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Executive Summary

Health Disparities in Ovarian Cancer

Report From the Ovarian Cancer Evidence Review Conference

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Health disparity, defined by the Centers for Disease Control and Prevention (CDC) as "preventable differences in the burden of disease, injury, violence, or opportunities to achieve optimal health that are experienced by socially disadvantaged populations," is seen across multiple diseases. We conducted an evidence review of health disparities and inequities and their mitigation strategies related to ovarian cancer as part of a CDC-sponsored project to develop educational materials for clinicians on the prevention and early diagnosis of gynecologic cancers. Our review found profound disparities in outcomes such as survival, treatment, and stage at diagnosis by factors such as race and ethnicity, insurance, socioeconomic status, and geographic location. We found little direct evidence on mitigation strategies. Studies support equivalent response to equivalent treatment between groups, suggesting that adherence to National Comprehensive Cancer Network guidelines can at least partially mitigate some of the differences.

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Health disparity is defined by the Centers for Disease Control and Prevention (CDC) as "preventable differences in the burden of disease, injury, violence, or opportunities to achieve optimal health that are experienced by socially disadvantaged populations".[1] The CDC funded a project to develop clinician educational materials for the prevention and early diagnosis of ovarian cancer, which included a review of the literature on disparities in ovarian cancer diagnosis, treatment, and outcomes. In conducting this review, we found abundant evidence on inequities in ovarian cancer care and outcomes experienced by marginal-

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Box 1. Key Questions and PICO Criteria for the Health Disparities in Ovarian Cancer Literature Search

1. **What groups experience inequities and disparities in the ovarian cancer care continuum, and what are those observed disparities?**

   P: Adults with diagnosis of ovarian cancer, members of historically marginalized or underserved group(s), including the following:

   a. Racial identities: Non-Hispanic Black or African American, Asian, American Indian and Alaska Native, Native Hawaiian and other Pacific Islander, multiracial

   b. Ethnic identities: Hispanic or Latinx, Mexican, Puerto Rican

   c. Sex-and gender-diverse populations (eg, women who have sex with women [lesbian and bisexual], transgender men, gender nonbinary or nonconforming people, queer people)

   d. Lower socioeconomic status (income below the federal poverty level, public insurance [Medicaid], no insurance)

   e. Other marginalized identities (currently incarcerated, undocumented immigration status, veteran, experiencing marginal housing or homelessness, individuals with substance use disorder)

2. **What factors contribute to health disparities in ovarian cancer?**

   P: Adults with diagnosis of ovarian cancer
   I: Living conditions and exposures (physical environment, access to care, systemic racism, transphobia, homophobia, or bias), mistrust of health care system, resource stratification

   C: Individuals who experience living conditions and exposures listed above vs individuals who do not

   O: Relative risk or odds ratio of ovarian cancer, subtype of ovarian cancer, incidence, stage at diagnosis, survival rate, quality-adjusted life-years, receipt of standard care evaluation and treatment, mortality rates

3. **How can health disparities in ovarian cancer be mitigated so that health disparity populations share optimal care and desirable outcomes?**

   P: Adults with diagnosis of ovarian cancer
   I: Interventions or recommendations to mitigate or reduce health disparities in ovarian cancer

   C: One intervention or recommendation vs another or usual care

   O: Relative risk or odds ratio of ovarian cancer, subtype of ovarian cancer, incidence, stage at diagnosis, survival rate, quality-adjusted life-years, receipt of standard of care or treatment, mortality rates

PICO, P=patient, problem, or population; I=intervention; C=comparison, control, or comparator; O=outcome.

ized groups. This article summarizes the literature on health disparities in ovarian cancer, including differences in survival, stage at diagnosis, treatment, and genetic testing among racial, ethnic, socioeconomic, cultural, and geographic groups. This review also summarizes the sparse evidence on mitigation strategies that may improve the worse outcomes that are often experienced by these groups. The clinician educational material is available online at acog.org.

METHODS

The CDC recognized the need for educational materials for clinicians on the prevention and early detection of gynecologic cancers. The American College of Obstetricians and Gynecologists (ACOG) convened a panel of experts in evidence review from the Society for Academic Specialists in General Obstetrics and Gynecology and content experts from the Society of Gynecologic Oncology to review relevant literature, best practices, and existing practice guidelines as a first step toward developing evidence-based educational materials for women's health care clinicians about ovarian cancer.

Methods for the evidence review process are outlined in detail in the companion article, "Executive Summary of the Ovarian Cancer Evidence Review Conference."[2] Experts in literature searches from the ACOG Resource Center searched the Cochrane Library, MEDLINE (through Ovid), and PubMed (for references not indexed through MEDLINE) for articles published between January 2000 and October 2021. Literature was organized by types of studies. Published guidelines were categorized separately from studies. A primary reviewer was assigned to review titles and abstracts and then the entire manuscript when appropriate. Reference lists from relevant articles found in the search were also reviewed. The reviewer did additional searches as necessary, including extending the search range or reviewing references identified by reviewers. Internet searches were performed with standard search

Table 1. Differences in Incidence and Survival for Ovarian Cancer

Study (year)	Type of Study	Data Source	N (%)	Evaluation	Study Findings
Karanth et al[8] (2019)	Meta-analysis	16 studies from 2002 to 2016	190,107	Black vs White	18% increased risk of mortality among Black patients vs White patients (RR 1.18, 95% CI 1.11–1.26)
Karanth et al[8] (2019)	Meta-analysis	4 studies from 2010 to 2016	64,854	Hispanic vs non-Hispanic White	No differences in mortality outcomes between Hispanic and non-Hispanic White patients (RR 0.96, 95% CI 0.84–1.10)
Karanth et al[8] (2019)	Systematic review	6 studies from 2008 to 2016	—*	Asian and Pacific Islander vs White	No statistical differences found between Asian and Pacific Islander patients vs White patients in all 6 studies
Terplan et al[10] (2009)	Meta-analysis	4 studies from 1973 to 2002 (discussing data before 1985) 5 studies from 1995 to 2008 (discussing data after 1985)	106,704	Black vs White	Pooled RR for 5-y survival rates for White vs Black patients Before 1985, 0.93 (95% CI 0.89–0.97) After 1985, 1.17 (95% CI 1.05–1.31)
CONCORD-2[9] (2017)	Retrospective cohort study	Patients diagnosed between 2001 and 2009 from 37 states covering 80% of the U.S. population	172,849	Black vs White	Black patients had worse survival vs White patients in both calendar periods: 2001–2003: 29.6%, CI 28.1–31.1% vs 40.1%, CI 39.6–40.6% 2004–2009: 31.1%, CI 29.5–32.7% vs 41.7%, CI 41.2–42.2%
Bristow et al[11] (2011)	Retrospective cohort study	Patients aged at least 18 y with stage IIIC ovarian cancer diagnosed between January 1, 1995, and December 31, 2008, and treated at Johns Hopkins Medical Center	405 White 366 (90.4) Black 39 (9.6)	Black vs White	No significant difference between White and Black patients: Undergoing primary surgery (90.4% vs 82.1%, *P*=.06) Achieving optimal residual disease (73.0% vs 69.2%, *P*=.28) Achieving complete cytoreduction (51.4% vs 53.8%, *P*=.49) No significant difference in overall survival White patients (50.5 mo) vs Black patients (47.0 mo, *P*=.57) HR 1.06, *P*=.81†
Terplan et al[12] (2008)	Retrospective cohort study	Patients with stage I –IV epithelial ovarian cancer undergoing primary treatment at University of Chicago from 1992 to 2007 treated by 1 of 5 gynecologic oncologists	209 White 163 (78) Black 46 (22.0)	Black vs White	No difference in mortality (HR 1.0, 95% CI 0.57–1.77) or disease recurrence (HR 0.95, 95% CI 0.56–1.60)

(*continued*)

Table 1. Differences in Incidence and Survival for Ovarian Cancer (*continued*)

Study (year)	Type of Study	Data Source	N (%)	Evaluation	Study Findings
Farley et al[13] (2009)	Retrospective cohort study	Patients from 1 of 7 GOG trials with stage III or IV epithelial ovarian cancer who received standard IV cisplatin and paclitaxel	1,489 White 1,392 (93.5) Black 97 (6.5)	Black vs White	No difference in progression-free survival between White patients (16.1 mo) and Black patients (16.2 mo, *P*=.22): HR 1.12 (95% CI 0.90–1.40)‡ No difference in overall survival between White patients (39.7 mo) and Black patients (37.9 mo, *P*=.13): HR 1.19 (95% CI 0.95–1.49)‡
Karanth et al[8] (2019)	Systematic review	6 studies from 2008 to 2015	—*	Insurance status	5 of 6 studies observed higher mortality rates among patients with no insurance or had public insurance; two not statistically significant
Karanth et al[8] (2019)	Meta-analysis	7 studies from 2008 to 2015	78,061	Socioeconomic status	Lower socioeconomic status was associated with a 10% increased risk of mortality (RR 1.10, 95% CI 1.03–1.18)
Lee et al[14] (2019)	Retrospective cohort study	Patients diagnosed with ovarian cancer between 1990 and 2014 identified across the 13 SEER registries	90,854 White 84,416 (92.9) Filipino 1,978 (2.2) Chinese 1,559 (1.7) Japanese 1,091 (1.2) Asian Indian or Pakistani 680 (0.7) Vietnamese 578 (0.6) Korean 552 (0.6)	Asian vs White	Lower AAIRs for ovarian cancer in all Asian subgroups vs non-Hispanic White women: Non-Hispanic White AAIR 14.15 (95% CI 14.06–14.25) Asian Indian or Pakistani AAIR 10.51 (95% CI 9.65–11.42) Chinese AAIR 7.87 (95% CI 7.48–8.27) Filipino AAIR 9.73 (95% CI 9.30–10.17) Japanese AAIR 8.75 (95% CI 8.22–9.30) Korean AAIR 7.23 (95% CI 6.62–7.88) Vietnamese AAIR 8.64 (95% CI 7.91–9.41)

RR, relative risk; HR, hazard ratio; GOG, Gynecologic Oncology Group; IV, intravenous; SEER, Surveillance, Epidemiology, and End Results; AAIR, age-adjusted incidence rate.

* Not reported in systematic review.

† In multivariate analysis adjusted for age, tumor grade, surgical complexity, and gross residual disease, there was no increased risk of ovarian cancer–related death in the Black cohort compared with the White patients.

‡ Adjusted for age, stage debulking status, histology, and performance score.

engines to seek guidelines, recommendations, and tools that might not have been published in peer-reviewed publications. The assigned panel member conducted a structured literature review, which was then reviewed by other panel members and discussed at a virtual meeting of stakeholder professional and patient advocacy organizations. Key questions, key words, and PICO criteria (P=patient, problem, or population; I=intervention; C=comparison, control, or comparator; O=outcome) for framing the health disparities in ovarian cancer literature search are listed in Box 1. The summary of evidence of health disparities in ovarian cancer is published

as a separate document to allow its presentation in adequate detail. Health disparities were felt to be important to outline in full detail by the stakeholder representatives at our uterine cancer review conference.[3,4] We took the same approach here for consistency with the prior module and because the scope of disparities seemed equally significant.

When reporting results of individual studies, we used the terminology describing gender, race, and ethnicity from the source article. Studies almost uniformly used "women" or "females" to refer to the gender of those affected by ovarian cancer. Although ovarian cancer can affect individuals of different sexes who have ovaries, we used "women" or "females" in this review to reflect the cited literature. In keeping with the most common categories of race and ethnicity used in national data collection, when we had a choice of terminology, we used "Black" in place of "non-Hispanic Black" or "African American" and "White" in place of "non-Hispanic White" or "Caucasian." We used "Hispanic," not "Latinx," because "Latinx" was rarely used in any of the articles reviewed. Although some studies restricted their analysis to Hispanic White individuals, others included Hispanic individuals of any race. Given the lack of consistency in the literature, we used "Hispanic" without reference to race.

RESULTS

Differences in Incidence and Survival

Race and Ethnicity

According to the U.S. Cancer Statistics Working Group, the incidence of ovarian cancer in the United States in 2019 was 19,571, and 13,445 women died of ovarian cancer.[5] The rate of ovarian cancer was highest among non-Hispanic American Indian and Alaska Native women (11.4/100,000 women) and non-Hispanic White women (11.0/100,000 women) in 2019. Rates in Hispanic women of any race (10.3/100,000 women), non-Hispanic Asian and Pacific Islander women (9.4/100,000 women), and non-Hispanic Black women (9.1/100,000 women) were lower.[6] The higher incidence found in non-Hispanic White women may be attributable to the higher incidence of hereditary breast and ovarian cancer mutations in the Ashkenazi Jewish population (40%).[7] A change in reporting in the November 2021 submission to the SEER (Surveillance, Epidemiology, and End Results) cancer database resulted in a large increase in rates for American Indian and Alaska Native women. This change was prompted by concern for misclassification of race in the cancer data.[6] This may in part explain the higher rates of ovarian cancer in non-Hispanic American Indian and Alaska Native women. We did not find any studies focusing on why the incidence of ovarian cancer in non-Hispanic American Indian and Alaska Native women is higher.

A meta-analysis of 16 studies including 190,107 patients that evaluated survival or mortality in Black patients found an 18% increased risk of mortality among Black patients compared with White patients (relative risk [RR] 1.18, 95% CI 1.11–1.26) (Table 1).[8] No differences in mortality outcomes between Hispanic and non-Hispanic White patients (RR 0.96, 95% CI 0.84–1.10) or Asian and Pacific Islander and non-Hispanic White patients were found.[8] Similar results were reported by the CONCORD-2 study, one of the largest and most geographically comprehensive population-based survival studies. It included a total of 172,849 ovarian cancer cases and found that Black women had consistently worse survival compared with White women in both calendar periods in this study (2001–2003: 29.6%, 95% CI 28.1–31.1% vs 40.1%, 95% CI 39.6–40.6%; and 2004–2009: 31.1%, 95% CI 29.5–32.7% vs 41.7%, 95% CI 41.2–42.2%).[9]

Another meta-analysis compared survival rates between Black and White women over time.[10] A cutoff point of 1985, which coincides with the introduction of platinum-based chemotherapy and widespread acceptance of surgical debulking, was used. When White women were compared with Black women, the pooled RR for 5-year survival before 1985 was 0.93 (95% CI 0.89–0.97) and after 1985 was 1.17 (95% CI 1.05–1.31).[10]

The disparity in survival may be attributable to consistent, quality care. Multiple studies have shown that patients who receive similar treatments have similar overall survival. Bristow et al[11] found no statistical difference between White women and Black women treated in a single tertiary gynecologic oncology referral center in undergoing primary surgery (90.4% vs 82.1%, P=.06), achieving optimal residual disease (73.0% vs 69.2%, P=.28), achieving complete cytoreduction (51.4% vs 53.8%, P=.49), or overall survival (50.5 months vs 47.0 months, P=.57). A second study of 209 women (78% White and 22% Black) undergoing treatment at a single center had similar results.[12] Both studies performed multivariate analysis and found no differences between Black and White cohorts after controlling for factors such as age, tumor grade, surgical complexity, gross residual disease, stage of diagnosis, and preoperative CA 125.[11,12]

A retrospective review of 97 Black women and 1,392 White women who participated in one of seven

Table 2. Disparities in Diagnosis of Ovarian Cancer

Study (Year)	Type of Study	Data Source	Total [n (%)]	Evaluation	Study Findings
Sakhuja et al[15] (2017)	Retrospective cohort study	SEER database Patients who were older than age 40 y with ovarian cancer between 2000 and 2010	46,423 White 43,219 (93.1) Black 3,203 (6.9)	Black vs White	27.2% of Black patients (n=876) vs 25.2% of White patients (n=10,865) were newly diagnosed before age 55 y ($P<.001$) In patients younger than age 65 y, Black patients had 20% higher odds of late-stage diagnosis (stage III–IV) vs White patients (OR 1.20, 95% CI 1.07–1.35) In multivariate analysis, Black patients had 14% higher odds of late-stage diagnosis (aOR 1.14, 95% CI 1.04–1.25)*
Beckmeyer-Borowko et al[16] (2016)	Retrospective cohort study	National Cancer Database Patients who were diagnosed with ovarian cancer between 1998 and 2011	148,668 White 137,106 (92.2) Black 11,562 (7.8)	Black vs White	Late-stage disease (stage III–IV) was diagnosed in 76.3% of Black women and 70.1% of White women ($P<.001$); aOR 1.26, 95% CI 1.19–1.33† Black women were more likely to be diagnosed with late-stage ovarian cancer than White women in 3 time periods: 1998–2002: OR 1.36, 95% CI 1.23–1.49 2003–2007: OR 1.27, 95% CI 1.15–1.39 2008–2011: OR 1.15, 95% CI 1.05–1.27
Præstegaard et al[17] (2016)	Pooled analysis	18 studies total: 11 studies were conducted in the United States, 8 in Europe, and 1 in Australia 15 studies were population-based, and 3 studies were hospital-based	10,601	Socioeconomic status	Women who completed high school or less had an increased risk of late-stage diagnosis vs women who completed more than high school (79.69% vs 77.53%, respectively, $P<.008$); aOR 1.15, 95% CI 1.03–1.28‡
Lee et al[14] (2019)	Retrospective cohort study	Patients diagnosed with ovarian cancer between 1990 and 2014 identified across the 13 SEER registries	90,854 White 84,416 (92.9) Filipino 1,978 (2.2) Chinese 1,559 (1.7) Japanese 1,091 (1.2) Asian Indian or Pakistani 680 (0.7) Vietnamese 578 (0.6) Korean 552 (0.6)	Asian vs White	Non-Hispanic White women were less likely to be diagnosed with localized or regional vs distant tumor stage vs Asian American women ($P<.01$) Non-Hispanic White 21.31 vs 59.09 Asian Indian or Pakistani 26.18 vs 59.85 Chinese 34.38 vs 55.36 Filipino 33.01 vs 56.52 Japanese 33.08 vs 55.46 Korean 31.34 vs 57.61 Vietnamese 36.16 vs 55.54

SEER, Surveillance, Epidemiology, and End Results; OR, odds ratio; aOR, adjusted odds ratio.
* Adjusted for county-level health care availability (variables included numbers of total hospitals, hospitals with oncology services, hospitals with ultrasonography services, obstetrician-gynecologists, and physicians), and socioeconomic status.
† Adjusted for age, histology, grade, health insurance status, education level, income, facility type, facility location, and facility case volume.
‡ Adjusted for age, race, and ethnicity.

Gynecologic Oncology Group (GOG) trials with stage III or IV epithelial ovarian cancer and received standard intravenous cisplatin and paclitaxel found no difference in progression-free survival between White women (16.1 months) and Black women (16.2 months, $P=.22$).[13] After adjustment for age, stage, debulking status, histology, and performance score, the hazard ratio for disease progression was 1.12 (95% CI 0.90–1.40) in Black women compared with White women.[13] This study was limited by the small number of Black patients but also highlights the disparities that exist in clinical trial enrollment of minorities (93.5% White women vs 6.5% Black women).

In a study by Lee et al[14] that included 90,854 patients from the SEER database between 1990 and 2014, the investigators found that non-Hispanic White women consistently had a higher incidence of ovarian cancer (age-adjusted incidence rate 14.15, 95% CI 14.06–14.25) compared with Asian American women in all subgroups ($P<.01$). Among the Asian ethnicities, Asian Indian or Pakistani women had the highest (age-adjusted incidence rate 10.51, 95% CI 9.65–11.42) and Korean women had the lowest (age-adjusted incidence rate 7.23, 95% CI 6.62–7.88) rate of ovarian cancer. Conversely, clear-cell tumors accounted for a higher percentage of all ovarian cancer cases in Asian American subgroups compared with non-Hispanic White women. For example, 13.6% of all ovarian cancers in Chinese women and less than 5% in non-Hispanic White women are clear-cell tumors.[14]

Insurance Status

In a systematic review that assessed survival outcomes and insurance status, five of the six studies observed higher mortality rates among patients who had no insurance or public insurance, with three of the studies reaching statistical significance.[8] According to the authors of this systematic review, there were not enough studies with unique populations to conduct a meta-analysis.

Socioeconomic Status

The Karanth et al[8] meta-analysis found that lower socioeconomic status was associated with a 10% increased risk of mortality (seven studies, 78,061 patients, RR 1.10, 95% CI 1.03–1.18).

Disparities in Diagnosis

Two large retrospective cohort studies using the SEER database and National Cancer Database found that Black women were more likely to be diagnosed with advanced-stage epithelial ovarian cancer (stage III and IV) compared with White women (Table 2).[15,16] According to the SEER data, Black women have 20% higher odds of diagnosis at late-stage cancer compared with White women (odds ratio [OR] 1.20, 95% CI 1.07–1.35).[15] In multivariable models adjusted for health care availability and socioeconomic status, Black women had 14% higher odds of late-stage diagnosis (OR 1.14, 95% CI 1.04–1.25).[15]

In the SEER data, Black patients were also more likely to be diagnosed at a younger age. A total of 27.2% of Black women (n=876) compared with 25.2% of White women (n=10,865) were newly diagnosed with epithelial ovarian cancer before age 55 years ($P<.001$).[15]

Disparities in diagnosis were found that were based on socioeconomic status. In a study of socioeconomic status (as measured by education level), women who completed high school or less had an increased risk of late-stage diagnosis (stage III–IV) compared with women who completed more than high school (79.69% vs 77.53%, respectively, $P<.008$). This difference persisted when adjusted for age, race, and ethnicity (OR 1.15, 95% CI 1.03–1.28).[17]

A significant difference in the tumor stage (localized or regional vs distant) at the time of diagnosis was noted between non-Hispanic White women and Asian American women. Although the majority of women in both groups were diagnosed with distant tumors, Asian American women are much more likely to be diagnosed with localized or regional tumors. A total of 21.31% of non-Hispanic Women were diagnosed with localized or regional tumors compared with 34.38% of Chinese American women and 36.16% of Vietnamese American women ($P<.01$).[14]

Our literature review found no studies on disparities in diagnosis in other races or ethnicities, including Hispanic women, and other socioeconomic status factors.

Disparities in Treatment

Race and Ethnicity

Two meta-analyses found that Black women and women in other racial and ethnic minority groups were less likely to receive guideline-concordant care than White women.[8,18] One analysis found that Black women were 25% less likely to receive ovarian cancer treatment than White women (RR 0.75, 95% CI 0.66–0.84), although publication bias was noted (Table 3).[8] Hispanic patients had a nonstatistically significant 9% decrease in receipt of ovarian cancer treatment compared with non-Hispanic White patients (RR 0.91, 95% CI 0.82–1.01).[8] No difference was found in treatment between Asian and Pacific Islander patients compared with White patients.

Table 3. Disparities in Treatment of Ovarian Cancer

Study (Year)	Type of Study	Data Source	n	Evaluation	Study Findings
Karanth et al[8] (2019)	Meta-analysis	16 studies from 2002 to 2015	175,350	Black vs White	Black women were 25% less likely to receive ovarian cancer treatment than White women (RR 0.75, 95% CI 0.66–0.84), although publication bias was noted
Pozzar and Berry[18] (2017)	Systematic review	10 studies from 1996 to 2016	—*	Black vs White	9 of the 10 studies found that Black women and women in other racial and ethnic minority groups were less likely to receive guideline-concordant care
Karanth et al[8] (2019)	Meta-analysis	10 studies from 2002 to 2015	101,407	Hispanic vs non-Hispanic White	Hispanic patients had a nonsignificant 9% decrease in receipt of ovarian cancer treatment vs non-Hispanic White patients (RR 0.91, 95% CI 0.82–1.01)
Karanth et al[8] (2019)	Meta-analysis	7 studies from 2007 to 2015	65,783	Asian and Pacific Islander vs White	No significant difference in receipt of ovarian cancer treatment between Asian and Pacific Islander patients vs White patients (RR 0.98, 95% CI 0.92–1.06)
Karanth et al[8] (2019)	Meta-analysis	6 studies from 2008 to 2015	111,410	Insurance status (Medicare insurance vs private insurance)	Patients with Medicare insurance were 10% less likely to receive treatment vs patients with private insurance (RR 0.90, 95% CI 0.82–0.97)
Karanth et al[8] (2019)	Meta-analysis	8 studies from 2003 to 2015	112,734	Insurance status (no, public, or another type of insurance vs private insurance)	Patients who had no insurance, public insurance, or another type of insurance experienced a 12% decrease in treatment vs patients with private insurance (RR 0.88, 95% CI 0.83–0.94)
Karanth et al[8] (2019)	Meta-analysis	5 studies from 2008 to 2015	103,477	Insurance status (Medicaid vs private insurance)	Patients with Medicaid insurance had a nonsignificant decrease in treatment (RR 0.96, 95% CI 0.87–1.05)
Moss et al[19] (2019)	Randomized clinical trial	Secondary analysis of GOG-218 trial	993	Insurance status	Compared with patients with private insurance, those with public or no insurance had lower health-related quality-of-life scores Physical well-being scores: No insurance −1.93 points (SE 0.63, $P<.01$) Public insurance: −1.0 points (SE 0.49, $P=.04$) Functional well-being scores: No insurance −1.98 points (SE 0.76, $P=.01$) Public insurance −1.29 points (SE 0.59, $P=.03$)
Karanth et al[8] (2019)	Meta-analysis	10 studies from 2002 to 2015	130,801	Socioeconomic status	Women with lower socioeconomic status were 15% less likely to receive NCCN-concordant ovarian cancer treatment than those in the highest socioeconomic category (RR 0.85, 95% CI 0.77–0.94)

RR, relative risk; GOG, Gynecologic Oncology Group; SE, standard error; NCCN, National Comprehensive Cancer Network.
* Not reported in systematic review.

Table 4. Disparities in Genetic Testing for Ovarian Cancer

Study (Year)	Type of Study	Data Source	Total [n (%)]	Evaluation	Study Findings
Lin et al[20] (2021)	Meta-analysis	8 studies from 2009 to 2020	7,862 White 6,469 (82.3) Black 599 (7.6) Asian 794 (10.1)	Black vs White Asian vs White	Referral to genetic counseling: White 43% [95% CI 26–62%] vs Black 24% [95% CI 13–42%] vs Asian 23% [95% CI 2–83%] Completion of genetic testing: White 40% [95% CI 25–57%] vs Black 26% [95% CI 17–38%] vs Asian 14% [95% CI 2–51%]
Lin et al[20] (2021)	Meta-analysis	6 studies from 2015 to 2020	7,681 Private insurance 5,320 (69.3) Medicare or Medicaid insurance 2,078 (27.1) No insurance 283 (3.7)	Insurance status	Referral to genetic counseling: Private insurance 39% [95% CI 26–54%] Medicare or Medicaid insurance 27% [95% CI 18–38%] No insurance 24% [95% CI 13–41%] Completion of genetic testing: Private insurance 47% [95% CI 30–64%] Medicare or Medicaid insurance 26% [95% CI 16–40%] No insurance 23% [95% CI 18–28%]
Gamble et al[21] (2021)	Retrospective cohort study	IBM Truven Health MarketScan Research database (a large claims database that includes 240 million unique insured patients) Patients who underwent surgery for ovarian cancer from 2011 to 2017	27,181 Commercial insurance 24,082 (88.6) Medicaid insurance 3,099 (11.4)	Insurance status	Rates of precision testing: Commercial insurance: 55.6% Medicaid insurance 48.4% (adjusted RR 0.91, 95% CI 0.84–0.98)* Rates of molecular genetic testing: Commercial insurance 13.7% Medicaid insurance 4.5% (adjusted RR 0.33, 95% CI 0.25–0.42)† Rates of testing over time (2011–2017): Commercial insurance 47–66.6% Medicaid insurance 41.4–57.6%, $P<.01$
Huang et al[22] (2019)	Retrospective cohort study	Using the tumor registry at the University of Miami from January 1, 2011, to December 31, 2016	367 Private 182 (49.6) Medicaid insurance, Medicare insurance, self-paid, or no insurance 185 (50.4)	Insurance status	Germline testing: Private insurance (68.1%) vs Medicare insurance (48.5%), Medicaid insurance (36.7%), no insurance (35%), or self-paid (25%), $P\leq.01$ In multivariate analysis, patients with Medicare (aOR 0.51, 95% CI 0.28–0.94) or Medicaid insurance aOR 0.42, 95% CI 0.18–0.99) were less likely to receive germline testing vs those with private insurance‡ Somatic testing: Private insurance (39%) vs Medicare insurance (25.7%), Medicaid insurance (3.3%), no insurance (0%), or self-paid (0%), $P\leq.01$ In multivariate analysis, patients with Medicaid insurance were less likely to receive somatic testing (aOR 0.15, 95% CI 0.04–0.62) vs patients with private insurance‡

RR, relative risk; aOR, adjusted odds ratio.

* Precision testing of any type, including germline, somatic, and ancillary pathology tests such as microsatellite instability, immunohistochemistry, and fluorescence in situ hybridization.

† Molecular genetic testing including germline and somatic testing.

‡ Adjusted for age, race or ethnicity, testing medical center, and stage of diagnosis, among other factors.

Insurance Status

Patients with Medicare insurance, no insurance, other public insurance, or another type of insurance were 10–12% less likely to receive guideline-concordant care compared with patients with private insurance.[8] A secondary analysis of GOG-218 found that insurance type was consistently correlated with health-related quality-of-life scores.[19] Compared with patients with private insurance, those with other types of insurance had lower mean health-related quality-of-life scores.[19]

Socioeconomic Status

In a systematic review and meta-analysis by Karanth et al,[8] women with lower socioeconomic status were 15% less likely to receive guideline-concordant ovarian cancer treatment than those in the highest socioeconomic category (RR 0.85, 95% CI 0.77–0.94).

Disparities in Genetic Testing

Genetic or precision testing, which includes germline mutation and somatic tumor testing, has significantly improved the care of patients with ovarian cancer and their families (Table 4). A meta-analysis found lower rates of referral to genetic counseling and completion of genetic testing in Black patients (24% [95% CI 13–42%] and 26% [95% CI 17–38%]) and Asian patients (23% [95% CI 2–83%] and 14% [95% CI 2–51%]) compared with White patients (43% [95% CI 26–62%] and 40% [95% CI 25–57%]).

Receipt of genetic counseling and testing also differed among patients depending on insurance status. Patients with private insurance were more likely to be referred to genetic counseling (39%, 95% CI 26–54%) compared with patients with Medicare or Medicaid insurance (27%, 95% CI 18–38%) and

Table 5. Geographic and Travel Barriers for Patients With Ovarian Cancer

Study (Year)	Type of Study	Data Source	N	Study Findings
Bristow et al[11] (2014)	Retrospective cohort study	California cancer registry Patients older than age 18 y with stage IIIC–IV epithelial ovarian cancer diagnosed from January 1, 1996, to December 31, 2006	11,770	Living a distance of 80 km (50 miles) or more from a high-volume hospital was associated with an increased risk of nonadherent care (OR 1.88, 95% CI 1.61–2.19) Patients willing to travel longer distances (32 km [20 miles] or farther) to receive treatment were less likely to experience deviation from guideline-concordant care (OR 0.80, 95% CI 0.690.92) White patients were significantly more likely to travel 32 km or farther to receive care (21.8%) vs Black (14.4%), Hispanic (15.9%), and Asian and Pacific Islander (15.5%) patients ($P<.01$)
Erickson et al[26] (2014)	Retrospective cohort study	Patients diagnosed with ovarian cancer between 2004 and 2009 at the University of Alabama at Birmingham Hospital, where most patients received guideline-concord care (78.5%)	367	Patients who received NCCN-concordant care lived a mean distance of 82.4 miles from the center, whereas those who did not receive NCCN-concordant care lived a mean distance of 87.5 miles ($P>.05$)
Weeks et al[27] (2021)	Retrospective cohort study	Iowa cancer registry Patients diagnosed with stage IB–IV ovarian cancer from January 1, 2010, to December 31, 2016	675	Patients in rural areas were less likely to receive surgery from a gynecologic oncologist than patients in urban areas (OR 0.48, 95% CI 0.30–0.78) Patients in rural areas who were treated by a gynecologic oncologist were more likely to receive cytoreductive surgery (OR 2.84, 95% CI 1.31–6.14) and chemotherapy (OR 4.22, 95% CI 1.82–9.78)
Weeks et al[28] (2021)	Retrospective cohort study	Patients with ovarian cancer diagnosed from 2011 to 2012 in Iowa or Missouri or from 2010 to 2012 in Kansas	1,003	Rural women had lower odds of receiving either a surgical referral to a gynecologic oncologist (OR 0.37, 95% CI 0.23–0.59) or surgery by a gynecologic oncologist (OR 0.37, 95% CI 0.24–0.58)

OR, odds ratio; NCCN, National Comprehensive Cancer Network

those with no insurance (24%, 95% CI 13–41%). The rates of completing genetic testing once referred were even more disparate among the three different insurance groups. Forty-seven percent (95% CI 30–64%) of patients with private insurance completed testing compared with 26% (95% CI 16–40%) of patients with Medicare or Medicaid insurance and 23% (95% CI 18–28%) of patients with no insurance.[20] Two additional studies found similar disparities.[21,22] This difference remained after adjustment for factors including age, race or ethnicity, and stage of diagnosis.[22]

Other Special Populations

Our literature search found no studies on ovarian cancer disparities experienced by populations that are systematically disadvantaged by their gender identity or sexual orientation or those with other marginalized identities such as people who are currently incarcerated, have undocumented immigration status, are veterans, are experiencing homelessness, or have substance use disorders.

Social and Cultural Differences

A multicenter case-control study that included 599 Black women from the African American Cancer Epidemiology Study found that increasing religiosity or spirituality (characterized as attending religious services several times per week vs one or fewer times per month) was associated with an increase in late-stage diagnosis (OR 1.98, 95% CI 1.11–3.52).[23] We found no other publications assessing the effects of religiosity or spirituality on ovarian cancer.

Geographic and Travel Barriers

Several studies found that a patient's geographic location can affect their receipt of guideline-concordant care (Table 5). Bristow et al[24] found that living a distance of 80 km (50 miles) or more from a high-volume hospital was associated with an increased risk of non–guideline-adherent care (OR 1.88, 95% CI 1.61–2.19). Patients who were willing to travel longer distances (32 km [20 miles] or farther) to receive treatment were less likely to experience deviation from guideline-concordant care (OR 0.80, 95% CI 0.69–0.92). White patients were significantly more likely to travel 32 km or farther to receive care (21.8%) compared with Black (14.4%), Hispanic (15.9%), and Asian and Pacific Islander patients (15.5%, $P<.01$). Geographic differences were also noted in a study by Ulanday et al,[25] which revealed differences in lymph node dissection rates by SEER region. However, the significance of this is unclear. Erickson et al[26] did not find that distance from a National Comprehensive Cancer Network (NCCN)–designated Cancer Center affected receipt of guideline-concordant care.

Disparities in treatment were also present when patients from rural and urban area were compared.[27,28] Patients from rural areas were less likely to receive surgery from a gynecologic oncologist than patients from an urban area (OR 0.48, 95% CI 0.30–0.78) and thus less likely to receive cytoreductive surgery and chemotherapy.[27]

Hospital Characteristics

In a meta-analysis that included 10 studies and 218,126 patients, Karanth et al[8] found that patients who received care at a low-volume hospital (five or fewer ovarian cancer cases treated per year) received 30% less NCCN guideline–recommended treatment compared with patients treated at high-volume hospitals (RR 0.70, 95% CI 0.58–0.85). In a systematic review, three studies found a statistically significant 8–16% increased mortality in low-volume hospitals compared with high-volume hospitals.

Furthermore, low-volume surgeons were also found to provide a 31% decrease in treatment compared with high-volume surgeons in a meta-analysis that included four studies and 26,651 patients (RR 0.69, 95% CI 0.56–0.85).[8] In a systematic review that included three studies, low-volume physicians were associated with a 31% higher mortality than high-volume physicians.[8]

In a meta-analysis that included five studies and 146,787 patients, a statistically significant 16% lower likelihood of treatment was found in "worse" compared with "better" hospital characteristics (RR 0.84, 95% CI 0.79–0.90).[8] Community cancer programs, long distance to any care or high-volume care, hospitals not approved by the American College of Surgeons, and small or isolated rural hospitals were considered worse hospital characteristics according to the authors.[8] Academic or research cancer programs, short distance to any care or high-volume care, hospitals approved by the American College of Surgeons, and teaching and urban hospitals were considered better hospital characteristics.[8]

Language Barriers

A retrospective study conducted in a university gynecologic oncology practice found that non–English speakers were less likely to be referred for genetic counseling than their English-speaking counterparts (36.8% vs 56.6%, $P\leq.01$).[29] However, once referred, non–English speakers were more likely to complete genetic counseling than English speakers,

although the difference was not statistically significant (78.6% vs 66.9%, P=.79).[29]

Mitigation Strategies

Our literature search did not find any articles specifically studying interventions to reduce disparities in ovarian cancer diagnosis or treatment. Several articles looked at various ways to improve enrollment of vulnerable groups in clinical trials and genetic screening referral.

One randomized controlled trial tested the effectiveness of a telephone service in identifying low-income women at risk for hereditary breast and ovarian cancer and referring them to free genetic counseling.[30] The study found that a significantly greater portion of participants in the intervention group (telephone call) than the control group (brochure) obtained genetic counseling during the intervention period (38.6% vs 4.5%, 95% CI 12.0–54.3%).[30]

The Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial is a randomized controlled trial launched by the National Cancer Institute to determine whether widespread use of specific screening tests can reduce mortality.[31] Initiatives to improve recruitment of racial and ethnic minority individuals included using Black interviewers, locating screening centers in areas with a large Black population, using lists from professional societies with a large number of Black members or representation, and using endorsements from well-known Black figures in the community.[32] Such methods helped to increase enrollment of Black participants. Although the data were not specific to increasing ovarian cancer screening enrollment, these strategies did lead to more than 5% Black enrollment.[32]

Box 2. Summary of Areas of Racial and Ethnic Ovarian Cancer Health Disparities Found in the Literature Search

Areas in which ovarian cancer health disparities were noted:

- Outcomes
  - Incidence
  - Mortality
- Care
  - Diagnostic differences
    - Earlier age at diagnosis
    - Higher stage at diagnosis
  - Guideline-concordant care
  - Undergoing genetic counseling and testing
  - Having precision testing

Areas in which ovarian cancer health disparities have not been studied:

- Populations who are systematically disadvantaged by gender identity, sexual orientation, or other marginalized identities
- Role of racism and other nonclinical systemic factors

Area in which ovarian cancer health disparities were abrogated:

- Mortality differences disappear in comparisons of women who receive similar treatments in clinical trials or at the same treatment center

DISCUSSION

Our literature review found profound disparities in outcomes such as survival, treatment, and stage at diagnosis by factors such as race, insurance, socioeconomic status, and geographic location. Black patients and those with low socioeconomic status or nonprivate insurance routinely experienced worse outcomes than their counterparts.

Black patients had 17–18% worse survival compared with White patients.[8,10] Potential explanations include earlier age and later stage at diagnosis and disparities across the entire care continuum of ovarian cancer: diagnosis, treatment, and precision testing (Box 2). Race is a social, not biological, construct. Accordingly, we did not specifically search for biological differences. We noted many disparities, particularly differences in cancer care and potential delay in diagnosis, that by themselves could be adequate to explain the observed outcome disparities. Of the many differences noted in the review (Box 2), only two, earlier age and later stage at diagnosis, are not immediately attributable to health disparities. The difference in age at diagnosis was noted in a single study and showed only a 2% difference in incidence of diagnosis before age 55 years, which, although statistically significant, is of unclear clinical significance and is unlikely to explain the much larger survival difference.[15] Two large database studies found that Black patients were more likely to be diagnosed with late-stage ovarian cancer than White patients.[15,16] The disparity persisted despite adjustment for health care availability variables and socioeconomic status. This could suggest that differential access to appropriate health care may not be the only reason for differences in outcomes of Black patients with ovarian cancer and that unmeasured factors such as structural racism may contribute.

Differences in diagnosis and treatment have been substantiated in several systematic reviews and meta-analyses showing that Black patients are less likely to receive NCCN guideline–concordant care and face poorer outcomes.[8,18] In a meta-analysis consisting of

almost 200,000 patients, Black patients received 25% less guideline-adherent treatment and a concomitant 18% increased risk of mortality compared with White patients.[8] The disparity first became evident with the availability of effective treatment in the 1980s with the introduction of carboplatin therapy and cytoreductive surgery.[10] Although survival has been improving in both groups over time, the CONCORD-2 study noted persistent differences between outcomes in Black and White patients.[9] Our review also noted that genetic testing was less frequently performed in Black patients. This may result in part from limited general knowledge of genetics, negative attitudes about genetics and its research, and concerns that involvement has potential to promote further racial discrimination.[20,33] A key finding of our review was that racial differences in mortality outcomes are not present in comparisons of Black and White patients who have same-stage disease and receive similar treatments.[11–13]

Historically, differences in biology have been proposed for the disparities that exist in Black patients and other minorities. Epigenetic events have been implicated in several cancers such as breast, prostate, colorectal, and endometrial.[34] Epigenetic differences among races and ethnicities can possibly attribute to true genetic variations and disparities.[34] Although several epigenetic events have been found to be related to survival of ovarian cancer, none have any reported racial or ethnic differences.[35–38]

Black patients and individuals in other racial and ethnic minority groups are underrepresented in clinical trials and experimental treatments.[13,31,32] Scalici et al[39] looked at 445 publications from GOG clinical trials accounting for 67,568 patients and found that participants were primarily White (83%). Black people (8%) and those of other races and ethnicities (9%) contributed to only a small proportion of these trials. Barriers to participation in these groups may stem from inherent mistrust of health care, lack of access to such trials, and individual factors.[32,39]

Other sociodemographic characteristics that were consistently shown to contribute to worse outcomes include low socioeconomic status and insurance status other than private insurance. In a meta-analysis, women with low socioeconomic status were 15% less likely to receive NCCN guideline–concordant ovarian cancer treatment, which resulted in a 10% increased risk of mortality compared with patients of high socioeconomic status.[8] Similarly, patients with Medicare insurance, other public insurance, or no insurance were 10–12% less likely to receive NCCN guideline–concordant care than patients with private insurance.[8] Nonprivate insurance status also adversely affected receipt of genetic testing.[20–22] Other barriers that can lead to health disparities in the treatment of ovarian cancer include social and cultural differences, geographic and travel barriers, hospital characteristics, and language barriers.[8,18,23,29] Patients treated in lower-volume hospitals, by lower-volume surgeons, and in hospitals with worse characteristics received 16–31% less NCCN guideline–recommended treatment.[8] A movement toward regionalization of care for patients with ovarian cancer can help to improve outcomes and should be stressed as one of the mitigation strategies moving forward.

One of the limitations of our review was the paucity of data found for other marginalized groups, including American Indian and Alaska Native people, a group who had the highest ovarian cancer incidence rate in 2019. Despite conducting additional searches on populations who are systematically disadvantaged by their gender identity, sexual orientation, or other marginalized identities (eg, people who are currently incarcerated; have undocumented immigration status; are veterans; are experiencing homelessness; or have substance use disorders), we found no relevant studies. Further efforts are needed to ensure that research is conducted involving these other marginalized groups, including sexual and gender minority populations, to address these knowledge gaps. This review also found no studies explicitly exploring the effect of racism in the diagnosis and treatment of ovarian cancer or the role of nonclinical systemic factors in ovarian cancer disparities.

We did not find any studies evaluating strategies to mitigate these disparities. We found glaring differences in diagnosis and treatment and strong data to support equivalent response to equivalent treatment. Strategies to remove disparities in outcomes should focus on ensuring similar diagnostic evaluation and treatment. Understanding early warning signs and knowing when further diagnostic testing is appropriate are important tools for all primary care physicians to have and to share with their patients, especially among marginalized groups who already have a distrust of the health care field (see "Executive Summary of the Ovarian Cancer Evidence Review Conference"[2]).

Our review suggests that many of the observed outcome disparities stem from disparities in diagnosis and treatment and are a call to action to ensure equal access to early diagnosis and guideline-concordant treatment. We believe structural racism is a key contributor to the observed differences in diagnosis, treatment, and outcomes. In line with the ACOG Joint Statement on Collective Action in Addressing

Racism, discrimination and racism should be treated as evidence-based risk factors for poor health outcomes, and as clinicians, we should recognize this in caring for our patients.[40] Research to develop effective strategies to correct these disparities needs to be an immediate priority.

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