Impact of race versus ethnicity on infertility diagnosis between Black American, Haitian, African, and White American women seeking infertility care: a retrospective review

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Abstract

Objective: Studies have examined the impact of race on infertility, but few have compared ethnic differences in infertility within a given race. We sought to determine whether infertility etiologies differ between Black ethnic subgroups. Design/Setting: Retrospective study in an urban safety net hospital. Population: Women seeking infertility care between 2005-2015. Methods: Charts of women with infertility and PCOS ICD-9 diagnoses were reviewed to confirm diagnoses. Data was stratified by race and subsequently by ethnicity to evaluate differences in infertility etiologies between Black American, Haitian, and African women. White American women were used as the comparison group. Main outcome measures: Infertility diagnoses between ethnic groups. Results: A total of 358 women met inclusion criteria including 99 Black American, 110 Black Haitian, 61 Black African, and 88 White American women. Anovulation/polycystic ovarian syndrome (PCOS) was the most common diagnosis in each ethnic group, accounting for 40% of infertility among White American, 57% among Black American, 25% among Haitian, and 21% among African women. There were no significant differences in individual infertility diagnoses between Black and White women. Between ethnic subgroups, multivariate analysis showed significantly higher odds of infertility due to anovulation/PCOS in Black American women compared to African women (odds ratio [OR]=4.9; 95% CI=1.4-17.0). Compared to African women, higher odds of tubal factor infertility were observed in Black American (OR=4.7; 95% CI=1.16-18.7) and Haitian women (OR=4.0; 95% CI=1.1-14.0). Conclusions: Causes of infertility weren't homogeneous across Black ethnic groups. Studies examining infertility should specify ethnic subgroups within race as this may affect results.

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Short title: Infertility between ethnic groups within same race

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ABSTRACT

Objective: Studies have examined the impact of race on infertility, but few have compared ethnic differences in infertility within a given race. We sought to determine whether infertility etiologies differ between Black ethnic subgroups.

Design/Setting: Retrospective study in an urban safety net hospital.

Population : Women seeking infertility care between 2005-2015.

Methods : Charts of women with infertility and PCOS ICD-9 diagnoses were reviewed to confirm diagnoses. Data was stratified by race and subsequently by ethnicity to evaluate differences in infertility etiologies between Black American, Haitian, and African women. White American women were used as the comparison group.

Main outcome measures: Infertility diagnoses between ethnic groups.

Results: A total of 358 women met inclusion criteria including 99 Black American, 110 Black Haitian, 61 Black African, and 88 White American women. Anovulation/polycystic ovarian syndrome (PCOS) was the most common diagnosis in each ethnic group, accounting for 40% of infertility among White American, 57% among Black American, 25% among Haitian, and 21% among African women. There were no significant differences in individual infertility diagnoses between Black and White women. Between ethnic subgroups, multivariate analysis showed significantly higher odds of infertility due to anovulation/PCOS in Black American women compared to African women (odds ratio [OR]=4.9; 95% CI=1.4-17.0). Compared to African women, higher odds of tubal factor infertility were observed in Black American (OR=4.7; 95% CI=1.16-18.7) and Haitian women (OR=4.0; 95% CI=1.1-14.0).

Conclusions: Causes of infertility weren't homogeneous across Black ethnic groups. Studies examining infertility should specify ethnic subgroups within race as this may affect results.

INTRODUCTION

Infertility is a common medical condition that affects women worldwide. Race is a determinant of infertility diagnoses, and racial disparities account for a significant proportion of poor health outcomes overall(1). Studies have demonstrated racial disparities in access to infertility care and live birth rates following assisted reproductive technologies (2),[(3)]. While socioeconomic status accounts for some of these findings, studies adjusting for these risk factors continue to show a significant impact of race on infertility(4), [(5)], [(6)],[(7)].

While prior research supports variations in the prevalence of different causes of infertility between racial groups, racial groups in the United States are heterogeneous, and differences between ethnic groups within a race may of importance in predicting outcomes. Some studies suggest that ethnicity may be a greater risk factor for acquiring certain medical conditions then race alone. Malouf et al. showed significant differences in live birth rates after in vitro fertilization (IVF) treatment among women of similar races but different

nationalities in the United Kingdom: they found that Black African women undergoing IVF had lower odds of live birth following IVF compared to Black Caribbean women(8).

While several studies have examined the impact of race on infertility diagnosis and treatment outcomes, few have investigated the role of ethnicity or nationality on the etiology of infertility. Boston Medical Center, a 500-bed urban academic safety-net hospital with a large, international Black patient population, is uniquely positioned to evaluate differences in infertility diagnoses by ethnicity. This study aims to identify the role of ethnicity in the causes of infertility among Black American, Haitian, and African women seeking infertility care at a tertiary care center.

METHODS

We conducted a 10-year retrospective chart review of all Black American, Haitian, African, and White American women seeking infertility care at Boston Medical Center (BMC) between January 1, 2005 and July 15, 2015. Patients with infertility ICD-9 diagnoses seen by a reproductive endocrinologist were included in the cohort; these patients were identified by analyzing the BMC Clinical Data Warehouse database (Appendix S1). The study was approved by the Boston University School of Medicine Institutional Review Board (IRB# H-34265). No funding was received for this study.

Charts were reviewed to determine infertility diagnosis with information obtained from physician notes, clinical history, and fertility testing. Data was first stratified by place of birth, and then subdivided by self-identified race (White or Black) and among Black women ethnicity (defined as Haitian, African, or Black American) as determined by place of birth and primary language. Women were included if they had a confirmed infertility diagnosis, identified as either Black or White, and were born in either Haiti, Africa, or the United States (US). Women were excluded if race and place of birth were unavailable, they identified with an ethnicity different from those of interest regardless of place of birth, or the infertility diagnosis could not be corroborated from the medical record. White American women were used as a comparison group. Demographic and infertility testing results including day 3 follicle-stimulating hormone (FSH) levels were compared between groups. Infertility diagnoses were compared between White and Black women. Subgroup analyses were then performed comparing White women to Black Haitian, African, and American women seeking infertility treatment.

Statistical analyses using unpaired t-test or one-way ANOVA were used for analysis of continuous variables. For ANOVA, a significant omnibus F-test was followed by Fisher's PLSD post hoc comparisons. Discrete data were analyzed by chi squared tests followed by comparison of cell chi-squared contributions. Multivariate multinomial logistic regression was then used to evaluate associations of independent variables with the dichotomous outcome variable, infertility diagnosis. Univariate and multivariable regression models were used to identify pertinent risk factors. Medical insurance type was used as a proxy for socioeconomic status, with uninsured status and Medicaid insurance as an indicator of low socioeconomic status (SES). SAS (version 9.3) and StatView (version 5.0.1) statistical software were used to perform the analyses. Statistical significance was defined as a p-value < 0.05.

RESULTS

A total of 1278 women were identified by the BMC Clinical Data Warehouse database with ICD9 codes for infertility from 2005 to 2015. Among these women, 662 met inclusion criteria, and their charts were reviewed. Infertility was confirmed in 99 Black American, 110 Black Haitian, 61 Black African, and 88 White American women (Figure 1). Black women were on average of similar age to White Americans at the time of their diagnosis (33 and 32 years old respectively, p=0.064) (Table 1). However, after stratification into Black ethnic subgroups, this similarity was not retained, and Black Haitians and Black Africans were on average older (35 years old) at the time of diagnosis compared to Black Americans and White Americans (31 and 32 years old respectively, p<0.001). Body mass index (BMI) was higher among Black compared to White American women (p=0.008), and this difference was maintained after a subgroup analysis of Black ethnic groups, with the highest BMI seen among Black American women (p=0.004).

There was no significant difference in parity or marital status between all Black women combined compared to White American women. However, subgroup analysis of Black ethnic subgroups showed differences in both parity and marital status between groups. In terms of parity, 41% of African women were multiparous compared to 25% of Haitian, 17% of Black American, and 18% of White American women (p<0.001). African women (62%) were more likely to be married than Black American (19%), Haitian (41%), and White American (48%) women (p=0.007). A greater proportion of Black women (32%) were unemployed compared to White American women (10%, p=0.003). Subgroup analysis comparing White women and Black ethnic subgroups continued to show this difference, with Black Africans having the highest rate of unemployment (43%), followed by Black Haitians (35%, p<0.001). In addition, Black women were more likely to be uninsured or on Medicaid compared to White American women (55% and 14% respectively, p<0.001). This difference was maintained when Black ethnic groups were stratified with the highest uninsured rate seen among Black Haitians (61%) and Black Africans (61%, p<0.001).

Infertility diagnoses fell into 6 categories: anovulation/polycystic ovary syndrome (PCOS), tubal Factor, uterine Factor, male Factor, premature ovarian failure (POF), and unexplained. Table 2 and Figure 2 summarize the prevalence of the various infertility diagnoses in the racial/ethnic groups. As above, an initial analysis was performed comparing all Black women (i.e., by combining ethnicities) with White American women. A significantly higher proportion of Black women (19.6%) had infertility secondary to tubal factor compared to White American women (6.8%, p=0.03). In addition, White American women (29.5%) had a significantly higher frequency of unexplained infertility compared to Black women (13.3%, p=0.006).

With regard to comparisons with racial/ethnic subgroups, Black American women had a higher frequency of infertility secondary to anovulation/PCOS (56.5%, p=0.001) compared to White American (39.8%), Black Haitian (25.5%) and Black African women (21.3%). Black African women had a higher percentage of infertility secondary to POF (18.0%) compared to the other groups that ranged between 2.7 and 3.4% (p=0.0004). A comparison of day 3 FSH) levels, showed no difference in rates of elevated day 3 FSH level [?]10 mIU/ml among all Black women (10%) compared to White women (4.5%, p=0.09). However, the stratified analysis of Black ethnic subgroups showed a greater percentage of African (16%) and Haitian (16%) women with elevated day 3 FSH compared to Black (1.0%) and White (4.5%) American women (p=0.001, Table 1). White American women had a lower frequency of infertility secondary to tubal factor (6.8%) than the other groups of women, especially in comparison to Black Americans (18.2%) and Black Haitians (25.5%, p=0.03). Black Haitians (20.9%) and Black Africans (16.4%) had a higher frequency of infertility secondary to Uterine Factor than either Black (7.1%) or White Americans (9.1%, p=0.03). There were no differences in the frequency of male factor infertility among the groups. In Black Haitian and Black African women, infertility diagnoses were more evenly distributed compared to the other two groups, with anovulation/PCOS (25.5% and 21.3%), tubal factor (25.5% and 11.5%) and uterine factor (20.9% and 16.4%) contributing to the majority of infertility diagnoses (Table 2).

Tables 3 and 4 present the final unadjusted and adjusted multivariate logistic regression analyses. The regression analyses were adjusted for factors known to influence fertility, including age, BMI, parity, and SES. There were no differences in prevalence of male factor infertility among the groups, so only infertility factors affecting females were included in the analysis. Table 3 summarizes the prevalence of the various infertility diagnoses in the White/overall Black groups and shows the adjusted and unadjusted analyses between racial groups. Tubal factor infertility was more common in Black compared to White women (19.6% and 6.8% respectively, p=0.04), but this difference was not retained in the adjusted analysis (p=0.15). There were no other significant differences in infertility etiologies between Black and White races after adjusting for potential confounders. In the multivariate model comparing infertility diagnoses between the White and individual Black ethnic groups (Table 4), Black American women had five times the odds of having PCOS/anovulation compared to Black African women (95% CI 1.4, 17.0). In addition, compared to Black African women, higher odds of tubal factor infertility were observed in Black American (aOR=4.7, 95% CI=1.2, 18.7) and Black Haitian women (aOR=4.0, 95% CI=1.4, 14.0). No other significant differences were seen among specific ethnic groups for the diagnoses of premature ovarian failure, uterine factor, and unexplained infertility.

DISCUSSION

Main Findings

Studies investigating the association between ethnicity and infertility are limited. In this study, we found differences in prevalence of infertility etiologies between certain Black ethnic groups. The distribution of infertility diagnoses among Black Haitian and Black African women was more even compared to White and Black American women. Black Haitian and Black African women had a similar distribution of infertility etiologies, while the distribution of infertility diagnoses among Black and White American women more closely mirrored each other. Furthermore, we were able to observe differences between White women and different Black ethnic groups that were not apparent when all Black women were grouped together. Generally, Black American women had baseline characteristics more similar to White American women than to Black African and Black Haitian women. Black American women also had a prevalence of infertility diagnoses more similar to White American women than to their Black ethnic counterparts. With regard to specific infertility diagnoses, Black African women were less likely to have PCOS/anovulation compared to Black American women after adjusting for BMI and age. Furthermore, ethnic group differences were also seen in the prevalence of tubal factor infertility. Black American and Black Haitian women had higher rates of tubal factor infertility compared to Black African women. The rates of tubal factor infertility were not significantly different between White American women and Black African women.

Strengths and Limitations

The strength of our study is the unique and large international Black patient population at BMC that created the potential to study ethnic differences within race. We are the first to describe differences in infertility etiology within a race. Furthermore, the robust chart analysis used in this study allowed for more accurate stratification of race and ethnicity as well as confirmation of infertility diagnoses without sole dependence on ICD-9 coding. The potential for misclassification bias was limited by using a combination of race, place of birth, and language to help confirm the racial and ethnic identity of each woman. By identifying differences in infertility etiologies within the Black race, our study highlights the importance of ethnic, environmental, and cultural factors in the genesis of infertility.

Limitations of our study include its retrospective nature and the small sample size for each ethnic subgroup. We may have been underpowered to see small differences between groups. We attempted to limit selection bias inherent in retrospective studies by having two independent investigators conduct chart reviews. In addition, as ICD-9 codes were used to identify the potential cohort, it is possible that women with improper ICD-9 infertility coding were missed. Lastly, the duration of residency in the United States for Black Haitian or Black African women could not be ascertained and controlled for to quantify the impact of U.S. cultural and environmental influences on their infertility diagnoses. The lack of difference in prevalence of male factor infertility between groups was limited by our inability to confirm semen analysis results of male partners of all subjects. Furthermore, the race and ethnicity of the male partners were not obtained, and we could not assess whether male partner racial and ethnic differences impacted rates of infertility.

Interpretation

The more similar distribution of infertility diagnoses seen among White and Black American women compared to Black Haitian and Black African women point to the potential stronger influence of environmental factors on infertility than race alone, or "nurture over nature." Some of the differences may also be attributable to more limited access to infertility care seen among women not born in the United States, as suggested by the higher age at presentation, lower rates of commercial insurance, and higher unemployment rates seen among Black African and Black Haitian women. Black African and Black Haitian women also had higher day 3 FSH levels at baseline compared to Black American and White American women, further suggesting that immigrant women present for care at a later age than their American counterparts.

The differences in infertility diagnosis prevalence seen between Black ethnic groups are also likely secondary to environmental rather than genetic influences. Differences in the rate of PCOS/anovulation between Black

American women and Black African women suggest that genetics may not be the most important factor impacting their diagnosis. Other ethnic group differences, such as those seen for tubal factor infertility between Black African women compared to Black American and Black Haitian women, may be attributable to lifestyle differences.

Conclusion

Our study shows that race and ethnicity are two separate patient characteristics that can affect infertility and likely other disease processes. Within one race there may be inherent and environmental factors that increase the risk of different etiologies of infertility. We found that ethnicity appears to play a more significant role in the cause of infertility than previously suspected. While our study suggests that the etiology of infertility differs between ethnic groups belonging to the same race, larger prospective studies are needed to elucidate the impact of ethnicity on the etiology of infertility.

Disclosure of interests: No disclosures

Contribution to authorship: Authors RHO, MM, WK, and JP were involved in the conception, planning, carrying out, analysis and writing up of the work. AF was involved in the analysis and write up of the work.

Details of ethics approval: N/A

Key words: Race, Ethnicity, Infertility, Black, Haitian, African, Disparities

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REFERENCES

1. Fiscella K, Franks P, Gold MR, Clancy CM. Inequality in quality: addressing socioeconomic, racial, and ethnic disparities in health care. JAMA. 2000;283(19):2579-84.

2. Greil AL, McQuillan J, Shreffler KM, Johnson KM, Slauson-Blevins KS. Race-ethnicity and medical services for infertility: stratified reproduction in a population-based sample of U.S. women. J Health Soc Behav. 2011;52(4):493-509.

3. Quinn M, Fujimoto V. Racial and ethnic disparities in assisted reproductive technology access and outcomes. Fertil Steril. 2016;105(5):1119-23.

4. Marshall LM, Spiegelman D, Barbieri RL, Goldman MB, Manson JE, Colditz GA, et al. Variation in the incidence of uterine leiomyoma among premenopausal women by age and race. Obstet Gynecol. 1997;90(6):967-73.

5. Dimitriadis I, Batsis M, Petrozza JC, Souter I. Racial Disparities in Fertility Care: an Analysis of 4537 Intrauterine Insemination Cycles. J Racial Ethn Health Disparities. 2017;4(2):169-77.

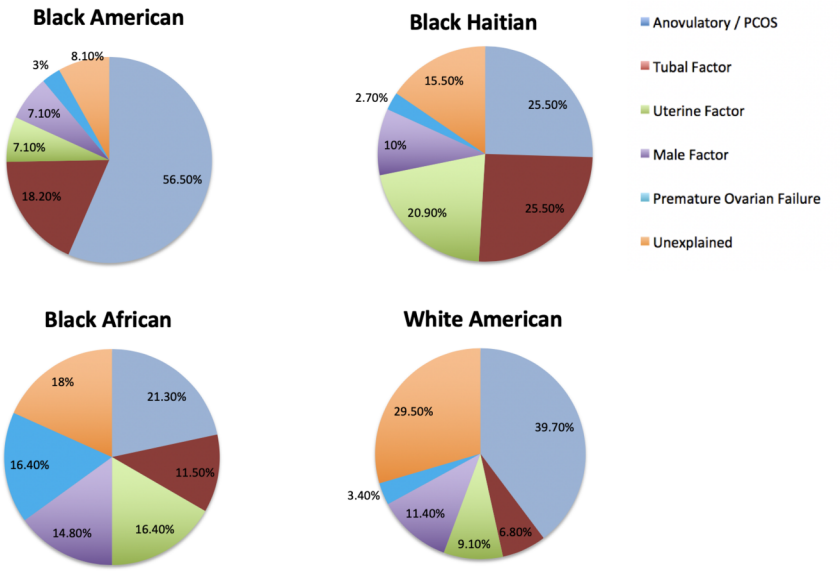
6. Green JA, Robins JC, Scheiber M, Awadalla S, Thomas MA. Racial and economic demographics of couples seeking infertility treatment. Am J Obstet Gynecol. 2001;184(6):1080-2.

7. Jain T. Socioeconomic and racial disparities among infertility patients seeking care. Fertil Steril. 2006;85(4):876-81.

8. Maalouf W, Maalouf W, Campbell B, Jayaprakasan K. Effect of ethnicity on live birth rates after in vitro fertilisation/intracytoplasmic sperm injection treatment: analysis of UK national database. BJOG. 2017;124(6):904-10.

Figure 1: Derivation of the Study Cohort

Figure 2: Infertility Diagnosis Prevalence Within Each Racial/Ethnic Group



African subjects were from Nigeria (49%), Liberia (8%), Algeria (8%), Sudan (7%), Uganda (5%), Cameroon (3%), Ghana, Kenya, Tanzania, Angola, Somalia, Guinea (each 1.5%), and 9% from unspecified African countries. Overall, 61% of African cohort was from West Africa, 10% from East Africa, 15% from North Africa, 2% from Southern Africa, and 3% from Central Africa.

Table 1: Baseline Characteristics of the Racial/Ethnic Groups

	Black (All Ethnicities) (n=270)	**White American (n=88)**	**P-value**	**Black American (n=99)**	**Black Haitian (n=110)**	**Black African (n=61)**	**White American (n=88)**	**P-valu**
Age	33.3 ± 6.2	32.0 ± 5.8	0.064	30.6 ± 6.3	35.1 ± 5.7	34.5 ± 5.2	32.0 ± 5.8	<0.001
BMI	31.4 ± 7.1	28.9 ± 8.0	**0.008**	32.8 ± 8.9	30.6 ± 5.9	30.3 ± 5.2	28.9 ± 8.0	0.004
Parity	191 (70.7)	71 (80.7)	0.147	73 (73.7)	82 (74.5)	36 (59.0)	71 (80.7)	<0.001
Nulliparous	69 (25.6)	16 (18.2) 1		17 (17.2) 9	27 (24.5) 1	25 (41.0) 0	16 (18.2) 1	
Multi-parous	10 (3.7)	(1.1)		(9.1)	(0.9)	(0.0)	(1.1)	
Unknown								
Marital Status	102 (37.8)	42 (47.7)	0.358	19 (19.2)	45 (40.9)	38 (62.3)	42 (47.7)	<0.001
Married	141 (52.2)	40 (45.5) 2		71 (71.7) 1	54 (49.1) 3	16 (26.2) 2	40 (45.5) 2	
Single Di-vorced/Separated	6 (2.2) 21 (7.8)	(2.3) 4 (4.5)		(1.0) 8 (8.1)	(2.7) 8 (7.3)	(3.3) 5 (8.2)	(2.3) 4 (4.5)	
Unknown								

	Black (All Ethnicities) (n=270)	**White American (n=88)**	**P-value**	**Black American (n=99)**	**Black Haitian (n=110)**	**Black African (n=61)**	**White American (n=88)**	**P-valu**
Employment	115 (42.6)	56 (63.6) 9	**<0.001**	48 (48.5)	45 (40.9)	22 (36.1)	56 (63.6) 9	<0.001
Status	87 (32.2)	(10.2) 8		23 (23.2)	38 (34.5)	26 (42.6) 2	(10.2) 8	
Employed	23 (8.5) 45	(9.1) 15		11 (11.1)	10 (9.1) 17	(3.3) 11	(9.1) 15	
Unemployed	(16.7)	(17.0)		17 (17.2)	(15.5)	(18.0)	(17.0)	
Other								
Unknown								
Insurance	149 (55.2)	12 (13.6)	**<0.001**	45 (45.5)	67 (60.9)	37 (60.7)	12 (13.6)	<0.001
Type	118 (43.7)	74 (84.1) 2		53 (53.5) 1	42 (38.2) 1	23 (37.7) 1	74 (84.1) 2	
Medicaid/Uninsured	3 (1.1)	(2.3)		(1.0)	(0.9)	(1.6)	(2.3)	
Commercial/Military								
Unknown								
Day 3	207 (76.7)	77 (87.5) 4	0.085	88 (88.9) 1	77 (70.0)	42 (68.9)	77 (87.5) 4	<0.001
FSH <10	28 (10.4)	(4.5) 7		(1.0) 10	17 (15.5)	10 (16.4) 9	(4.5) 7	
mIU/ml [?]	35 (13.0)	(8.0)		(10.1)	16 (14.5)	(14.8)	(8.0)	
10 mIU/ml								
Unknown								

Data presented as mean ± SD or n (%).

Black (all ethnicities) were compared to White American women with t-test or chi-squared test.

For all racial/ethnic group comparisons, analyses were performed with ANOVA or chi-squared test.

Table 2: Infertility Diagnoses by Race and Ethnic Group[1]

Infertility Diagnosis	**Black (All Ethnicities) (n=270)**	**White American (n=88)**	**Black American (n=99)**	**Black Haitian (n=110)**	**Black African (n=61)**	**White American (n=88)**
Anovulation/ PCOS	97 (35.9)	35 (39.8)	56 (56.5)	28 (25.5)	13 (21.3)	35 (39.8)
Premature Ovarian Failure	17 (6.3)	3 (3.4)	3 (3.0)	3 (2.7)	11 (18.0)	3 (3.4)
Tubal Factor	53 (19.6)	6 (6.8)	18 (18.2)	28 (25.5)	7 (11.5)	6 (6.8)
Uterine Factor	40 (14.8)	8 (9.1)	7 (7.1)	23 (20.9)	10 (16.4)	8 (9.1)
Unexplained[2]	36 (13.3)	26 (29.5)	8 (8.1)	17 (15.5)	11 (18.0)	26 (29.5)

[1]Data presented as n (%); Overall $p<0.001$ for Black (All Ethnicities) versus White American women (chi-squared test), and overall $p<0.0001$ for all racial/ethnic group comparisons (chi-squared test). [2]All patients with unexplained etiology for infertility had day 3 FSH <10	[1]Data presented as n (%); Overall $p<0.001$ for Black (All Ethnicities) versus White American women (chi-squared test), and overall $p<0.0001$ for all racial/ethnic group comparisons (chi-squared test). [2]All patients with unexplained etiology for infertility had day 3 FSH <10	[1]Data presented as n (%); Overall $p<0.001$ for Black (All Ethnicities) versus White American women (chi-squared test), and overall $p<0.0001$ for all racial/ethnic group comparisons (chi-squared test). [2]All patients with unexplained etiology for infertility had day 3 FSH <10	[1]Data presented as n (%); Overall $p<0.001$ for Black (All Ethnicities) versus White American women (chi-squared test), and overall $p<0.0001$ for all racial/ethnic group comparisons (chi-squared test). [2]All patients with unexplained etiology for infertility had day 3 FSH <10	[1]Data presented as n (%); Overall $p<0.001$ for Black (All Ethnicities) versus White American women (chi-squared test), and overall $p<0.0001$ for all racial/ethnic group comparisons (chi-squared test). [2]All patients with unexplained etiology for infertility had day 3 FSH <10	[1]Data presented as n (%); Overall $p<0.001$ for Black (All Ethnicities) versus White American women (chi-squared test), and overall $p<0.0001$ for all racial/ethnic group comparisons (chi-squared test). [2]All patients with unexplained etiology for infertility had day 3 FSH <10	[1]Data presented as n (%); Overall $p<0.001$ for Black (All Ethnicities) versus White American women (chi-squared test), and overall $p<0.0001$ for all racial/ethnic group comparisons (chi-squared test). [2]All patients with unexplained etiology for infertility had day 3 FSH <10	[1]Data presented as n (%); Overall $p<0.001$ for Black (All Ethnicities) versus White American women (chi-squared test), and overall $p<0.0001$ for all racial/ethnic group comparisons (chi-squared test). [2]All patients with unexplained etiology for infertility had day 3 FSH <10

Table 3: Multivariate Multinomial Logistic Regression Model of Racial Groups as Risk Factors for Various Infertility Diagnoses

Infertility Diagnosis	**Race and ethnicity (%) White Americans**	**Race and ethnicity (%) All Black Subjects**	**Race and ethnicity (%) All Black Subjects**	**Race and ethnicity (%) All Black Subjects**	**Unadjusted Odds Ratio (95% CI)**	**Adjusted Odds Ratio (95% CI)***
Anovulation/PCOS	39.8			35.9	1.03 (0.45, 2.34)	0.89 (0.34, 2.27)
Premature Ovarian Failure (POF)	3.4		6.3	6.3	2.10 (0.50, 8.73)	2.15 (0.46, 10.11)
Tubal Factor	6.8		19.6	19.6	**3.27 (1.08, 9.96)**	2.46 (0.73, 8.28)

Uterine Factor	9.1		14.8	14.8	1.85 (0.65, 5.29)	1.89 (0.58, 6.22)
Unexplained	29.5		13.3	13.3	0.51 (0.21, 1.24)	0.57 (0.21, 1.53)
*Analysis adjusted for Age, BMI, Parity, and SES	*Analysis adjusted for Age, BMI, Parity, and SES	*Analysis adjusted for Age, BMI, Parity, and SES	*Analysis adjusted for Age, BMI, Parity, and SES	*Analysis adjusted for Age, BMI, Parity, and SES	*Analysis adjusted for Age, BMI, Parity, and SES	*Analysis adjusted for Age, BMI, Parity, and SES

Table 4: Multivariate Multinomial Logistic Regression Model of Racial/Ethnic Groups as Risk Factors for Various Infertility Diagnoses

Infertility Diagnosis	Race and Ethnicity (%)	Race and Ethnicity (%)	Unadjusted Odds Ratio (95% CI) (95% CI)	Adjusted Odds Ratio (95% CI)*
Anovulatory/PCOS	White Americans (39.8)	Black Americans (56.5)	2.29 (0.80, 6.56)	1.52(0.48, 4.78)
Premature Ovarian Failure (POF)				
	White Americans (39.8)	Black Haitians (25.5)	0.73 (0.27, 1.96)	0.75 (0.24, 2.33)
	White Americans (39.8)	Black Africans (21.3)	0.41(0.14, 1.24)	0.31 (0.09, 1.10)
	Black Americans (56.5)	Black Haitians (25.5)	**0.32 (0.11, 0.91)**	0.49 (0.16, 1.53)
	Black Africans (21.3)	Black Americans (56.5)	**5.54 (1.74, 17.62)**	**4.87 (1.40, 16.97)**
	Black Africans (21.3)	Black Haitians (25.5)	1.76 (0.59, 5.29)	2.40 (0.74, 7.73)
Premature Ovarian Failure (POF)	White Americans (3.4)	Black Americans (3.0)	1.43 (0.22, 9.26)	1.72 (0.24, 12.14)
	White Americans (3.4)	Black Haitians(2.7)	0.91 (0.15, 5.58)	1.01 (0.14, 7.10)
	White Americans (3.4)	Black Africans (18.3)	4.07 (0.85, 19.44)	3.75 (0.65, 21.45)
	Black Americans (3.0)	Black Haitians (2.7)	0.64 (0.10, 4.09)	0.59 (0.08, 4.10)
	Black Africans (18.3)	Black Americans (3.0)	0.35 (0.07, 1.76)	0.46 (0.08, 2.54)
	Black Africans (18.3)	Black Haitians (2.7)	0.22 (0.05, 1.05)	0.27 (0.05, 1.36)
Tubal Factor	White Americans (6.8)	Black Americans (18.2)	**4.29 (1.13, 16.31)**	3.52 (0.86, 14.44)
	White Americans (6.8)	Black Haitians (25.5)	**4.24 (1.24, 14.50)**	3.02 (0.78, 11.72)
	White Americans (6.8)	Black Africans (11.5)	1.30 (0.32, 5.33)	0.76 (0.16, 3.56)
	Black Americans (18.2)	Black Haitians(25.5)	0.99 (0.32, 3.03)	0.86 (0.26, 2.83)

Infertility Diagnosis	**Race and Ethnicity (%)**	**Race and Ethnicity (%)**	**Unadjusted Odds Ratio (95% CI) (95% CI)**	**Adjusted Odds Ratio (95% CI)***
	Black Africans (11.5)	Black Americans (18.2)	3.31 (0.89, 12.36)	**4.65 (1.16, 18.74)**
	Black Africans (11.5)	Black Haitians (25.5)	3.27 (0.98, 10.97)	**4.00 (1.14, 14.04)**
Uterine Factor	White Americans (9.1)	Black Americans (7.1)	1.25 (0.31, 5.07)	1.53 (0.34, 6.84)
	White Americans (9.1)	Black Haitians (20.9)	2.61 (0.81, 8.46)	2.63 (0.69, 9.98)
	White Americans (9.1)	Black Africans (16.4)	1.39 (0.38, 5.07)	1.18 (0.27, 5.14)
	Black Americans (7.1)	Black Haitians (20.9)	2.09 (0.59, 7.45)	1.72 (0.45, 6.62)
	Black Africans (16.4)	Black Americans (7.1)	0.90 (0.23, 3.58)	1.30 (0.30, 5.65)
	Black Africans (16.4)	Black Haitians (20.9)	1.88 (0.60, 5.96)	2.23 (0.66, 7.54)
Unexplained	White Americans (29.5)	Black Americans (8.1)	0.44 (0.13, 1.53)	0.46 (0.12, 1.71)
	White Americans (29.5)	Black Haitians (15.5)	0.59 (0.21, 1.70)	0.75 (0.23, 2.43)
	White Americans (29.5)	Black Africans (18.0)	0.47 (0.15, 1.48)	0.46 (0.13, 1.66)
	Black Americans (8.1)	Black Haitians (15.5)	1.35 (0.38, 4.80)	1.62 (0.43, 6.10)
	Black Africans (18.0)	Black Americans (8.1)	0.94 (0.24, 3.58)	1.01 (0.25, 4.13)
	Black Africans (18.0)	Black Haitians (15.5)	1.26 (0.40, 4.04)	1.64 (0.49, 5.51)
	*Analysis adjusted for Age, BMI, Parity, and SES	*Analysis adjusted for Age, BMI, Parity, and SES	*Analysis adjusted for Age, BMI, Parity, and SES	*Analysis adjusted for Age, BMI, Parity, and SES