Published in final edited form as:

Paediatr Perinat Epidemiol. 2019 March ; 33(2): 119–125. doi:10.1111/ppe.12538.

The Prevalence of Infertility in American Indian/Alaska Natives and Other Racial/Ethnic Groups: National Survey of Family Growth (NSFG)

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Abstract

Background: The prevalence of infertility in American Indian/Alaska Native (AI/AN) populations is unknown. The objective of our study was to estimate the prevalence of infertility and impaired fecundity in the AI/AN population and other racial and ethnic groups.

Methods: We analyzed female respondent data from the pooled National Survey of Family Growth (NSFG) cycles 2002, 2006–2010 and 2011–2013. We used modified Poisson regression with robust error variance accounting for survey weighting to estimate prevalence proportion ratios (PPR) and 95% confidence intervals (CI) for NSFG definitions of infertility and impaired fecundity by race and Hispanic ethnicity.

Results: The prevalence of infertility and impaired fecundity in the pooled NSFG was 6.4% (95% CI: 5.7%, 7.0%) and 11.0% (95% CI: 11.0%, 12.2%), respectively. Compared to whites, blacks had a 1.45 times greater adjusted prevalence of infertility (95% CI: 1.15, 1.83) and AI/ANs had a 1.37 times greater prevalence of infertility (95% CI: 0.91, 2.06) compared to whites. We observed a 1.30 times greater prevalence of impaired fecundity among AI/AN (95% CI: 1.04, 1.62) compared to whites. We observed no differences in impaired fecundity for black or Asian/Native Hawaiian/Pacific Islander women compared to whites or for Hispanic compared to non-Hispanic women.

Conclusions: Inequalities in the burden of reproductive impairments among blacks and AI/AN women warrant further evaluation to identify opportunities for prevention and disparity reduction.

Keywords

Indians; North American; infertility; impaired fecundity; race; ethnicity

Background

Infertility is the inability to conceive within one year of unprotected intercourse and has been identified as a public health priority by the Centers for Disease Control and Prevention (CDC).¹ The CDC emphasizes that infertility is more than a quality-of-life issue with considerable public health consequences including psychological distress, social stigmatization, economic strain, and marital discord. Furthermore, infertility is associated with increased risk of subsequent chronic health conditions.^{2–5} The public health importance of infertility is reinforced by the World Health Organization⁶ and American Society for Reproductive Medicine,⁷ which define infertility as a reproductive system disease.

A report from the 2006–2010 National Survey of Family Growth (NSFG) estimated that 6% of married women aged 15–44 years in the U.S. are infertile and 12% have impaired fecundity, defined as the inability to conceive and carry a baby to term.⁸ Racial disparities in infertility have been observed, with the highest prevalence reported for non-Hispanic black women.⁸ Comparisons of the racial/ethnic burden of infertility, however, have been mostly limited to assessments of blacks, whites, and Hispanics, excluding subgroups such as American Indian/Alaska Native (AI/AN) and Asian/Pacific Islanders (Asian/PI).^{9,10} As a result, the prevalence of infertility in AI/AN populations is unknown.

Our objective was to evaluate the prevalence of infertility and impaired fecundity in the AI/AN population compared to other racial/ethnic groups to assess potential reproductive health disparities in this underserved population.

Methods

Study Design.

We used pooled data from the NSFG survey cycles 2002, 2006–2010, and 2011–2013 to examine racial/ethnic variation in infertility prevalence. The NSFG, a national survey using a multistage probability design, is conducted through in-person interviews by the CDC's National Center for Health Statistics including individual participants in each cycle.^{11,12} The pooled NSFG cycles gathered information on infertility and impaired fecundity among men and women ages 15–44 years. We analyzed female respondent data from the pooled NSFG data.

Race and Ethnicity.

Racial groups were categorized by NSFG as 1) AI/AN; 2) Asian/PI; 3) black; or 4) white. NSFG respondents self-reported their racial group and were allowed to choose up to four races. Respondents reporting multiple races were asked to choose the racial group that best described them, which we used in our analyses. Ethnicity was categorized as Hispanic or Non-Hispanic (NH).

Outcome Measures of Infertility and Impaired Fecundity.

We examined differences in the prevalence of infertility and impaired fecundity by race/ethnic group. The prevalence of infertility, a couple-based measure, was our primary outcome of interest. Consistent with NSFG definitions,⁸ infertility was defined as “12 or

more months of intercourse without pregnancy and without contraception” among women who were married or cohabiting. Women in this analysis were also classified as surgically sterile or presumed fertile (residual of women who did not meet the definition of infertile or surgically sterile, but are married/cohabiting) and were included in the denominator, which is consistent with previous studies.^{8,9} For respondents with missing infertility data, the NSFG used regression imputation (n=13) and logical imputation conducted by subject-matter experts at the National Center for Health Statistics (n=49) to impute responses.

Impaired fecundity was defined as all women, regardless of marital or cohabiting status, who (i) reported it was not physically possible to conceive (excluding surgical sterilization); (ii) were classified as subfecund (i.e., difficult for a couple to conceive/deliver a baby or received medical advice to not become pregnant); or (iii) had a long interval without conception (i.e., no pregnancy in the 36 months prior to interview when married/cohabiting continuously, without contraception, and no months without intercourse). Women were classified as fecund if the respondent was currently pregnant and her husband/partner was not surgically sterile or she did not meet the criteria for one of the other impaired fecundity categories. Women with impaired fecundity or who were surgically sterile were included in the denominator for consistency with prior reporting.⁸ The respondent was classified as surgically sterile if this was reported during the interview. All respondents provided a response to the question on impaired fecundity with no imputation conducted.

Covariates.

We obtained demographic characteristics from the NSFG, which included age at interview, marital status (currently married to a person of the opposite sex, not married but living with opposite sex partner, widowed, divorced or annulled, separated for reasons of marital discord, never been married), education (years), poverty level (<150, 150–299, and 300 percent of the Federal Poverty Level of the survey year), parity (number of live births), body mass index (BMI), smoking during the last three months (none, <1/2 pack per day, 1/2 pack per day), pelvic inflammatory disease treatment (ever/never), use of Depo-Provera (ever/never), age at menarche (years), any medical help to become pregnant (ever/never), total family income of the respondent in the calendar year before the interview (<\$14,999, \$15,000–\$34,999, \$35,000–\$59,999, \$60,000), and gynecologic disorders (ever/never diagnosed with fibroids, endometriosis, or ovulation problems).

Statistical Methods.

All data analyses were conducted via remote access to the NCHS Research Data Center (RDC) using SAS v. 9.4. Initial analyses evaluated weighted counts, percentages, and 95% confidence intervals by infertility/impaired fecundity status. We used modified Poisson regression with robust error variance to assess the relationship between race and ethnicity and the prevalence of 1) infertility and 2) impaired fecundity accounting for the complex survey design to estimate prevalence proportion ratios (PPR). Covariates evaluated in the multivariable regression models included age, parity, marital status, education, poverty level, body mass index, smoking, pelvic inflammatory disease treatment, ever use of Depo-Provera, age at menarche, any medical help to become pregnant, income, and gynecologic disorders. For comparison with previous findings,⁸ we also evaluated models adjusted for

age, parity, marital status, education, and poverty level only. This study was reviewed by the University of Oklahoma Health Sciences Center Institutional Review Board and classified as exempt.

Results

The prevalence of infertility and impaired fecundity was 6.4% (95% CI: 5.7%, 7.0%) and 11.0% (95% CI: 11.0%, 12.2%), respectively. When evaluating descriptive characteristics of women who were infertile or had impaired fecundity, many demographic, behavioral, and reproductive factors differed by infertility and fecundity status (Table 1). Respondents with infertility were more often black (13%) compared to those who were fecund/surgically sterile (10%); approximately 5% of women in each group were AI/AN. Similar proportions (16%) of women with and without impaired fecundity were black; AI/AN women made up 6% and 5% of women with and without impaired fecundity, respectively.

Compared to whites, blacks had a 1.45 times greater adjusted prevalence of infertility (95% CI: 1.15, 1.83) (Table 2). AI/ANs had a 1.37 times greater prevalence of infertility compared to whites (95% CI: 0.91, 2.06), though the 95% confidence interval included the reference value of 1.0. The adjusted PPR for infertility among Asian/PI women compared to white women (PPR: 0.89, 95% CI: 0.53–1.49) was not increased. The adjusted PPR for Hispanic women compared to non-Hispanic women was 1.23 (95% CI: 0.95–1.58). In analysis of impaired fecundity, we observed a 1.30 times greater adjusted prevalence among AI/AN women (95% CI: 1.04, 1.62) compared to whites (Table 3). No increased PPRs were observed for black and Asian/PI women compared to whites, or among Hispanic compared to non-Hispanic women.

Comment

We observed increased infertility among black women, and increased infertility and impaired fecundity among AI/AN women, relative to whites. No differences in prevalence of infertility or impaired fecundity were observed for other racial groups compared to whites or by Hispanic ethnicity. Our results demonstrating increased infertility and impaired fecundity among black women compared to white women were consistent with both 2002 (adjusted OR: 1.98, 95% CI: 1.28, 3.06) and 2006–2010 (adjusted OR: 1.84, 95% CI: 1.10, 3.06) NSFG estimates, indicating consistency over time.^{8,9} Our results were also consistent with a prospective study, which observed an association with infertility among black compared to white women, excluding surgically sterile women (adjusted OR: 1.97, 95% CI: 1.25, 3.12).¹⁰ No other studies have evaluated the prevalence of infertility and impaired fecundity among AI/AN women. Disparities in infertility are likely due to differential distributions of factors such as age, education, socioeconomic status, health behaviors, acute and chronic health conditions, exposure to environmental and infectious agents, access to quality infertility services, and service-seeking behaviors, though research is limited.¹

A strength was the ability to evaluate infertility and impaired fecundity over several NSFG cycles. One limitation is the classification of infertility and impaired fecundity. Measures of infertility were self-reported and do not equate with medical evaluation and treatment.

NSFG participants were not queried specifically about infertility. Instead, it was constructed from survey questions addressing marital status, sexual activity, and contraceptive use. In addition, the NSFG definition of infertility was restricted to married or cohabiting women ages 15–44 years who have not used contraception in the previous 12 months, which limits the generalizability of the estimates.

Inequalities in the burden of reproductive impairments among blacks and AI/AN women warrant further evaluation of the contribution of underlying causes of infertility/impaired fecundity and opportunities to reduce disparities. Given mounting evidence of maternal/child health disparities among AI/ANs,^{13–15} it is imperative to understand the contribution of infertility to the reproductive health status of this underserved population.

Acknowledgements:

This project is supported by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) under 1 R40MC29449-01-00 and by Oklahoma Shared Clinical and Translational Resource Institute NIGMS U54 GM104938. The information, content and/or conclusions are those of the authors and should not be construed as the official position or policy of, nor should any endorsements be inferred by HRSA, HHS or the U.S. The findings and conclusions in this paper are those of the author(s) and do not necessarily represent the views of the Research Data Center, the National Center for Health Statistics, or the Centers for Disease Control and Prevention.

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Pooled characteristics of female National Survey of Family Growth respondents in cycles 2002, 2006–2010, 2011–2013, by infertility and fecundity status.

Table 1.

	Infertility			Fecundity		
	Infertility (n=784)		n	Fecund/Surgically Sterile (n=10924)		n
	W% (95% CI) ^a			W% (95% CI) ^a		
Age (years)						
15–24	62	7.8 (5.1, 10.5)	1813	13.9 (12.9, 14.9)	674	8218
25–29	147	18.2 (14.1, 22.3)	2382	19.8 (18.7, 20.8)	540	4192
30–34	171	18.9 (15.5, 22.2)	2449	21.2 (20.0, 22.4)	578	3800
35–39	199	25.7 (21.1, 30.3)	2230	22.0 (20.8, 23.1)	576	3305
40–44	205	29.5 (25.1, 33.8)	2042	23.1 (21.7, 24.4)	614	3017
Unknown	0	0.0 (0.0, 0.0)	8	0.1 (0.0, 0.3)	0	9
Race						
White	545	76.4 (72.3, 80.6)	8148	80.2 (78.6, 81.8)	1970	14949
Black	141	12.8 (9.6, 16.1)	1485	9.7 (8.8, 10.7)	692	5031
Asian/Pacific Islander	37	4.5 (2.5, 6.4)	499	4.8 (4.1, 5.6)	106	990
American Indian/Alaska Native	49	5.2 (3.1, 7.2)	682	4.6 (3.6, 5.7)	180	1352
Unknown	12	1.1 (0.2, 2.0)	110	0.6 (0.4, 0.9)	34	219
Hispanic ethnicity						
Hispanic	209	19.7 (16.2, 23.3)	2730	17.5 (15.6, 19.4)	649	5122
Non-Hispanic	575	80.3 (76.7, 83.8)	8194	82.5 (80.6, 84.4)	2333	17419
Education (years)						
0–11	160	17.6 (13.7, 21.4)	1916	14.4 (13.2, 15.6)	609	5227
12	187	22.2 (17.5, 26.9)	2258	20.1 (18.8, 21.5)	635	4869
13–16	222	27.9 (23.0, 32.8)	3434	31.8 (30.1, 33.4)	1006	7035
16	215	32.3 (26.8, 37.8)	3316	33.7 (31.7, 35.7)	732	5410
Poverty status (percent of Federal Poverty Level)						
<150	246	29.9 (24.9, 35.0)	3431	27.0 (25.5, 28.6)	1171	8965

	Infertility			Fecundity		
	Infertility (n=784)		Fecund/Surgically Sterile (n=10924)	Impaired fecundity (n=2982)		Fecund/Surgically Sterile (n=22541)
	n	W% (95% CI) ^a	n	n	W% (95% CI) ^a	n
150–299	220	24.1 (19.9, 28.3)	3222	810	26.6 (24.1, 29.1)	6280
300	318	45.9 (40.7, 51.2)	427	1001	38.0 (35.0, 41.0)	7296
Annual family income (\$)						
<15,000	128	13.6 (10.3, 16.8)	1655	788	22.2 (19.9, 24.5)	5451
15,000 to 34,999	236	28.7 (24.1, 33.2)	2830	852	26.6 (24.3, 29.0)	6408
35,000 to 59,999	175	22.5 (17.8, 27.1)	2825	626	21.1 (18.6, 23.5)	5229
60,000	245	35.3 (30.3, 40.4)	3614	716	30.1 (27.2, 33.1)	5453
Marital status^b						
Currently married to a person of the opposite sex	638	80.2 (75.5, 84.9)	8124	1273	50.5 (47.3, 53.7)	7489
Not married but living with opposite sex partner	146	19.8 (15.1, 24.5)	2800	381	13.2 (11.1, 15.2)	2565
Widowed	N/A		N/A	16	0.3 (0.1, 0.5)	97
Divorced or annulled	N/A		N/A	239	6.8 (5.6, 7.9)	1459
Separated for reasons of marital discord	N/A		N/A	144	4.0 (2.9, 5.1)	784
Never been married	N/A		N/A	929	25.2 (22.8, 27.7)	10147
Body mass index (kg/m²)						
<18.5	10	1.9 (0.2, 3.7)	179	49	1.6 (1.0, 2.2)	356
18.5–24.9	271	36.3 (31.3, 41.4)	3848	877	32.1 (29.2, 34.9)	6836
25.0–29.9	193	25.8 (21.0, 30.5)	2710	665	22.3 (19.9, 24.6)	4616
30.0–35.0	126	13.4 (10.6, 16.1)	1577	471	15.3 (13.3, 17.2)	2681
35.0	158	19.5 (15.5, 23.5)	1346	625	18.8 (16.9, 20.8)	2498
Unknown	26	3.1 (1.0, 5.1)	1264	295	10.0 (8.2, 11.7)	5554
Smoking during last 3 months						
None	576	72.8 (68.5, 77.0)	8214	2019	69.5 (66.9, 72.2)	16824
<1/2 pack (1–14) per day	98	12.9 (9.8, 16.1)	1449	490	14.7 (12.9, 16.5)	3180
1/2 pack (15+) per day	108	13.8 (10.4, 17.2)	1246	471	15.8 (13.9, 17.7)	2506
Unknown	2	0.4 (0.0, 1.1)	15	2	0.0 (0.0, 0.1)	31
Age at menarche (years)						

	Infertility			Fecundity		
	Infertility (n=784)		Fecund/Surgically Sterile (n=10924)	Impaired fecundity (n=2982)		Fecund/Surgically Sterile (n=22541)
	n	W% (95% CI) ^a	n	n	W% (95% CI) ^a	n
<10	39	4.9 (2.8, 7.0)	380	157	5.0 (3.8, 6.1)	804
10–12	361	45.3 (40.6, 50.1)	5142	1444	46.0 (43.2, 48.7)	10939
13	375	47.9 (43.0, 52.8)	5371	1361	48.0 (45.2, 50.8)	10718
None/Unknown	9	1.9 (0.3, 3.5)	31	20	1.1 (0.3, 1.9)	80
Parity (total number of live births)						
0	336	42.7 (37.6, 47.9)	2447	1292	43.1 (40.0, 46.1)	9994
1	232	28.0 (23.7, 32.4)	2461	804	26.4 (24.0, 28.8)	3972
2	122	16.7 (13.0, 20.5)	3301	506	17.5 (15.5, 19.5)	4557
3	94	12.5 (9.1, 16.0)	2715	380	13.1 (10.9, 15.2)	4018
Treatment for pelvic inflammatory disease						
No	745	95.3 (93.5, 97.1)	10361	2736	92.7 (91.5, 93.9)	21564
Yes	39	4.7 (2.9, 6.5)	563	246	7.3 (6.1, 8.5)	977
Presence of gynecologic problems						
No	488	61.5 (56.8, 66.3)	8334	1635	55.0 (52.2, 57.8)	18487
Yes	296	38.5 (33.7, 43.2)	259	1347	45.0 (42.2, 47.8)	4054
Ever use of Depo Provera						
No	652	85.9 (82.7, 89.0)	8355	2241	78.7 (76.3, 81.1)	17675
Yes	132	14.1 (11.0, 17.3)	2561	741	21.3 (18.9, 23.7)	4852
Unknown	0	0.0 (0.0, 0.0)	8	0	0.0 (0.0, 0.0)	14
Any medical help to become pregnant^c						
No	474	60.5 (56.0, 65.0)	9799	2128	72.1 (69.7, 74.5)	19789
Yes	310	39.5 (35.0, 44.0)	1122	789	27.9 (25.5, 30.3)	1035

^aWeighted Percent^bFor the infertility question, only women who were married or living with a partner of the opposite sex qualified for this analysis.^cNumbers reported for “Any Medical Help to become Pregnant” may not sum to the totals for infertility and impaired fecundity since not all participants are eligible for this question in the National Survey for Family Growth (respondents must have had sexual intercourse with a male and be 18 years or older at the time of the interview).

Table 2.

Prevalence of infertility by race and ethnicity, National Survey of Family Growth 2002, 2006–2010, 2011–2013.

Race/Ethnicity	^a n	Weighted Infertility Prevalence (%) (95% CI)	Unadjusted PPR (95% CI)	Model 1 ^b PPR (95% CI)	Model 2 ^c PPR (95% CI)
Total	11708	6.4 (5.7, 7.0)	--	--	--
White	8693	6.1 (5.3, 6.8)	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Black	1626	8.2 (6.4, 10.0)	1.35 (1.06, 1.73)	1.45 (1.15, 1.83)	1.42 (1.13, 1.80)
American Indian/Alaska Native	731	7.0 (4.5, 9.6)	1.16 (0.77, 1.74)	1.37 (0.91, 2.06)	1.34 (0.88, 2.05)
Asian/Pacific Islander	536	6.0 (3.3, 8.6)	0.98 (0.62, 1.55)	0.89 (0.53, 1.49)	0.93 (0.58, 1.49)
Non-Hispanic	8769	6.2 (5.5, 6.9)	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Hispanic	2939	7.1 (5.8, 8.4)	1.15 (0.92, 1.43)	1.23 (0.95, 1.58)	1.23 (0.96, 1.57)

^a an includes those eligible for question on infertility (n=11708)^b Prevalence proportion ratios (PPR) adjusted for age, parity, marital status, education, poverty level, body mass index, smoking, pelvic inflammatory disease treatment, use of Depo-Provera, age at menarche, any use of infertility services, income, and gynecologic disorders.^c PPRs adjusted for age, parity, marital status, education, poverty level

Table 3.

Prevalence of impaired fecundity by race and ethnicity, National Survey of Family Growth 2002, 2006–2010, 2011–2013.

Race/Ethnicity	^a n	Weighted Impaired Fecundity Prevalence (%) (95% CI)	Unadjusted PPR (95% CI)	Model 1 ^b PPR (95% CI)	Model 2 ^c PPR (95% CI)
Total	25523	11.0 (11.0, 12.2)	--	--	--
White	16919	11.6 (10.9, 12.3)	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Black	5723	11.5 (10.3, 12.8)	1.00 (0.88, 1.13)	1.09 (0.95, 1.25)	1.13 (0.99, 1.28)
American Indian/Alaska Native	1532	13.2 (10.7, 15.7)	1.14 (0.92, 1.41)	1.30 (1.04, 1.62)	1.27 (1.02, 1.57)
Asian/Pacific Islander	1096	11.1 (7.5, 14.7)	0.96 (0.68, 1.34)	1.07 (0.80, 1.44)	0.94 (0.68, 1.31)
Non-Hispanic	19752	11.8 (11.1, 12.5)	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Hispanic	5771	11.0 (10.0, 12.1)	0.94 (0.82, 1.06)	1.01 (0.88, 1.16)	0.95 (0.83, 1.08)

^a an eligible for question on impaired fecundity (n=25523)^b Prevalence proportion ratios (PPR) adjusted for age, parity, marital status, education, poverty level, body mass index, smoking, pelvic inflammatory disease treatment, use of Depo-Provera, age at menarche, any use of infertility services, income, and gynecologic disorders.^c PPRs adjusted for age, parity, marital status, education, poverty level