Infertility Services for Veterans Enrolled in Veterans Health Administration Care

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BACKGROUND: Infertility care is provided to Veterans through the Veterans Health Administration (VHA) medical benefits package and includes infertility evaluation and many infertility treatments.

OBJECTIVE: Our objective was to examine the incidence and prevalence of infertility diagnoses and the receipt of infertility healthcare among Veterans using Veterans Health Administration (VHA) healthcare from 2018 to 2020.

METHODS: Veterans using the VHA and diagnosed with infertility during October 2017–September 2020 (FY18–20) were identified in VHA administrative data and through VA-purchased care (i.e., community care) claims. Infertility was categorized among men as azoospermia, oligospermia, and other and unspecified male infertility, and among women as anovulation, infertility of tubal origin, infertility of uterine origin, and other and unspecified female infertility using diagnosis and procedure codes (ICD-10, CPT).

KEY RESULTS: A total of 17,216 Veterans had at least one VHA infertility diagnosis in FY18, FY19, or FY20, including 8766 male Veterans and 8450 female Veterans. Incident diagnoses of infertility were observed in 7192 male Veterans (10.8/10,000 person (p)-years) and 5563 female Veterans (93.6/10,000 p-years). A large proportion of Veterans who were diagnosed with infertility received an infertility-related procedure in the year of their incident diagnosis (males: 74.7, 75.3, 65.0%, FY18–20 respectively; females: 80.9, 80.8, 72.9%, FY18–20 respectively).

CONCLUSIONS: In comparison to a recent study of active duty servicemembers, we found a lower rate of infertility among Veteran men and a higher rate among Veteran women. Further work is needed to investigate military exposures and circumstances that may lead to infertility. Given the rates of infertility among Veterans and active duty servicemembers, enhancing communications between Department of Defense and VHA systems regarding sources of and treatment for infertility is essential to help more men and women benefit from infertility care during military service or as Veterans.

KEY WORDS: Infertility; Veterans; Veterans Health Administration

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INTRODUCTION

The prevalence of infertility — the inability to establish a viable pregnancy after 12 months of regular, unprotected sexual intercourse[1] — in the USA is estimated to affect 11% of women and 9% of men aged 15–44 years.[2] The causes of infertility vary and may be multiple, including age, hormonal or genetic disorders, physical trauma, substance use, exposure to environmental toxins, obesity, and use of certain medications[3]; however, the etiology of infertility is often unknown.[4] As infertility is often idiopathic, treatment can be complex and depends on the possible causes of infertility, access to infertility care, and personal preferences for reproductive therapies.[3]

Infertility care is provided to Veterans through the Veterans Health Administration (VHA) medical benefits package. The VHA medical benefits package, described in the Code of Federal Regulation (38 C.F.R. § 17.38.), covers full infertility evaluation and many infertility treatments for Veterans. This coverage is available to all Veterans regardless of service connectedness, relationship/marital status, gender identity, or sexual orientation. This law provides coverage for the Veteran but not any testing or treatments necessary for the non-Veteran partner. However, not all infertility treatments are available for all Veterans. Infertility benefits, such as assisted reproductive technology (ART), including in vitro fertilization (IVF), are allowed only for cisgender opposite-sex legally married Veterans with a service-connected disability found to be related to infertility.[5]

Despite the broad range of infertility services included in the VHA medical benefits policy, no comprehensive studies have examined infertility diagnoses among male and female Veterans. Previous work has indicated that injury due to combat (e.g., urogenital or spinal cord injuries[6,7]), environmental exposures (e.g., effects of military occupation on semen quality parameters[8]), and trauma (e.g., lifetime sexual assault[9]) among Veterans may be associated with infertility.[7] Past studies examining infertility using Veteran

self-report[9,10] may not accurately reflect medical care provided by the VHA. Previous research using VHA electronic medical record data to examine infertility diagnoses among women Veterans from Operations Enduring Freedom, Iraqi Freedom, and New Dawn (OEF/OIF/OND) indicated that only 2% of women Veterans aged 18–45 received an infertility diagnosis between 2001 and 2010.[11] This number is much lower than prevalence estimates of infertility among the general population of the same age, with current estimates of 15.5% for women.[12] Given the gaps in knowledge, updated estimates of infertility diagnoses among Veterans utilizing VHA benefits are needed. Therefore, the objective of this work was to conduct a comprehensive examination of infertility diagnoses and diagnostic services among Veterans enrolled in VA care between 2018 and 2020.

METHODS

Sample and Data Sources

We examined the incidence and prevalence of diagnosed male and female infertility among Veterans using VHA healthcare and infertility services obtained by those Veterans during fiscal years 2018–2020 (FY18–20; October 2017–September 2020). Data on service use were extracted on the cohort of Veterans diagnosed with infertility. Data on spouses of VHA Veterans were not available. Diagnoses were made by VHA providers or identified through community care claims. Procedures were conducted by VHA providers or by a Community Care Network (CCN) provider through a VHA referral.

Data were obtained from Corporate Data Warehouse tables accessed through the VINCI operations interface.[13] Data were extracted in Microsoft SQL Server Management System (SSMS) and then written out for subsequent recoding and analysis. All data were compiled and analyzed in SAS (version 9.2 and EG 7.15, Cary, NC). This study was deemed a quality improvement assessment by the VA and therefore did not undergo formal VA IRB approval.

Infertility Definitions

We categorized types of infertility based on previous literature.[14,15] Among Veteran men, we examined azoospermia, oligospermia, other male infertility, and unspecified male infertility. For Veteran women, we included anovulation, infertility of tubal origin, infertility of uterine origin, other female infertility, and unspecified female infertility. ICD-10 diagnosis codes were used to identify infertility in VHA electronic medical records and the number of diagnoses by type, respectively. Diagnosis codes were based on past work and a review of current diagnosis codes utilized by major insurers.[11] A full list of diagnosis codes examined is available in Appendix A.

Incidence in this report is defined as the ratio of total new cases in a population divided by the total population. The total population varies based on the table presented, either the entire study period (FY18–FY20) or by individual year. The incidence date was considered the date of the first outpatient medical encounter that included a case-defining diagnosis of infertility. The index date for incident cases was the earliest diagnosis date; for FY18, cases with infertility diagnosed in FY17 were excluded from incident estimates. An individual could be counted as an incident case of infertility only once during the study period (FY18–FY20). Incidence rates were calculated as an incident infertility diagnoses per 10,000 person-years (p-years). Prevalence is defined as the proportion of the given population with an infertility diagnosis at any point during the study period (FY18–FY20), also presented per 10,000 p-years. For total cohort calculations, we only included Veterans that fell within our age restrictions (i.e., 18–89 for male Veterans; 18–49 for female Veterans).

Infertility-Related Procedures

We examined medications and procedures related to an infertility diagnosis, as documented in the VHA electronic medical record. Included procedures and medications were based on past work and a review of Current Procedural Terminology (CPT) codes and infertility drugs utilized by major insurers.[11] As we were unable to differentiate between diagnostic procedures and treatments in some cases (e.g., gonadotropin assays), we examined a combined list of related CPT codes in this analysis. A complete list of medications and procedures examined is available in Appendix A.

Other Measures

Demographic and clinical data were also extracted from VHA electronic medical records and included the following variables: age (calculated as of date of first infertility diagnosis, with a minimum date of 10/1/2017, and categorized into 10-year age groups); race (White, Black or African American, Asian, Native Hawaiian or Other Pacific Islander, American Indian or Alaska Native, or unknown); Hispanic ethnicity; marital status (married, divorced, never married, widowed); urban or rural residence (defined by the Rural–Urban Commuting Areas (RUCA) system[16]); period of service (Operations Enduring or Iraqi Freedom (OEF/OIF); Post-Vietnam; Other); VHA priority group; and history of military sexual trauma (MST). VHA priority group ranges from 1 to 8 and describes why a Veteran is eligible for VHA care.[17] Groups 1–3 include Veterans with a service-connected disability (50–100%, 30–40%, or 10–20% disabled, respectively); group 4 includes Veterans with non-service-connected catastrophic disabilities; group 5 includes Veterans eligible by reason of being impoverished; and priority groups 6, 7, and 8 include Veterans based on other factors. No Veterans in our sample were part of priority group 8. MST was measured by the VAs universal screening

questions that assess whether Veterans reported experience of MST (defined as sexual harassment and/or assault during military experience).[18] We based cohort age restrictions (males 18–89; females 18–49) on similarly published work examining infertility among active duty service men[15] and service women[14], with some logical modifications after a review of available VHA data.

Analysis

We tabulated demographic and clinical characteristics of Veterans with a prevalent or incident diagnosis. We also presented their medications and procedures related to an infertility diagnosis, as documented in VHA electronic medical records. A complete listing of included medications and procedures is available in Appendix A. To compare demographics to Veterans without infertility diagnoses in FY18–20, we extracted data on 6,664,784 men and 594,322 women using the VHA in the same period. Chi-square tests examined differences by age group, race, ethnicity, and urban or rural residence.

RESULTS

Overall Infertility Incidence and Prevalence

A total of 12,755 Veterans receiving VHA care in FY18–20 had an incident infertility diagnosis. Across all three study years, this comprised 17,216 prevalent infertility cases, representing 0.2% of Veterans enrolled in VA care. During the 3-year surveillance period, 8766 male Veterans and 8450 female Veterans received at least one infertility diagnosis; 7192 male Veterans and 5563 female Veterans were newly diagnosed in these years. A large proportion of Veterans who were diagnosed with infertility received an infertility-related procedure at the VHA in the year of their incident diagnosis (males: 74.7, 75.3, 65.0%, FY18–20 respectively; females: 80.9, 80.8, 72.9%, FY18–20 respectively). Due to the COVID-19 pandemic, a decrease in utilization was observed in FY20 (Table 1).

Male Infertility and Demographics

A total of 7192 male Veterans received incident diagnoses of male infertility for a crude overall incidence rate of 10.8 cases per 10,000 p-years. This represents 0.1% of male Veteran users of VHA. The majority of incident male infertility cases were unspecified male infertility (2.4 per 10,000 p-years), followed by other male infertility (1.2 per 10,000 p-years), then azoospermia with or without other/unspecified (0.5 per 10,000 p-years), and oligospermia with or without other/unspecified (0.2 per 10,000 p-years; Fig. 1).

The majority of male Veterans with at least one infertility diagnosis between FY18 and FY20 were between the ages of 30–39 (54.8%), White (69.9%), non-Hispanic (83.4%), married (53.1%), and living in an urban area (71.6%) (see Table 2). Most (92.4%) of these Veterans served in Operations Enduring or Iraqi Freedom (OEF/OIF) and 72% were in VHA priority group 1, indicating that they were 50–100% service-connected.

The most common infertility-related procedures (following thyroid assays, which are standard tests for infertility but not unique to infertility care) among men diagnosed with infertility were testosterone and gonadotropin assays. Fertility-related medications were rarely prescribed to male Veterans (Appendix A).

Table 1 Incident Infertility Rates by Gender and Year

	Male Veterans	Female Veterans
Total FY18, FY19, and FY20		
Total # unique Veterans receiving VHA outpatient care	6,664,784	594,322
Incident infertility cases diagnosed	7192	5563
Incidence per 10,000 person-years	10.8	93.6
Prevalent infertility cases diagnosed	8766	8450
Prevalence per 10,000 person-years	13.2	142.2
FY18		
Total # unique Veterans receiving VHA outpatient care	5,567,586	411,023
Incident infertility cases diagnosed	2463	1959
Incidence per 10,000 person-years	4.4	47.7
% of incident cases with an infertility-related procedure in same FY	74.7%	80.9%
FY19		
Total # unique Veterans receiving VHA outpatient care	5,613,688	423,131
Incident infertility cases diagnosed	2575	1965
Incidence per 10,000 person-years	4.6	46.4
% of incident cases with an infertility-related procedure in same FY	75.3%	80.8%
FY20		
Total # unique Veterans receiving VHA outpatient care	5,449,471	393,946
Incident infertility cases diagnosed	2154	1639
Incidence per 10,000 person-years	4.0	41.6
% of incident cases with an infertility-related procedure in same FY	65.0%	72.9%

Note: Includes female Veterans aged 18–49 and male Veterans 18–89. See Appendix A for infertility-related procedures examined

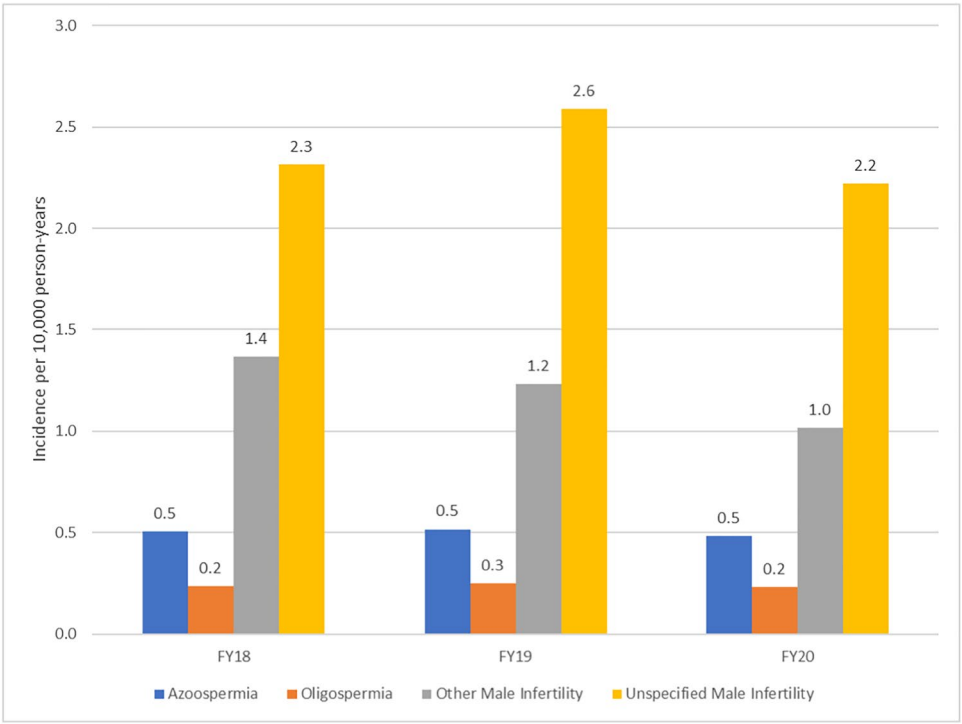

Figure 1 Annual incidence rates of male Veteran Infertility diagnoses by type of infertility, FY18–FY20.

Comparison to Male Veterans Without an Infertility Diagnosis

Among male outpatients in FY18–20, men with infertility diagnoses were more likely to be 30–39 (55%) compared to those without any infertility diagnosis (10% were aged 30–39). Males with infertility were more likely to be Asian (3%) or Black (21%) compared to their counterparts without an infertility diagnosis (1% Asian, 18% Black) as well as Hispanic (13% versus 7% without infertility). Males with infertility were more likely to live in an urban setting (73%) compared to males without an infertility diagnosis (66% urban; data not shown).

Female Infertility and Demographics

A total of 5563 female VHA users of childbearing age, 20–49 years (none was 18–19), were diagnosed with infertility for the first time, resulting in an overall incidence of 93.6 cases per 10,000 p-years. This represents 0.9% of female Veteran users of VHA, regardless of age. Infertility of unspecified origin was the most frequent diagnosis (25.7 per 10,000 p-years), followed by other female infertility (7.0 per 10,000 p-years), anovulation, and infertility of tubal origin (both 5.9 per 10,000 p-years), and infertility of uterine origin (0.8 per 10,000 p-years; Fig. 2).

Most Veteran women who had at least one infertility diagnosis between FY18 and FY20 were between the ages of 30–39 (61.3%), White (47.3%), non-Hispanic (79.5%), married (47.5%), and living in an urban area (76.4%) (see Table 1). Most (90.7%) of these Veterans served in OEF/OIF and 68% were in VHA priority group 1, indicating that they were 50–100% service-connected.

The most common procedures (following thyroid assays, which are standard tests for infertility but not unique to infertility care) included assays of gonadotropin and prolactin and transvaginal and pelvic ultrasound exams. The most commonly prescribed fertility-related medications were clomiphene citrate and progesterone (Appendix A).

Comparison to Female Veterans Without an Infertility Diagnosis

Women Veterans with infertility were more likely to be aged 30–39 (61%) than their counterparts without infertility (38%). Women Veterans with versus without infertility were more likely to be Black (41% vs. 34%) yet were similar on Hispanic ethnicity (13% vs. 12%). Women with infertility lived primarily in urban areas (77%), similar to their counterparts without infertility (79%; data not shown).

DISCUSSION

In this study examining infertility diagnoses across the VHA system between FY18 and 20, we found an overall crude incidence rate of 10.8 cases per 10,000 p-years among Veteran men aged 18 and over and 93.6 cases per 10,000 p-years among Veteran women aged 20–49. In comparison to a

Table 2 Demographic and Military Characteristics of Veterans with an Infertility Diagnosis, FY18–FY20

	Men ($n = 8766$) %	Women ($n = 8450$) %
Age group (years)*		
19–24	1.1%	3.3%
25–29	11.9%	17.7%
30–34	28.1%	31.2%
35–39	26.7%	30.1%
40–44	13.6%	13.6%
45 +	18.5%	4.0%
Race**		
White	69.9%	47.3%
Black or African American	19.5%	36.5%
Asian	2.7%	3.5%
Native Hawaiian or Other Pacific Islander	1.5%	2.1%
American Indian or Alaska Native	1.3%	1.9%
Unknown	6.4%	7.7%
Ethnicity		
Hispanic	12.9%	12.2%
Non-Hispanic	83.4%	79.5%
Unknown	2.9%	4.1%
Marital status		
Married	53.1%	47.5%
Divorced	22.8%	24.5%
Never married	22.6%	24.7%
Widowed	0.3%	0.2%
Urban/rural status		
Urban	71.6%	76.4%
Rural	27.0%	22.3%
Period of service		
OEF/OIF	92.4%	90.7%
Post-Vietnam	4.1%	0.8%
Other	0.3%	1.3%
VHA priority group		
1: 50–100% service-connected	71.9%	67.7%
2: 30–40% service-connected	0.3%	3.8%
3: 10–20% service-connected or special grouping	15.4%	16.8%
4: Catastrophically disabled	0.2%	0.4%
5: Low income	11.7%	9.4%
6: 0% service-connected or post-9/11 or special group	0.1%	0.6%
7: Agreed to copay, means-tested	0.3%	1.5%
Missing	0.0%	0.1%
History of military sexual trauma (positive screen)	2.8%	32.8%

Note: Age is calculated as of date of first infertility diagnosis in FY18–FY20, with a minimum date of 10/1/2017. Percentages may not total to 100% due to missing data

*No women Veterans were younger than 20 years old or older than 49 years old

**Race categories are not mutually exclusive

recent Department of Defense (DoD) study among active duty servicemembers, this reflects a lower rate of identified infertility among Veteran men and a higher rate among Veteran women, where the overall incidence rate of infertility among men and women active duty members was 32.3 and 79.3 cases per 10,000 person-years, respectively, from 2013 to 2018.[14,15] The most common types of male infertility diagnosed among Veteran men (unspecified, azoospermia, and oligospermia) were similar to those in the DoD study.[15] The most common types of infertility diagnosed in Veteran women (unspecified, anovulation, and tubal origin) were similar to both the DoD results[14] and our earlier findings among OEF/OIF/OND women Veterans.[11]

The reasons for the higher rates of infertility among Veteran women compared to active duty women are unclear. However, we hypothesize that women Veterans may have delayed childbearing while serving in active duty, resulting in an older Veteran cohort in general. It is also possible that conditions related to and/or causing infertility may take longer to develop, and thusly be diagnosed after a woman is out of DoD care and in VHA care. In a recent paper by Mancuso and colleagues, both male and female Veteran infertility was associated with exposures to environmental, chemical, and hazardous materials that the Veterans were exposed to during military service.[19] With the recent passing of the PACT Act,[20] further examining the associations between

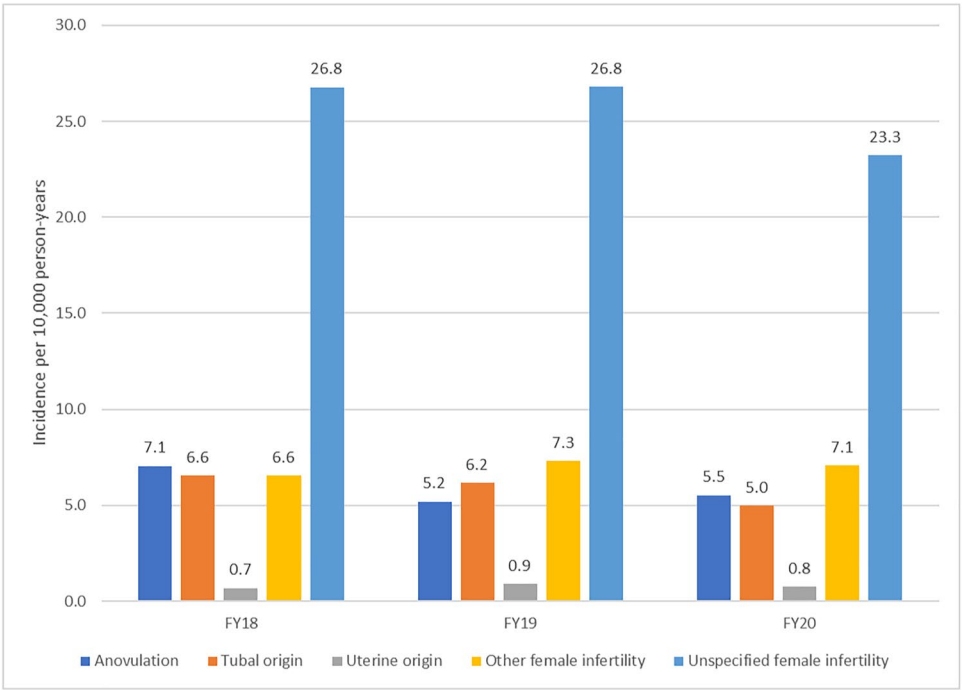

Figure 2 Annual incidence rates of female Veteran infertility diagnoses by infertility type, FY18–FY20.

exposures to burn pits, Agent Orange, and other toxic substances with infertility may be warranted. Exploring these associations further is an important next step in identifying accessible pathways to infertility care as Veterans transition out of active duty service and into VHA care, specifically among Veteran women who may be more likely to be diagnosed with infertility after active duty service.

In this cross-sectional analysis, we focused primarily on an examination of the incidence and prevalence of infertility among Veterans in the VHA. While we did not examine causes of infertility or the effects of infertility on Veterans and their partners, a recent Cochrane review highlighted both prevention and the long-term impacts of infertility as two priorities for future research.[21] These objectives should also be tailored for Veterans receiving care within the VHA. A better understanding of the causes of infertility among active duty and Veteran populations, specifically those caused by service-related injuries or disabilities, could impact interventions to help reduce infertility hazards during military service. Elucidating the causes of infertility is particularly important to expand access to infertility care, as only Veterans with a service-connected disability are eligible for ART.

The incidence rates we present here are likely underestimated among all Veterans. Rates reflect only those Veterans who sought care for infertility from the VHA, and as previously noted data on spouses of VHA Veterans were not available. While the majority of the Veterans in our sample had an incident infertility diagnosis in our study years, we suspect that this is due to treatment seeking following a diagnosis (i.e., Veterans with an existing infertility diagnosis would not necessarily need further diagnostic testing). Other limitations of our study include not assessing whether female infertility was primary (in women who were never pregnant) or secondary (in women who had had at least one successful pregnancy). Additionally, as this was a cross-sectional analysis, we could not examine temporal associations between infertility diagnoses and health characteristics such as mental health conditions or substance use disorders. As noted above, we were unable to examine potential causes of infertility.

A further look into the specific demographic characteristics of Veterans who are most likely to be screened for and diagnosed with infertility — and who is most likely to receive treatment — is crucial. In related work, we found that Veterans were likely to report confusion around IVF benefits or have no access to IVF providers near their residence, suggesting disparities in accessing infertility treatments such as IVF among eligible Veterans.[22] In this current analysis, we found that both men and women Veterans with infertility were likely to live in urban areas, which may indicate greater access to infertility diagnostic care in urban compared to rural settings. Similar to previous work finding higher self-reported rates of infertility among racial minority women Veterans,[23] we found that women Veterans with infertility were more likely to be Black compared to their counterparts without infertility. This was also observed among the VHA men, who were more likely to be Asian or Black compared to their counterparts without infertility. Examining access to and utilization of treatment by race and ethnicity is an important consideration for future work, especially as a recent review indicates that within the general population, Black and Hispanic women wait longer before seeking or accessing treatment for infertility, have a lower prevalence of receiving testing and/or treatment for infertility, have a lower likelihood

of pursuing fertility treatment after undergoing infertility evaluation, and are less likely to utilize medical services to conceive compared to White women.[24] Furthermore, unique aspects of the VHA healthcare system (e.g., the ability to receive a referral to a mental health provider while undergoing infertility treatment) may provide opportunities for improving care related to the broader impacts of infertility diagnoses and treatment on Veterans and their families.

PUBLIC HEALTH IMPLICATIONS

Further work is needed to investigate military exposures and circumstances that may lead to infertility. Given the rates of infertility among Veterans and active duty servicemembers, enhancing communications between DoD and VHA regarding sources of and treatment for infertility is essential to help more men and women benefit from infertility care during military service or as Veterans. Additionally, assessing the impact of infertility care restrictions on Veterans ineligible for specific infertility benefits (e.g., no ART for those who are unmarried, LGBT+couples) is also important to understand the full prevalence and incidence of infertility and the inequities of access to infertility care. Furthermore, research should examine who is most likely to utilize and receive infertility services at VHA and to determine if there are any geographic or site factors that lead to disparities in access to infertility care.

Supplementary Information *The online version contains supplementary material available at https://doi.org/10.1007/s11606-023-08080-z.*

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Declarations

Conflict of interest *The authors declare that they do not have a conflict of interest.*

REFERENCES

1. **Vander Borght M, Wyns C**. Fertility and infertility: Definition and epidemiology. Clin Biochem 2018;62:2-10. https://doi.org/10.1016/j.clinbiochem.2018.03.012.
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(67):1–18, 1 p following 19. (https://www.ncbi.nlm.nih.gov/pubmed/24988820). Accessed 6/4/22.
3. Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP). Infertility FAQs. 4/20/22 (https://www.cdc.gov/reproductivehealth/drh/about-us/index.htm). Accessed 6/4/22.
4. **Gelbaya TA, Potdar N, Jeve YB, Nardo LG**. Definition and epidemiology of unexplained infertility. Obstet Gynecol Surv 2014;69(2):109-15. https://doi.org/10.1097/OGX.0000000000000043.
5. Department of Veterans Affairs; Veterans Health Administration. VHA Directive 1332(2): Fertility Evaluation and Treatment. Washington, DC: 2020. https://www.va.gov/vhapublications/ViewPublication.asp?pub_ID=5431. Accessed 1/10/23.
6. Department of Veterans Affairs. Fertility counseling and treatment for certain Veterans and spouses. Federal Register 2017;82:Suppl 12:6273-6276.
7. **Edmonds SW, Zephyrin LC, Christy A, Ryan GL**. Infertility Services for Veterans: Policies, Challenges, and Opportunities. Semin Reprod Med 2019;37(1):12-16. https://doi.org/10.1055/s-0039-1692127.
8. **Lindaman LA, Pilsner JR, Kroll-Desrosiers AR, Haskell S, Brandt CA, Mattocks KM**. Semen Quality Parameters Among U.S. Veterans of Operation Enduring Freedom, Operation Iraqi Freedom, and Operation New Dawn. Military medicine 2017;182(5):e1775-e1781. https://doi.org/10.7205/MILMED-D-16-00278.
9. **Ryan GL, Mengeling MA, Booth BM, Torner JC, Syrop CH, Sadler AG**. Voluntary and involuntary childlessness in female veterans: associations with sexual assault. Fertil Steril 2014;102(2):539-47. https://doi.org/10.1016/j.fertnstert.2014.04.042.
10. **Katon J, Cypel Y, Raza M, et al**. Self-reported infertility among male and female veterans serving during Operation Enduring Freedom/Operation Iraqi Freedom. J Womens Health (Larchmt) 2014;23(2):175-83. https://doi.org/10.1089/jwh.2013.4468.
11. **Mattocks K, Kroll-Desrosiers A, Zephyrin L, et al**. Infertility care among OEF/OIF/OND women Veterans in the Department of Veterans Affairs. Medical care 2015;53(4 Suppl 1):S68-75. https://doi.org/10.1097/MLR.0000000000000301.
12. **Thoma ME, McLain AC, Louis JF, et al**. Prevalence of infertility in the United States as estimated by the current duration approach and a traditional constructed approach. Fertil Steril 2013;99(5):1324-1331 e1. https://doi.org/10.1016/j.fertnstert.2012.11.037.
13. HSR&D Web Team. Health Services Research & Development: Corporate Data Warehouse (CDW). March 28, 2014 (https://www.hsrd.research.va.gov/for_researchers/vinci/cdw.cfm).
14. **Stahlman S, Fan M**. Female infertility, active component service women, U.S. Armed Forces, 2013–2018. MSMR 2019;26(6):20–27. (https://www.ncbi.nlm.nih.gov/pubmed/31237765). Accessed 8/23/21.
15. **Williams VF, Atta I, Stahlman S**. Brief report: Male infertility, active component, U.S. Armed Forces, 2013–2017. MSMR 2019;26(3):20–24. (https://www.ncbi.nlm.nih.gov/pubmed/30912665). Accessed 8/23/21.
16. Department of Veterans Affairs. Rural Veterans. (https://www.ruralhealth.va.gov/aboutus/ruralvets.asp). Accessed 1/10/23.
17. Department of Veterans Affairs. VA priority groups. 10/15/19 (https://www.va.gov/health-care/eligibility/priority-groups/).
18. **Kimerling R, Gima K, Smith MW, Street A, Frayne S**. The Veterans Health Administration and military sexual trauma. American journal of public health 2007;97(12):2160-6.
19. **Mancuso AC, Mengeling MA, Holcombe A, Ryan GL**. Lifetime infertility and environmental, chemical, and hazardous exposures among female and male US veterans. Am J Obstet Gynecol 2022. https://doi.org/10.1016/j.ajog.2022.07.002.
20. Sergeant First Class Heath Robinson Honoring our Promise to Address Comprehensive Toxics Act of 2022 or the Honoring our PACT Act of 2022. Public Law No: 117–168 (08/10/2022) S.3373.
21. **Duffy JMN, Adamson GD, Benson E, et al**. Top 10 priorities for future infertility research: an international consensus development study. Fertil Steril 2021;115(1):180-190. https://doi.org/10.1016/j.fertnstert.2020.11.014.
22. **Mattocks KM, Marteeny V, Walker L, Kroll-Desrosiers A, Mengeling M**. Examining Veterans' Experiences with In Vitro Fertilization Provided Under P.L. 114–223. Medical care 2023;IN PRESS.
23. **Goossen RP, Summers KM, Ryan GL, et al**. Ethnic Minority Status and Experiences of Infertility in Female Veterans. J Womens Health (Larchmt) 2019;28(1):63-68. https://doi.org/10.1089/jwh.2017.6731.
24. **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(3):138-146. (In eng). https://doi.org/10.1097/gco.0000000000000780.