Cancer Causes & Control (2023) 34:133–140
https://doi.org/10.1007/s10552-022-01646-y

ORIGINAL PAPER

Diversity and transparency in gynecologic oncology clinical trials

Mary Katherine Montes de Oca[1] · Elizabeth P. Howell[1] · Daniel Spinosa[1] · Hope Knochenhauer[2] · Benjamin J. Peipert[1] · Eric Severson[5] · Shakti Ramkissoon[5] · Tomi F. Akinyemiju[3] · Rebecca A. Previs[1,4,5]

Received: 18 May 2022 / Accepted: 12 October 2022 / Published online: 25 October 2022

Abstract

Purpose Clinical trials advance the standard of care for patients. Patients enrolled in trials should represent the population who would benefit from the intervention in clinical practice. The aim of this study was to assess whether clinical trials enrolling patients with gynecologic cancers report racial and ethnic participant composition and to examine the level of diversity in clinical trials.

Methods Using ClinicalTrials.gov, we identified clinical trials enrolling patients with ovarian, uterine/endometrial, cervical, vaginal, and vulvar cancers from 1988 to 2019. Race and ethnicity data were extracted from participant demographics. Descriptive statistics on race, ethnicity, cancer type, location, study status, and sponsor type were calculated. Among trials which reported race and/or ethnicity, sub-analyses were performed on composition of race and ethnicity by funding source, location, and completed study status.

Results A total of 1,882 trials met inclusion criteria; only 179 trials (9.5%) reported race information. Of these, the racial distribution of enrollees was 66.9% White, 8.6% Asian, 8.5% Black/African American, 0.4% Indian/Alaskan Native, 0.1% Native Hawaiian/Pacific Islander, 1.0% more than one race, and 14.5% unknown. Only 100 (5.3%) trials reported ethnicity. Except for trials enrolling patients with cervical cancer which enrolled 65.2% White and 62.1% Non-Hispanic/Latino/a patients, enrollees in trials for other gynecologic cancers were over 80% White and 88% Non-Hispanic/Latino/a. Industry funded trials enrolled higher proportions of White (68.4%) participants than non-industry funded trials (57.5%). Domestic trials report race (11.5%) and ethnicity (7.6%) at higher rates than international trials (6.9% and 2.3%, respectively). Reporting of race (1.7% vs. 13.9%) and ethnicity (1.7% vs. 11.1%) has increased over time for patients enrolled in 2000 vs. 2018.

Conclusion Less than 10% of trials enrolling patients with gynecologic malignancies report racial/ethnic participant composition on ClinicalTrials.gov. Accurate reporting of participant race/ethnicity is imperative to ensuring minority representation in clinical trials.

Keywords Gynecologic oncology · Clinical trials · Diversity · Race · Ethnicity

Introduction

Clinical trials are widely acknowledged as a reliable method of addressing important clinical questions and advancing the standard of care across medical specialties [1]. ClinicalTrials.gov is a national registry of clinical trials that contains more than 330,000 registered trials, making it the world's largest source of clinical trial data [2, 3]. A clinical trial population should represent the patients who would benefit from the intervention outside of a trial to ensure safety and effectiveness of the intervention for all patients. Historically, racial and ethnic minority groups have been underrepresented in clinical trials [4, 5]. In fact, the United States National Institutes of Health

✉ Mary Katherine Montes de Oca
mm765@duke.edu

1 Department of Obstetrics and Gynecology, Duke University Medical Center, 2608 Erwin Rd, STE 210, Durham, NC 27705, USA

2 School of Medicine, Duke University, Durham, NC, USA

3 Department of Population Health Sciences, Duke University School of Medicine, Durham, NC, USA

4 Division of Gynecologic Oncology, Duke Cancer Institute, Durham, NC, USA

5 Labcorp Oncology, Durham, NC 27560, USA

Revitalization Act of 1993 called for explicit inclusion of more women and minorities in clinical trials [6]. Despite this legislation, representation of racial/ethnic minorities in modern day clinical trial enrollment remains a persistent challenge. In 1997, 92% of clinical trial participants were White, and in 2014, White participants comprised 86% of enrollees [7]. In 2011, Blacks and Hispanics represented 12% and 16% of the United States population but only 5% and 1% of clinical trial participants, respectively [8].

Racial disparities exist among patients with gynecologic cancers and have been previously described [9–12]. Uterine cancer incidence rates are increasing across all racial and ethnic groups, most notably in Non-Hispanic black (NHB) and Asian women [13]. In the United States from 2015 to 2019, the incidence rate of uterine cancer per 100,000 women was 28.0 for NH-White women, 29.3 for NH-Black, and 26.0 for Hispanic women [14]. Compared to non-Hispanic White (NHW) women, NHB women have higher incidence rates of aggressive histologic subtypes of uterine cancer and worse 5-year survival at almost every stage and subtype [15]. During the same time period, the incidence of cervical cancer per 100,000 women was 7.1 for NH-White women, 9.0 for NH-Black women, and 10.0 for Hispanic women, and the incidence of ovarian cancer per 100,000 women was 11.0 for Non-Hispanic White patients, 9.1 for NH-Black patients, and 10.3 for Hispanic patients [14]. While survival rates for ovarian cancer have improved for White women from 36 (1975–1977) to 43% (2001–2007), they have worsened for Black women from 42 to 36% across the same timeframe [16].

In addition to disparities in disease burden and survival, disparities in utilization of cancer-directed treatment between racial groups have been identified [17]. Black women with uterine cancer, both early and advanced stage, were less likely to receive a hysterectomy after controlling for tumor grade and histology at all stages [18]. Similar disparities exist in cervical cancer-directed treatment with surgery and radiation [19, 20]. Non-Hispanic Black and Hispanic patients with metastatic gynecologic cancers were found to be less likely to utilize palliative care [21]. Differences in ovarian cancer care and survival were found between Black and White women in several large clinical trials and clinical databases [10–12, 22–24]. Black women with ovarian cancer had worse health outcomes, were more likely to be diagnosed at advanced stages, and less likely to receive surgical treatment, lymph node dissection, care from a high-volume surgeon, NCCN guideline-adherent care, or hospice care [11]. Several studies have reported that equal quality care leads to similar outcomes among Black and White women with gynecologic cancer [23, 24]. There is also evidence of equivalent survival between White and minority patients with advanced or recurrent ovarian cancer who participated in clinical trials, further emphasizing the benefit of minority enrollment in clinical trials [25].

It is well established that enrollment in cancer trials is particularly low for racial and ethnic minorities, women, and elderly patients compared to White patients, men and younger patients [4, 5, 26–28]. One recent study found that NH-Black and Hispanic women are underrepresented in clinical trials for ovarian cancer evaluating therapeutic interventions [29]. Despite these known disparities in diagnosis, treatment, and survival of gynecologic cancers, data regarding the representation of these groups in publicly accessible databases of clinical trials is sparse, limiting efforts to monitor progress in clinical trials equity. The aim of this study was to assess whether trials on ClinicalTrials.gov, the clinical trial registry of record, enrolling patients with gynecologic malignancies report racial and/or ethnic participant composition, and if so, the diversity of these trials.

Methods

Trial identification and data export

A retrospective analysis of clinical trials enrolling patients with gynecologic oncology and registered to ClinicalTrials.gov was performed in January 2020. The terms "ovarian cancer," "endometrial cancer," "uterine cancer," "cervical cancer," "vaginal cancer," and "vulvar cancer" for "condition or disease" were used in the ClinicalTrials.gov search tool to identify trials. Trial types were limited to "Interventional (Clinical Trials)." Study titles were manually reviewed by the primary authors of the study. Multiple reviewers excluded trials not pertaining to the diagnosis and management of gynecologic malignancy including stem cell therapy trials. Year of study initiation was not limited in our search. No studies reported race or ethnicity until 1999. Therefore, sub-analysis of trends over time was limited to the years 1999–2018 to provide meaningful evaluation of recent trends and to allow for reasonable time for trial reporting before the data download in 2020. Study initiation date was used to assess trends over time.

Data fields of interest included: study title, status, cancer type, intervention type, primary and secondary outcomes, study sponsor, funding source, phase, enrollment, number of sites, location of sites, and start and end dates. Race (American Indian or Alaskan Native, Asian, Native Hawaiian or other Pacific Islander, Black or African American, White, more than one race, unknown) and ethnicity (Hispanic/Latino/a, non-Hispanic/Latino/a, unknown) data were extracted from participant demographics included on ClinicalTrials.gov; trials that did not include this data were considered non-reporters. Trial status of completed, suspended, terminated, or withdrawn were included for analysis. Trials

which stopped early but may start again were labeled suspended; studies which stopped early and would not start again were labeled terminated; studies which stopped earlier prior to enrolling the first study participant were labeled withdrawn. Funding source was labeled as either industry or non-industry by the authors of this study. Both consortium and other/unknown were labeled as non-industry. Automatically generated data fields were supplemented by manual data extraction.

Statistical analysis

Clinical trials were stratified by cancer type, year of study initiation, location (domestic vs. international) funding source (industry vs. non-industry), and completed study status. Trials that enrolled patients with multiple cancer types were included in the analysis for each cancer type. Trials were considered "international" if they included sites both in the United States (US) and internationally. Categorical variables were presented as frequency and percent.

Results

We identified 3,826 trials enrolling patients with gynecologic malignancies between 1988 and 2019. Duplicative entries, trials not pertaining to gynecologic malignancies, stem cell therapy trials, and those missing data on location were removed. A total of 1,882 interventional trials met inclusion criteria (Fig. 1), with trials open to the following cancer types: cervical ($n = 585$, 31%), endometrial/uterine ($n = 457$, 24%), ovarian ($n = 1{,}774$, 62%), vaginal ($n = 92$, 7%), and vulvar ($n = 102$, 5%). Overall, 1480 (78.6%) of trials were completed, 25 (1.3%) suspended, 309 (16.4%) terminated, and 68 (3.6%) withdrawn. Prior to 1999, no studies reported race or ethnicity. From 1999 to 2018, 179 trials (9.5%) reported any data regarding the race of participants, 100 (5.3%) reported data regarding ethnicity, and 95 (5.0%) studies reported data on race and ethnicity.

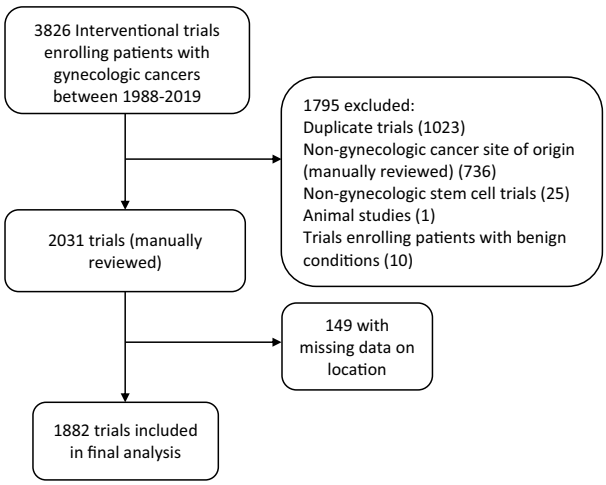

Fig. 1 Consort diagram of clinical trials enrolling gynecologic cancer patients from ClinicalTrials.gov

Race and ethnicity reporting in overall clinical trial population

For the trials enrolling patients with gynecologic cancers that reported race, the racial breakdown of our cohort of enrollees was 66.9% White, 8.5% Asian, 8.5% Black or African American, 0.4% Indian or Alaskan Native, 0.1% Native Hawaiian or Pacific Islander, 1.0% identified with more than one race, 14.5% were unknown (Table 1). White patients made up more than 80% of enrollees in trials for ovarian, uterine, vulvar, and vaginal cancer, and 65.2% of enrollees in trials for cervical cancer (Table 1). Trials enrolling patients with cervical cancer reported enrollment of 9.0% Black or African American patients and 18.1% Hispanic patients. Trials enrolling patients with uterine cancer reported enrollment of 7.1% Black or African American patients and 5.8% Hispanic patients. Most patients enrolled in trials evaluating vulvar and vaginal cancer were exclusively non-Hispanic/Latino/a participants (97.6% and 97.5%, respectively). Asian participants had relatively higher representation in vulvar and vaginal cancer trials (14.0% for both). A subset of trials (14.0%) enrolled exclusively White participants, with zero non-White enrollees (Table 1). Over one-third of trials (34.1%) enrolled greater than 90% White participants. Black patients were enrolled in 119 (66.5%) trials. Patients categorized as "American Indian or Alaskan Native" or "Native Hawaiian or Pacific Islander" were represented in 17.9% and 7.3% of trials, respectively. Over half of trials (98 trials, 54.7%) included participants whose race was categorized as unknown.

With respect to ethnicity, this cohort of enrollees was comprised of 63.6% Non-Hispanic/Latino/a, 17.4% Hispanic/Latino/a, and 19.0% unknown patients (Table 1). Thirty-one percent of trials enrolled exclusively non-Hispanic/Latino/a patients, with zero Hispanic/Latino/a enrollees (Table 1).

Funding source

A total of 631 (33.5%) trials were industry funded, and 1,251 (66.5%) trials were non-industry funded. Of industry-funded trials, 91/631 (14.4%) report race and 41/631 (6.5%) report ethnicity. In contrast, for non-industry funded trials, 88/1,251 (7.0%) trials report race and 59/1,251 (5.1%) trials report ethnicity. Industry funded trials enrolled a higher percentage of White (68.4%) participants compared to non-industry funded trials (57.5%) (Table 2). Non-industry funded trials had substantially

Table 1 Reported race and ethnicity of enrollees in all gynecologic oncology trials ($n = 1,882$)

	Overall *n* (%)	Ovarian *n* (%)	Uterine *n* (%)	Cervix *n* (%)	Vulva *n* (%)	Vagina *n* (%)
Race not reported	665,612 (85.3)	107,714 (91.5)	51,535 (95.0)	540,148 (83.9)	16,071 (89.7)	15,984 (89.6)
Race reported	114,619 (14.7)	10,059 (8.5)	2,705 (5.0)	103,533 (16.1)	1,854 (10.3)	1,853 (10.4)
Ethnicity not reported	717,283 (91.9)	113,963 (96.8)	53,637 (98.9)	584,469 (90.8)	16,409 (91.5)	16,262 (91.2)
Ethnicity reported	62,948 (8.1)	3,810 (3.2)	603 (1.1)	59,212 (9.2)	1,516 (8.5)	1,575 (8.8)
Race (of those reported)						
White	76,696 (66.9)	8,411 (83.5)	2,185 (80.9)	67,519 (65.2)	1,542 (83.1)	1,538 (83.0)
Black/African American	9,720 (8.5)	286 (2.8)	193 (7.1)	9,324 (9.0)	22 (1.2)	27 (1.5)
Asian	9,820 (8.6)	913 (9.1)	93 (3.4)	8,907 (8.6)	260 (14.0)	260 (14.0)
American Indian/Alaskan Native	462 (0.4)	25 (0.3)	7 (0.3)	432 (0.4)	7 (0.4)	5 (0.3)
Native Hawaiian/Pacific Islander	130 (0.1)	12 (0.1)	4 (0.2)	117 (0.1)	1 (0.1)	1 (0.1)
More than one race	1,123 (1.0)	3 (0.03)	4 (0.2)	1,119 (1.1)	8 (0.4)	9 (0.5)
Unknown	16,668 (14.5)	409 (4.1)	219 (8.1)	16,115 (15.6)	14 (0.8)	12 (0.7)
Ethnicity (of those reported)						
Non-Hispanic	40,039 (63.6)	3,384 (88.8)	531 (88.1)	36,749 (62.1)	1,479 (97.6)	1,535 (97.5)
Hispanic	10,931 (17.4)	233 (6.1)	35 (5.8)	10,698 (18.1)	31 (2.0)	34 (2.2)
Unknown	11,978 (19.0)	178 (4.7)	37 (6.1)	11,783 (19.9)	6 (0.4)	6 (0.4)
Clinical trials enrolling 100% White participants (of reported)	25 (14.0)	22 (88.0)	2 (8.0)	4 (16.0)	0 (0)	0 (0)
Clinical trials enrolling 100% non-Hispanic participants (of reported)	31 (31.0)	23 (74.2)	4 (12.9)	8 (25.8)	2 (6.5)	2 (6.5)

Data are shown for the 179 trials reporting race and 100 trials reporting ethnicity according to cancer of origin between 1988 and 2019. The column sum may not equal 100.0% as all percentages were rounded to the first decimal point. The row may not equal 100.0% as some trials enrolled patients with multiple different gynecologic cancer sites

Table 2 Reported race and ethnicity of enrollees in all gynecologic oncology trials by funding source, location, and completed study status between 1999 and 2018

	Industry funded $n = 631$ trials	Non-industry funded $n = 1,251$ trials	Domestic $n = 1,071$ trials	International $n = 811$ trials	Completed $n = 1,480$ trials
Total trials per group reporting race	91	88	123	56	138
Race	*n* of enrollees (%)				
White	67,930 (68.4)	8,766 (57.5)	36,538 (58.1)	40,158 (77.7)	74,633 (66.8)
Black/African American	6,232 (6.3)	3,488 (22.9)	9,233 (14.7)	487 (0.9)	9,403 (8.4)
Asian	8,752 (8.8)	1,068 (7.0)	2,064 (3.3)	7,756 (15.0)	9,478 (8.5)
American Indian/Alaskan Native	217 (0.2)	245 (1.6)	433 (0.7)	29 (0.1)	442 (0.4)
Native Hawaiian/Pacific Islander	117 (0.1)	13 (0.1)	119 (0.2)	11 (0.02)	127 (0.1)
More than one race	361 (0.4)	762 (5.0)	920 (1.5)	203 (0.4)	1,123 (1.0)
Unknown	15,765 (15.9)	903 (5.9)	13,621 (21.6)	3,047 (5.9)	16,460 (14.7)
Total trials per group reporting ethnicity	41	59	81	19	76
Ethnicity (of those reported)	*n* of enrollees (%)				
Non-Hispanic	30,776 (60.6)	9,263 (76.2)	36,786 (61.9)	3,253 (91.3)	39,361 (63.3)
Hispanic	8,681 (17.1)	2,250 (18.5)	10,749 (18.1)	182 (5.1)	10,870 (17.5)
Unknown	11,342 (22.3)	636 (5.2)	11,849 (20.0)	129 (3.6)	11,906 (19.2)

The column sum may not equal 100.0% as all percentages were rounded to the first decimal point

lower rates of participants classified as unknown, with respect to reporting both race (5.9% vs. 15.9%) and ethnicity (5.2% vs. 22.3%) compared to industry funded trials.

Location type

There were 1,071 domestic trials and 811 international trials. Of domestic trials, 123/1,071 (11.5%) reported race and 81/1,071 (7.6%) reported ethnicity. Of international trials, 56/811 (6.9%) reported race and 19/811 (2.3%) reported ethnicity. Domestic trials enrolled fewer White participants than international trials (58.1% vs 77.7%). A higher proportion of Black participants (14.7% vs 0.9%) and a lower proportion of Asian participants (3.3% vs 15.0%) were enrolled in domestic trials compared to international trials, respectively. Non-Hispanic/Latino/a patients made up 61.9% of domestic and 91.3% of international trials, and Hispanic/Latino/a patients made up 18.1% of domestic and 5.1% of international trials. Domestic trials had a higher proportion of patients with unknown race and ethnicity at 21.6% and 20.0%, respectively, compared to international trials at 5.9% and 3.6%, respectively.

Study status

A total of 1,480 (78.6%) trials reported a study status of completed. Among completed trials, 138 (9.3%) reported race and 76 (5.1%) reported ethnicity (Table 2). The enrolled population by race and ethnicity was similar among completed trials in comparison to all trials as follows: 66.8% vs 66.9% White in completed vs. all trials, respectively; 8.4% vs. 8/5% Black or African American; 8.5% vs. 8.6% Asian; 63.3% vs. 66.9% Non-Hispanic/Latino/a. Similar proportions of race and ethnicity were unknown among both completed and all trials.

Trends over time

Reporting of race and ethnicity for enrollees in gynecologic oncology clinical trials increased between 2000 and 2018 (Fig. 2). For example, in 2000, 1/60 trials (1.7%) reported race and ethnicity; in 2006, 14/117 (12.0%) trials reported race and 5/117 (4.3%) reported ethnicity; and in 2018, 5/36 (13.9%) trials reported race and 4/36 (11.1%) reported ethnicity. Ethnicity was less frequently reported than race of clinical trial enrollees. The race and ethnicity of trial enrollees by year is outlined in Supplementary Tables 1 and 2. Of note, there were several years (2000–2003, 2005, 2017) when three or fewer trials reported any ethnicity data.

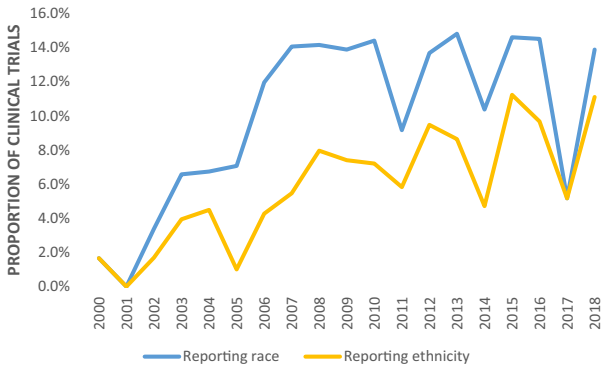

Fig. 2 Clinical trials enrolling patients with gynecologic malignancies reporting on race or ethnicity between 2000 and 2018 on ClinicalTrials.gov

Discussion

Less than 10% of gynecologic oncology clinical trials on ClinicalTrials.gov registered between 1988 and 2019 provide information on the race or ethnicity of participants. A sub-analysis of completed trials revealed similar race and ethnicity reporting results. Of the trials that report race and ethnicity, significant proportions of the participant race and ethnicity remain unknown. White patients make up greater than 80% of enrollees in trials for patients with ovarian, uterine, vulvar, and vaginal cancer. The majority of trials enrolling patients with vulvar and vaginal cancers enroll exclusively non-Hispanic/Latino/a patients. Trials for patients with cervical cancer contained the most diverse enrollees with 9.0% Black or African American patients and 18.1% Hispanic patients. Industry funded trials enroll a higher percentage of White participants than non-industry funded trials. Reporting of enrollee race and ethnicity appears to be improving with time.

Prior studies have established that reporting of race and ethnicity as well as diversity in clinical trials is poor. Racial and/or ethnic minorities are underrepresented in NCI-funded clinical trials [30–32]. A prior study on oncology specific clinical trials that led to FDA oncology drug approvals found that race was not reported in over one-third of trials. Among those that reported race and ethnicity, representation of Black and Hispanic patients was very low compared to the estimated US cancer population [33]. Similarly, a study on racial and ethnic representation in breast, lung, prostate, and colorectal cancer studies incorporating precision oncology objectives in the ClinicalTrials.gov registry demonstrated consistent overrepresentation of White participants and underrepresentation of Black and Hispanic participants. Over half of precision oncology studies did not report any information about race or ethnicity [34]. A study of published articles of gynecologic oncology phase 1 clinical trials from 1985 to 2018 revealed marked underrepresentation

of Black women. In addition, 77% of phase 1 trials did not report racial distribution of participants [35]. A retrospective study on completed clinical trials involving immunotherapy for breast and gynecologic cancers demonstrated that enrollment of Black women was 32-fold lower for ovarian, 19-fold lower for cervical, and 15-fold lower for uterine cancer than expected [35]. In our study, only 9.5% of studies reported race and 5.3% reported ethnicity.

These alarming statistics on underrepresentation of minority participants in clinical trials persist despite several initiatives by federal agencies to improve racial disparities in research. In 1993, the National Institutes of Health (NIH) Revitalization Act sought to ensure that women and minority populations were included in NIH-funded clinical research [36]. In 2012, the Food and Drug Administration (FDA) Administration Safety and Innovation Act prioritized enhanced reporting, participation and transparency of minorities in clinical trials [37]. In 2017, the NIH Policy and Guidelines on the Inclusion of Women and Minorities as Subjects in Clinical Research updated policies under the 1993 act to provide additional guidance on reporting race/ethnic differences in NIH phase III clinical trials [38]. Most recently, ASCO and the Association of Community Care Centers published a joint research statement about how to increase racial and ethnic diversity in clinical trials [27]. Despite these efforts, it is unclear how these recommendations are enforced and how these recommendations influence improvements in minority representation in clinical trials. For example, while NIH guidelines mandate racial representation in NIH-funded clinical research, industry funded trials most often lead to drug approvals [36, 38].

Clinical trials enrolling patients with the most common gynecologic malignancies (endometrial, ovarian, and cervical cancer) provide much of the evidence for clinical guidelines and standard of care treatment [39]. Therefore, the racial distribution of patients enrolled in clinical trials would ideally represent the population affected. In addition, despite improvements in cancer-directed therapy and survival for White women with gynecologic cancer, survival rates have worsened for Black women [12]. Thus, minority underrepresentation in clinical trials and worsening survival rates prompt an urgent unmet need for improving racial and ethnic minority representation in cancer clinical trials and appropriate reporting of race/ethnicity. The underlying barriers to minority representation in clinical trials are multifactorial. Among these are costs, transportation barriers, and differences in cultural perspectives [40]. Providers influence disparities with discriminatory behaviors, as well as differences in surgical experience and geography of practice [41]. Implicit bias may distort a provider's perceptions of patient eligibility, potential benefit of clinical trial enrollment, and administrative burden required to enroll more diverse patients. Minority patients may be disproportionally excluded due to co-morbidities and functional status requirements that are indirectly related to the therapy being evaluated. Racial and ethnic differences in distrust of physicians or hospital systems and low autonomy decision-making style can also contribute to disparities [42, 43].

The first step in addressing cancer care disparities involves transparency in reporting enrollment of racial and ethnic minorities in clinical trials among women with gynecologic cancers. Reporting of race and ethnicity should be required for all clinical trials. This data could be used to promote a standard table on race and ethnicity that could be included in all future trials. Second, we urge clinical trialists to develop and implement a plan for enhancing diversity and eliminating barriers for minorities' participation in clinical trials. Strategies include providing financial navigation support, evaluating the relevance of functional status criteria, hiring and retaining diverse clinical research staff, providing language accommodations, and developing patient recruitment strategies that promote minority participation. Leaders should be committed to regular evaluation of diversity in clinical trial enrollment and to providing adequate support for recruitment and retention of diverse patients in clinical trials [26]. Research workforce should be educated on cultural competence and implicit bias. Both the community and patients should be engaged and educated in a way that is culturally comprehensible such that individuals feel more empowered to participate in innovative care [44]. Online recruitment and effective outreach strategies can increase minority awareness and enrollment on cancer clinical trials [45, 46], perhaps at a lower cost than traditional enrollment methods [47].

Strengths of this study include its novelty as a comprehensive evaluation of racial and ethnic representation in clinical trial participants with gynecologic cancer and inclusion of the most common gynecologic cancer types. However, using a large clinical database such as ClinicalTrials.gov with incomplete information about systemic, provider, and patient factors may lead to selection bias. It is possible that differences in these parameters could account for a proportion of the observed disparities. In addition, the study is limited by the natural consequence of using a large database which lacks uniform reporting on a variety of factors that include race and ethnicity. Additionally, other variables such as co-morbid conditions, rates of prior surgery including hysterectomy and access to health care and testing are known to differ by race and ethnicity among patients with gynecologic cancers and may impact trial enrollment; however, this detail is not provided within the ClinicalTrial.gov database. While most trials ($n = 1{,}406$) were limited to patients with gynecologic cancer and thus contained only female enrollees, 476 trials contained other cancer types and included both male and female patients. Therefore, we recognize that the data is not entirely generalizable for our

specific population of interest. In addition, there are several years (2000–2003, 2005, 2017) when three or fewer trials reported any ethnicity data, limiting the interpretation our temporal trend data. In our cohort, there were very few studies on trials on vulvar and vaginal cancer, making the data more difficult to interpret. Despite these limitations, using ClinicalTrials.gov allows for evaluation of a large sample size over time.

In conclusion, participant race and ethnicity are notably underreported in gynecologic cancer clinical trials on ClinicalTrials.gov. While there have been slight improvements in reporting rates over time, improving gynecologic cancer-related disparities should remain a priority. In order to improve disparities among women with gynecologic cancers, we must require reporting of race and ethnicity for all clinical trials, identify barriers to enrolling underrepresented minority subjects, and implement strategies to improve clinical trial diversity.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s10552-022-01646-y.

Author contributions MKM: manuscript author, statistical analysis, data compilation. EPH: manuscript author, statistical analysis, data compilation. DS: ClinicalTrials.gov data search, abstraction and compilation, statistical analysis, manuscript review and editing. HK: statistical analysis, graphic creator. BP: data analyst, manuscript review and editing. ES: manuscript review and editing. SR: manuscript review and editing. TA: manuscript review and editing. RP: manuscript author, review and editing.

Funding Rebecca A. Previs is supported by grants from the NIH 1K12HD103083-01 and the Emerson Collective. Tomi Akinyemiju is supported by grant R37CA233777 from NIH/NCI.

Data availability The datasets generated during and/or analyzed during the current study are available upon request.

Declarations

Conflict of interest The authors have no conflicts to disclose.

References

1. Sibbald B, Roland M (1998) Understanding controlled trials. Why are randomised controlled trials important? BMJ 316(7126):201
2. Zarin DA, Califf RM (2021) Trial reporting and the clinical trials enterprise. JAMA Intern Med 181(8):1131–1132
3. Anderson ML, Peterson ED (2015) Compliance with results reporting at clinicaltrials.gov. N Engl J Med 372(24):2370–2371
4. Duma N et al (2018) Representation of minorities and women in oncology clinical trials: review of the past 14 years. J Oncol Pract 14(1):e1–e10
5. Murthy VH, Krumholz HM, Gross CP (2004) Participation in cancer clinical trials: race-, sex-, and age-based disparities. JAMA 291(22):2720–2726
6. Institute of Medicine Committee on, E. and S. Legal Issues Relating to the Inclusion of Women in Clinical (1991) In: Mastroianni AC, Faden R, Federman D (eds) Women and health research: ethical and legal issues of including women in clinical studies, vol I. National Academies Press, Washington
7. Knepper TC, McLeod HL (2018) When will clinical trials finally reflect diversity? Nature 557:157–159
8. Coakley M et al (2012) Dialogues on diversifying clinical trials: successful strategies for engaging women and minorities in clinical trials. J Womens Health 21(7):713–716
9. Allard JE, Maxwell GL (2009) Race disparities between black and white women in the incidence, treatment, and prognosis of endometrial cancer. Cancer Control 16(1):53–56
10. Bristow RE et al (2013) Disparities in ovarian cancer care quality and survival according to race and socioeconomic status. J Natl Cancer Inst 105(11):823–832
11. Collins Y et al (2014) Gynecologic cancer disparities: a report from the health disparities taskforce of the society of gynecologic oncology. Gynecol Oncol 133(2):353–361
12. Terplan M et al (2012) Have racial disparities in ovarian cancer increased over time? an analysis of SEER data. Gynecol Oncol 125(1):19–24
13. Giaquinto AN et al (2022) The changing landscape of gynecologic cancer mortality in the United States. Obstet Gynecol 139(3):440–442
14. Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Populations—Total U.S. (1969–2020) <Katrina/Rita Adjustment>—Linked To County Attributes—Total U.S., 1969–2020 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, released January 2022
15. Cote ML et al (2015) The growing burden of endometrial cancer: a major racial disparity affecting black women. Cancer Epidemiol Biomark Prev 24(9):1407–1415
16. Howlader N et al (2012) SEER Cancer Statistics Review, 1975–2009 (Vintage 2009 Populations) based on November 2011 SEER data submission, posted to the SEER web site. https://seer.cancer.gov/archive/csr/1975_2009_pops09/
17. Scalici J et al (2015) Minority participation in gynecologic oncology group (GOG) studies. Gynecol Oncol 138(2):441–444
18. Madison T et al (2004) Endometrial cancer: socioeconomic status and racial/ethnic differences in stage at diagnosis, treatment, and survival. Am J Public Health 94(12):2104–2111
19. Mundt AJ et al (1998) Race and clinical outcome in patients with carcinoma of the uterine cervix treated with radiation therapy. Gynecol Oncol 71(2):151–158
20. del Carmen MG et al (1999) Ethnic differences in patterns of care of stage 1A(1) and stage 1A(2) cervical cancer: a SEER database study. Gynecol Oncol 75(1):113–117
21. Islam JY et al (2021) Racial and ethnic disparities in palliative care utilization among gynecological cancer patients. Gynecol Oncol 160(2):469–476
22. Albain KS et al (2009) Racial disparities in cancer survival among randomized clinical trials patients of the Southwest oncology Group. J Natl Cancer Inst 101(14):984–992
23. Farley JH et al (2009) Race does not impact outcome for advanced ovarian cancer patients treated with cisplatin/paclitaxel: an analysis of gynecologic oncology group trials. Cancer 115(18):4210–4217
24. Winter WE 3rd et al (2007) Prognostic factors for stage III epithelial ovarian cancer: a gynecologic oncology group study. J Clin Oncol 25(24):3621–3627
25. Patel KB et al (2018) Participation in clinical trials may overcome health disparities in the treatment of advanced or recurrent epithelial ovarian cancer. Gynecol Oncol 149:4–5
26. Boulware LE et al (2022) Combating structural inequities - diversity, equity, and inclusion in clinical and translational research. N Engl J Med 386(3):201–203

27. Oyer RA et al (2022) Increasing racial and ethnic diversity in cancer clinical trials: an american society of clinical oncology and association of community cancer centers joint research statement. J Clin Oncol 40(19):2163–2171
28. Pierce L (2021) ASCO's commitment to addressing equity, diversity, and inclusion of black cancer patients and survivors. JCO Oncol Pract 17(5):255–257
29. Wagar MK et al (2022) Racial and ethnic enrollment disparities in clinical trials of poly(ADP-ribose) polymerase inhibitors for gynecologic cancers. Gynecol Oncol 165(1):49–52
30. Chen MS Jr et al (2014) Twenty years post-NIH Revitalization Act: enhancing minority participation in clinical trials (EMPaCT): laying the groundwork for improving minority clinical trial accrual: renewing the case for enhancing minority participation in cancer clinical trials. Cancer 120(Suppl 7):1091–1096
31. Parham G et al (1997) The National Cancer Data Base report on malignant epithelial ovarian carcinoma in African-American women. Cancer 80(4):816–826
32. Sateren WB et al (2002) How sociodemographics, presence of oncology specialists, and hospital cancer programs affect accrual to cancer treatment trials. J Clin Oncol 20(8):2109–2117
33. Loree JM et al (2019) Disparity of race reporting and representation in clinical trials leading to cancer drug approvals from 2008 to 2018. JAMA Oncol 5(10):e191870
34. Aldrighetti CM et al (2021) Racial and ethnic disparities among participants in precision oncology clinical studies. JAMA Netw Open 4(11):e2133205
35. Awad E et al (2020) Minority participation in phase 1 gynecologic oncology clinical trials: Three decades of inequity. Gynecol Oncol 157(3):729–732
36. Freedman LS et al (1995) Inclusion of women and minorities in clinical trials and the NIH Revitalization Act of 1993–the perspective of NIH clinical trialists. Control Clin Trials 16(5):277–285
37. FDA (2012) FDA Administration Safety and Innovation Act (FDASIA), Section 907 Action Plan. https://www.fda.gov/RegulatoryInformation/LawsEnforcedbyFDA/SignificantAmendmentstotheFDCAct/FDASIA/ucm389100.htm
38. NIH. *Policy and Guidelines on the Inclusion of Women and Minorities as Subjects in Clinical Research*. 2017. https://grants.nih.gov/grants/funding/women_min/guidelines.htm
39. Schilsky RL (2013) Publicly funded clinical trials and the future of cancer care. Oncologist 18(2):232–238
40. Ford JG et al (2008) Barriers to recruiting underrepresented populations to cancer clinical trials: a systematic review. Cancer 112(2):228–242
41. McGuire TG, Miranda J (2008) New evidence regarding racial and ethnic disparities in mental health: policy implications. Health Aff 27(2):393–403
42. Armstrong K et al (2007) Racial/ethnic differences in physician distrust in the United States. Am J Public Health 97(7):1283–1289
43. Katz SJ et al (2017) Treatment experiences of Latinas after diagnosis of breast cancer. Cancer 123(16):3022–3030
44. Williams S et al (2020) Strategies for overcoming disparities for patients with hematologic malignancies and for improving enrollment on clinical trials. Oncology 34(6):216–223
45. Markman M, Petersen J, Montgomery R (2008) An examination of the influence of patient race and ethnicity on expressed interest in learning about cancer clinical trials. J Cancer Res Clin Oncol 134(1):115–118
46. Rimel BJ et al (2015) A novel clinical trial recruitment strategy for women's cancer. Gynecol Oncol 138(2):445–448
47. Holmes DR et al (2012) Increasing minority patient participation in cancer clinical trials using oncology nurse navigation. Am J Surg 203(4):415–422