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Racial/Ethnic Differences in the Utilization of Infertility Services: A Focus on American Indian/Alaska Natives

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Abstract

Objectives Previous studies have identified racial/ethnic disparities in infertility care, but patterns among American Indian/Alaska Natives (AI/AN) have not been reported. Our objective was to evaluate infertility services use in the US by race/ethnicity using data from the National Survey of Family Growth (NSFG). *Methods* We analyzed female respondent data from the pooled NSFG cycles 2002, 2006–2010 and 2011–2013. Respondents reported use of infertility services and types of services. We calculated weighted crude and adjusted prevalence proportion ratios (PPR) and 95% confidence intervals (95% CI) using modified Poisson regression with robust error variances accounting for the complex survey design to compare infertility services use across race/ethnicities. *Results* Overall, 8.7% of women reported using medical services to get pregnant. The prevalence of using any medical service to help get pregnant was lower for American Indian/Alaska Native (AI/AN) (PPR: 0.60, 95% CI 0.43–0.83) and black (PPR: 0.53, 95% CI 0.44–0.63) compared to white women and in Hispanic compared to non-Hispanic women (PPR: 0.57, 95% CI 0.48–0.67). The prevalence of accessing treatment, testing, and advice also differed by race and ethnicity. *Conclusions for Practice* We observed disparities in accessing services to get pregnant among AI/AN and black women and reduced use of advice among Asian/Pacific Islanders compared to whites. We also observed reduced service utilization for Hispanic compared to non-Hispanic women. Differential utilization of specific services suggests barriers to infertility care may contribute to reproductive health disparities among underserved populations.

Keywords Infertility · Services · Race · Ethnicity · Indians, North American

Significance

Access to infertility services is a public health priority, according to the Centers for Disease Control and Prevention (CDC), and disparities exist for racial/ethnic minorities in utilization of infertility services. We observed disparities in accessing services to get pregnant among American Indian/Alaska Native, black, and Hispanic women. These results suggest barriers to infertility care may contribute to reproductive health disparities among underserved populations.

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Objectives

Access to infertility services is a public health priority, according to the Centers for Disease Control and Prevention (CDC), and disparities exist for racial/ethnic minorities in utilization of infertility services (Butts and Seifer 2010; Centers for Disease Control and Prevention 2014; Chin et al. 2015; Feinberg et al. 2006; Inhorn and Fakih 2006; McCarthy-Keith et al. 2010). The 2006–2010 National Survey of Family Growth (NSFG) reported that 8.7% of respondents had ever used medical help to get pregnant, but fewer Hispanics and non-Hispanic blacks reported using help to get pregnant compared to non-Hispanic whites (Chandra et al.

2014). However, American Indian/Alaska Native (AI/AN) women were not assessed. The 2012 Agency for Healthcare Research and Quality National Healthcare Disparities Report found that AI/ANs had poorer quality of care and worse access to care than whites across a broad set of measures, although infertility services were not specifically addressed (Agency for Healthcare Research and Quality & U.S. Department of Health and Human Services 2013). Studies indicate that those who utilize infertility services are more likely to be older, highly educated, married, non-Hispanic whites compared to those who do not utilize these services (Chandra et al. 2013; Greil et al. 2014; Nachtigall 2006; Staniec and Webb 2007). These disparities in infertility service utilization may be attributed to the cost of care and lack of health insurance for affordable diagnostic testing and treatment (Smith et al. 2011). Thus, barriers to infertility care may disproportionately affect underserved populations, but no study to date has reported on the prevalence of infertility service use in AI/AN populations.

Prevention of reproductive health disparities requires monitoring race-specific infertility prevalence, treatment patterns and related risk factors to identify, guide, implement and monitor effective public health action strategies to safeguard reproductive health (Centers for Disease Control and Prevention 2014). This study addresses this need by evaluating racial/ethnic disparities in infertility service use in a nationally representative sample, providing the first assessment to include the AI/AN population.

Methods

Study Design and Population

We conducted a secondary analysis of cross-sectional data from the NSFG to examine racial/ethnic variation in the utilization of infertility services, with emphasis on the AI/AN population (Centers for Disease Control & Prevention 2015). The NSFG is a national survey conducted by the CDC's National Center for Health Statistics and the only US population-based survey on infertility and receipt of infertility services (Lepkowski et al. 2006, 2010). Informed consent was obtain for all participants (Centers for Disease Control & Prevention 2015). The NSFG survey cycles 2002, 2006–2010 and 2011–2013 gathered information on pregnancy, infertility, health status and health services among men and women aged 15–44 years. Respondent selection was based on nationally representative, multistage area probability samples from areas across the United States (Lepkowski et al. 2006, 2010). For this analysis, we included female respondent data from the pooled NSFG data given that the female questions provide greater detail on types of medical services to achieve pregnancy and are generally regarded as less prone to reporting errors than men (Chandra et al. 2013).

Race and Ethnicity

The NSFG assessed race, ethnicity, and other covariates through self-report. The NSFG allowed respondents to select up to four races but were asked which one race best described them, which we used to define race in this analysis. Racial groups were categorized as (1) AI/AN; (2) Asian, Native Hawaiian or Pacific Islander (Asian/PI); (3) black and (4) white. Ethnicity was assessed separately as Hispanic or non-Hispanic (NH). Because race data for AI/ANs and Asian/PIs are restricted from public access by NSFG, we accessed data through the National Center for Health Statistics Research Data Center. Because of the restricted status of the detailed racial information, protections to avoid disclosure prevented the use of combined race/ethnicity classifications in these analyses (e.g., non-Hispanic white, etc.).

Outcome Measures of Infertility Service Use

In the selected survey cycles, the NSFG asked two types of infertility services questions addressing whether the respondent or her partner: (1) ever used any medical help to get pregnant, which excludes those seeking medical help to prevent miscarriage, and (2) ever used infertility services, which includes help to get pregnant and help to prevent miscarriage (Chandra et al. 2014). Questions regarding use of any medical services to help get pregnant or any infertility services were asked of all women if they reported having sexual intercourse with a male and were 18 years of age or older at the time of the interview, regardless of fertility problems. Specific types of services were only asked of women who reported any use of medical help to get pregnant. Due to small sample sizes for specific types of services within race and ethnicity groups, we analyzed three categories of infertility services: treatment, testing, and advice. Treatment included drugs to improve ovulation, surgery to correct blocked tubes, artificial insemination, in vitro fertilization or other assisted reproduction, and surgery for endometriosis or fibroids. Testing included infertility testing on either the female respondent or her partner. Advice was a separate service option provided on the original NSFG survey and was not further defined.

Covariates

Demographic covariates obtained from the survey included age at interview, marital status, income, poverty, education, metropolitan residence, religion, current insurance and body mass index. Covariates addressing reproductive history included parity, history of treatment for pelvic inflammatory

disease, gynecologic problems, and fecundity. Gynecologic problems were defined as the presence of ovulation problems, uterine fibroids, or endometriosis. Fecundity was classified as surgically sterile, impaired fecundity (i.e., impossible or difficult to carry a baby to term or ≥ 3 year interval without conception when married or cohabiting and not using contraception), or fecund.

Statistical Analysis

We compared prevalence of infertility services use by race and ethnicity and other demographic covariates by calculating weighted prevalence proportions and 95% confidence intervals (CI) accounting for the complex sampling of the NSFG and imputation of missing values (Lepkowski et al. 2006, 2010). To determine if there were statistically significant differences in the demographic covariates by use of services, we used weighted Chi-Square tests. The prevalence of services use was compared across race/ethnicity groups using modified Poisson regression with robust error variance accounting for the complex survey design (Hale et al. 2013). We estimated weighted prevalence proportion ratios (PPR) and 95% CIs controlling for covariates of interest. Our analyses examined several measures of service utilization: (1) the NSFG constructed variable reflecting ever use of medical help to get pregnant, (2) specific types of services among women who ever used medical services to help get pregnant, (3) ever use of medical help to get pregnant restricted to infertile women, and (4) ever use of infertility services. The NSFG defined infertility as greater than 12 months of intercourse without pregnancy among married or cohabiting respondents in a continuous relationship for 12 months or more with no use of contraception (Chandra et al. 2013).

We controlled our multivariable models for age at interview, marital status, income, poverty, education, metropolitan status, history of treatment for pelvic inflammatory disease, gynecologic problems, religion, parity, current insurance, body mass index, and fecundity. This study was reviewed by the Institutional Review Board at the University of Oklahoma Health Sciences Center.

Results

In the NSFG survey cycles 2002, 2006–2010, and 2011–2013 combined, 8.7% (95% CI 8.1–9.3, n = 1824) of women used any medical help to get pregnant (Table 1). We observed statistically significant differences in the distribution of all demographic factors between those who have and have not ever used any medical help to get pregnant, with the exception of metropolitan status. Women using any medical help to get pregnant had an older age distribution compared to those not utilizing care. In addition, women who used

any medical help to get pregnant were more likely to be married to a person of the opposite sex, have 16 or more years of education, have private insurance, lower poverty, and higher income. There was also a higher percentage of women reporting gynecologic problems and impaired fecundity among those using any medical help to get pregnant compared to those who did not.

The race-specific prevalence of using medical help to get pregnant was lower among AI/ANs [5.8% (95% CI 3.9–7.7)] and blacks [5.1% (95% CI 4.2–5.9)] compared to whites [9.6% (95% CI 8.9–10.4)], with Asian/PIs [9.9% (95% CI 6.6–13.1)] similar to whites (Table 2). Thus, when compared to white women, 40% fewer AI/AN women (PPR: 0.60, 95% CI 0.43–0.83) and 47% fewer black women (PPR: 0.53, 95% CI 0.44–0.63) utilized care. When adjusted for demographic and reproductive characteristics, differences in the use of medical help to get pregnant were no longer observed between AI/AN and white women (PPR: 1.04, 95% CI 0.81–1.34). In contrast, disparities between blacks and whites remained after covariate adjustment but were attenuated, with black women exhibiting a 23% lower prevalence of using any medical help to get pregnant compared to whites (PPR: 0.77, 95% CI 0.64–0.92). We observed no differences for Asian/PI women compared to whites in unadjusted or adjusted analyses. When assessing ethnicity, Hispanic women had a lower unadjusted prevalence of using medical help to get pregnant compared to non-Hispanic women [5.3% (95% CI 4.5–6.1) vs. 9.4% (95% CI 8.7–10.1); PPR: 0.57 (95% CI 0.48–0.67)]; however, the PPR approached 1.0 after adjustment for covariates.

In our analyses of specific service types among women who used medical help to get pregnant, the prevalence of treatment, testing or seeking advice to get pregnant did not differ for AI/AN women when compared to white women. Black women had lower prevalence of receiving treatment (PPR: 0.78, 95% CI 0.63–0.97) and testing (PPR: 0.77, 95% CI 0.63–0.93) compared to white women, which we also observed among Hispanic compared to non-Hispanic women (Treatment PPR: 0.70, 95% CI 0.57–0.87; Testing PPR: 0.76, 95% CI 0.64–0.91) (Table 2). These associations were attenuated after controlling for covariates and, with the exception of the prevalence of treatment among blacks, the upper bound of the confidence interval narrowly exceeded 1.0. Black (PPR: 0.85, 95% CI 0.74–0.97) and Asian/PI women (PPR: 0.68, 95% CI 0.49–0.97), had a 15–32% lower adjusted prevalence of seeking advice for infertility compared to white women.

When restricted to infertile women (n = 784), the prevalence of using any medical help to get pregnant was similar in magnitude for white and AI/AN women but ranged from a low of 31.1% (95% CI 20.0–42.2) among black women to a high of 41.4% (95% CI 18.9–63.9) among Asian/PI women (Table 3). Racial differences among infertile women

Table 1 Distribution of participant characteristics by use of medical services to help get pregnant

	Ever used medical services to achieve pregnancy		Never used medical services to achieve pregnancy		p value
	N = 1824		N = 21,917		
	N	Weighted % (95% CI)	N	Weighted % (95% CI)	
Total	1824	8.7 (8.1–9.3)	21,917	91.3 (90.7–91.9)	< 0.0001
Age					
15–24 years	126	5.4 (4.1–6.8)	6984	30.2 (29.0–31.3)	< 0.0001
25–29 years	279	14.2 (11.8–16.5)	4453	17.9 (17.2–18.7)	
30–34 years	409	22.3 (19.7–24.9)	3969	16.9 (16.1–17.6)	
35–39 years	525	29.2 (26.1–32.3)	3356	17.0 (16.2–17.9)	
40–44 years	481	28.9 (25.8–32.0)	3150	18.0 (17.1–18.9)	
Race					
White	1393	82.6 (80.0–85.2)	14,406	74.1 (72.3–76.0)	< 0.0001
Black	258	9.1 (7.5–10.7)	5094	16.3 (15.0–17.6)	
Asian/Pacific Islander	80	5.0 (3.3–6.8)	915	4.4 (3.9–4.9)	
American Indian/Alaska Native	74	3.3 (2.2–4.4)	1295	5.2 (3.8–6.6)	
Hispanic ethnicity					
Hispanic	307	10.4 (8.5–12.3)	5000	17.6 (15.8–19.5)	< 0.0001
Non-Hispanic	1517	89.6 (87.7–91.5)	16,917	82.4 (80.5–84.2)	
Education					
0–11 years	190	6.9 (5.6–8.2)	4117	16.4 (15.4–17.3)	< 0.0001
12 years	290	14.9 (12.5–17.4)	4968	21.7 (20.8–22.6)	
13–15 years	625	32.2 (28.8–35.5)	7409	34.0 (32.9–35.1)	
16 + years	719	46.0 (42.4–49.5)	5423	27.9 (26.5–29.4)	
Marital status					
Currently married to a person of the opposite sex	1307	79.7 (77.2–82.3)	7454	41.5 (40.1–43.0)	< 0.0001
Not married but living with opposite sex partner	125	6.7 (5.0–8.4)	2819	13.1 (12.3–13.9)	
Widowed	9	0.5 (0.1–1.0)	104	0.4 (0.3–0.6)	
Divorced or annulled	165	6.0 (4.8–7.2)	1533	6.5 (6.0–7.0)	
Separated for reasons of marital discord	79	2.7 (1.8–3.5)	849	3.2 (2.8–3.5)	
Never been married	139	4.3 (3.1–5.5)	9158	35.3 (34.0–36.5)	
Current insurance					
Private insurance	1370	81.6 (79.2–83.9)	12,055	61.1 (59.4–62.8)	< 0.0001
Medicaid, CHIP, other state-sponsored plan	166	5.6 (4.3–6.8)	4165	14.5 (13.5–15.5)	
Medicare, military health care, or other government health care	63	3.2 (1.9–4.4)	936	3.9 (3.0–4.8)	
Single-service plan, indian health service, uninsured	225	9.7 (7.9–11.4)	4730	20.5 (19.3–21.7)	
Presence of gynecologic problems[a]					
No	713	38.4 (34.9–41.9)	17,756	80.8 (79.9–81.7)	< 0.0001
Yes	1111	61.6 (58.1–65.1)	4161	19.2 (18.3–20.1)	
Poverty status					
< 150 percent of poverty level	393	16.3 (14.1–18.4)	8885	35.6 (34.2–37.1)	< 0.0001
150–299 percent of poverty level	499	25.4 (22.6–28.2)	6077	28.1 (27.1–29.1)	
≥ 300 percent of poverty level	932	58.3 (55.1–61.5)	6955	36.3 (34.8–37.7)	
Metropolitan status					
Principal city of metropolitan statistical area [MSA]	734	35.3 (31.5–39.0)	9606	38.6 (36.0–41.1)	0.17
Other MSA	807	47.1 (42.3–51.9)	9089	43.8 (41.0–46.6)	
Not MSA	283	17.6 (13.4–21.9)	3222	17.7 (15.2–20.1)	
Religion					
No Religion	248	12.7 (10.3–15.0)	4087	18.4 (17.3–19.5)	0.0003

Table 1 (continued)

| | Ever used medical services to achieve pregnancy | | Never used medical services to achieve pregnancy | | p value |
| | N = 1824 | | N = 21,917 | | |
	N	Weighted % (95% CI)	N	Weighted % (95% CI)	
Catholic	497	25.6 (22.7–28.5)	5633	25.1 (23.6–26.5)	
Protestant	918	53.5 (49.9–57.1)	10,605	48.7 (47.1–50.3)	
Other Religions	161	8.3 (6.0–10.7)	1592	7.9 (6.3–9.4)	
Parity					
0	598	31.4 (28.1–34.6)	8906	40.0 (38.6–41.4)	< 0.0001
1	472	24.5 (21.6–27.3)	4304	17.8 (17.1–18.5)	
2	464	26.2 (23.3–29.1)	4599	22.0 (21.1–23.0)	
≥ 3	290	18.0 (15.1–20.9)	4108	20.2 (19.1–21.3)	
Treatment for pelvic inflammatory disease					
No	1671	93.3 (91.9–94.8)	20,854	95.6 (95.2–96.0)	0.0004
Yes	153	6.7 (5.2–8.1)	1063	4.4 (4.0–4.8)	
BMI					
< 18.5	37	2.3 (1.2–3.4)	368	2.0 (1.7–2.4)	0.0002
18.5–24.9	580	39.2 (35.5–42.8)	7133	41.3 (39.9–42.6)	
25.0–29.9	415	21.3 (18.9–23.8)	4866	26.7 (25.6–27.8)	
30.0–34.9	283	17.7 (14.9–20.4)	2869	15.0 (14.2–15.9)	
≥ 35.0	359	19.5 (16.9–22.2)	3038	15.0 (14.1–15.8)	
Total family annual income					
< $15,000	224	9.1 (7.4–10.8)	5554	20.6 (19.6–21.6)	< 0.0001
$15,000 to $34,999	392	16.0 (13.9–18.1)	6344	26.9 (25.8–28.0)	
$35,000 to $59,999	440	23.9 (20.8–27.0)	4994	23.9 (22.9–24.9)	
≥ $60,000	768	51.0 (47.5–54.5)	5025	28.6 (27.2–30.1)	
Fecundity					
Fecund	600	34.9 (31.5–38.2)	15,255	66.6 (65.5–67.8)	< 0.0001
Impaired fecundity	789	38.8 (35.6–42.0)	2128	9.6 (9.0–10.2)	
Surgically sterile	435	26.3 (23.2–29.5)	4534	23.8 (22.7–24.9)	

[a]Gynecologic problems were defined as the presence of ovulation problems, uterine fibroids, or endometriosis

did not achieve statistical significance in either unadjusted or adjusted analyses. However, we observed a significantly elevated prevalence of using any medical help to get pregnant among Hispanic women compared to non-Hispanic women (PPR: 1.33, 95% CI 1.06–1.67) after controlling for demographic and reproductive characteristics.

When evaluating the use of any infertility services (including help to prevent miscarriage), we observed that 12.6% of all women utilized services (95% CI 11.9–13.2%, n = 2664). Patterns of comparisons by race and ethnicity remained similar but were mostly attenuated when compared to evaluations that excluded seeking help to prevent miscarriage (Table 4). After adjusting for covariates, AI/AN women had a 14% higher prevalence of using any infertility services compared to whites, though differences were not statistically significant (PPR: 1.14, 95% CI 0.93–1.40) (Table 4). In contrast, black women had a lower

prevalence of using any infertility services (PPR: 0.87, 95% CI 0.74–1.02) compared to whites.

Conclusions for Practice

We observed disparities among AI/AN and black women compared to white women and Hispanic compared to non-Hispanic women for use of any medical help to get pregnant, type of medical services received, and any infertility service. Asian/PI women had a similar prevalence of using services compared to whites, with the exception of a lower prevalence of seeking advice.

Previous studies have not evaluated utilization of infertility care among AI/AN women, who generally have poorer access to care for a range of health issues (Cobb et al. 2014). We observed disparities among AI/AN women in use of

Table 2 Prevalence of using medical services to get pregnant by race/ethnicity among all women

	N using services	Weighted % using services	Unadjusted PPR (95% CI)	Adjusted[a] PPR (95% CI)
Any services				
White	1393	9.6 (8.9–10.4)	Reference	Reference
Black	258	5.1 (4.2–5.9)	**0.53 (0.44–0.63)**	**0.77 (0.64–0.92)**
American Indian/Alaska Native	74	5.8 (3.9–7.7)	**0.60 (0.43–0.83)**	1.04 (0.81–1.34)
Asian/Pacific Islander	80	9.9 (6.6–13.1)	1.02 (0.74–1.41)	1.08 (0.83–1.41)
Non-Hispanic	1517	9.4 (8.7–10.1)	Reference	Reference
Hispanic	307	5.3 (4.5–6.1)	**0.57 (0.48–0.67)**	0.94 (0.79–1.12)
Treatment[b]				
White	736	52.9 (49.2–56.6)	Reference	Reference
Black	94	41.2 (33.0–49.4)	**0.78 (0.63–0.97)**	0.98 (0.80–1.21)
American Indian/Alaska Native	31	47.7 (29.6–65.8)	0.90 (0.63–1.28)	0.87 (0.67–1.13)
Asian/Pacific Islander	30	47.1 (29.1–65.2)	0.89 (0.61–1.29)	1.00 (0.75–1.33)
Non-Hispanic	774	52.9 (49.4–56.4)	Reference	Reference
Hispanic	125	37.3 (30.1–44.5)	**0.70 (0.57–0.87)**	0.85 (0.70–1.03)
Testing				
White	851	61.8 (58.2–65.4)	Reference	Reference
Black	112	47.3 (37.9–56.7)	**0.77 (0.63–0.93)**	0.84 (0.68–1.03)
American Indian/Alaska Native	35	53.9 (38.7–69.0)	0.87 (0.64–1.18)	0.94 (0.74–1.20)
Asian/Pacific Islander	43	62.8 (47.2–78.4)	1.02 (0.80–1.30)	1.08 (0.88–1.32)
Non-Hispanic	903	61.7 (58.2–65.3)	Reference	Reference
Hispanic	149	47.1 (39.4–54.8)	**0.76 (0.64–0.91)**	0.87 (0.73–1.04)
Advice				
White	1041	74.8 (71.3–78.3)	Reference	Reference
Black	182	68.7 (60.0–77.4)	0.92 (0.81–1.04)	**0.85 (0.74–0.97)**
American Indian/Alaska Native	55	76.0 (59.6–92.4)	1.02 (0.85–1.22)	1.04 (0.85–1.27)
Asian/Pacific Islander	52	53.7 (36.4–71.0)	**0.72 (0.52–0.99)**	**0.68 (0.49–0.97)**
Non-Hispanic	1132	73.5 (70.0–77.1)	Reference	Reference
Hispanic	210	70.1 (62.3–77.9)	0.95 (0.86–1.06)	0.93 (0.83–1.05)

Bold values indicate a statistically significant result

Includes all women regardless of fertility problems

[a]Adjusted for age, marital status, income, poverty, education, metropolitan status, history of treatment for pelvic inflammatory disease, gynecologic problems, religion, parity, current insurance, body mass index, and fecundity

[b]Treatment included drugs to improve ovulation, surgery to correct blocked tubes, artificial insemination, in vitro fertilization or other assisted reproduction, and surgery for endometriosis or fibroids

Table 3 Prevalence of using any medical services to get pregnant by race/ethnicity for infertile women

Race/ethnicity	N using services	Weighted % using services	Unadjusted PPR (95% CI)	Adjusted[a] PPR (95% CI)
White	234	40.9 (35.5–46.2)	Reference	Reference
Black	35	31.1 (20.0–42.2)	0.76 (0.52–1.11)	0.93 (0.70–1.23)
American Indian/Alaska Native	19	39.8 (19.8–59.9)	0.98 (0.58–1.63)	1.31 (0.88–1.95)
Asian/Pacific Islander	15	41.4 (18.9–63.9)	1.01 (0.58–1.75)	1.04 (0.63–1.69)
Non-Hispanic	230	40.3 (35.1–45.6)	Reference	Reference
Hispanic	80	36.1 (26.9–45.4)	0.90 (0.67–1.19)	**1.33 (1.06–1.67)**

Bold value indicates a statistically significant result

[a]Adjusted for age, marital status, income, poverty, education, metropolitan status, history of treatment for pelvic inflammatory disease, gynecologic problems, religion, parity, current insurance, and body mass index

Table 4 Prevalence of use of infertility services by race/ethnicity among all women

	N using infertility services	Weighted % using infertility services	Unadjusted PPR (95% CI)	Adjusted[a] PPR (95% CI)
White	1936	13.4 (12.6–14.2)	Reference	Reference
Black	461	9.4 (7.9–10.9)	**0.70 (0.60–0.83)**	0.87 (0.74–1.02)
American Indian/Alaska Native	137	10.4 (7.6–13.2)	**0.78 (0.62–0.98)**	1.14 (0.93–1.40)
Asian/Pacific Islander	107	12.6 (9.0–16.2)	0.94 (0.72–1.23)	1.09 (0.87–1.37)
Non-Hispanic	2159	13.2 (12.4–14.0)	Reference	Reference
Hispanic	505	9.3 (8.1–10.5)	**0.70 (0.61–0.81)**	1.01 (0.88–1.17)

Bold values indicate a statistically significant result

Use of any infertility services includes use of medical services to prevent miscarriage. This analysis also includes all women regardless of fertility problems

[a]Adjusted for age, marital status, income, poverty, education, metropolitan status, history of treatment for pelvic inflammatory disease, gynecologic problems, religion, parity, current insurance, body mass index, and fecundity

services in the unadjusted analysis, which reflects the actual magnitude of the gap in healthcare utilization experienced by this population. However, this differential in utilization of infertility services was attenuated after accounting for differences in participant characteristics, indicating that socioeconomic and clinical factors may account for a large proportion of the disparity.

While this is the first study to report disparities in infertility services use for AI/AN women, our results for other race/ethnic groups are similar to recent studies. In a population-based cohort of women in the state of Georgia, Chin et al. (2015) observed that black women were 48% less likely to seek care for help getting pregnant compared to white women (RR 0.54, 95% CI 0.35–0.81). Also consistent with our results, the authors observed that the association between infertility service utilization and race was weaker and no longer statistically significant when restricted to infertile women, indicating reduced disparities among infertile women (Black vs. white RR 0.76, 95% CI 0.52–1.11) compared to the results observed among all women.

Chandra et al. (2014) reported on infertility services utilization from the combined 1995, 2002, and 2006–2010 NSFG cycles. The authors reported disparities among all Hispanic [Odds Ratio (OR) 0.64, 95% CI 0.54–0.76] and non-Hispanic black women (OR 0.70, 95% CI 0.59–0.83) utilizing medical services to help achieve pregnancy compared to non-Hispanic white women. In contrast to our results, the disparities persisted when limiting the analysis to women with current fertility problems aged 25–44 (Hispanic OR 0.73, 95% CI 0.56–0.96; non-Hispanic black OR 0.72, 95% CI 0.54–0.97], whereas we observed increased utilization for Hispanic women with infertility. However, our comparison groups differed from those in Chandra et al. (2014) since we analyzed race and ethnicity as separate variables and included a wider range of ages (15–44 years). We also defined infertility as 12 or more months of intercourse without pregnancy and without contraception among those who

were currently married or cohabiting, which differed from the broader definition used by the authors (either impaired fecundity or 12-month infertility).

Racial/ethnic disparities in infertility service utilization may be attributed to the cost of care and lack of health insurance for affordable diagnostic testing and treatment (Adashi and Dean 2016; Quinn and Fujimoto 2016). In a recent analysis of the CDC's National Assisted Reproductive Technology Surveillance System, Dieke et al. (2017) noted that in states with insurance mandates for in vitro fertilization treatments, use of assisted reproductive technology (ART) was higher for each race/ethnic group studied compared to states without mandates (non-Hispanic [NH] Asian/Pacific Islander: 1.5, NH white 2.1, NH black 2.2, Hispanic 1.9, NH AI/AN 4.8 times higher). The particularly large disparity for NH AI/AN ART use in states without insurance mandates indicates the importance of socioeconomic barriers for these families. In a study of US military personnel, disparities in infertility services use were reduced for black women, with the percentage of black women seeking infertility care in the Department of Defense [DoD] ART program similar to the percentage of black women in the DoD (17.4 vs. 19.1%, respectively). ART in the DoD is provided at lower cost than in the civilian population (Feinberg et al. 2006). However, a disparity remained in Hispanic women utilizing services compared to the percentage of Hispanic women in the DoD (3.9 vs. 9.0%, respectively). Similarly, Jain (2006) observed disparities in minority patients seeking care at an infertility clinic in a state with mandated coverage for infertility treatment (Massachusetts). The authors reported longer duration of infertility among black patients (Jain 2006) and disparities in the distribution of race, education, and income among survey respondents compared to the demographic distribution in the state (Jain and Hornstein 2005).

Economic issues may not fully explain the reasons for persistent disparities for Hispanic women, though the reasons for this are not clear (Feinberg et al. 2006, 2007;

Greil et al. 2014). In a qualitative study, Greil et al. (2014) reported that factors related to secondary infertility, ethical concerns about infertility treatment, definition of "trying to get pregnant," support of family and friends for infertility treatment, and a lower value of motherhood may also contribute to uptake of infertility services in black and Hispanic women. These results indicate that barriers to seeking infertility care are complex and deserve further exploration.

A strength of our study was the ability to combine the NSFG survey data over multiple survey cycles, ranging a span of 12 years. This provided a unique opportunity to examine utilization of infertility services among racial/ethnic groups including the AI/AN population, whose numbers in clinical and population-based studies are frequently too limited to assess separately from other racial groups. The number of AI/ANs included in the NSFG is small compared to other racial/ethnic groups, including blacks and Hispanics who are oversampled in the NSFG (Lepkowski et al. 2010). Although the AI/AN population in the US is small (0.8%), the percentage of AI/ANs varies greatly across the US from 0.2% in West Virgina to 13.8% in Alaska (United States Census Bureau 2017). Inclusion of AI/ANs in the NSFG may vary by different AI/AN populations and regions sampled for each survey cycle, but the ability to pool multiple cycles may improve generalizability of the results to the AI/AN population. However, cultural factors related to infertility were not explored within the NSFG.

One limitation of this study is the cross-sectional nature of the NSFG data. Women were surveyed regarding whether they have ever sought medical service to get pregnant and/or prevent miscarriage. Because we only have information from one point in time for each woman, we are unable to evaluate differences in the duration of infertility on service utilization. We also were unable to obtain information on the patterns of care for women, including the time spent on different types of infertility treatment or fertility outcomes. Furthermore, survey non-response is a potential source of bias. To reduce this risk, the NSFG implemented a two-phase design, with the second phase of the study including selection of a probability sample of non-responders for interview from the first phase of the study (Lepkowski et al. 2010). Because of the small number of AI/AN and Asian/PI infertile women in the NSFG (Table 3), our estimates are imprecise as evidenced by wide confidence intervals and should be interpreted with caution (Klein et al. 2002). The cross-sectional nature of this survey also does not capture the diversity within race and ethnic groups in the US. For example, there are over 500 federally-recognized tribes in the US, all with different cultures and factors related to infertility and other health care utilization (National Congress of American Indians 2015). Another limitation of our study is a lack of information on cultural reasons for using or not using infertility services. Qualitative data may be needed to better understand the factors related to infertility care, particularly culturally-specific values. Future interventions to reduce disparities should address the costs of treatment, accessibility of care, health education, and preventable infertility (Quinn and Fujimoto 2016). In addition, studies should further explore outcomes among AI/AN women seeking care for infertility, an area in which research has also been limited but suggestive of lower fecundability among AI/AN patients undergoing intrauterine insemination treatment (Craig et al. 2018).

In conclusion, we observed disparities in infertility service utilization for AI/AN and black women and, more specifically, for services providing medical advice among Asian/PI and black women compared to whites in the NSFG. With the exception of AI/ANs, these observed disparities remained after accounting for demographic characteristics and reproductive history. Further evaluation of factors related to utilization of infertility services, including differences by socioeconomic status, should be explored in future studies. The CDC's National Public Health Action Plan on infertility highlights the need to understand factors related to utilization of infertility services (Centers for Disease Control and Prevention 2014). As the first study to evaluate NSFG data on infertility services use by race/ethnicity including AI/AN women, these results contribute to the limited knowledge on infertility service utilization for this diverse population. Differential utilization of specific services suggests barriers to infertility care may contribute to reproductive health disparities among underserved populations.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

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