Race and ethnicity expression in reproductive endocrinology and infertility research studies compared with other obstetrics and gynecology subspecialty studies

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Objective: To compare the percentage of patients per race and ethnicity group in the most cited reproductive endocrinology and infertility studies with the most cited studies in 3 other obstetrics and gynecology (OBGYN) subspecialties: gynecologic oncology, urogynecology (URO), and maternal-fetal medicine.
Design: Retrospective cohort study.
Setting: Not applicable.
Patient(s): Patients previously recruited in research studies.
Intervention(s): None.
Main Outcome Measure(s): Expression of minorities in research studies.
Result(s): Individual searches were conducted for the most cited articles in OBGYN subspecialties until 50 studies met the inclusion criteria for each OBGYN subspecialty. A total of 29,821,148 patients were included and compared between subspecialty and US Census data. Reproductive endocrinology and infertility studies had the highest percentage of White patients (80.5%), although URO studies had fewer Black patients (6.6%) compared with other subspecialties. Reproductive endocrinology and infertility studies had the lowest percentage of Hispanic patients (4.9%), yet more Asian patients were present in URO studies (3.3%) than in other subspecialties. Gynecologic oncology studies were most likely to have missing data in race expression (19.3%). Comparing study types, retrospective studies had the highest percentage of White patients (61.9%), although randomized controlled trials had the lowest expression of Hispanic patients (8.8%).
Conclusion(s): Reproductive endocrinology and infertility studies featured the highest rates of White patients compared with other OBGYN subspecialty studies, although URO studies had the lowest rates of Black patients. Randomized controlled trials featured higher rates of White patients and lower levels of Hispanic patients compared with US Census data. (F S Rep® 2024;5:304–11. ©2024 by American Society for Reproductive Medicine.)
Key Words: Race, ethnicity, research

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Racial disparities, both in access to infertility care and in treatment outcomes, have been well documented within the United States. These disparities are related to socioeconomic status, racial and ethnic background, geographic location, sexual orientation, as well as other additional factors (1). People of middle to lower socioeconomic status and Black or Hispanic race as well as ethnicity are underrepresented in patients with

infertility undergoing treatment (1, 2). Lower socioeconomic status also leads to significant disadvantages when it comes to seeking infertility care, with a disproportionate impact on women of color compared with White women (3, 4). These disadvantages persist in states that mandate insurance coverage for infertility treatment (3, 5). Despite a higher prevalence of an infertility diagnosis among Black and Hispanic women (11.6% of Black women and 7.7% of Hispanic women, vs. 7.1% of White women), women of color are less likely to pursue infertility treatment (4, 6). In addition, minoritized populations are more likely to discontinue infertility treatment early compared with White women, regardless of insurance coverage (7).

Racial and/or ethnic minoritized women in the United States have been found also to have poorer infertility treatment outcomes, including a reduced live birth rate after in vitro fertilization (IVF) treatment (8). Despite this fact, several novel algorithms that aim to predict the success of ovulation induction or IVF treatment fail to include race and ethnicity in their respective models (9–11). Additionally, 2 large databases containing IVF treatment cycle data in the United States (National Assisted Reproductive Technologies Surveillance System and the Society of Assisted Reproductive Technology) are missing significant amounts of patient race as well as ethnicity data (8). There is also evidence that race and ethnicity are not included in several infertility algorithms; however, race as well as ethnicity are included in at least some gynecologic oncology responses to treatment algorithms (9–12).

Given the prevalence of infertility within racial and ethnic minoritized populations, the underserved nature of these populations, as well as the diminished success of infertility treatment for these patients, we sought to analyze the inclusion of racial and ethnic minorities in the frequently cited literature. The purpose of this study is to compare the percentage of patients of racial and ethnic minoritized groups in the most frequently cited reproductive endocrinology as well as infertility studies with the most frequently cited studies in 3 other obstetrics and gynecology (OBGYN) subspecialties: gynecologic oncology (ONC), urogynecology (URO), and maternal-fetal medicine (MFM). A secondary objective was to compare the percentage of patients of racial and ethnic minoritized groups to the general population of the United States as well as to compare race and ethnicity expression in the highest-cited studies and different types of studies in these OBGYN studies. We hypothesize that minoritized races and ethnic groups will be underrepresented in the reproductive endocrinology and infertility (REI) studies compared with the other OBGYN subspecialties.

MATERIALS AND METHODS

A retrospective analysis of the literature was conducted to identify OBGYN studies in the 10 years before the initiation of this investigation (2012–2022). A literature search was conducted to determine the most cited articles for each OBGYN subspecialty. For the purposes of this study, racial and/or ethnic "minorities" as well as "women of color" referred to non-White patients.

Search method and search terms

A librarian-mediated search of Web of Science was performed for each OBGYN subspecialty, filtering results to include only human studies in the United States in the previous 10 years (searches conducted in August 2023 subspecialties below) and excluding review articles. The Web of Science database was used as it is one of the most widely used and comprehensive citation resources (13). The "Times Cited" display indicates the total number of times a published article is cited by other articles in Web of Science indexes, dating from 1900 to August 7, 2023, and was used to select the highest viewed studies. This search was formatted to include the titles of the top 30 cited journals in OBGYN ranked using total citation average over the past 3 years (according to the Scimago Journal and Country Rank online tool) (Supplemental Table 1, available online), as well as the following high impact journals chosen as important by the investigator team: *Journal of the American Medical Association*, *New England Journal of Medicine*, *Lancet*, and *Journal of Medicine* (14). Results were limited to US studies only. Search results were sorted by highest number of citations, and a list was compiled for each subspecialty in sequential order. A board-eligible or certified physician subspecialist reviewed each list specific to their subspecialty. Minimally invasive gynecologic surgery and complex family planning research studies were not considered for inclusion in this study. Separate searches for each subspecialty were performed using the following terminology and search strategies:

- Gynecologic oncology: (TS = [oncol* OR neoplasm OR cancer] AND TS = [gynecolog* OR uterine OR cervical OR urogenital OR vaginal OR ovar* OR vulva]) OR TS = ([gestational trophoblastic neoplasia] NOT TS = [breast OR human papillomavirus OR HPV OR Papillomaviruses OR prostate OR colorectal OR rectal OR liver OR lung OR gastric OR Helicobacter pylori OR childhood OR leukemia OR bladder]).
- Maternal-fetal medicine: (maternal-fetal medicine OR maternal-fetal medicine OR materno-fetal medicine OR pregnancy complications OR labor complications OR high-risk obstetrics OR high-risk obstetrics OR high-risk pregnancy OR high-risk pregnancy OR preterm delivery OR preterm birth OR pre-eclampsia OR preeclampsia OR obstetric syndrome OR intrauterine growth restriction OR preterm premature rupture of membranes OR late spontaneous abortion OR stillbirth OR abruptio placentae OR small for gestational age OR large for gestational age).
- Reproductive endocrinology and infertility: TS = (infertility OR in vitro fertilization OR in vitro fertilization OR fertilization in vitro OR assisted reproduct* OR unexplained infertility*) NOT TS = ([male OR men OR man] OR [polycystic ovary or polycystic ovar*]).
- Uropgynecology: Urogynecolog* OR ([Pelvic floor OR Pelvic floor] AND [insufficiency OR dysfunction OR disorder]) OR ([Urinary Incontinence OR stress urinary incontinence

OR stress incontinence] AND [female OR women OR woman]) OR ([uterine OR pelvic organ OR cervical OR cervix OR vaginal wall OR vaginal vault] AND prolaps*) OR TS = (urogenital tract fistula OR retrovaginal fistula).

Criteria for inclusion or exclusion

The most cited articles were evaluated in sequential order (from most cited to least cited) by 5 investigators (A.R., K.R., S.C., L.S., and B.P.—two of these investigators checked each section) for inclusion. Studies were included if they were conducted primarily in the United States and listed the number of patients per race and ethnicity. Attention was made to include as many race or ethnicity categories as possible.

Raw data for patients were recorded (including missing race/ethnicity information) for each study. Studies were excluded when they were qualitative studies (review, meta-analysis, or case study/survey) in nature (n = 186); missing or incomplete racial data (n = 241); conducted >10 years ago from publication date (n = 1); were not specific to the subspecialty in question (n = 109—these included studies considered in more than one subspecialty); conducted primarily outside the United States (n = 131); primarily performed using animal or cadaveric data (n = 23); or appeared to use the same dataset as a previous study in a subspecialty cohort (n = 11) (Supplemental Fig. 1, available online).

Data selection, management and analysis

The total number of study participants and the number of participants per race and ethnicity were extracted. Fifty studies were included for each subspecialty, and data were added together per race and ethnicity group per total patient in the study. Data were compared for race and ethnicity groups (White, Black, Hispanic, Asian and Pacific Islander [PI], American Indian, mixed race/other, and unknown/missing) between cohorts of OBGYN subspecialties. Study participants were listed as unknown and missing when the study was transparent, as well as some patients' race and ethnicity were not recorded. When they were listed as non-White, mixed race, or other, these patients were categorized as mixed race and other for this analysis. This data were compared also with the US Census 2020 Demographic and Housing Characteristics File for Hispanic or Latino, and not Hispanic or Latino by race survey (15). The 2020 Demographic and Housing Characteristics File presents US data for all ages as well as presents it in total with all sexes included (no available census data was available for females only). Study type (randomized controlled trials [RCTs], prospective cohort studies, retrospective cohort studies, and others defined as cross-sectional studies or other qualitative studies not meeting exclusion criteria) was recorded and compared with the race as well as ethnicity groups above. Likewise, all included studies' citations were recorded. Secondary analyses were performed comparing RCT and prospective cohort studies per subspecialty to the distribution of race as well as ethnicity groups. Analysis of variance and χ^2 testing, using the total numbers of each cohort comparison, were used to determine differences in the expression of these race and ethnicity cohorts between OBGYN subspecialties as well as study types. Statistical analyses were performed with IBM SPSS Statistics for Windows (Version 29.0.2.0; IBM Corp, Armonk, NY).

RESULTS

Our search yielded 9,640 articles, which were sequentially reviewed for inclusion from highest to lowest citation number in each subspecialty. Nine hundred and two studies were sequentially reviewed until 50 studies in each subspecialty meeting study inclusion were reached (Supplemental Fig. 1). Full study titles for all studies and raw data for each study are included in Supplemental Tables 2–5. A description of the included studies, study type, and citation average are included in Table 1. Reproductive endocrinology and infertility and MFM had lower levels of randomized controlled trials compared with ONC as well as URO groups, and REI and URO groups had lower levels of citations per average.

Primary outcomes

A total of 29,821,148 patients were included in the analysis, including the following number of patients per subspecialty cohort (REI: 964,273; ONC: 2,037,027; MFM: 26,759,080; and URO: 60,768), and a US population was also compared with a total of 331,449,281 people. The full results for this comparison are listed in Table 2. All values are statistically different from each other ($P>.001$). Reproductive endocrinology and infertility studies included more White patients than other subspecialty studies as well as US data (REI: 80.5%, ONC: 60.9%, MFM: 57.5%, and URO: 71.0%, $P<.001$ between all groups, United States: 57.8% for comparison). Urogynecology studies included fewer Black patients compared with other OBGYN subspecialties and US data (URO: 6.6%, REI: 9.8%, ONC: 10.7%, MFM: 15.8%, $P<.001$ between all groups, and United States: 12.2% for comparison). Reproductive endocrinology and infertility studies had the fewest Hispanic patients (REI: 4.9%, ONC: 6.4%, MFM: 19.0%, URO: 17.1%, $P<.001$ between all groups, and United States: 18.7% for comparison), and ONC studies had fewer participating Asian as well as PI patients in their studies (ONC: 0.3%, REI: 1.2%, MFM: 2.8%, URO: 3.3%, $P<.001$ between all groups, and United States: 6.1% for comparison). Reproductive endocrinology and infertility studies were also more likely to have mixed race as well as other data regarding race and ethnicity in their studies (REI: 3.2%, ONC: 2.4%, MFM: 1.0%, URO: 1.2%, $P<.001$ between all groups, and United States: 12.8% for comparison). Data for Native Americans were limited but were most likely to be represented in MFM studies, although unknown and missing were most likely to be represented by ONC studies (Table 2).

Secondary outcomes

In addition, race and ethnicity expressions were compared with differing types of research studies. Retrospective cohort studies demonstrated the highest percentage of White patients (61.9% vs. 55.5% in RCTs, 49.3% for prospective cohorts, and 48.4% for others, $P<.001$). Randomized controlled trials and other study types had the lowest

TABLE 1

Study type and citation number differences between subspecialty studies included in the analysis.

Subspecialty	All studies	REI	ONC	MFM	URO
Study type					
RCT	44	8 (18.2)	15 (34.1)	6 (13.6)	15 (34.1)
Prospective cohort	34	9 (26.5)	5 (14.7)	13 (38.2)	7 (20.6)
Retrospective cohort	85	22 (25.9)	29 (34.1)	25 (29.4)	9 (10.6)
Other	37	11 (29.7)	1 (2.7)	6 (16.2)	19 (51.4)
Citation mean (±SD)		66.28 (56.23)[a]	165.42 (194.51)	172.28 (119.48)	71.04 (69.60)[b]
Interquartile range	84.5	32	74	47	56

Note: Data presented as numbers (percentages). The citation mean provided is up to date of search on July 8, 2023. MFM = maternal-fetal medicine; ONC = gynecologic oncology; RCT = randomized controlled trial; REI = reproductive endocrinology and infertility; URO = urogynecology.
[a] Significantly fewer citations in REI compared with ONC and MFM. $P<.05$.
[b] URO study citations are significantly lower than ONC only. $P<.05$.

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percentage of Black participants (13.8% and 13.7% vs. 18.2% and 15.9% for prospective cohort and retrospective cohort studies, $P<.001$). Randomized controlled trial studies had the lowest percentage of Hispanic participants (8.8% vs. 21.2%, 14.9%, and 24.6% in prospective cohort, retrospective cohort, and cross-sectional/other studies, $P<.001$). Asian participants were the most represented in RCT studies (11.0% vs. 5.8%, 0.8%, and 6.9% in a prospective cohort, retrospective cohort, and cross-sectional/other studies, $P<.001$). American Indian participants were lowly expressed in all study types except RCTs (11.6%), and mixed race and others were most expressed in cross-sectional as well as other studies. Unknown and missing were highest in retrospective cohort studies at 2% (Table 3).

When comparing race and ethnicity expression in RCT studies per subspecialty, URO studies had the highest percentage of White patients (82.1% vs. 75.0% in REI, 71.6% in ONC, and 37.9% in MFM studies, $P<.001$) (Fig. 1A). Gynecologic oncology studies had the highest expression of Black patients (14.1% vs 6.8% in REI, 29.8% in MFM, and 9.3% in URO, $P=.042$), although MFM studies had the highest expression of Hispanic patients (21.8% vs. 9.0% in REI, 3.2% in ONC, and 8.0% in URO, $P<.001$). Reproductive endocrinology and infertility RCTs had the highest expression of Asian as well as PI participants (7.0% vs. 5.3% in ONC, 4.5% in MFM, and 0.9% in URO RCTs), although this was not a significant finding ($P=.368$). Maternal-fetal medicine RCTs had the highest expression of American Indian participants (11.0%). There were no significant differences in RCT subspecialties among mixed races or missing data. In prospective cohort studies, ONC studies had the highest percentage of White patients (78.0% vs. 69.1% in REI, 45.1% in MFM, and 68.2% in URO studies, $P<.001$). There were no differences in the expression of Black, Hispanic, or Asian patients in subspecialty cohorts for prospective studies. Maternal-fetal medicine had the highest expression among American Indian participants (6.3%). Reproductive endocrinology and infertility studies had the highest mixed race or other race and ethnicity (9.8%, $P<.001$), although there were no differences in subspecialty cohorts for prospective studies for missing data (Fig. 1B).

TABLE 2

Distribution of race and ethnicity expression in most cited articles in all obstetrics and gynecology subspecialties studies.

Race/ethnicity group	OBGYN studies total	REI	GYN ONC	MFM	URO GYN	*P* value[a]	US census data (% only)
Total research population	29,821,148	964,273	2,037,027	26,759,080	60,768	—	—
White	17,401,120 (58.4)	776,451 (80.5)	1,202,568 (60.9)	15,378,931 (57.5)	43,170 (71.0)	<.001	57.8
Black	4,556,559 (15.3)	94,222 (9.8)	218,962 (10.7)	4,239,393 (15.8)	3,982 (6.6)	<.001	12.2
Hispanic	5,276,642 (17.7)	47,009 (4.9)	129,820 (6.4)	5,089,413 (19.0)	10,400 (17.1)	<.001	18.7
Asian/PI	767,933 (2.6)	11,272 (1.2)	5,849 (0.3)	748,825 (2.8)	1,987 (3.3)	<.001	6.1
American Indian	1,018,136 (3.4)	17 (<0.1)	35 (<0.1)	1,017,998 (3.8)	86 (0.1)	<.001	0.7
Mixed race/other	341,084 (1.1)	30,687 (3.2)	48,055 (2.4)	261,615 (1.0)	727 (1.2)	<.001	12.8
Unknown/missing	394,216 (1.3)	142 (<0.01)	393,581 (19.3)	0	493 (<0.01)	<.001	—

Note: GYN ONC = gynecologic oncology; MFM = maternal-fetal medicine; OBGYN = obstetrics and gynecology; PI = Pacific Islander; REI = reproductive endocrinology and infertility; URO GYN = urogynecology; US = United States.
[a] All values statistically significant between each value in each row.

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TABLE 3

Distribution of race and ethnicity expression in study types in most cited articles in all obstetrics and gynecology subspecialties studies.

Race/ethnicity group	OBGYN studies total	RCT (N = 44)	Prospective cohort (N = 34)	Retrospective cohort (N = 85)	Other (N = 37)	*P* value[a]
Total research population	29,821,148	52,047	162,607	21,087,141	8,519,353	<.001
White	17,413,981 (57.7)	28,883 (55.5)	80,146 (49.3)	13,182,010 (61.9)	4,122,942 (48.4)	<.001
Black	4,556,946 (15.4)	7,148 (13.8)	29,575 (18.2)	3,351,629 (15.9)	1,168,594 (13.7)	<.001
Hispanic	5,276,642 (18.1)	4,593 (8.8)	34,467 (21.2)	3,143,433 (14.9)	2,094,149 (24.6)	<.001
Asian/PI	772,746 (2.7)	5,735 (11.0)	9,449 (5.8)	172,097 (0.8)	585,465 (6.9)	<.001
American Indian	1,023,264 (3.5)	6,016 (11.6)	7,066 (4.3)	699,011 (3.3)	311,082 (3.7)	<.001
Mixed race/other	341,084 (1.1)	748 (1.4)	1,821 (1.1)	101,761 (0.4)	236,754 (2.8)	<.001
Unknown/missing	394,216 (1.4)	624 (1.2)	36 (<0.1)	393,222 (1.9)	334 (<0.01)	<.001

Note: OBGYN = obstetrics and gynecology; PI = Pacific Islander; RCT = randomized controlled trial.
[a] All values are statistically significant between each value in each row.

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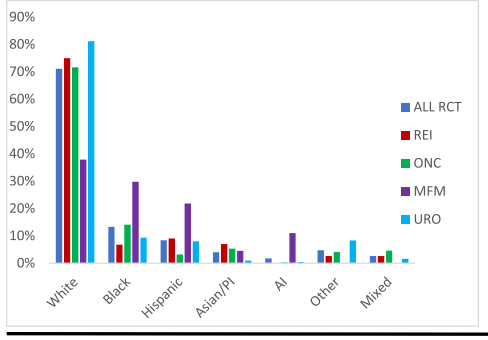
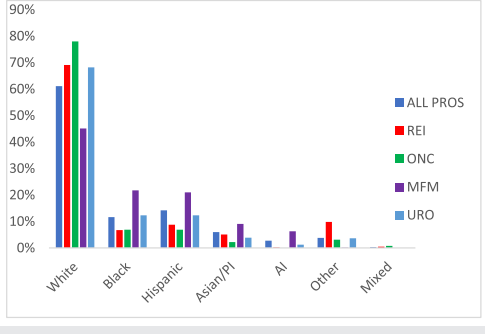
DISCUSSION

In this review of the most cited studies in OBGYN literature over the last 10 years, this study illustrates the lack of inclusion of representative percentages of patients of minoritized racial and ethnic groups within OBGYN subspecialties compared with US Census data. All subspecialty studies demonstrated race and ethnicity expression was not comparative to US Census data, but it is concerning that REI studies included increased White patients and decreased Black and Hispanic patients compared with 2 or 3 of the other OBGYN subspecialties. We noted that ONC research included the fewest number of Asian patients, although MFM studies included the highest percentage of Black patients. Research study type also demonstrated a trend with racial and ethnicity study expression because in RCTs, URO and REI had the highest number of White participants as well as a lower number of

FIGURE 1



		ALL RCT	REI	ONC	MFM	URO	*P value*
Total Research Population	52,047						
White	28,883	71.1%	75.0%	71.6%	37.9%	81.2%	<0.001
Black	7,148	13.3%	6.8%	14.1%	29.8%	9.3%	0.042
Hispanic	4,593	8.4%	9.0%	3.2%	21.8%	8.0%	<0.001
Asian/PI	5,735	4.0%	7.0%	5.3%	4.5%	0.9%	0.368
American Indian	6,016	1.7%	0.0%	0.3%	11.0%	0.4%	<0.001
Mixed Race/Other	748	4.7%	2.6%	4.1%	0.0%	8.3%	0.580
Unknown/Missing	624	2.6%	2.6%	4.6%	0.0%	1.6%	0.369



		ALL PROS	REI	ONC	MFM	URO	*P value*
Total Research Population	162,607						
White	80,146	61.1%	69.1%	78.0%	45.1%	68.2%	<0.001
Black	29,575	11.6%	6.7%	6.9%	21.7%	12.3%	0.113
Hispanic	34,467	14.2%	8.8%	6.9%	21.%	12.3%	0.210
Asian/PI	9,449	6.0%	5.1%	2.2%	9.1%	3.9%	0.257
American Indian	7,066	2.7%	0.2%	0.0%	6.3%	1.2%	0.020
Mixed Race/Other	1,821	3.8%	9.8%	3.1%	0.1%	3.6%	<0.001
Unknown/Missing	36	0.3%	0.5%	0.8%	0.0%	0.0%	0.254

(**A**) Expression of race and ethnicity in randomized controlled trials in each obstetrics and gynecology (OBGYN) subspecialties with tabular raw data. (**B**) Expression of race and ethnicity in prospective cohort studies in each OBGYN subspecialties with tabular raw data. MFM = maternal-fetal medicine; ONC = gynecologic oncology; PROS = prospective; RCT = randomized controlled trial; REI = reproductive endocrinology and infertility; URO = urogynecology.

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Black participants. It should be also highlighted here that 131 studies were excluded from our REI literature search because of missing or incomplete race and ethnicity data, including 17 RCTs. This pales in comparison to 110 studies for all other subspecialties combined, which were excluded because of missing race and ethnicity data.

Although all subspecialties had lower minoritized women expression in research studies, it is concerning that REI studies had the highest White patient expression and lower Black, Hispanic, Asian, American Indian, and mixed race and ethnicity expression when compared with the US population. It has been well-described in recent years that Black and Hispanic women have less access to and utilization of fertility care in the United States (16). Barriers that may exist in prohibiting access to fertility care for these patients may include the impact of systemic racism, financial limitations, lack of insurance coverage, geographical access, education, and social stigmas, including distrust (17–19). Studies have been performed recently to address some of these barriers. A recent study conducted a low-cost IVF program in a county hospital setting, enrolling nearly 90% of patients with an immigrant origin, demonstrating that increasing access increases care for minoritized groups (20). A recent report also suggested that prioritizing pipeline programs to increase the number of minority students who become reproductive medicine physicians may in turn lead to minimized bias and mistrust among these groups (21). As research studies in REI are comprised of the patients who present for care and undergo treatment, interventions such as these are needed to continue to increase access as well as utilization of care for minoritized populations before research in REI will likely reflect higher minoritized patient groups.

Because further research suggests not only differences in infertility diagnoses between racial groups (Black, White) but also within specific ethnic groups (i.e., Black, compared with Haitian, Black American, African), a more diverse research population is needed to understand further differences and treatment algorithms (22). As medicine as a whole seeks to implement personalized medicine for the treatment of various conditions, newer REI studies evaluating treatments for ovulation induction and in vitro fertilization techniques should seek to ensure including a diverse cohort of race and ethnicity groups (23). Secondary findings for subspecialties outside of REI may be explained by differences in specific patient populations and the nature of our study design. Many of the most cited articles within ONC literature pertained to endometrial cancer (n = 13). These pathologies have decreased incidence in Asian populations compared with non-Hispanic White and non-Hispanic Black patients, which may account for the very low expression of Asian patients in this data set (24). Urogynecology studies included the smallest percentage of Black women. In a retrospective cohort study analyzing National Surgical Quality Improvement data from 2005–2015, only 4.7% of women undergoing pelvic organ prolapse surgery were categorized as Black and were less likely to undergo an apical suspension procedure (25). In another retrospective study of women presenting to primary care offices at a single institution for urinary incontinence over a 5-year period, only 7.9% of the population analyzed was Black, although Black patients had an increase of 36% in the odds of being diagnosed with pelvic floor dysfunction (26). Maternal-fetal medicine studies had the highest proportion of Black patients, possibly explained by the racial and ethnic disparities seen in obstetric care. Black patients are more likely to have fetal demise, preterm birth, fetal growth restriction, maternal mortality, and hypertensive disorders of pregnancy; these conditions comprise most MFM studies (27).

It is evident that the cause of the expression of minoritized groups in research does not fall on the patients alone, because there is evidence of researchers and institutions as self-identifying barriers. The perspectives of cancer researchers at 5 US cancer centers were revealed via interviews in a recent publication, and they identified themes surrounding recruiting of minoritized groups, nonspecific recruitment strategies, and poor access to clinical trials for minoritized patients (28). It is also clear that clinical trials have increased demand on patients (increased visits, more laboratory draws, and others), which may play specifically on the financial implications of being away from employment or home for these patients (29). One study in Parkinson research outlined several of these barriers but developed specific mitigation strategies to include minoritized groups (institutional goals, community outreach, delivery of material via print or other media, reimbursement for travel, and others) (30). Similar strategies should be highly sought after in each OBGYN subspeciality to address the concerning lack of these groups in research studies.

Although strengthening the reporting of observational studies in epidemiology and consolidated standards of reporting trials guidelines detail demographic descriptions of participants in studies, there is a need to update these guidelines to mandate race and ethnicity descriptions of participants (31, 32). Similarly, we call on journal editor teams to suggest this inclusion as part of their investigator guidelines.

Our study has several limitations. First, we only included studies published within the last 10 years by including the most cited studies. Limited studies to 10 years or less of publication may have limited possible citations, especially for those studies published in the last 2–3 years. Nevertheless, we felt including articles written >10 years ago would not provide a current picture of the race and ethnicity distribution; therefore, we limited it to the past 10 years. In addition, the studies included were from patients with the most highly studied pathologies within these specialties, which may be more prevalent in specific populations. A further limitation of our study was an inability to compare the race and ethnicity distribution in these pathologies because of several pathologies present in these 200 included studies. Additionally, our study is limited by the number of patients with race or ethnicity identified as "other." The high number of MFM study participants also is a limitation, as several large

population cohort studies from large healthcare systems or multistate registries were present in these studies. Limiting this study to a specific number per study may have changed the outcomes, but we felt this would have reduced the citations per study, so we did not limit the numbers. Finally, our study is greatly limited by the high volume of missing data in the studies excluded. This limitation makes it possible that the findings of our study are not completely accurate. Strengths of this study include the novel study design and rigorous study review, which meticulously included only studies meeting inclusion criteria. Our study is also strengthened by the large number of patients included, allowing our data to be more readily compared with the general population.

Improving the representation of minoritized populations in research studies is a major goal in academic and clinical medicine and has been identified by national organizations as a top priority. This study illustrates the lack of inclusion of representative percentages of patients of minoritized racial and ethnic groups in all OBGYN subspecialty research but focuses on REI research. Patients of racial and ethnic minoritized groups have higher rates of infertility as well as poorer fertility treatment outcomes (when compared with White women), yet they are not represented appropriately in the most cited research articles in this field. It is imperative for REI as a subspecialty to study methods of eliminating barriers to infertility care, as well as to increase the representation of minoritized patients in research studies. Our collective goal should center on determining the best possible infertility therapies for each race and ethnicity.

CRediT AUTHORSHIP CONTRIBUTION STATEME

Anne Roshong: Writing Original Draft- Review and Editing, Data Curation; Kendal Rosalik: Writing Original Draft, Data Curation; Samantha Carson: Data Curation; Laura Spilman: Data Curation; Jacqueline Luizzi: Conceptualization; Data Curation; Torie Plowden: Writing Review and Editing: Bruce Pier: Conceptualization, Formal Analysis, Writing- Review and Editing, Data Curation, Supervision.

Declaration of Interests

A.R. has nothing to disclose. K.R. has nothing to disclose. S.C. has nothing to disclose. L.S. has nothing to disclose. J.L. has nothing to disclose. T.P. has nothing to disclose. B.D.P. has nothing to disclose.

REFERENCES

1. Ethics Committee of the American Society for Reproductive Medicine. Electronic address:. Disparities in access to effective treatment for infertility in the United States: an Ethics Committee opinion. Fertil Steril 2021;116:54–63, asrm@asrm.org.
2. Chandra A, Copen CE, Stephen EH. Infertility and impaired fecundity in the United States, 1982-2010: data from the National Survey of Family Growth. Natl Health Stat Report 2013:1–19.
3. Galic I, Negris O, Warren C, Brown D, Bozen A, Jain T. Disparities in access to fertility care: who's in and who's out. F S Rep 2020;2:109–17.
4. Merkison JM, Chada AR, Marsidi AM, Spencer JB. Racial and ethnic disparities in assisted reproductive technology: a systematic review. Fertil Steril 2023;119:341–7.
5. Ebeh DN, Jahanfar S. Association between maternal race and the use of assisted reproductive technology in the USA. SN Compr Clin Med 2021;3:1106–14.
6. Snow M, Vranich TM, Perin J, Trent M. Estimates of infertility in the United States: 1995-2019. Fertil Steril 2022;118:560–7.
7. Bedrick BS, Anderson K, Broughton DE, Hamilton B, Jungheim ES. Factors associated with early in vitro fertilization treatment discontinuation. Fertil Steril 2019;112:105–11.
8. Baker VL, Luke B, Brown MB, Alvero R, Frattarelli JL, Usadi R, et al. Multivariate analysis of factors affecting probability of pregnancy and live birth with in vitro fertilization: an analysis of the Society for Assisted Reproductive Technology Clinic Outcomes Reporting System. Fertil Steril 2010;94:1410–6.
9. Luke B, Brown MB, Wantman E, Stern JE, Baker VL, Widra E, et al. A prediction model for live birth and multiple births within the first three cycles of assisted reproductive technology. Fertil Steril 2014;102:744–52.
10. Luke B, Brown MB, Wantman E, Stern JE, Baker VL, Widra E, et al. Application of a validated prediction model for in vitro fertilization: comparison of live birth rates and multiple birth rates with 1 embryo transferred over 2 cycles vs 2 embryos in 1 cycle. Am J Obstet Gynecol 2015;212:676.e1–7.
11. Souter I, Sun F, Zhang H, Diamond MP, Legro RS, Wild RA, et al. A personalized medicine approach to ovulation induction/ovarian stimulation: development of a predictive model and online calculator from level-I evidence. Fertil Steril 2022;117:408–18.
12. Rose PG, Java J, Whitney CW, Stehman FB, Lanciano R, Thomas GM, et al. Nomograms predicting progression-free survival, overall survival, and pelvic recurrence in locally advanced cervical cancer developed from an analysis of identifiable prognostic factors in patients from NRG oncology/gynecologic oncology group randomized trials of chemoradiotherapy. J Clin Oncol 2015;33:2136–42.
13. Clarivate. Web of science: times cited accessibility and variation. Web of Science. Available at: https://support.clarivate.com/ScientificandAcademicResearch/s/article/Web-of-Science-Times-Cited-accessibility-and-variation?language=en_US. Accessed March 31, 2023.
14. Scimago. Journal rankings. Scimago Journal & Country Rank. Available at: https://www.scimagojr.com/journalrank.php?category=2729. Accessed August 22, 2023.
15. CENSUS. Hispanic or Latino, and not Hispanic or Latino by race. United States Census. Available at: https://data.census.gov/table?q=DECENNIALDHC2020.P9&d=DEC+Demographic+and+Housing+Characteristics&tid=DECENNIALDHC2020.P9. Accessed August 22, 2023.
16. Beroukhim G, Mahabamunuge J, Pal L. Racial disparities in access to reproductive health and fertility care in the United States. Curr Opin Obstet Gynecol 2022;34:138–46.
17. Portugal A, Kosturakis AK, Onyewuenyi TL, Rivera-Cruz G, Jimenez PT. Breaking down barriers: advancing toward health equity in fertility care for black and Hispanic patients. Obstet Gynecol Clin North Am 2023;50:735–46.
18. Peterson MM. Assisted reproductive technologies and equity of access issues. J Med Ethics 2005;31:280–5.
19. Armstrong A, Plowden TC. Ethnicity and assisted reproductive technologies. Clin Pract (Lond) 2012;9:651–8.
20. Herndon CN, Anaya Y, Noel M, Cakmak H, Cedars MI. Outcomes from a university-based low-cost in vitro fertilization program providing access to care for a low-resource socioculturally diverse urban community. Fertil Steril 2017;108:642–9.e4.
21. Richard-Davis G. The pipeline problem: barriers to access of Black patients and providers in reproductive medicine. Fertil Steril 2021;116:292–5.
22. Kelley AS, Qin Y, Marsh EE, Dupree JM. Disparities in accessing infertility care in the United States: results from the National Health and Nutrition Examination Survey, 2013-16. Fertil Steril 2019;112:562–8.
23. Goetz LH, Schork NJ. Personalized medicine: motivation, challenges, and progress. Fertil Steril 2018;109:952–63.

24. Siegel RL, Miller KD, Fuchs HE, Jemal A. Cancer statistics, 2021. CA Cancer J Clin 2021;71:7–33.
25. Cardenas-Trowers OO, Gaskins JT, Francis SL. Association of patient race with type of pelvic organ prolapse surgery performed and adverse events. Female Pelvic Med Reconstr Surg 2021;27:595–601.
26. Kenne KA, Wendt L, Brooks Jackson J. Prevalence of pelvic floor disorders in adult women being seen in a primary care setting and associated risk factors. Sci Rep 2022;12:9878.
27. Minehart RD, Bryant AS, Jackson J, Daly JL. Racial/ethnic inequities in pregnancy-related morbidity and mortality. Obstet Gynecol Clin North Am 2021;48:31–51.
28. Niranjan SJ, Wenzel JA, Martin MY, Fouad MN, Vickers SM, Konety BR, et al. Perceived institutional barriers among clinical and research professionals: minority participation in oncology clinical trials. JCO Oncol Pract 2021;17:e666–75.
29. Nipp RD, Hong K, Paskett ED. Overcoming barriers to clinical trial enrollment. Am Soc Clin Oncol Educ Book 2019;39:105–14.
30. Vaswani PA, Tropea TF, Dahodwala N. Overcoming barriers to Parkinson disease trial participation: increasing diversity and novel designs for recruitment and retention. Neurotherapeutics 2020;17:1724–35.
31. Butcher NJ, Monsour A, Mew EJ, Chan AW, Moher D, Mayo-Wilson E, et al. Guidelines for reporting outcomes in trial reports: the CONSORT-outcomes 2022 Extension. J Am Med Assoc 2022;328:2252–64.
32. von Elm E, Altman DG, Egger M, Pocock SJ, Gotzsche PC, Vandenbroucke JP, et al. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. Lancet 2007;370:1453–7.