stage, tumor histology, tumor grade, hospital volume, year of diagnosis, treatment modality	Those who identified as NHB, Hispanic, and those who were uninsured or Medicaid-insured were less likely to receive guideline-based care. Hispanic patients (adjusted HR 0.68, 95% CI: 0.62–0.74) had lower odds of mortality
Weragoda 2016	Cohort	Birmingham, AL Atlanta, GA	■ Race	■ Five-year cervical cancer survival	Incidence Rate/Rate Ratio or Hazard Ratio	Year of diagnosis, age at diagnosis, stage of cancer, mode of treatment, location	There were statistically significant differences between Black and White patients in all characteristics. A higher percentage of Black patients underwent radiation, chemotherapy, or both as the mode of treatment compared to White patients

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Wu 2020	Cohort	USA	■ Insurance status (private, insurance, Medicaid, Medicare, uninsured, other governmental insurance, other) ■ Race and ethnicity ■ Zip code ■ High school education attainment ■ Median household income ■ Residential location (metropolitan, urban, rural)	■ Guideline-concordant cervical cancer care per National Comprehensive Cancer Network and European Society of Medical Oncology guidelines	Incidence Rate/Rate Ratio or Hazard Ratio	Age at diagnosis, year of diagnosis, stage, histology, grade, tumor size in millimeters, presence of lymph vascular space invasion, hospital cancer program status, annualized volume of cases	Medicaid and uninsured patients had an increased risk of mortality for all stages of disease compared to privately insured patients. Medicaid patients were at a 36% increased risk of death compared with privately insured patients (HR 1.36, 95% CI 1.31–1.41), with a 63% increased risk for patients with early-stage disease (HR 1.63, 95% CI 1.49–1.79) and a 30% increased risk of death for those with locally advanced tumors (HR 1.30; 95% CI, 1.24–1.36)

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Zahnd 2017	Ecological	AL, AK, IL, KY LA, MI, MS TN	■ Race and ethnicity ■ Unemployment rate ■ Rurality ■ Income	■ Cancer mortality	Incidence Rate/Rate Ratio or Hazard Ratio Other: Mortality rate	Gender, age	Age-adjusted cervical cancer mortality rates were more than twice as high in Delta Region Black patients as White patients (5.6 per 100,000, 95% CI: 5.1–6.1 vs. 2.6 per 100,000, 95% CI: 2.4–2.8, respectively)
CERVICAL CANCER INCIDENCE, DIAGNOSIS, AND STAGE AT DIAGNOSIS, TREATMENT AND/OR SURVIVAL OUTCOMES							
Albright 2021	Cohort	USA	■ Expansion state residence ■ Non-expansion state residence ■ Race ■ Residence	■ Rate of uninsurance at diagnosis ■ Medicaid coverage ■ Early-stage diagnosis ■ Treatment at an academic facility ■ Any treatment or surgery within 30 days of diagnosis	Other: Difference in difference analysis	Age, race, ethnicity, comorbidity, cancer site, low-income and low-education zip code of residence	January 2014 Medicaid expansion was associated with increased access to health insurance coverage at diagnosis, treatment at facilities affiliated with academic institutions, and treatment within 30 days of diagnosis. Medicaid expansion had an inverse effect on uninsurance at diagnosis of gynecologic cancer (−2.00%, 95% CI: −2.3-−1.7 $p<0.001$) and a positive effect on early stage diagnosis (0.80%, 95% CI: 0.2–1.4 $p=0.02$), treatment at academic facility (0.83%, 95% CI: 0.1–1.5 $p=0.02$), treatment within 30 days (1.62%, 95% CI: 1.0–2.3 $p<0.001$), and surgery within 30 days (1.54%, 95% CI: 0.8–2.3 $p<0.001$). The impact of Medicaid expansion was more pronounced among individuals living in low-income zip codes, Hispanic individuals, and cervical cancer patients
Denslow 2012	Cohort	NC	■ Race ■ Insurance ■ County tier level	■ Incidence rate ■ Mortality rate	Incidence Rate/Rate Ratio or Hazard Ratio Other: Mortality Rate	Age	Hispanic patients had the highest incidence rate (18.3 cases per 100 k), and Black patients had the highest mortality rate (4.5 cases per 100 k), although White patients accounted for most cases

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Gomez 2015	Cohort	CA	■ Nativity ■ Neighborhood SES ■ Hispanic enclave index scores	■ Cancer stage and mortality	Odds Ratio Incidence Rate/Rate Ratio or Hazard Ratio	Marital status, age group, and year of diagnosis	Foreign-born patients with cervical cancer were no more likely than US-born patients to be diagnosed at regional- or distant-stage disease after controlling for age at diagnosis, year of diagnosis, marital status, and neighborhood SES (OR 1.04 95% CI: 0.94–1.15). Compared with foreign-born cases in high-SES—low-enclave neighborhoods, foreign-born cases in low-SES—-low-enclave neighborhoods had 91% increased odds of diagnosis at a later stage (OR 1.91, 95% CI: 1.18–3.07), and those in low-SES—high-enclave neighborhoods had 37% increased odds of diagnosis at a later stage (OR 1.37, 95% CI: 1.07–1.75)
Gopalani 2018	Cross-sectional	OK	■ Race and ethnicity	■ Cervical cancer incidence and mortality rates	Incidence Rate/Rate Ratio or Hazard Ratio Other: Annual percent change	Age	A disproportionately higher incidence of cervical cancer among AIAN and AAPI patients and deaths among AIAN and Black patients were observed. In Oklahoma, the highest age-adjusted incidence rates were in AIAN (14.8 per 100,000 patients) and AAPI patients (11.7 per 100,000 patients) and the highest mortality rates were in AIAN (4.5 per 100,000 patients) and Black (3.9 per 100,000 patients) patients

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Gopalani 2020	Descriptive – prevalence/incidence survey	USA	■ Race and ethnicity	■ Cervical cancer incidence and mortality	Incidence Rate/Rate Ratio or Hazard Ratio	Age	Cervical cancer incidence rates were significantly higher (RR 1.46, 95% CI: 1.44–1.47) among NHB (10.8 per 100,000 patients) than NHW (7.4 per 100,000 patients). Similarly, mortality rates were significantly higher (RR 2.05, 95% CI: 2.01–2.09) in NHB (4.4 per 100,000 patients) compared to NHW (2.1 per 100,000 patients). From 1999 to 2015, overall incidence and mortality trends decreased significantly for both races. Mortality rates steadily increased with age for both races and incidence rates only increased with age in NHB patients
Hagopian 2018	Cohort	Queens, NY	■ Nativity ■ Race ■ Insurance status	■ Receipt of cervical cancer screening ■ Stage at diagnosis ■ Tumor characteristics ■ Treatment ■ Survival	Incidence Rate/Rate Ratio or Hazard Ratio	Not reported	The most favorable survival curves were observed among patients born in Latin America and Asia whereas the least favorable was demonstrated in US-born patients. Time to death was analyzed using the Cox proportional hazards model. Birthplace was significantly associated with survival time (P = 0.0001)

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Khan 2014	Cohort	USA	■ Race and ethnicity	■ The primary site of cervical cancer ■ Lymph node involvement ■ Grading and differentiation behavior ■ Survival	Incidence Rate/Rate Ratio or Hazard Ratio	Age at diagnosis, marital status	The study found a 4.54-month difference between the two groups, where NHB were more likely to live longer than Hispanic Blacks. The 5-year survival rate for cervical cancer was significantly different based on race, with Black patients having a lower 5-year survival rate (58.2%) compared to their White counterparts (69.5%). Squamous cell neoplasms were the most prevalent histological finding across both ethnic groups, with NHB patients having an increased chance of developing rare forms of cervical cancer

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Matz 2021	Cohort	USA	■ Race and ethnicity	■ Stage at diagnosis ■ Cervical cancer survival	None (e.g., descriptive study) Other: Age-standardized 5-year net survival	Period of diagnosis, state, age	The distribution of stage at diagnosis was more favorable for White patients than Black patients in each calendar period of diagnosis. The proportions of distant and unknown stage were consistently higher in Black patients than in White patients in all time periods. Survival was consistently higher in White patients than in Black patients in each calendar period of diagnosis. However, the disparity in survival between White and Black patients may be narrowing over time – in absolute terms, survival was 8.0% higher for White patients diagnosed during 2001–2003, but only 7.2% higher for White patients diagnosed during 2009–2014. Survival was lower for Black patients than for White patients, with the survival for Black patients falling below the pooled estimate for the United States for most states in each calendar period of diagnosis. The difference in survival between Black and White patients is wide, systematic, and persistent over time. A smaller proportion of Black patients received cancer-directed surgery than White patients

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Montealegre 2013	Cohort	USA	■ Nativity	■ Late-stage diagnosis and cause-specific survival	Odds Ratio Incidence Rate/Rate Ratio or Hazard Ratio	Stage at diagnosis, age, histology, cancer-directed therapy	Foreign-born Hispanics were significantly more likely than US-born Hispanics to have late-stage diagnosis. Cause-specific mortality hazard was significantly lower in foreign-born Hispanic patients compared to Us-born Hispanics. Adjusted OR for late-stage diagnosis among Hispanic patients diagnosed with invasive cervical cancer US-born: 1.00 Foreign-born: 1.10 (1.05–1.15) Adjusted HR for Hispanic patients diagnosed with invasive cervical cancer
Ortiz 2018	Cohort	CO, CT, GA, MD, MI, NJ, NY, PR, TX	■ Race and ethnicity	■ Incidence of cervical cancer ■ Overall Survival	Incidence Rate/Rate Ratio or Hazard Ratio	Age, year, registry, prior AIDS diagnosis	HPV-related cancer incidence rates were substantially elevated among Hispanic people living with HIV (PLWH) in comparison with the general Hispanic population. Among HIV-infected Hispanic patients, elevated rates were observed for cervical cancer (SIR 3.59, 95% CI: 3.02–4.25). Incidence rate ratios comparing HPV-related cancer rates among PLWH by race and ethnicity show that Hispanic patients had close to a twofold higher rate of cervical cancer than NHWs (adjusted incidence rate ratio [aIRR] 1.70, 95% CI: 1.19–2.43) but a rate similar to that of NHBs (aIRR 1.15, 95% CI: 0.94–1.42.) Among HIV-infected Hispanics with an HPV-related cancer diagnosis, 5-year survival was just over 50% across cancer types

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Quick 2020	Cohort	USA	■ Race and ethnicity ■ Insurance status ■ SES	■ Stage at diagnosis ■ Histology excluding in situ cancer ■ Cervical cancer incidence	Incidence Rate/Rate Ratio or Hazard Ratio	Age, marital status, stage, histology, grade	For all patients with cervical cancer, a poorly differentiated grade was more common than a well-differentiated grade in the older age groups (< 65, 28.6% vs 12.2%); 65–74, 35% vs 7%; 75, 34.5% vs 4.5%) and these percentages were higher among Black patients. For Black patients, the incidence rate steadily increased with age and peaked in the 80–84-year age group. For patients aged 65–74 years, Black patients had a considerably higher incidence rate than White patients (17.4 per 100,000 compared to 9.9 per 100,000). This difference was even greater for Black patients aged ≥ 75 years who had an incidence rate that was 2.5 times that of White patients (20.4 per 100,000 compared to 8.1 per 100,000). Older Black patients had higher incidence rates of regional and distant disease than White patients in the same age groups and Black patients aged < 65 years. The rate of poorly differentiated or undifferentiated cancer was highest among Black patients aged ≥ 75 years (IR 7.2 per 100 K, 95% CI: 6.1–8.5). Incidence rates were highest among Black patients aged 75 years residing in counties with lower educational attainment (21 per 100,000)

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Thomas 2021	Cohort	MS	■ Race	■ Cervical cancer disease stage at presentation ■ Cervical cancer treatment ■ Cervical cancer survival	Incidence Rate/Rate Ratio or Hazard Ratio	Not reported	There was a significant difference in the disease stage at the time of presentation between Black and White in that compared to Black patients, a higher number of White patients presented with locally advanced disease [Federation of Gynecology and Obstetrics (FIGO) stages IB2 to IVA] (78.6 vs. 86.7%; $p<0.001$). However, a higher proportion of Black patients presented with metastatic disease at diagnosis (13.3 vs. 8.3%; $p<0.001$) compared to White patients. There was no significant difference in overall survival between Black and White patients. The study revealed that more Black patients presented with metastatic disease compared to White patients. However, the analysis did not identify any racial disparities in the prognosis of the entire cohort
Wagner 2012	Cohort	GA	■ Race	■ Cervical cancer mortality-to-incidence	Other: Mortality-to-Incidence Ratio	Age, sex	Mortality-to-Incidence ratio for Black patients was 0.423, 95% CI: 0.362–0.492 and for White patients was 0.279, 95% CI: 0.247–0.315. This difference was significant

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Watson 2014	Cohort	USA	■ Race	■ Cervical cancer incidence Cervical cancer mortality	Incidence Rate/Rate Ratio or Hazard Ratio	Age, IHS region, stage	Overall, a total of 380 AIAN patients died from cervical cancer from 1999 to 2009. AIAN patients had a cervical cancer death rate of 3.3, which was higher than the rate of 2.2 for White patients (RR 1.54). For CHSDA (IHS Contract Health Service Delivery Area) counties only, the death rate from cervical cancer for AIAN patients was 4.2, which was nearly twice the corresponding rate among White patients in the same counties (rate 2.0; RR 2.11). AIAN patients had an incidence rate of cervical cancer of 8.7, compared with a rate of 7.5 for White patients. However, when restricted to CHSDA areas, the rate for AIAN patients was 11.0, which was higher than that for White patients in CHSDA areas

Table 2 (continued)

Author and year	Study design	Geographic location(s)	Measure(s) of structural racism/downstream consequences	Measure(s) of cervical cancer outcome(s)	Measure(s) of association	Covariates/confounders considered	Key findings
Yoo 2017	Ecological	USA	■ Race and ethnicity	■ Cervical cancer incidence ■ Cervical cancer mortality	Incidence Rate/Rate Ratio or Hazard Ratio	Age, year of diagnosis	The average age-adjusted cervical cancer incidence rate was the highest among South-NHBs (11.1) and mortality rate was the highest among US14-NHBs (5.4). In 2012, the degree of racial disparities between South-NHBs and South-NHWs was greater in terms of mortality rates (NHB:NHW = 1.80:1.35) than incidence rates (NHB:NHW = 1.45:1.15). While mortality disparity ratios decreased from 2000–2012 for US14-NHB (APC: −1.9 (−2.3,−1.4), mortality disparity ratios for South-NHWs (although lower than NHBs) increased compared to US14-NHW

number of "yes" answers to the appraisal questions for each study design (e.g., for cross-sectional studies there are 8 questions in the quality assessment tool, so 0–2 "yes" responses were considered high risk, 3–4 were considered intermediate risk, and 5–8 were considered low risk).

Results

Overview

Of the 206 articles reviewed, 203 articles were rated as low (98.5%), two articles were rated as intermediate (1%), and one article was rated as high risk (0.5%) according to ROB summary ratings (Supplementary Tables 2, 3, 4, 5, 6 and 7). One cross-sectional study [31] was appraised as intermediate ROB due to unclear sample inclusion criteria, the inability to address confounding factors and unclear procedures for measuring the exposure and condition (Supplementary Table 2). The cohort study by Eng et al. [32] was appraised as high ROB due to limited understanding of participant recruitment and follow-up procedures and the inability to identify and address confounding factors (Supplementary Table 4). Another cohort study [26] was appraised as intermediate ROB due to lack of information on follow-up procedures and the inability to identify and address confounding factors (Supplementary Table 4). Overall, the ROB evaluation of included studies confirms the relatively high quality of studies included in the review, with minimal potential for biased results. In subsequent sections of the review, we summarize and synthesize the findings related to the reported associations between measures of (or surrogates for) structural racism and CC outcomes across the continuum from screening to survivorship.

Screening and Early Detection

Racial and Ethnic Disparities in Screening Rates

Several studies cross-sectionally investigated CC screening rates across race, ethnicity, and socioeconomic factors, with some finding that AAPI individuals have lower CC screening rates (OR 0.45, 95% CI: 0.36, 0.55) compared to NHWs in an analysis of the 2012 Behavioral Risk Factor Surveillance System (BRFSS) data, which included a weighted sample of 47.9 million eligible individuals [33]. Similarly, McDaniel et al. reported that compared to NHW patients, Asian American (OR 0.17, 95% CI: 0.15, 0.19), Native Hawaiians and Other Pacific Islanders (NHOPI) (OR 0.34, 95% CI: 0.25, 0.46) and AIANs (OR 0.66, 95% CI: 0.53, 0.83) were significantly less likely to receive a Pap test [6]. These lower screening rates observed among AAPI individuals persisted even after adjusting for factors such as educational attainment and insurance status [6, 33].

Some studies found that racially and ethnically minoritized populations had lower screening rates [34, 35] compared to NHWs [35–43]. However, most studies that assessed the relationship between race and ethnicity with receipt of recommended CC screening found no statistically significant differences in screening rates [44–52] or reported that racial and ethnic minorities were more likely to have received a Pap test [21, 47, 50, 52–66]. For instance, Wilson et al. found no statistically significant differences in screening completion rates among NHB, Hispanic/Latinx, or NHW individuals and noted that Spanish-speaking individuals were more likely to have been screened than English-speaking participants in Nashville, TN [44]. Mishuris et al. similarly observed no difference in screening rates between non-NHWs and NHWs [46]. Several studies found that NHB and Hispanic/Latinx women were more likely to meet screening guidelines than NHW women [21, 51, 53, 54, 57, 58, 61, 66], and that screening disparities between NHB and NHW women have declined over time [67]. One study reported that the prevalence of meeting screening guidelines was higher among NHBs (PR 1.1, 95% CI: 1.0, 1.01) and Hispanic/Latinx individuals (PR 1.1, 95% CI: 1.0, 1.1) compared to NHWs in adjusted models [58]. Another study that assessed receipt of low-value screening tests, defined as screening for patients identified as low- or average-risk, found that NHB women were less likely to receive low-value screening tests compared to NHWs in adjusted models [68]. Surprisingly, another study found that among uninsured adults, NHB and Hispanic/Latinx women had higher odds of receiving Pap tests compared to NHWs [51]. Haas et al. also reported higher odds of being up to date on screening among NHBs and Hispanic/Latinxs, as well as Asians compared to NHWs [54]. These findings suggest that other factors aside from racial and ethnic identity contribute to CC prevention disparities and that race and ethnicity are proxies for other social drivers.

Social and Structural Drivers of Health (SDOH) and Screening Rates

Factors across several SDOH domains were linked to lower screening rates. Studies consistently identified underinsurance as a barrier, limiting healthcare access and reducing screening rates [6, 37, 42, 48, 55, 58, 69–78]. Sackey et al. found that underinsured women had more than four times the odds of having no screening history in the five years prior to their CC diagnosis (OR 4.26, 95% CI: 1.15, 15.80) [42]. Datta et al. and Benavidez also found that those without insurance were less likely to have been screened in adjusted models [58, 69]. Several studies also found that having a regular healthcare provider was associated with screening for CC [33, 54, 79–84].

Lower educational attainment was another key factor, with patients without a high school diploma being twice as likely to have never been screened compared to those who had at least completed high school [40, 41, 58, 69, 70, 72]. For example, a cross-sectional analysis of Texas BRFSS data from 2014–2015 demonstrated that women with lower education and household income had lower odds of receiving timely Pap testing [38]. Across studies, higher income was consistently associated with screening adherence [33, 36, 38, 51, 56, 58, 69, 72, 85]. LaFrinere-Sandoval et al. found that those with lower income or who lacked health insurance had lower odds of receiving a Pap test [85]. This pattern was also observed by Stanley et al., who found that cost barriers were associated with higher rates of unscreened individuals in both metropolitan and non-metropolitan areas [72].

Social and environmental factors are also associated with screening uptake. Shelton et al. found that social capital, such as having connections to the community and being able to get help from friends when needed, was associated with greater adherence to Pap testing (OR 1.61, 95% CI: 1.25, 2.06) [86]. The impact of residential segregation was mixed, with one study finding that those in highly segregated areas were less likely to be screened [87], though others observed no significant association between residential segregation and screening uptake [88, 89].

Perceived Discrimination and Cultural Factors and Screening

The role of discrimination within the context of CC screening varied across studies identified in this review. Some studies found that racial or ethnic discrimination was not significantly associated with CC screening [45, 90]. However, other studies included in this review such as Ibekwe et al. found that individuals who reported experiencing racial discrimination were almost three times more likely to receive CC screening in adjusted models (OR 2.79, 95% CI: 1.37, 5.67) [4]. Regarding healthcare discrimination, one study found that perceived HIV stigma and discrimination did not significantly predict CC screening behaviors [45]. However, such findings were not always consistent.

Sociocultural barriers to screening included language barriers [70, 71, 91], limited knowledge of CC screening [41, 92–94], poor communication with healthcare providers [70, 77, 80, 92, 94], medical mistrust [47, 88, 89], stigma, fear, and embarrassment [81, 89, 93–95]. VanManh et al. reported limited English proficiency as a barrier to CC screening among immigrant communities (OR 0.24, 95% CI: 0.14, 0.41) [96], a pattern also reported by Xie et al. [91] Additionally, qualitative analyses frequently cited a lack of trust in healthcare providers as a barrier [92, 94], particularly among immigrant populations [89, 93]. Immigration recency significantly contributed to screening adherence, [74, 83, 96–99] as highlighted by a study that found that African immigrants who had lived in the US for less than five years were less likely to have undergone a Pap test [99].

Abnormal Screening Results and/or Follow-up after Abnormal Screening

Healthcare Access Barriers

Numerous cohort and cross-sectional studies investigated the disparities impacting abnormal CC screening results and follow-up care [19, 22, 100–110]. Overall, racial and ethnic minoritized women were more likely to have abnormal Pap tests [111, 112]. Findings indicate that, after receiving abnormal screening results, NHB, AIAN, and Hispanic/Latinx women were less likely to receive timely follow-up care compared to NHW women [21, 22, 102, 107, 113]. Similarly, women born in Central and South American countries experienced higher odds of follow-up delays compared to US-born women in New Jersey (OR 1.46, 95% CI: 1.12, 1.92) [22]. Additionally, individuals with a history of underinsurance were significantly more likely to have a history of "no screening/no follow-up" compared to those without documented underinsurance, highlighting delays or lack of screening tests [42].

Factors such as access to reliable insurance coverage and quality healthcare were found to be major predictors for receipt of screening and appropriate follow-up care [42, 50, 89, 90, 107, 114]. In terms of quality care, NHB patients were less likely to receive follow-up recommendations after abnormal test results [21, 42, 50, 89, 90, 107, 114]. Furthermore, delays in follow-up care after receipt of abnormal results were more likely to occur among women screened at Federally Qualified Health Centers (FQHCs) compared with those receiving care from private physician practices (OR 2.77, 95% CI: 1.23, 6.23) [22].

Studies consistently found that fear, cultural beliefs, and compounding factors related to poverty, incarceration, gender roles, and health system barriers contribute to delays in CC screening and follow-up care, especially among minoritized populations [92, 108, 115, 116]. Moss et al. found that 89% of participants from rural, segregated counties in the Northeastern US who were enrolled in a qualitative study were up to date with CC screening [89], a rate that positively associated with higher healthcare trust, lower cancer fatalism, and the absence of cost barriers [89]. Conversely, fear of screening results was associated with lower adherence to screening recommendations [89]. Jodry et al. found that

patients with a history of incarceration had higher rates of abnormal Pap tests, as well as higher rates of loss to follow-up [117].

Diagnosis

Racial Disparities in Incidence and Early vs. Late Diagnoses of Cervical Cancer

The overall incidence of invasive CC declined significantly between 1973 and 2007—by 70.2% among NHB women and 51% among NHW women, according to Adegoke et al. [118]. The greater decline in incidence for NHBs (estimated annual percent change [APC] −3.8%, 95% CI: −4.1, −3.6) was also reported by Ward et al. [119]. Among women under 50 years, the Black-to-White disparity in incidence diminished by nearly two-fold (RR 1.9, 95% CI: 1.7, 2.1) in 1975–1979 to almost negligible (RR 0.9, 95% CI: 0.8, 1.0) in 2005–2009 [120]. Conversely, for both time periods, incidence rates for NHBs compared to NHWs aged 50–64 years (RR 2.4, 95% CI: 2.1, 2.7 and RR 1.7, 95% CI: 1.5, 2.0) and aged ≥ 65 years (RR 3.3, 95% CI: 2.9, 3.8 and RR 2.2, 95% CI: 1.9, 2.7) remained significantly elevated, despite the magnitude of disparity decreasing over time [120]. From 1973 to 2007, NHB women saw declining incidence rates annually for cervical squamous cell carcinoma (SCC), adenocarcinoma (AC), and adenosquamous cell carcinoma (ASC) (10.9%, 2.1%, and 6.1% per year, respectively) [118]. NHW women had decreasing incidence for SCC (7.7% annually) but increasing incidence for AC (3.6% annually) and ASC (1.3% annually) [118]. More recent data show that SCC incidence rates stabilized for NHWs, while continuing to decline for other racial groups [121]. AC incidence rates increased for Whites during 2002–2015 (1.3% per year), while remaining stable in AAPI women and decreasing in NHB and Hispanic/Latinx women during 1999–2015 [121]. Overall, CC incidence was higher among racial and ethnic minority women compared to NHW women over time across studies [102, 118–130], with very few exceptions [131].

Evidence shows that significant differences in late-stage diagnosis across racial groups exist [125, 132–138]. Specifically, NHB women have higher odds of late-stage diagnosis relative to NHW women [132–135, 139], and NHB women were found to have lower odds of being diagnosed with localized cancer versus their NHW counterparts [138, 140]. Although one study found no statistically significant difference in stage at diagnosis for NHB and NHW women, NHBs still had higher odds of advanced stage at diagnosis [141]. Findings were mixed for Hispanic/Latinx individuals, as two studies [134, 142] reported almost 20% increased odds of advanced-stage CC diagnoses among Hispanic/Latinx compared to NHW individuals, while one study showed decreased odds [139]. Foreign-born Hispanic/Latinx adults were also more likely than US-born Hispanic/Latinx adults to be diagnosed with late-stage CC in one study [143], while another found that foreign-born Hispanic/Latinx patients in low-SES-low-enclave neighborhoods had 91% increased odds of late-stage diagnosis [136].

Area-Level Measures of Structural Racism and Cervical Cancer Diagnosis

Structural racism at the area level significantly impacts CC diagnoses, with residents of lower SES neighborhoods bearing a disproportionate burden of advanced-stage diagnoses among minoritized populations [134, 142, 144–147]. A study in California showed that 73% and 74% of late-stage CC cases among NHB and Hispanic/Latinx women, respectively, were concentrated in the two lowest SES quintiles, compared to only 37% of cases among NHW women [145]. SES disparities intersect with racial segregation, as areas with the lowest SES are predominantly inhabited by NHB (33.5%) and Hispanic/Latinx (60.1%) residents, while higher-SES areas have a higher proportion of NHW residents (68.9%) [144]. Women from the lower SES neighborhoods are 73% (IRR 1.73, 95% CI: 1.52, 1.96) more likely to develop CC than their counterparts in the highest SES neighborhoods [144]. Furthermore, advanced-stage CC diagnosis is 54% (OR 1.54, 95% CI: 1.29, 1.85) more likely for patients in low versus high SES census tracts, highlighting a strong inverse relationship between SES and diagnostic stage [142].

Structural racism significantly contributes to disparities in CC risk, particularly among NHB and Hispanic/Latinx women [125, 148]. For instance, women residing in census tracts where ≥ 20% of the population is NHB have a 23% (RR 1.23, 95% CI: 1.02, 1.47) higher risk of developing high-grade cervical lesions (HGCL) compared to those in areas with < 20% NHB residents [146]. This disparity is even more pronounced among NHB women, who experience a 56% (RR 1.56, 95% CI: 1.14, 2.12) greater risk of HGCL in these neighborhoods where ≥ 20% of the population is NHB [146]. Moreover, the disparity between NHB and NHW women is the strongest (RR 2.38, 95% CI: 1.82, 3.04) in neighborhoods where ≥ 20% of the population is NHB [146]. A comparable, yet marginally non-significant association, was observed for Hispanic/Latinx women: those living in census tracts with ≥ 20% (vs. < 20%) NHB showed 27% higher rates (RR 1.27, 95% CI: 0.98, 1.64) of HGCL [146]. The intersection of race, SES, and access to care disparities extends to mortality outcomes among women with HIV; the prevalence of CC as the cause of death among deceased NHB women who had HIV (57.8 per 10,000) was approximately 1.5 times greater than that of Hispanic/Latinx

women and 3.5 times greater than that of NHW women (15.7 per 10,000) [149].

Medicaid expansion resistance is a form of macro-level structural racism, given the opposition from states largely in the Southern US with a high proportion of uninsured NHB adults and other minoritized populations reinforcing racial hierarchy and inequities in coverage [150]. According to Lee et al. [151], Medicaid expansion under the Affordable Care Act (ACA) resulted in lower rates of uninsured patients (adjusted difference in difference [DID] = −3.0%, 95% CI: −5.2, −0.8; P < 0.01) in expansion states compared to non-expansion states [151]. Patients in expansion states were less likely to be NHB than those living in non-expansion states [151, 152]. Moss et al. [153] found that among individuals with CC, uninsured rates fell by 25% (from 8.9% to 6.7%; P = 0.001) following Medicaid expansion [153]. Expansion states had a 50% decrease in uninsured rates for NHB and NHW individuals with CC (P ≤ 0.001 and.023, respectively), but no significant changes were observed for those who were Hispanic/Latinx [153]. Importantly, between 2010 and 2014, uninsured individuals with CC were primarily concentrated in non-expansion states, where insurance rates did not change significantly across any racial or ethnic minority population [153]. The distribution of cancer stage was similar between expansion and non-expansion states, as well as between pre- and post-Medicaid expansion years [151–153]. Furthermore, neighborhoods with high teen birth rates—an indicator of poor access to contraceptives, a known CC risk factor—were identified as "hot spots" for CC, often correlating with areas of concentrated poverty and minority populations [154].

Structural racism operates differently within urban and rural areas [155]. Geographic disparities exacerbate these inequities, especially in rural areas where CC rates are consistently higher at all stages [156–160]. Yu et al. found that rural counties exhibited rate ratios of 1.11 (95% CI: 1.07, 1.15) for localized-stage, 1.14 (95% CI: 1.10, 1.19) for regional-stage, and 1.12 (95% CI: 1.05, 1.19) for distant-stage CC [158]. NHW women in rural areas had higher CC rates than their urban counterparts, although their overall incidence remained lower than that of NHB and Hispanic/Latinx women [158]. Moreover, Hispanic/Latinx and NHB women had higher incidence of regional and distant CC than NHW women [158]. This finding by Yu et al. (2019) contrasted with that of Zahnd et al., who showed greater rates of distant stage CC in rural NHWs, but not among NHBs or Hispanic/Latinxs [161].

Treatment

Racial and Ethnic Disparities in Treatment Receipt

Several studies reported that NHB women consistently receive suboptimal treatment for CC compared to NHW women [135, 137, 162–172]. In general, NHBs were less likely to undergo surgery and more likely to receive chemotherapy or radiation [137, 164, 165, 168, 173–175]. For instance, Fleming et al. reported that NHB individuals had significantly lower odds of receiving surgery (OR 0.51, 95% CI: 0.41, 0.65) and higher odds of receiving chemotherapy (OR 1.43, 95% CI: 1.11, 1.82), or external beam radiation (OR 1.45, 95% CI: 1.16, 1.87) compared to their NHW counterparts [164]. Similarly, NHB women in Alabama were more likely to receive radiation (OR: 1.12, 95% CI: 0.88,1.42), surgery-radiation sequence (OR: 1.05, 95% CI: 0.77, 1.43), and chemotherapy (OR: 1.09, 95% CI: 0.86, 1.39) compared to NHW women, though these results were not significant [173]. It is also important to note that time to treatment initiation (TTI) varied significantly across racial and ethnic groups. For example, Ramey et al. reported that NHB and Hispanic/Latinx individuals faced significantly longer delays with an estimated TTI of 45.2 and 49.4 days respectively, compared to 38.1 days for NHW individuals [176]. These results were supported by Kotha et al., who found that Hispanic/Latinx patients had more than two-times increased odds of experiencing delayed treatment (OR 2.71, 95% CI 1.16, 6.35) [177].

Insurance status and living in a Medicaid expanded state were found to be key factors influencing access to treatment [114, 151, 153, 178–183]. NHB women and other women of color with Medicaid or without insurance face higher risks of suboptimal care and overall worse health outcomes [6, 33, 36–38, 42, 48, 50, 56, 58–61, 64, 69, 71, 73, 76, 80, 85, 88, 90, 93, 94, 97, 107, 115, 153, 178, 179, 181–196]. Wu et al. reported that patients with Medicaid experienced a 36% higher risk of mortality compared to those with private insurance (HR 1.36, 95% CI 1.31, 1.41), with risks escalating to 63% for early-stage disease (HR 1.63, 95% CI 1.49, 1.79) and 30% for locally advanced tumors (HR 1.30, 95% CI, 1.24, 1.36) [186]. Another study found that NHB patients were less likely than non-Black patients to receive optimal treatment (46.2% vs. 58.3%, P = 0.01) [187]. These racial disparities were most pronounced among NHB patients, who faced a 32% higher risk of mortality compared to their non-Black counterparts (AHR 1.32, 95% CI 1.20, 1.46, P = 0.01) [187]. However, disparities in survival decreased with age and were no longer observed among patients aged 65 years or older (P = 0.01 for interaction) [187].

Survivorship

Racial and ethnic disparities persist in CC survivorship outcomes, with NHB women experiencing significantly poorer survival rates compared to NHW women, a trend influenced by both geographic and socioeconomic factors [64, 123, 137, 174, 184, 193, 194, 197–205]. For example,

NHB women with CC have a 5-year survival rate of 62.6%, compared to 71.8% for NHW women [206]. Studies also revealed that NHB women were more likely to die from CC even when controlling for other factors like stage at diagnosis and receipt of treatment [123, 159, 161, 193, 194, 205, 207–210]. Additionally, some studies found that survival was highest among Hispanic/Latinx populations [165, 193, 208, 209, 211, 212], though there is some evidence of poorer survival among Hispanic/Latinx adults [213, 214]. Rauh-Hain et al. determined that 5-year cancer-specific survival among individuals with CC was highest among Hispanic/Latinx (75.7%, 95% CI: 74.7, 76.7) and AAPI individuals (74.4%, 95%CI: 72.7, 76.0), lower among NHW individuals (71.8%, 95% CI: 71.1, 72.5), and lowest among NHB individuals (62.6%, 95% CI: 61.2, 64.0) [165], and this was echoed in other studies [215]. Racial and ethnic disparities in CC mortality also differed across geographic locations and poverty levels [102, 160]. Moss et al., determined that mortality rates were highest among NHB women residing in counties that were both rural and with persistent poverty (mean rate: 7.83%, 95% CI: 7.55, 8.12%) [89].

One study noted that compared to US-born Hispanic/Latinx and AAPI patients, more favorable survival curves were observed among foreign-born patients [216]. Mortality rates were also lower among US-born patients compared to foreign born patients, with the exception of those born in Mexico [217]. High mortality rates were also observed among NHOPIs and Southeast Asians compared to NHW [218, 219].

Discussion

Given that CC continues to disproportionately burden minoritized and marginalized women in the US, understanding the impacts of historical policies that have manifested as structural racism within today's context is critical. Of the 206 articles included in the review, 124 studies (60%) simply examined the role of racial and ethnic identity – which is a poor proxy for the impact of structural racism and racialized discrimination on health – and CC outcomes. We also found that several other measures, which may also be categorized as individual-level proxies of structural racism, were also explored to assess inequities across the CC care continuum. Specifically, a large focus on individual-level socioeconomic status (SES) measures, including income, education, and employment status, which tend to strongly associate with race and ethnicity, were frequently used as primary exposures. Lower SES was consistently associated with less frequent screening for CC and worse CC survivorship outcomes [145, 190, 198, 220]. When evaluating educational attainment as a measure of structural inequality, studies overwhelmingly showed that lower education levels were often linked to lower health literacy, reduced access to screening for CC, and poorer CC outcomes [6, 33, 34, 38–40, 45, 50, 56, 60, 61, 69, 76, 82, 85, 86, 95, 186, 188, 221, 222]. Likewise, analysis of the relationship between lower household income and/or poverty with CC outcomes consistently revealed that individuals experiencing economic disadvantage experienced poorer CC outcomes [19, 33, 40, 49, 51, 56, 58, 61, 69, 85, 101, 151, 188, 189, 193, 197, 222].

Access to healthcare through insurance highlights the disparities between those who have private insurance, public insurance, or have no insurance. Minoritized groups, particularly NHB and Hispanic/Latinx women, were more likely to be uninsured or underinsured, which contributed to delayed diagnoses and suboptimal treatment for CC [6, 33, 36–38, 42, 48, 50, 56, 58–61, 69, 71, 73, 75, 76, 80, 85, 88, 90, 93, 94, 97, 107, 115, 153, 167, 178, 188–193, 196]. Disparities were also observed with regard to Medicaid expansion at the state level. The impact of Medicaid expansion, or the lack thereof, as a measure of structural racism, highlights health disparities between residents of states that did expand and residents of states that did not expand their Medicaid eligibility criteria. Merits of Medicaid expansion are highly debated in Southern US states, with significant opposition to expansion of Medicaid coverage driven by assumptions regarding benefits for racial and ethnic minorities and immigrants. Variation in ease of access to Medicaid insurance also varies across states, with certain states, largely those in the South, requiring more rigorous reporting of work history to be compliant with eligibility [150]. Our review found that residence in a state with expanded Medicaid access was associated with increased access and utilization at every stage of the CC care continuum, underscoring the benefits of Medicaid expansion to mitigate poorer CC outcomes [114, 151–153, 178, 181, 182, 223–225].

The type of healthcare facility and distance to healthcare provider were also explored. The characteristics of the facility in which CC care was received (e.g., academic medical center, a community hospital, NCI-designated cancer center) may be another proxy for structural racism reflecting disparities in access to high-quality healthcare based on race and SES [22, 54, 87, 178, 226]. Travel distance to care facilities, as a measure of structural barriers, showed that women in rural or racially segregated areas had worse access to timely CC diagnosis and treatment [19, 151, 227].

To understand the downstream impacts of structural racism at an area-level, multiple studies utilized geographic and neighborhood-level measures of socioeconomic deprivation and residential segregation [125, 228], as well as urban vs. rural residence. The use of area-based measures like the Area Deprivation Index (ADI), which combines factors such as poverty, education, employment, and housing conditions, have been used to assess how living in deprived neighborhoods impacts access to CC prevention and treatment. The use of

these indices often showed that residents of highly socioeconomically deprived neighborhood environments, who also tend to belong to racial and ethnic minority groups, experienced worse CC outcomes [19, 222, 229, 230]. Residing in racially segregated areas with fewer healthcare resources also negatively impacted CC outcomes [4, 19, 87, 88, 228]. Although findings on the association of CC outcomes, perceived interpersonal racial and ethnic discrimination, experiences of racial discrimination in medical settings, and medical mistrust were mixed, these factors were analyzed as barriers to CC screening and care in several studies [4, 47, 82, 88, 90, 231]. Rural minority populations residing in more isolated areas were often found to have reduced access to quality healthcare and, therefore, experienced poorer CC outcomes [58, 88, 89, 157, 159, 173, 174, 227, 230, 232]. This review reflects the complex interplay of structural barriers, cultural factors, and upstream factors, emphasizing the far reaching impact of structural racism, moving beyond racial and ethnic identity. This underscores the importance of assessing *how* racism perpetuates within our society across multiple domains to address inequities in outcomes across the CC care continuum.

Structural racism is associated with persistent inequities in cancer outcomes across all types, not just CC [233, 234]. For example, minoritized groups are more likely to face environmental exposures to air pollution, known carcinogens, pesticides, silica, and asbestos leading to higher incidence of lung cancer [235]. Reduced access to health services and inequities associated with insurance status contribute to lower screening rates and elevated lung cancer risk among minorities [235, 236]. Similarly, measures of structural racism impact breast cancer outcomes [151–153]. Studies show that NHB individuals with breast cancer have higher odds of breast cancer treatment delays, are less likely to receive guideline-concordant treatment [166], and have higher rates of mortality compared to NHW individuals [64, 233, 234, 237]. Considering incidence and survival rates for all cancer types overall, measures of structural racism at the county-level (e.g., SES, poverty, income, education, health insurance coverage) are also associated with higher cancer incidence and lower five-year survival among NHB and AAPI populations [238, 239]. Thus, findings reported here for CC review are consistent with evidence for other cancers as well.

Inequities in healthcare access and quality in the US are in part driven by structural racism in US healthcare policy [150]. As observed in our systematic review, inequities in access to health insurance coverage, both individually, and at the state level through varying adoption of Medicaid expansion, impact delays in and quality of CC treatment. Prior evidence has shown that state level policies that increase access to care, including Medicaid expansion, leads to increased CC screening [240]. However, it is unclear how these policies influence stage at diagnosis and treatment as indicated by our review. Furthermore as states begin to expand insurance in other ways (e.g., California's expansion eligibility and enrollment for adults ages 26 through 49 to qualify for full-scope Medi-Cal regardless of immigration status in 2024 [151, 241]) more research is needed to advance our understanding of how state level policies impact cancer care, reproductive health, and access to care in general and whether such policies can mitigate structural inequities in the receipt of optimal care. Beyond state insurance policies, current pay for performance incentives, geographic access of oncology providers, and the financing structure for safety-net hospitals will need to focus not only on reducing structural barriers to screening, but also longer-term treatment and survivorship care. These downstream phases of the care continuum are understudied based on findings from the current review. At the health care delivery and health system levels, addressing structural barriers will require diversifying the healthcare workforce to align with target communities, promoting health equity-based strategies in all systems including institutional discrimination, and education to address institutional racism [242]. Recent evidence in testing anti-racism interventions in health care settings demonstrate that effective and sustainable interventions will require health system leadership buy in, self-evaluation, and embedding equity policies throughout health care settings [243].

To better understand the impacts of structural racism on CC care and outcomes across the continuum, future studies should also prioritize improved measurement of structural racism. Race and ethnicity of an individual should not be used a proxy of structural racism. We call on CC disparities researchers to carefully consider the use of race and ethnicity within their studies to meaningfully conceptualize the construct and what it represents. Race is a social construct within the US context, that is not a proxy for biological or cultural differences across people. Thus, when used in CC studies, race and ethnicity capture the racialized experiences within US society within different contexts, such as healthcare settings or communities. Our review demonstrates that members of minoritized populations experience poorer CC care and outcomes, however, the mechanisms through which these racial experiences occur have not been fully delineated due to limitations in measurement of structural racism. Ways to improve measurement of structural racism is an urgent public health need and a topic of active study [244].

Structural racism is a complex driver of health that can be evaluated using latent variable models, which conceptualizes structural racism as a system and multidimensional exposure [245–247]. Using intersectionality theory is another promising methodological approach to understand varying systems of oppression and the dynamics of power and privilege at multiple intersecting identities [248, 249]. Scholars have developed measures such as structural gendered racism to understand how racism and sexism reinforce one another to perpetuate inequities in health outcomes [247]. Mixed methods research, including

those applying intersectionality theory, lends an important opportunity to gain rich data on the impacts of structural racism on CC outcomes captured via assessment methods such as digital diaries, photovoice, online forums and more traditional forms of qualitative data collection such as focus groups [250]. By complementing quantitative data with in-depth interviews, we can address the limitations of epidemiologic survey methods to understand systems that drive health inequities at a macro-level and how we might address them. Additionally, effective anti-racist programs must be informed by populations affected by structural racism, which can be best achieved through community-based qualitative research methods as well as bi-directional partnership engaged research translation and dissemination.

Conclusion

This systematic review highlights the persistent racial and socioeconomic disparities in CC screening, diagnosis, treatment, and survival, underscoring the critical role of structural racism in driving inequitable cancer outcomes. While many studies rely on race and ethnicity as proxies for structural racism, our findings reveal that deeply rooted, upstream factors—such as socioeconomic status, healthcare access, residential segregation, and discriminatory policies—drive inequities across the CC care continuum. Lower screening rates among AAPI women, delayed follow-up care for Black and Hispanic/Latinx women, and barriers to timely, high-quality treatment for marginalized groups reflect systemic inequities rather than individual behaviors. Medicaid expansion and access to high-quality care emerged as crucial factors in mitigating these disparities, yet gaps remain, particularly in states resistant to expanding healthcare access. Future research must move beyond race as a crude categorization of individuals and populations, and employ rigorous, multidimensional measures of structural racism to accurately assess its impact on cancer outcomes. Implementing equity-centered interventions, dismantling discriminatory policies, and incorporating anti-racism frameworks in health systems will be critical to advancing equitable CC prevention and control. Ultimately, eliminating CC disparities requires a paradigm shift toward addressing structural racism as a fundamental driver of health inequities rather than merely documenting racial differences in CC outcomes.

Key References

- Datta GD, Pana MP, Mayrand M-H, Glenn B. Racial/ethnic inequalities in cervical cancer screening in the United States: An outcome reclassification to better inform interventions and benchmarks. *Preventive Medicine*. 2022/06/01/ 2022;159:107,055. https://doi.org/10.1016/j.ypmed.2022.107055.

  ○ This study found that racial and ethnic minority women in the U.S., particularly Asian women, have higher rates of never undergoing cervical cancer screening compared to White women. These disparities highlight structural barriers to preventive care and emphasize the need for targeted interventions to improve screening access and cervical cancer outcomes among marginalized populations.

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  ○ This study found that Black women in the U.S. are more likely than non-Hispanic White women to miss follow-up appointments after abnormal cervical cancer screenings and Hispanic women are more likely than non-Hispanic White women to delay follow up care. These disparities underscore gaps in adequate post-screening care and highlights the need for targeted interventions to improve adherence and address structural barriers contributing to these inequities.

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  ○ This study found that Black women with cervical adenocarcinoma are 16% less likely than White women to receive an early-stage diagnosis, highlighting significant racial disparities in early detection. Addressing these inequities is critical to improving outcomes and reducing preventable morbidity and mortality among marginalized populations.

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Author Contribution AAML, JTsui, and JYI conceptualized the review. MLF conducted the literature searches. AS, AR, NCJ, NCO, AA, JW, JT, WT, SAC, and SO performed data extraction and critical appraisal. AS, AR, AAML, JTsui, and JYI drafted the initial manuscript. All authors provided critical feedback on earlier drafts and approved the final manuscript.

Data Availability No datasets were generated or analysed during the current study.

Declarations

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

Competing Interests Dr. Llanos serves as Section Editor (Cancer Epidemiology) of Current Epidemiology Reports. This role did not impact or conflict with her role on this review. The remaining authors certify that they have no affiliations with or involvement in any organization or entity with any financial or non-financial interest in the subject matter or materials discussed in this manuscript.

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