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Selection, Initiation, Continuation, and Efficacy of Reversible Contraception Among Enlisted U.S. Service Women in Their First Term of Service From 2012 to 2020

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ABSTRACT

Background:

Pregnancy is the second most common cause of limited duty days among active duty service members in the U.S. Military. Pregnancy accounts for 10% of all days on restricted duty, despite impacting a minority of active duty service members. One out of five service women will experience an unintended pregnancy every year despite the availability of no-cost contraception and reproductive healthcare. Young, single, junior enlisted service women experience the highest rate of unintentional pregnancy. Previous studies have demonstrated service branch-based variability in selection, initiation, and continuation of specific contraceptive methods related to service branch culture and access to contraception during basic training. It is unclear if these differences impact overall contraception use or fertility rates among junior enlisted service women in their first term of enlistment. This study examines rates of contraceptive selection, initiation, continuation, and efficacy among junior enlisted service women in their first 4-year enlistment period, and the service branch specific variability in these outcomes.

Methods:

This study is a secondary analysis of Military Healthcare Data Repository records from women who began basic training between 2012 and 2020 and remained on active duty for at least 12 months. We used Kaplan–Meier analyses to examine the effect of age and military branch on contraceptive continuation and efficacy. We used binomial regression for interval censored data, to assess the association of service branch with rates of contraceptive initiation, contraception use, births, and childbirth-related duty restrictions.

Results:

We identified 147,594 women who began basic training between 2012 and 2020. The mean age of these women at the beginning of basic training was 20.4 ± 3.1 years. Women in the marines and navy had higher contraceptive initiation rates than women in the army or air force. Among women initiating a contraceptive pill, patch, or ring (short-acting reversible contraception), 58.3% were still using some form of hormonal contraception 3 months later. Among women initiating depot-medroxyprogesterone (DMPA), 38.8% were still using any form of hormonal contraception 14 weeks later. Long-acting reversible contraceptive methods, such as intrauterine or subdermal contraceptives, had higher continuation rates and less service-based variability in continuation and failure rates than short-acting reversible contraception or depot-medroxyprogesterone. The proportion of days on any form of prescription contraception during the first 4 years on active duty varied from 23.3% in the army to 38.6% in the navy. The birth rate varied from 34.8 births/1,000 woman-years in the air force up to 62.7 births/1,000 woman-years in the army. Compared with women in the air force, women in the army experienced 2,191 additional days of postpartum leave and 13,908 days on deployment restrictions per 1,000 woman-years.

Discussion:

Service branch specific variability in contraceptive use is associated with differences in days of pregnancy-related duty restrictions during first 4 years on active duty among junior enlisted females. Robust implementation of best

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practices in contraceptive care across the military health system to improve contraceptive initiation and continuation appears to offer an opportunity to improve military readiness and promote the health and well-being of active duty service women, particularly in the army.

INTRODUCTION

After musculoskeletal injuries which account for 59% of limited duty days, pregnancy/childbirth is the second most common cause of limited duty days among active duty service members in the U.S. military, accounting for 10% of all days on restricted duty, despite impacting a minority of active duty service members.¹ Almost half of these pregnancies are unintended and potentially preventable.^{2,3} Unintended pregnancies are associated with multiple negative medical and socioeconomic consequences for the mother and infant and degrade military readiness.⁴⁻⁸ These pregnancies are more common among young, single, enlisted women in the U.S. Military who report having a lower education level, less knowledge about reproductive health and contraception, and a history of alcohol use.⁷⁻¹¹

Consistent use of reliable and effective contraception is important in preventing unintended pregnancies.¹¹⁻¹³ But, despite having a health benefit including no-cost contraception, contraceptive use is lower among women in the military than in the civilian population.^{4,8} Service women who are younger, concerned about contraception side effects, and do not perceive themselves to be at risk for pregnancy were less likely to use contraception.^{11,14}

Service women who desire contraception report several military cultural and regulatory barriers to contraceptive access. Cultural presumptions which equate contraceptive use with promiscuity increase service woman concerns about confidentiality, especially in environments where sexual involvement is prohibited, like basic training or during military deployment.^{5,13,15-17} These prohibitions may encourage military leaders to place a lower priority on contraceptive education and access for service members in these environments.¹⁵ For example, some service branches prohibit placement of long-acting reversible contraceptive (LARC) methods, such as subdermal contraceptive implants and intrauterine contraceptives, during basic training to minimize time out of training, leading to less contraceptive uptake during the first 6 months on active duty among new recruits and higher childbirth rates during the first 24 months on active duty.¹⁸

Service women also experience barriers to initiation and continuation of contraception which are intrinsic to the military environment. Reported barriers include a mismatch between clinic hours and work schedule, limited availability of the desired contraceptive method, inadequate training on reproductive health and contraception among service women and clinicians, privacy concerns with method storage, and difficulty with use of the method in austere environments.^{4-7,13,14,17,19-22}

Service women in the army are the least likely to obtain prescription contraception.⁹ Short-acting reversible

contraception (SARC) methods (most commonly oral contraceptive pills but may also include contraceptive transdermal patches or vaginal rings) are the most prescribed contraceptive method among U.S. service women.^{9,16,19} The use of LARC methods, which are the most effective contraceptive methods, has increased over time but lags behind use of short-acting methods.^{9,16} LARC methods have higher continuation rates than SARC methods among active duty service women, but discontinuation rates among service women are still higher than non-military populations, especially among younger women.^{16,19} Programs that expand LARC availability are associated with increased LARC uptake among service women.^{23,24} A process improvement initiative conducted at a single Navy Gynecology clinic found that the number of LARC methods prescribed at that clinic increased after integrating walk-in hours for active duty service women into the normal clinic schedule.²⁴ Provision of contraceptive education to all female naval recruits at the beginning of basic training, followed by optional same-day initiation of depot-medroxyprogesterone (DMPA) and SARC or scheduling a return visit for LARC placement during the 3rd or 4th week of basic training was associated with an increase in both overall prescription contraceptive use and LARC use after 6 months on active duty.²³

Recent instructions from the Defense Health Agency and the Secretary of Defense have mandated expansion of contraceptive services for service women, including establishing or expanding walk-in contraceptive clinics offering same-day access to all reversible contraceptive methods at military medical treatment facilities worldwide.^{25,26} Implementation of these programs across the Military Healthcare System (MHS) has been challenging because of concerns about costs, competing demands, or uncertainty about return on investment.^{4,23,24}

We conducted this study to describe the selection, continuation, and efficacy of prescription contraceptive use among the group with the highest risk of unintentional pregnancy, junior enlisted service women. We also measured the impact of episodes of childbirth among junior enlisted females on military readiness, so military leaders can properly balance the benefits of expanded contraceptive availability against the costs involved in implementing these programs.

METHODS

We examined data from the Military Health System Data Repository to assess the association of service branch with contraceptive method initiation, contraceptive continuation, contraceptive failure rates, fertility rates, availability for duty, and readiness for operational deployment during a woman's first 4 years on active duty (4 years representing the length of

a standard military enlistment). The Military Health System Data Repository was accessed by a Department of Defense data analyst, under the direction of one of the authors, and a deidentified dataset was provided to the research team to conduct this study. Inclusion criteria were female; active duty; rank E1-3; eligible for enlistment by age; and had an initial encounter between September 1, 2012 and February 8, 2019 with a subsequent encounter at least 12 months later.

We examined these women’s data from their first encounter to their last encounter in the MHS or 4 years after their first encounter, whichever occurred first. We used Current Procedural Terminology codes (11981–11983 and 58300–58301) to identify episodes of LARC initiation or removal. We used pharmacy records to identify initial prescriptions and refills for hormonal contraceptives. We assumed that all methods remained in effect until removed, a pregnancy occurred, a new method was started, or the most recently filled supply ran out. We recorded an episode of method discontinuation if a patient became pregnant while prescribed a method or did not start or resume a contraceptive method within 28 days of LARC removal or a contraceptive prescription running out. If a woman was prescribed a SARC method while using DMPA, an implant, or an IUD, we did not count that as a method switch, as SARC methods can be used to treat irregular menstrual bleeding associated with these methods.

We identified admissions for childbirth using Medicare Severity Diagnosis Related Group codes (765–768, 774–775). We only included admissions for childbirth which occurred during the first 4 years on active duty. Admissions 1 to 22 weeks apart were treated as one pregnancy and 23 or more weeks apart as two pregnancies. We assumed that each pregnancy began 40 weeks before delivery unless there was a prior delivery that occurred between 23 and 39 weeks before the current delivery. We defined contraceptive method failure as a pregnancy occurring while a contraceptive method was in effect or with 28 days of method discontinuation. As we were only including episodes of childbirth which occurred during the first 4 years on active duty, we censored all subjects at 3 years and 12 weeks of follow up or 40 weeks before their last encounter in the MHS whichever occurred first during our analyses including childbirth as an outcome variable. When assessing the impact of childbirth on service woman availability for duty, we assumed that women took the full 12 weeks of authorized postpartum leave and were not available for deployment during the 23 to 40 weeks of pregnancy or the 12 months after delivery.

We used Kaplan–Meier analyses to estimate the rates of contraceptive method discontinuation and failure in our sample and the association of service branch with these outcomes. We used binomial regression for interval censored data, adjusting for age at the first encounter (17–18, 19–20, 21–23, and 24–39), and specifying complimentary log–log as the link function, to assess the bivariable associations of service branch with our outcome variables after organizing

TABLE I. Contraceptive Method Initiations/1,000 Woman-Years by Service Branch

Service branch	Pill/patch/ring	Depot-medroxy progesterone	Subdermal implant	Intrauterine	Prescription contraception
Army	199.1	28.6	50.9	29.2	307.8
Air force	231.3	12.1	45.5	33.1	322.0
Marines	271.9	6.3	90.2	36.7	405.1
Navy	248.8	11.7	81.9	46.6	389.0
Average	231.7	16.2	63.5	36.6	356.0

Contraceptive initiation: use of a contraceptive method with no use of the same method type during the previous 28 days.
P < .001 for all comparisons.

our data in events/trials format. We used the number of births or days in a particular status as the event variable and total number of enrolled days as the trial variable. We used the estimated marginal means from these regressions to calculate mean contraceptive use, fertility rate, readiness for duty, and deployment readiness. The level of significance for our statistical tests was set at *P* < .001, because of the large sample size of our study. This study was reviewed and approved by the Department of Defense Privacy Review Board. The Office of Research Integrity at the first author’s institution reviewed this study protocol on December 3, 2019 and determined that as a study of pre-existing, de-identified data, this project did not involve research as defined by DHHS regulations and did not require IRB review.

RESULTS

The average age of the 147,594 women in our sample was 20.4 ± 3.1 years and 65.4% of our sample was 17 to 20 years old at the time of their initial encounter. The army accounted for 30.8% of our sample, air force 27.7%, marines 10.8%, and navy 30.7%. Mean follow-up after the first encounter was 3.0 ± 1.0 years, allowing us to examine over 440,000 total woman-years of contraceptive use.

Contraceptive Method Selection and Initiation

SARC methods were the most frequently initiated type of contraception in our sample (231.7 initiations/1,000 woman-years), followed by subdermal implants (63.5), intrauterine contraception (36.6), and DMPA (16.2) (Table I). The initiation rates for each method varied by service branch (*P* < .001). Women in the army had the lowest rates of SARC initiation (199.1) and intrauterine contraception placement (29.2), but the highest rate of DMPA initiation (28.6). Women in the navy and marines had the higher rates of SARC, LARC, and overall prescription contraception initiation than women in the army or air force (*P* < .001) (Table I).

Continuation of Prescription Contraception

Method continuation rates varied by contraceptive method and military service. Among women selecting a SARC method, 58.3% were still using prescription contraception 85 days after starting a SARC method (army 53.2%: 95% CI, 52.6, 53.8; air force 61.5%: 60.9, 62.1; marines 46.6%: 45.6, 47.6; and navy 63.8%: 63.2, 64.4; all comparisons $P < .001$). Less than half of women who started DMPA (38.8%) returned for their second injection or started a new contraceptive method after their first shot (continuation of prescription contraception beyond 91 days after first injection: army 47.4%: 45.8, 49.2; air force 41.1%: 38.4, 43.8; marines 39.8%: 33.7, 45.9; and navy 25.5%: 23.3, 27.7; all comparisons $P < .001$). Women who started LARC methods were more likely to continue prescription contraceptive use than women who started SARC methods or DMPA. Contraceptive continuation after starting an implant was highest among women in the navy followed by women in the marines (all $P < .001$). There was no

difference in the contraceptive continuation rate after implant placement between the army and air force (Fig. 1). Women in the navy had higher prescription contraceptive continuation rates after IUD placement than women in the other service branches ($P < .001$). There were no differences in contraception continuation rates after IUD placement between the other service branches (Fig. 1).

Overall Contraceptive Coverage

As a result of lower rates of contraception initiation and selection of contraceptive methods with lower continuation rates, women in the army had the lowest rate of prescription contraceptive use during their first 4 years on active duty at 24.9% (364 days on contraception out of 1,461 days on active duty). Women in the navy were the most likely to use prescription contraceptive methods at 39.0% of all days during the first 4 years on active duty and the most effective contraceptive methods at 7.7% of total days for IUDs

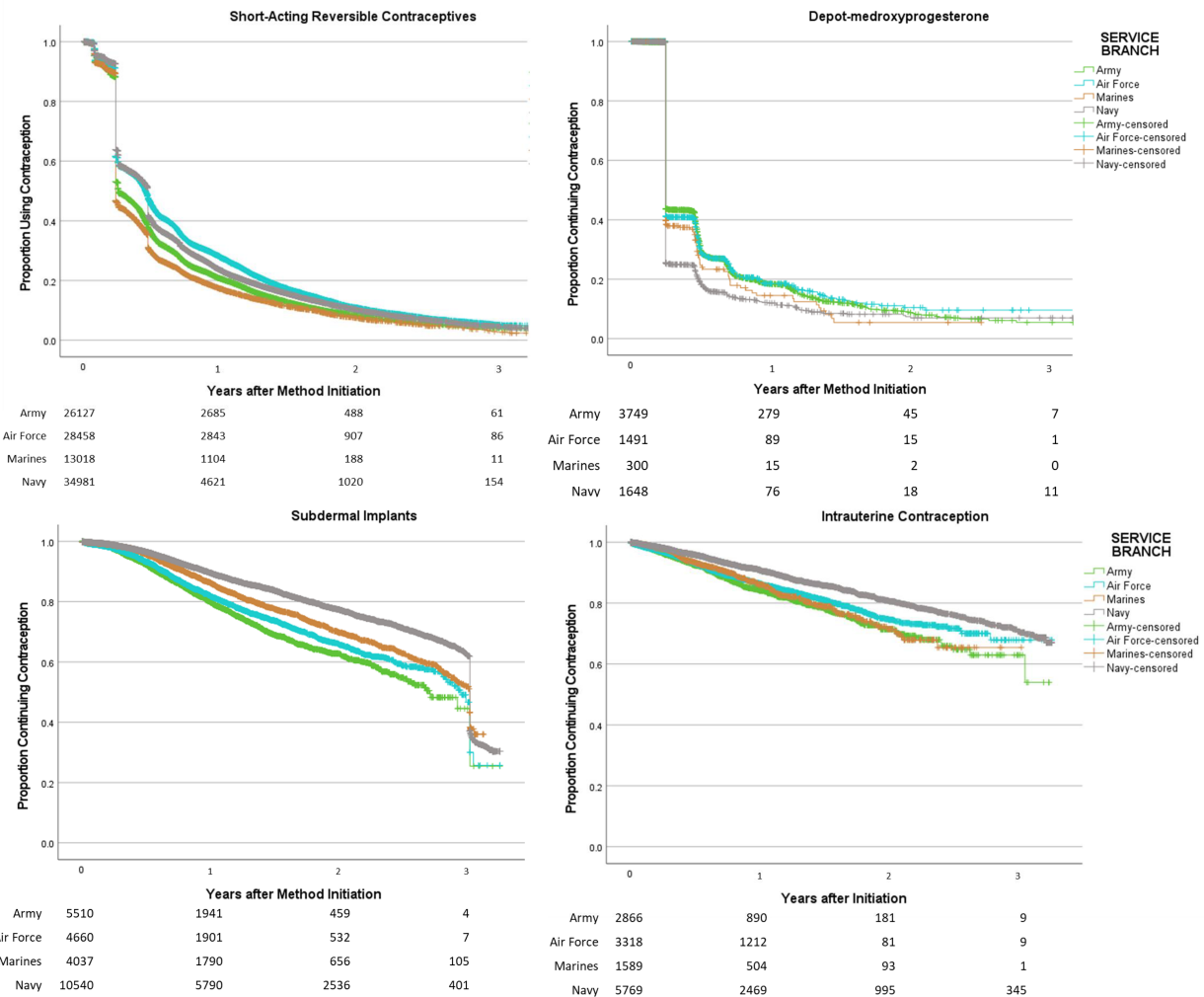


FIGURE 1. Continuation of Prescription Contraceptive Methods by Service Branch. Discontinuation: pregnancy while prescribed method or discontinuation of method without starting a new contraceptive method within 28 days. SARC Continuation: all comparisons $P < .001$. DMPA Continuation: all comparisons $P < .001$. Implant continuation: navy > marine > army and air force, $P < .001$. IUD continuation: navy > army, air force, and marines, $P < .001$.

Hormonal Contraception Use and Pregnancy during the First 4 years of Military Service

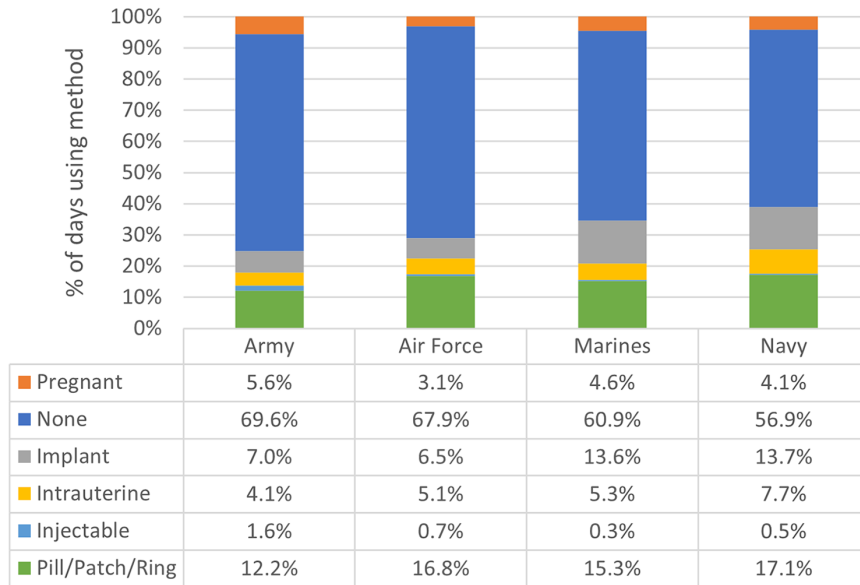


FIGURE 2. Hormonal contraceptive use and pregnancy during first 4 years of military service. % = average (number of days using method/total days on active duty) × 100. For example, on average, service women in the army were pregnant for 82 days during their first 4 years on active duty (82/1,461 = 0.056 = 5.6%). *P* < .001 for all comparisons between service branches.

and 13.7% for implants during the first 4 years on active duty (Fig. 2).

Contraceptive Failure Rates With Typical Use

Childbirth rates within 3 years of method initiation were low among women using an implant (range: 1.9% (95% CI 1.1, 2.7) to 6.9% (95% CI 4.5, 9.3)) or IUD (range: 4.2% (2.4, 5.8) to 7.2% (5.4, 9.0)), with little variation in failure rates by service branch. The 3-year failure rate for women on DMPA was 15.8% (14.4, 17.2). Women in the air force had lower SARC failure rates than women in the army, marines, and navy.

Fertility Rates

Women in the army had the highest overall fertility rate during the first 4 years on active duty. Most of the additional episodes of childbirth experienced by women in the army, compared with women in the other service branches, occurred among women who had never been on hormonal contraception or had discontinued a hormonal contraceptive method without starting a new method.

Childbirth and Military Readiness

Lower levels of contraceptive initiation, selection of methods with lower rates of continuation and efficacy, and a higher overall fertility rate among women in the army translated into the highest rates of childbirth-related non-deployability and unavailability for work. Compared with women in the service branch with the lowest fertility rate (air force), women in the

army had 2,191 additional days of postpartum leave per 1,000-woman years and 13,908 days on deployment restrictions per 1,000-woman years (Table II).

DISCUSSION

In this study, we demonstrated variation in contraceptive selection, continuation, coverage, and failure rates between service branches despite all service women having the same healthcare benefit including no-cost contraception and reproductive healthcare. Junior enlisted women in the army have lower rates of contraception initiation, are more likely to select methods with lower continuation and efficacy with typical use, and the highest fertility rate among the four service branches. This higher fertility rate results in a greater impact of childbirth on military readiness for the army than the other military branches.

Active duty service women report multiple cultural and logistical barriers to contraceptive use. These barriers are especially prominent for junior enlisted service women who have limited autonomy and resources.⁴⁻¹¹ Junior enlisted service women frequently receive medical care from early career General Medical Officers or Physician Assistants who may have little experience in prescribing LARC methods or managing complications of these methods, which could decrease LARC initiation and continuation rates.^{20,21} For example, in the Army Physician Assistants provide the majority of primary care for service member assigned to operational units. In a survey of 100 Army Physician Assistants, 96% reported they provided family planning to active duty service women.

TABLE II. Contraception, Childbirth, and Readiness by Service Branch between 2012 and 2019

	Army (n = 45,360)	Air force (n = 40,839)	Marines (n = 15,881)	Navy (n = 45,054)	Total (n = 147,134)
% of enrolled days on contraception	Mean (95% CI) 23.3% (23.0, 23.6)	Mean (95% CI) 27.7% (27.4, 28.1)	Mean (95% CI) 33.9% (33.4, 34.4)	Mean (95% CI) 38.6% (38.3, 38.9)	Mean (95% CI) 30.3% (30.1, 30.5)
Births/1,000 woman-years	62.7 (61.4, 64.0)	34.8 (33.7, 35.9)	49.7 (47.8, 51.6)	46.0 (44.9, 47.1)	48.4 (47.8, 49.0)
% availability for duty	98.7% (98.7, 98.7)	99.3% (99.3, 99.3)	99.0% (99.0, 99.0)	99.1% (99.1, 99.1)	99.0% (99.0, 99.0)
Days of postpartum leave/1,000 woman-years	4,746 days	2,555 days	3,647 days	3,283 days	3,647 days
% availability for deployment	91.2% (91.2, 91.2)	95.0% (95.0, 95.0)	92.9% (92.9, 92.9)	93.3% (93.3, 93.3)	93.1% (93.1, 93.1)
Deployment restriction days/1,000 woman-years	32,208 days	18,300 days	25,986 days	24,522 days	25,254 days

P < .001 for all comparisons between service branches.

Among these PAs, 10% were trained in placement of copper IUDs and one PA had placed one in the last 12 months, 17% were trained in levonorgestrel IUD placement and four had placed one in the last year, and 33% were trained in implant placement and 12 had placed one in the last year.²¹ Service branches which have implemented programs to reduce these access barriers, such as the navy and marine corps, have higher overall rates of prescription use and use of the most effective (LARC) methods.^{21,23,24} These differences in service branch specific contraceptive programs may account for some of the differences in contraceptive initiation overall and type of contraceptive initiated, seen in our study.

Contraceptive continuation rates found in our study are lower than previous studies of civilian populations.²⁶ It is difficult to determine the reasons for this because we do not know why women elected to start or stop hormonal contraception. Previous studies, which demonstrated higher method continuation rates, have examined contraceptive use among sexually active women who wished to avoid pregnancy.²⁶ Women in our study could have started contraception for a variety of reasons including desire for pregnancy prevention in the context of current sexual activity, prevention of pregnancy in case of a future sexual relationship, menstrual regulation, or menstrual suppression. This difference in reasons for contraceptive use may impact tolerance of side effects and continuation rates. This may explain some of the decrease in continuation rates seen in our study relative to these previous studies.

As seen in previous studies, women in our study who started LARC methods had much higher method continuation than women who start SARC methods or DMPA.^{16,18,27} In our study, many service women who started SARC methods or DMPA subsequently discontinued use of all prescription contraception within 3 months of the original prescription. This emphasizes the need for ready access to LARC methods for any program to increase contraception use among active duty service women. Prescribing service women SARC methods

or DMPA and deferring LARC placement until a later date is a suboptimal treatment plan as many of these women will not be able to overcome the logistical hurdles to access their desired LARC method and will subsequently stop all prescription contraception while women who started a LARC method at their initial visit would still be protected against unintentional pregnancy.

Unlike previous studies, we found that rates of prescription contraception use among women in the navy (39.0%), marines (34.5%), and air force (29.0%) were all higher than the rate of prescription contraception use among reproductive age women in the U.S. population (28.5%).²⁸ However, rates of prescription contraception use among women in the army (24.8%) was still lower than the national average. Lower rates of contraceptive initiation and selection of contraceptive methods with lower rates of continuation and efficacy are associated with lower rates of prescription contraception use and higher fertility rates among service women in the army. This is associated with an increase in days of deployment restrictions and postpartum leave among women in the army.

Rates of contraceptive use alone do not explain all the differences in fertility rates between service branches. Women in the air force have the lowest fertility rates among U.S. service women, but also have lower rates of contraception use than women in the navy or marines. It is likely that differences in pregnancy intentions and sexual activity rates among service women in the different service branches influence fertility rates. However, as over half of reported pregnancies are unintentional, it is likely that increased access to contraception would still assist all service women in family planning and reduce the rate of unintentional pregnancies. Previous studies in military and civilian populations have demonstrated that women who have access to the most effective methods—LARC method—will select and use these methods.^{23,24,27} Increasing accessibility of contraceptive options, especially LARC methods, may increase overall use of contraception

among service women, especially those in the army, and reduce the impact of unintentional pregnancy and childbirth on military readiness.

The large sample size, long follow-up period, and focus on a population at higher risk for unintended pregnancies and negative socioeconomic outcomes from these pregnancies are strengths of this study. However, there are several limitations to this study as well. This is a study of insurance billing and pharmacy data from the MHS, and we are unable to capture reproductive health events that occurred outside of the MHS or were not billed to the MHS. This limits our ability to capture pregnancies that ended in miscarriage or elective termination. We also cannot capture episodes of spontaneous IUD expulsion ending use of intrauterine contraception. The inclusion of women who have experienced a spontaneous expulsion in our group of women with continued use of an IUD probably produces an artificially elevated continuation and contraceptive failure rate for this method. Finally, limitations in our data also do not allow us to determine pregnancy intentions or to capture factors such as changes in marital status which might influence pregnancy intentions. Future qualitative research exploring service women's decision making on initiation and continuation of contraception would be helpful to further explore this issue.

CONCLUSION

LARC methods have superior continuation and efficacy rates compared with SARC methods. Rates of contraceptive use, fertility, and pregnancy-related duty restrictions vary by service branch. Decreasing the fertility rate among women in the army to the average of the other three service branches, by increasing the initiation and continuation of contraception, would decrease days of postpartum leave by over 1,000 days per 1,000 woman-years and childbirth-related deployment restrictions by over 7,000 days per 1,000 woman-years. Robust expansion of contraceptive access programs in accordance with Defense Health Agency guidance, especially in geographic areas or service branches with limited access to LARC methods, has the potential to decrease the rate of unintentional pregnancies among junior enlisted service women in their first term of service, promote service member wellbeing, and increase military readiness.²⁹

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CONFLICT OF INTEREST STATEMENT

C.M.R. received compensation from Organon Pharmaceuticals for participation in a focus group on reproductive healthcare for adolescent females in 2020. This study was funded by an Investigator Initiated Research Agreement from Organon Pharmaceuticals. This agreement provided salary support for C.M.R. and E.H.-G.. Organon is the manufacturer of the subdermal etonogestrel implant, one of the contraceptive options discussed in this study. None of the other authors have any competing interests to report.

DATA AVAILABILITY STATEMENT

The database for this study is available from the corresponding author upon reasonable request.

INSTITUTIONAL REVIEW BOARD

This study was reviewed and approved by the Department of Defense Privacy Review Board and the IRB of the first author.

AUTHOR CONTRIBUTION STATEMENT

C.M.R. conceived and designed, interpreted the data, and drafted the work. J.M.S., W.P.A., L.F.W., and E.H.-G. made substantial contributions to the conception of the work, revised it critically for important intellectual content. All authors provided final approval of the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work were appropriately investigated and resolved.

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