



NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

**PARENTHOOD AND ITS EFFECTS ON THE HEALTH
AND PERFORMANCE OF DUAL-MILITARY MARINES**

by

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March 2021

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REPORT DOCUMENTATION PAGE			<i>Form Approved OMB No. 0704-0188</i>	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC, 20503.				
1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE March 2021	3. REPORT TYPE AND DATES COVERED Master's thesis		
4. TITLE AND SUBTITLE PARENTHOOD AND ITS EFFECTS ON THE HEALTH AND PERFORMANCE OF DUAL-MILITARY MARINES			5. FUNDING NUMBERS	
6. AUTHOR(S) Amanda Henegar				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			10. SPONSORING / MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release. Distribution is unlimited.			12b. DISTRIBUTION CODE A	
13. ABSTRACT (maximum 200 words) Proper talent management is essential to the longevity of the Marine Corps, and it is vital that policies exist to support and retain current personnel. Parenthood is a common experience among Marines, and Marine families continue to contribute to the Marine Corps' overall mission accomplishment. The majority of research has evaluated how childbirth impacts traditional families, but little emphasis has been dedicated to Dual-military (Dual-mil) families. My research examines parenthood effects on Dual-mil Marines and identifies former Dual-mil Marines in the data. We believe Dual-mil Marines respond differently to parenthood. I conduct an event study analysis that uses personnel data from 2010–2019 to estimate the effects of birth on Dual-mil parents. Results show that childbirth impacts mothers' health and performance greater than that of fathers. Mothers in my study exhibited drops in all outcomes and notably never return to their pre-birth fitness levels. Male results illustrated that Dual-mil fathers exhibited greater drops in fitness following birth than other married fathers. Moreover, Dual-mil fathers exhibited a statistically significant drop in job performance immediately following birth, while other married fathers experienced a significant delayed performance drop. My research provides the Marine Corps with insight on Dual-mils and the effectiveness of current postpartum and parental leave policies.				
14. SUBJECT TERMS parenthood, retention, recruitment, Dual-military, parental leave policy, pregnancy			15. NUMBER OF PAGES 77	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UU	

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OF DUAL-MILITARY MARINES**

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MASTER OF SCIENCE IN MANAGEMENT

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**NAVAL POSTGRADUATE SCHOOL
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ABSTRACT

Proper talent management is essential to the longevity of the Marine Corps, and it is vital that policies exist to support and retain current personnel. Parenthood is a common experience among Marines, and Marine families continue to contribute to the Marine Corps' overall mission accomplishment. The majority of research has evaluated how childbirth impacts traditional families, but little emphasis has been dedicated to Dual-military (Dual-mil) families. My research examines parenthood effects on Dual-mil Marines and identifies former Dual-mil Marines in the data. We believe Dual-mil Marines respond differently to parenthood. I conduct an event study analysis that uses personnel data from 2010–2019 to estimate the effects of birth on Dual-mil parents. Results show that childbirth impacts mothers' health and performance greater than that of fathers. Mothers in my study exhibited drops in all outcomes and notably never return to their pre-birth fitness levels. Male results illustrated that Dual-mil fathers exhibited greater drops in fitness following birth than other married fathers. Moreover, Dual-mil fathers exhibited a statistically significant drop in job performance immediately following birth, while other married fathers experienced a significant delayed performance drop. My research provides the Marine Corps with insight on Dual-mils and the effectiveness of current postpartum and parental leave policies.

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LIST OF ACRONYMS AND ABBREVIATIONS

CFT	Combat Fitness Test
CPG	Commandant's Planning Guidance
DACOWITS	Defense Advisory Committee on Women in the Services
EAS	End of Active Service
FITREP	Fitness Report
MCO	Marine Corps Order
MTC	Movement to Contact
MUF	Maneuver Under Fire
PCS	Permanent Change of Station
PFT	Physical Fitness Test
PROCON	Proficiency and Conduct Scores
TFDW	Total Force Data Warehouse
TIS	Time in Service
USMC	United States Marine Corps

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ACKNOWLEDGMENTS

I would like to thank my advisors, Jenni and Yu-Chu, for their time, expertise and words of encouragement throughout my thesis work. I would also like to thank Olivia Healy for her coding expertise and support. Lastly, I would like to acknowledge and thank my husband, Erik, for his support and commitment to our household as I spent many hours coding and writing.

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I. INTRODUCTION

We should never ask our Marines to choose between being the best parent possible and the best Marine possible. These outcomes should never be in competition to the extent that success with one will come at the expense of the other. *Our parental / maternity leave policies are inadequate and have failed to keep pace with societal norms and modern talent management practices* [emphasis added]. *We fully support the growth of our Marine families and will do everything possible to provide parents with opportunities* [emphasis added] to remain with their newborns for extended periods of time.

— Parental leave / Maternity leave, 38th Commandant's Planning Guidance
(Berger, 2019, p. 7)

During a time when recruitment and retention of talent is essential to the longevity of the Marine Corps, policies must support current personnel and entice citizens to join the organization. The existence, change, and implementation of said policies is a modern talent management practice; parents are the population the commandant wants to target, recruit, and retain. Families provide support and enable resiliency in Marines; they are a facet that contributes to the Marine Corps's overall mission accomplishment. Parenthood is a common event among Marines; therefore, an environment of support and understanding is critical. Improving support resources makes the balance of work and family become more manageable for Marines. My study examines how parenthood impacts the Dual-military (Dual-mil) Marines' performance and health. Literature conveys that the arrival of a new child can change sleep patterns, fitness levels, priorities, and responsibilities; the immediate change that parents are thrust into can cause an exorbitant amount of stress. The stressors of parenthood can compound for Dual-mil parents due to the unique challenges that already exist for these Marines. Dual-mils have to balance two demanding careers in one household; although these career constructs are similar, they can conflict due to competing requirements or priorities. In 2018 10% of married Marines were Dual-mil marriages and females made up almost 60% of Dual-mil marriages (Ruttenber, 2020). Dual-mil females have their own unique struggles during motherhood, and the pressure to return to full-duty status can be difficult when a spouse also has a demanding workload.

The Defense Advisory Committee on Women in the Services (DACOWITS) 2019 Focus Group reported that women faced additional difficulty navigating careers when planning to start a family or after becoming a caregiver (Gaddes et al., 2019). The commandant continues to express his priorities of increasing the female population to 10%; policymakers need to find direct solutions to improve female issues in order to retain and recruit. The Marine Corps must adapt to the present societal norms that exist today; implementing policy that supports both Dual-mil females and their spouses will attract the females of society today.

A. PURPOSE

The purpose of my thesis is to analyze the effects that parenthood has on Dual-mil Marines; these individuals experience a unique set of challenges that must be identified to better support and retain this population. My analysis provides results and recommendations that can help shape future policy and the quality of life of Marine parents.

B. SCOPE AND METHODOLOGY

The panel data used in this analysis is from the Marine Corps Total Force Data Warehouse (TFDW) and contains monthly observations of active-duty and reservist Marines and their dependents from January 2010 to December 2019. The data includes demographics such as gender, race, age, marital status, physical fitness test (PFT) and combat fitness test (CFT) scores, proficiency, and conduct (PRO/CON) scores, fitness report (FITREP) scores, geo-location, education status, and Dual-mil spouse. All these demographics combined with monthly observations of Marines' performance allow for the establishment of pre- and post-birth trends among Dual-mil parents. Health and performance are based on a Marine's fitness scores and PROCON or FITREP scores. The parents included in this data were observed 12 months before birth and at least 12 to 24 months after birth to allow for adequate health and performance trends. The two groups being evaluated are Marines married to a Marine spouse, known as "USMC Dual-mil," and individuals who are married to another service member or civilian, known as "Other Married."

C. RESULTS AND FINDINGS

My findings illustrate that there is an upward trend in the number of Dual-mils present in the Marine Corps. The exploration of former Dual-mils in the data also suggests that there is a substantial population of service members that could still be in the service today. Insight on when, how, and why Dual-mil families decide to turn into single active-duty member families will have positive impacts on talent retention. Moreover, it can provide insight on the effectiveness of current policies or lack thereof.

Immediately following birth all parents exhibited drops in combined fitness and first-class fitness. Dual-mil fathers experienced a greater drop in combined fitness scores than Other Married fathers, while mothers suffered similar drops in fitness. Like Larson (2020) I also discovered that no mothers returned to pre-birth fitness levels after giving birth. Job performance findings illustrate that both mother groups experienced a significant drop in job performance following birth; additionally, their drop was larger than males. Dual-mil fathers suffered no immediate drop in job performance prior to or immediately following birth, their performance drop was delayed until Month 9. Other Married fathers also experienced a delayed job performance drop; however, it was smaller than Dual-mil fathers. The results illustrate that Dual-mil parents respond to and recover from childbirth differently than other parents in the Marine Corps. Further insight on these Marines allows for future policy to better serve Dual-mil families.

D. ORGANIZATION AND CHAPTERS

The first chapter of my thesis provides an overview of my research; the second chapter provides a review of literature and research on the topics of parenthood and Dual-mil marriages. Chapter III includes an explanation of the data and methodology used, followed by my analysis of results. The final chapter of my thesis provides recommendations and further research on Dual-mil marriages and females.

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II. LITERATURE REVIEW

A. DUAL-MILITARY

A typical Marine family has one active-duty Marine, a civilian spouse, and children or dependents. Generally, it is assumed that the civilian spouse's occupation is less demanding than the active-duty Marine's. A Dual-mil family has two active-duty Marines married to one another, and children or dependents. The expectation is that both Marines' careers are demanding. Every permanent change of station (PCS) cycle, military families face uncertainty and the threat of separation. However, the possibility of separation is higher for Dual-mil families due to the difficulty of colocation. Orders are based first on the needs/availability of the Marine Corps and second on colocation. Colocation level of difficulty is also dependent on the Marines' MOSs and career timing; aligning career requirements for low- and high-density MOSs is especially tough. Many Dual-mils find themselves in conflict over which should be prioritized: colocation or career advancement?

Research on Dual mil families is particularly important due to the large number of females that make up these marriages. Taking a special interest in this population aligns with the commandant's initiative to integrate and increase females within the Marine Corps. Studies researching retention of Dual-mils convey that "navigating a rigid career path while maintaining a family in a system with varying support and flexibility can strongly influence a Dual-service officer's decision to remain in military service" (Kocis & Sonntag, 2018). The varying support and flexibility are the results of changes to parental leave policies since 2015 and cyclical relocations. Moreover, when Dual-mil parents experience the arrival of a new child they are met with less spousal support due to the demand of their spouse's job. Like civilian mothers, Dual-mil mothers are left with primary parental duties when their spouse returns to work. However, Dual-mil Marine mothers are under added stress to return to Marine Corps height/weight and fitness standards, while their spouse must also maintain fitness standards. My research examines how parenthood impacts Marines' ability to maintain and return to fitness standards compared to single military member households.

Additionally, Dual-mil women have a lower rate of retention compared to women with civilian spouses; however, women that do stay in after 10 years show higher performance than their male counterparts (Wagner, 2017). It is evident that the current resources in place are inadequate for female service members; pointed research that explores how this population is affected by parenthood will provide the Marine Corps with the information necessary to create new resource support or to supplement resources that already exist.

The Marine Corps does not differentiate former Dual-mils from other, non-Dual-mil Marine families. So, while the USMC continues to focus on the status and retention of current Dual-mil Marines, we have no insight on how many former Dual-mils are in the Marine Corps. Former Dual-mils are couples who were both active duty at one point, but one spouse left the Marine Corps. The decision-making behind when and why Dual-mils decide to end active service (EAS) is more involved based on their unique challenges. Insight on how many civilian spouses are veterans/former Dual-mil spouses allows the Marine Corps to form a strategy on retaining Dual-mils. I wrote and created a new variable within the USMC TFDW data to identify these individuals and recommend that further research be conducted to analyze the common trends in Dual-mil EAS. Analysis could communicate where the Marine Corps can insert incentives or more support resources to retain this population.

B. PARENTHOOD IN THE MARINE CORPS

1. Culture

The progression of society and the evolution of Marine Corps policy has positively impacted the culture surrounding parenthood and pregnancy. In 2018 alone, 39.7% of Marine Corps active-duty Marines were married and/or had dependents, and the number of active-duty family members in 2018 totaled just over 160,000 (Military OneSource, 2018). From the inclusion of females to the combat arms community to updates in postpartum policies, each change has shifted the mindset of Marines and leaders. The changes in mindset allowed for the creation and availability of resources to support Marine parents and families.

Being a Marine takes commitment and dedication; it is sometimes referred to as a lifestyle due to its time requirement. Balancing such a demanding profession with a family can be challenging, as both commitments require energy, effort, and time. Depending on a Marine's situation, command, and leadership the scale can be imbalanced. In general, the perception is that staying at work longer equates to being a good Marine, and leaving "early" means that individual cares less. Regardless of how a Marine is spending time away from work, it is perceived as a distraction. Typically, time away from work is spent on family; therefore, family can be viewed as a distraction. As a result, maternity and paternity leave was expected to be as minimal as possible to expedite the return to work. The most recent changes to the parental leave policy attempts to dispel this belief by extending paternity (secondary caregiver) leave from 10 to 14 days, affording fathers additional time with their newborns. This signaled to Marines that taking more time to support their family was acceptable and allowed. It alleviated the pressure of Marines having to choose family or profession; it advocated that both priorities were equally as important.

Although the culture surrounding parenthood is improving, the opinions surrounding pregnancy continue to be negative (Gaddes et al., 2019). The negativity surrounding pregnancy is due to a Marine's duty and deployment status. Pregnant Marines are entered into a "limited" duty status—making them undeployable for their unit, meaning that the unit must operate with a shortfall. Of course, the climate surrounding pregnancy varies by command, but from a candid perspective, a pregnant female Marine is "mission incapable" for the Corps. Commands do not receive replacements for pregnant Marines; without a replacement, commands must operate with a gap for up to 20 months between pregnancy and the postpartum recovery period. Naturally, this gap increases workloads for other individuals in the unit and creates the perception that females are ineffective to the unit and Marine Corps. As parental/postpartum policy continues to change in accordance with the commandant's initiative Marines are beginning to experience the benefits of increased support. The increased paternity leave signaled that pregnancy, fatherhood, and motherhood was a natural and acceptable experience to have in the Marine Corps and that pregnant Marines should not be ostracized for it. Motherhood does not detract from females' value and contribution as a Marine; in fact, supporting parenthood is an

investment in the success of the organization. The stigma has not completely departed, but it continues to be mitigated through policy and progression of females and parenthood in society.

2. Institutional Bias

Larson (2020) and Bacolod et al.'s (2020) work demonstrated the culture surrounding parenthood in the Marine Corps has changed and must continue to change to support Marine families. Barton's (2019) thesis examined how current Marine Corps orders and policies concerning pregnancy and postpartum period create a stigma surrounding parenthood and pregnancy. She conducted qualitative research examining the ambiguity of language in policies; the lack of clarity and guidance in these policies can ostracize Marines creating unintentional bias (Barton, 2019). Her analysis argued that referring to a pregnant Marine as a "servicewoman" throughout the 2004 MCO 5100.12E ostracizes pregnant Marines; the word *exchange* insinuates that a pregnant Marine is not a Marine. The other issue surrounding parenthood is that language in orders and policies identify pregnancy as an injury or temporary status. Barton recommended that by "clarifying Marine Corps policies and making them more prescriptive, rather than restrictive, the Marine Corps can normalize pregnancy and preserve a lethal force while retaining the talent that women bring to the Corps" (Barton, 2019).

3. Leave-Taking Behavior

Dual-mil parents encounter different challenges and priorities than typical parents. Regardless of whom a Marine is married to, the pressure to continue to perform and balance work and family remains the same. The most immediate pressures following a birth are the urgency to return to the workplace, and to height/weight standards, and physical fitness standards. Households with Dual-mil parents have a more difficult time balancing these demands; without a flexible spouse, a new mother's return to full duty status can be challenging. Return to the workplace and full duty status takes time, and parental leave policy has adjusted accordingly to allow postpartum females to recover and to give both parents the time they need. The changes made to parental policy over time include the specification, qualification, timing, and duration of leave. Parental leave policy identifies

leave-takers in three categories: primary caregiver, secondary caregiver, and maternity convalescent. Parents identify caregivers based on their family situation, and maternity convalescent leave applies to the birth parent. The length of paternity leave has changed only once in the past decade, as secondary caregiver leave increased from 10 to 14 days. Maternity and primary caregiver leave has fluctuated from 6 to 12 to 18 weeks. Currently policy provides mothers with 84 days (12 weeks) of non-chargeable leave. Leave is broken down into 42 days of maternity convalescent and 42 days of primary caregiver leave.

Primary and secondary caregiver leave must be utilized within one year of birth and secondary caregiver leave must be taken up in one increment. Bacolod et al. (2020) examined leave-taking behavior across the incremental changes in policy from 2015 to 2019. The models in their research determined that during the 18-week and 12-week policies, males and females were anywhere between 3 to 6 percentage points more likely to use parental and any leave in the paternity and maternity period (Bacolod et al., 2020). Bartel et al. (2015) conducted analysis on father leave-taking behavior under the California paid family leave program. The researchers discovered that the program increased joint leave-taking and leave-taking in dual-earner fathers: “In fact half of fathers’ leave-taking occurs at the same time that the mother is off work and the other half takes place when she is working” (Bartel et al., 2015).

4. Health and Performance

Although fitness is not measured in civilian professions, it is commonly known that pregnancy and birth can have lasting effects on a women’s recovery and health. Civilian literature suggests that females experience a greater impact to health post-birth due to a shift in their physical activities. Bellows-Riecken & Rhodes (2008) discovered that mothers exercised 37% less, decreased participation in leisure activities, and became 10 times more likely to engage in household activities. The increased household and parental responsibilities that women experience cause their physical activity to decline more than men. However, when compared to non-parents, both mothers and fathers were more inactive; fathers decreased activity for only a short time period following birth, while mothers’ inactivity stretched for a longer time (Bellow-Riecken & Rhodes, 2008). As

parents gain more responsibilities, it is assumed that their job performance may decline as a result, but civilian literature has found that both mothers and fathers exhibited greater motivation to work hard for their families. Kmec (2011) found that parents do not find home life a distraction to work; in fact, his study discovered that mothers were more engaged in the workplace than fathers. The study suggested that may be due to women's overestimation of employer expectations to avoid negative working mother stereotypes. The majority of civilian research compares parents to non-parents. My thesis contributes to literature by comparing two different kinds of parents. Parents are an inevitable population within the labor force, and increased research on types of parents can enhance organizations' chances of success and improve employees' quality of life.

Estimation of how parenthood impacts service members' health and job performance provides information on what resources or support parents need. Larson's (2020) research estimated the effects of childbirth on first-time parents using an event study design analysis. Using a similar design, Cordero (2020) conducted a subgroup analysis that compared the health and performance of active-duty and reservist Marines following childbirth. Larson established pre- and post-birth trends among parents and non-parents to determine changes in health and job performance. Larson's work confirmed that the birth of a child impacts parents' health by causing a drop in physical fitness scores; however, over time parents return to their pre-birth fitness levels. Regarding job performance, Marine mothers' performance dropped significantly upon returning to work after maternity leave. Meanwhile, Marine fathers had no significant changes to performance pre- or post-birth; Larson predicts this is because males require no reintegration to the workplace after being absent for 14 days. Males did face a performance drop 20 months post-birth, suggesting that male parents could use added resources or support later in their parenthood journey rather than immediately following birth (Larson, 2020). The model used by Larson can be used to examine other subgroups in the Marine Corps; he suggested that further analysis should be conducted to target specific groups of parents who need support the most. Further subgroup analysis can provide the Marine Corps with complete information to determine resource allocation, what resources are needed and how these resources can be implemented to support Marine families.

Literature clearly suggests that parents experience drops in physical health and performance. My research takes it a step further by examining a certain type of parent. I aim to fill in the gaps of research for Dual-mil parents; I examined the number of former Dual-mil spouses that exist in my data and how parenthood impacts the health and performance of these individuals. My results can provide insight on the sufficiency or inadequacy of current policy and support resources. The next chapter provides an in-depth explanation of my data and analytical design.

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III. DATA AND METHODOLOGY

A. DATA DESCRIPTION

The panel data used in my analysis is from the Marine Corps' Total Force Data Warehouse (TFDW) and expands upon the original data set used by Larson (2020) and Cordero (2020). Larson's analysis covered data collected from January 2013 to March 2019; Cordero's research expanded the data set by adding an additional 3 ½ years ranging from January 2010 to December 2012 and April 2019 to October 2019. My data collection adds an additional 2 months and continues to track monthly observations of active-duty and reservist Marines and their dependents from January 2010 to December 2019. As a continuation of Larson and Cordero's research, I use matching variables to examine health and performance changes before and after birth for Dual-mil parents. The data on Marines includes demographics such as gender, race, age, marital status, general classification scores (measure of intelligence), education status, and service type. The data on dependents includes demographics such as date of birth, geo-location, gender, and whether or not the spouse is Dual-mil. This set of demographics allows me to identify new Dual-mil parents for the establishment of pre- and post-birth trends. Variables in my thesis used to illustrate health are PFT and CFT scores, which are standardized to compute combined fitness scores. Job performance is described through proficiency and conduct (PROCON) scores and fitness report (FITREP) scores; these evaluations are standardized to create a performance rating.

To determine health and job performance effects, I used two samples based on observation times of parents. The first sample observed parents for at least 12 months before and after birth, and the second sample further restricted the data to parents observed for at least 24 months after birth. The shorter observation period provided a larger sample size, while the longer observation period enabled a longer time frame to establish trends for the treatment and control groups. My models' treatment groups are Marines married to a Marine spouse, known as "USMC Dual-mil," and the control groups are "Other Married," comprising parents who are married to another service member or civilian. These groups

are my primary point of comparison, but I use other non-parent Marines to estimate time fixed effects, which capture changes that affect all Marines over time.

1. Summary Statistics

Tables 1 and 2 illustrate the summary statistics for mothers and fathers in the treatment and control groups. The treatment groups in both tables are the new Dual-mil mothers and fathers; the control groups are Other Married mothers and fathers. Both groups were observed having a child during the observation period. There are 1,107 Dual-mil fathers and 1,147 Dual-mil Mothers with adequate observation time in the ± 12 -month treatment sample. The control sample contains 21,501 Other Married fathers and 646 Other Married mothers. Based on these samples, it is evident that the Marine Corps is still a predominantly male organization and that there are many more Other Married fathers than Dual-mil fathers. The demographic means displayed in the tables are based on the monthly data in which the Marines had a child. Additionally, the table illustrates the differences in means between groups for each demographic variable. I also provide the p value of a joint F test on all demographic variables and individual t statistics for each demographic variable's difference in means.

The descriptive statistics demonstrate that both father groups share many similarities; the individual t tests and a joint F test show that the differences between the two groups are not jointly statistically significant. When compared to the control group, Dual-mil fathers are more likely to identify as African American or Hispanic and are less likely to have a combat arms MOS and some college education. Like Dual-mil mothers, Dual-mil fathers are also younger than Other Married fathers and are less likely to be officers.

The female groups share even less statistical differences (see Table 2). Dual-mil mothers are younger, have lower GCT scores, and are less likely to have a college education, but overall, the differences are not jointly statistically significant. The resemblance in the treatment and control groups allows me to make causal estimates on their health and performance. Prior to birth, both groups of parents perform similarly, and

following childbirth is when the groups diverge, suggesting that Dual-mil parents respond to parenthood differently than Other Married parents.

Table 1. Descriptive Statistics for Marine Fathers

	New Dual-mil Fathers	Controls (Other Married Fathers)	Difference between Fathers and Controls
	Mean/SD	Mean/SD	Coeff Diff/ T-Statistic
AFQT_score	62.731 (17.487)	63.682 (17.923)	0.951 (1.651)
GCT_score	110.436 (12.603)	112.178 (12.353)	1.742*** (4.570)
Some college (0/1)	0.030 (0.170)	0.039 (0.194)	0.009 (1.559)
College (0/1)	0.111 (0.314)	0.171 (0.377)	0.060*** (5.201)
Age	21.687 (3.843)	22.460 (4.078)	0.773*** (6.171)
Married (0/1)	0.223 (0.417)	0.321 (0.467)	0.098*** (6.825)
African American (0/1)	0.150 (0.357)	0.072 (0.259)	-0.078*** (-9.542)
Hispanic (0/1)	0.140 (0.347)	0.117 (0.322)	-0.023* (-2.302)
Officer (0/1)	0.100 (0.300)	0.152 (0.359)	0.052*** (4.694)
Combat_mos	0.199 (0.399)	0.285 (0.451)	0.086*** (6.237)
CSS_mos	0.428 (0.495)	0.341 (0.474)	-0.088*** (-5.981)
AVN_mos	0.260 (0.439)	0.265 (0.442)	0.005 (0.380)
Other_mos	0.112 (0.316)	0.109 (0.311)	-0.003 (-0.341)
Observations	1,107	21,501	22,608
F test <i>p</i> value	0.0000		

Demographics for male Marines in the sample from January 2010 to December 2019. The first and second columns display mean coefficients; standard deviations are in parentheses. The final column displays the difference in coefficients between the control (Other Married parents) and treatment (Dual-mil parents) groups. Below the coefficient differences are their associated *t* statistics in parentheses. Statistical significance shown by **p* < 0.05, ***p* < 0.01, ****p* < 0.001. Data source: USMC Total Force Data Warehouse.

Table 2. Descriptive Statistics for Marine Mothers

	New Dual-mil Mothers	Controls (Other Married Mothers)	Difference between Mothers and Controls
	Mean/SD	Mean/SD	Coeff Diff/ T-Statistic
AFQT_score	59.356 (16.543)	61.258 (17.458)	1.903* (2.154)
GCT_score	104.341 (11.639)	106.394 (12.422)	2.053*** (3.491)
Some college (0/1)	0.048 (0.214)	0.053 (0.223)	0.005 (0.438)
College (0/1)	0.100 (0.300)	0.181 (0.385)	0.081*** (4.927)
Age	20.950 (3.558)	21.924 (4.144)	0.974*** (5.238)
Married (0/1)	0.220 (0.414)	0.263 (0.441)	0.043* (2.084)
African American (0/1)	0.119 (0.324)	0.155 (0.362)	0.035* (2.124)
Hispanic (0/1)	0.179 (0.383)	0.164 (0.371)	-0.015 (-0.786)
Officer (0/1)	0.081 (0.273)	0.142 (0.350)	0.061*** (4.116)
Combat_mos	0.051 (0.221)	0.051 (0.220)	-0.000 (-0.033)
CSS_mos	0.602 (0.490)	0.570 (0.496)	-0.033 (-1.355)
AVN_mos	0.203 (0.403)	0.193 (0.395)	-0.010 (-0.490)
Other_mos	0.143 (0.350)	0.186 (0.389)	0.043* (2.384)
Observations	1,147	646	1,793
<i>F</i> test <i>p</i> value	0.0004		

Demographics for male Marines in the sample from January 2010 to December 2019. The first and second columns display mean coefficients; standard deviations are in parentheses. The final column displays the difference in coefficients between the control (Other Married parents) and treatment (Dual-mil parents) groups. Below the coefficient differences are their associated *t* statistics in parentheses. Statistical significance shown by **p* < 0.05, ***p* < 0.01, ****p* < 0.001. Data source: USMC Total Force Data Warehouse.

2. Data Outcomes

I examine three dependent variables to estimate the parenthood impacts to health and performance:

- *Combined Fitness Score*: a standardized variable where the mean=0, and SD=1, based on the combined scores from the physical and combat fitness tests. Both the PFT and CFT use a 300-point scale (100 maximum points for each event).
- *Top Performance on Fitness Test*: the probability that a Marine achieves a first-class fitness score, (235 points or higher for both the PFT and CFT) measured separately for males and females.
- *Job Performance Rating*: a standardized supervisor-rated job performance evaluation for both officers and enlisted. Appendix A describes the characteristics of each evaluation. (Larson, 2020, p. 29)

Marine Corps fitness is measured in two events: the PFT, which is conducted from January to June, and the CFT, which is conducted from July to December. My thesis combined PFT and CFT scores to create one metric for fitness. Combined fitness score was created by converting scale scores into Z scores for each test by gender and year. Once converted, I combined the Z scores into one fitness score to illustrate the fact that Marines have two fitness tests a year; overall standard deviation is 1 and the mean is 0. The conversion was necessary to account for variations in Marine Corps fitness standards and childbirths throughout a calendar year; the combination of scores allowed for multiple observations per year and more statistical power in my analysis. Tables 3 and 4 describe the events to be completed for each fitness test in the Marine Corps.

Table 3. USMC PFT Events

Physical Fitness Test (PFT)	
<i>January to June</i>	
Events	Alternate Events
Pull-ups: max repetitions	Push-ups: max repetitions in 2 minutes
Crunches: max repetitions in 2 minutes	Plank: max time
3-mile run	5,000-meter row

Table 4. USMC CFT Events

Combat Fitness Test (CFT)
<i>July to December</i>
Movement to Contact: 880-yard run
Ammo Can Lifts: max repetitions in 2 minutes
Maneuver Under Fire: 300-yard obstacle course

The Marine Corps uses different evaluation reports based on Marines' rank; PROCON scores are used to evaluate the ranks of private through corporal, and FITREPs evaluate all officers and enlisted ranks of sergeant and above. Like the combined fitness score, I also standardized performance by age and gender and combined evaluation scores (PROCON and FITREP) to create job performance ratings. The timing of evaluation is based on a Marine's reporting period or occasion; therefore, a Marine may receive multiple reports within a year, and a score is generated each time a report occurs.

B. METHODOLOGY

1. Former Dual-mil Identification

I explore and identify former Dual-mil spouses through the creation of a new variable. Prior to the creation of *former Dual-mil* spouse, these individuals fell into the civilian spouse variable. The former Dual-mil spouse variable is derived from the USMC spouse indicator variable, which returns a 1 for USMC spouse and 0 otherwise. Former Dual-mil spouses were identified to be individuals whose USMC spouse value changed from 1 to 0 but remained continuously married. The presence of these types of marriages and families may glean insight into the effectiveness of parental leave policies and retention.

Once I identify former Dual-mils in the data, I conduct a Least Absolute Shrinkage and Selection Operator (LASSO) model with 5-fold validation to identify what variables are most likely to predict a former Dual-mil within the TFDW data. I run this model on current and former Dual-mils in the data as of October 2019. Variables I include are rank, race, gender, age, MOS, education, and number of children. I also create an interaction between the variables, female and Everbaby (indicator variable for whether the Marine was observed having a child in the data: 1 for Marine has a child and 0 otherwise), to examine how being a mother predicts a former Dual-mil. The output created by the LASSO method includes relevant variables, and drops any irrelevant variables that would increase variance within the model. The negative coefficients in the output indicate that a particular characteristic is less common in the former Dual-mil population than the current Dual-mil population; a positive coefficient indicates that it is more common in the former Dual-mil population than the current Dual-mil population.

2. Event Study Regressions

Based on past studies and data available, I use two models that estimate the differences between the treatment and control groups. The primary group of interest is Both parents and my treatment is defined as those Marines who are married to a Marine and my control group consists of individuals who are married to either another service member (not a Marine) or a civilian. The nature of the USMC TFDW panel data allows me to

observe Marines at different points in their career, which enables a time-series measurement of Marines' health and performance. I also used year fixed effects to account for service-wide policy changes such as parental leave policy and increase in fitness standards. The non-parents in the analysis contribute toward the estimation of these time fixed effects. Equations 1 and 2 display the equations adapted from Larson (2020), Cordero (2020), and Healy and Heissel (2020) to conduct time-series event study analysis to estimate differences between groups. I examine health and performance outcomes of Dual-mil parents following birth and compare it to Other Married parents over time. I predict that Dual-mil parents will experience a larger dip in health and performance and will take longer to recover than Other Married parents. The design of my models can produce causal outcomes due to similarities of the treatment and control groups pre-birth for both genders. Since Dual-mil and Other Married parents' pre-birth trends are similar we can deduce that differences in their outcomes are a result of their differences in family, marriage, or career dynamics.

My first model estimates the monthly impact of parenthood on health and job performance for Dual-mil and Other Married parents, measured separately by gender. This model was run separately for each treatment group and compare their performances to non-parents.

$$Y_{it} = \sum_{k=-m}^l M_{it}^k \delta_k + \gamma_i + \tau_t + \varepsilon_{it} \quad (1)$$

In Equation 1, Y_{it} represents the outcomes for Dual-mil and Other Married parents, to include separate male and female calculations. The variable M_{it}^k , represents the monthly dummy variables for the pre- and post-birth periods; variables range from m months before birth ($m = -24$) to l months after birth ($l = 24$). The coefficient δ_k represents the estimated effect of childbirth on parents' outcomes k months before and after birth. τ_t is a time fixed effect to account for general changes over time, including any service-wide policy changes (i.e., PFT/CFT standards). γ_i is an individual fixed effect measure that accounts for individual changes that occur during the study, and ε_{it} is the error term.

3. Parsimonious Models

The model in Equation 1 is specific and provides monthly estimates of Marines' pre- and post-birth trends. The parsimonious models represented in Equation 2 are much more general: instead of monthly estimates, Equation 2 provides estimates on distinct time periods throughout pregnancy that I have determined. The time periods I established determine any trends pre-, during- and post-pregnancy including recovery. The results of this model allow me to test for statistical significance in the health and performance differences between parent groups. The following variables represent how I defined time periods; these are compared to 10 months before birth and prior in Equation 2:

$P_{it}^1 = 1$, for months -9 to -1 for males and females, if the Marine has a baby, and $P_{it}^1 = 0$ otherwise. Females do not receive this coefficient for health measures. This establishes *Pregnancy* trends.

$BJ_{it}^1 = 1$, for months 1–2 for males, 8–12 for females, if the Marine has a baby, and $BJ_{it}^1 = 0$ otherwise. This establishes any immediate postnatal trends.

$BJ_{it}^2 = 1$, for months 3–12 for males, 13–24 for females, if the Marine has a baby, and $BJ_{it}^2 = 0$ otherwise. This establishes additional postnatal trends.

$BJ_{it}^3 = 1$, for months 13–24 for all male Marines who have a baby. This establishes trends beyond the first year of birth. Females do not receive this variable. (Larson, 2020, pp. 32–33)

$D_i = 1$, for Dual-mil spouse, if a Marine is married to another Marine, and $D_i = 0$ otherwise.

Equation 2 re-estimates the impact of parenthood on Marines' health and performance as

$$Y_{it} = \alpha_1 P_{it}^1 + \alpha_2 BJ_{it}^1 + \alpha_3 BJ_{it}^2 + \alpha_4 BJ_{it}^3 + \beta_1 (P_{it}^1 D_i) + \beta_2 (BJ_{it}^1 D_i) + \beta_3 (BJ_{it}^2 D_i) + \beta_4 (BJ_{it}^3 D_i) + \gamma_i + \tau_t + \varepsilon_{it} \quad (2)$$

where the effect of pregnancy trends, such as the immediate and additional post-birth trends (Birth jump 1, 2 and 3), are represented by α_1 , α_2 , α_3 , and α_4 . These coefficients represent

the change in performance accrued by all parents in a given time period, relative to the pre-pregnancy period. The coefficients, β_1 , β_2 , β_3 , and β_4 , represent the interactions between D_i (Dual-mil spouse) and the pregnancy/postnatal trends (Birth jump 1, 2 and 3). These interactions illustrate how the difference relative to pre-birth period differs between the Dual-mil parents and Other Married parents. All other variables (γ_i , τ_t , ε_{it}) in Equation 2 have the same definition as Equation 1.

C. SCOPE & LIMITATIONS

Due to pregnancy cycles, female fitness scores are not observed 10 months before and 9 months after birth. Female limited duty status has no impact on job performance evaluations received during pregnancy. Therefore, job performance observes evaluations until 9 months before birth and starts again 7 months after birth. Estimation of health and performance 7 months after birth is to account for the 6 months that females are absent due to parental leave and their non-deployable status. Males are observed for the full 24 months before and after birth, as they are not in a limited duty status due to pregnancy. However, the model does not estimate fitness and performance effects in the actual month of birth. This estimation was omitted because the model enters fitness and performance scores by month rather than a specific date. Therefore, if a birth and fitness or performance occur within the same month, the model is unable to clearly identify if the estimate is pre- or post-trend.

Another limitation is the impact of service-wide policy changes; between 2010 and 2019, changes were made to fitness standards, parental leave, and postpartum policy. Increased standards in the PFT and CFT impacted all Marines and caused increased drops in overall scores. The changes in duration of parental leave and recovery requirements in postpartum policy also affect Marines' health and performance. These changes can influence retention, and when and how a Marine returns to work or full duty status (i.e., determines when they are required to take fitness test following birth). The individual and time fixed effects in both models account for these impacts.

A possible problem is FITREP data, specifically the occasion, duration, and career timing of reports. The nature of when these reports occurred and were written is different

for each individual. To mitigate the bias in these reports, the job performance variable was standardized. Larson (2020) recommended that additional research “analyze how different lengths of job evaluations interact with parenthood and performance” because that could explain more about the performance of parents than just the birth of a child (Larson, 2020).

Although the treatment and control groups are similar and move parallel to each other pre-birth, both Dual-mil and Other Married parents observations are small. Due to the size of the groups, standard errors may be higher. The data only covers 2010–2019, if the study continues for several more years, observations for this subgroup will increase and strengthen the outputs of this model.

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IV. RESULTS

A. FORMER DUAL-MIL SPOUSES

Figure 1 illustrates spouses in the data. The y-axis represents the number of spouses and the x-axis displays spouse type. “Unmarried” represents unmarried Marines, “Current spouse is Civilian” accounts for Marines married to persons that do not serve in the Marine Corps and are not Former Dual-mil spouses, “Current spouse is Marine” are individuals married to another Marine, and “Current spouse is Former Marine” are individuals who changed status from Dual-mil spouse to Civilian spouse under their current marriage (meaning their spouse ended active duty and they remained in the service). My code and data stop tracking Marines when they end active service. For example, I track both Marines in a Dual-mil marriage under “Current spouse is Marine,” but when Spouse A ends active service they will drop from the data (tracking stops). Spouse B will move from “Current spouse is Marine” to “Current spouse is Former Marine.” Therefore, a Dual-mil Marine ending active duty drops the current Dual-mil population by 2 and increases former Dual-mil population by 1.

Current data used by the USMC cannot distinguish Civilian spouses from Former Dual-mil spouses, so they all appear as Civilian spouses. I discovered that as of October 2019, the data contains 75,061 Civilian spouses and 3,162 Former dual-mil spouses. This analysis is the first to indicate that 4% of what the USMC identifies as Civilian spouses are actually Former Dual-mils. The reasons why these service members ended active-duty service is unknown. Alternatively, if those service members had remained in active duty the population of current Dual-mil spouses could increase by 91%.

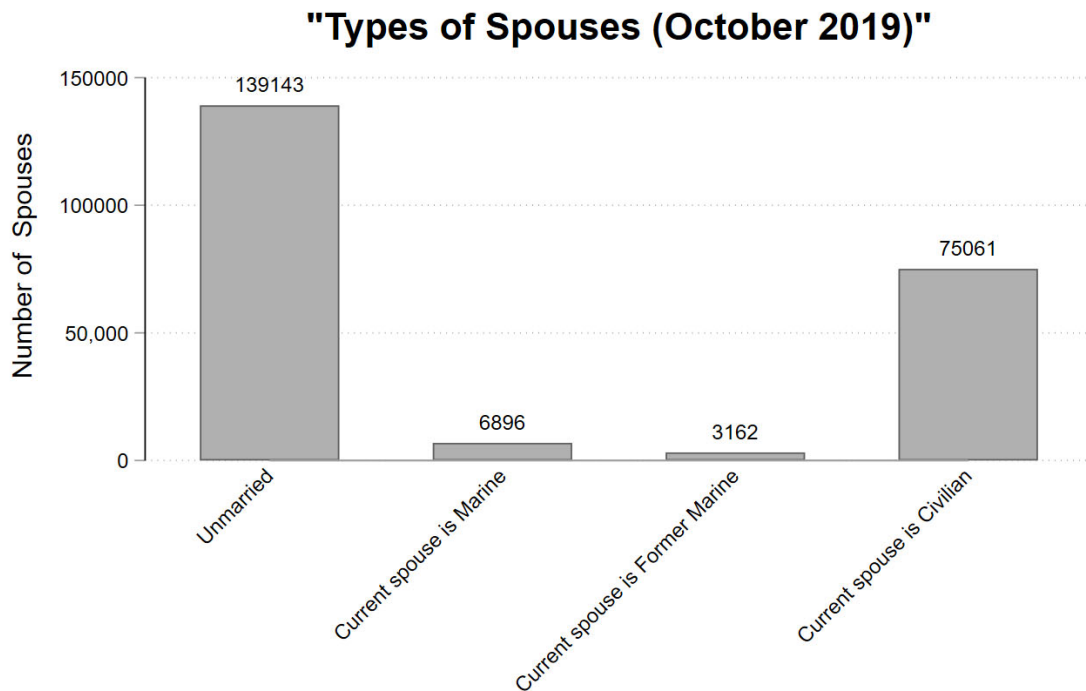


Figure 1. Spouses in the Sample, by Type. Source: Total Force Data Warehouse

Figure 2 illustrates the trend of current and former Dual-mil spouses from the start of the data period to the end (2010–2019). Former Dual-mils began a steady decline in 2014; in that same year, the amount of current Dual-mil spouses began its decline to its lowest numbers in 2015. The following years show a steady decline for former Dual-mils and a steady incline for current Dual-mils. It is unknown what the causes are for each population's increase and decrease. However, 2015 marked the beginning of major maternity and parental leave policy reform as Secretary of the Navy Ray Mabus increased maternity leave to an unprecedented 18 weeks for mothers (Rhodan, 2015).

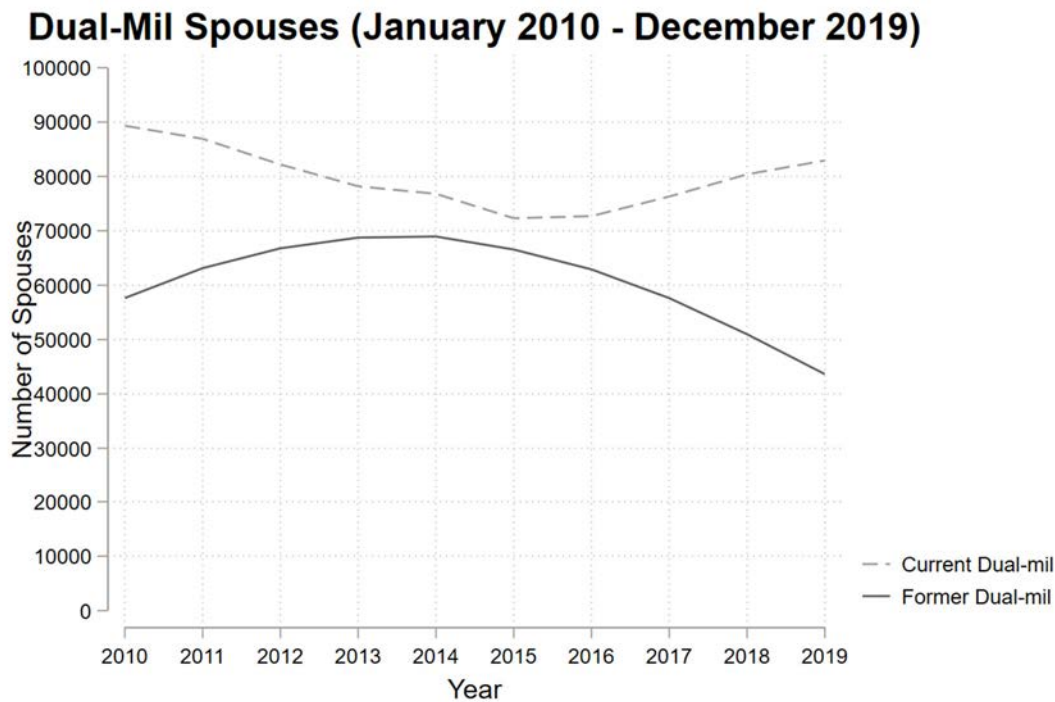


Figure 2. Current and Former Dual-mils in the Sample. Source: Total Force Data Warehouse

To further investigate former Dual-mils, I use the LASSO method to identify which variables are most likely to predict former Dual-mils within the TFDW data. Table 5 displays the variables that are most relevant in identifying former Dual-mils; the LASSO method dropped any irrelevant variables that would increase variance within the model. Negative coefficients signify attributes that make Marines less likely to be a former Dual-mil, and positive coefficients signify attributes that make Marines more likely to be a former Dual-mil. Results show that females are less likely to be former Dual-mils relative to males. Being a former Dual-mil means that this Marine remains in the service and their spouse ends active service, indicating that it is female Marines who tend to drop out of the Marines in Dual-mil households. Additionally, if a Marine is observed to have a child in the data study window, they are more likely to be a former Dual-mil (meaning one spouse stays in and the other ends active service) than to remain a current Dual-mil. Lastly, results

found that mothers are less likely to be a former Dual-mil. In other words, mothers in the Dual-mil marriage are choosing to end active service, and fathers are staying in.

Table 5. Characteristics of Former Dual-mils

	Former Dual-mil Coefficient
Female	-0.045
Everbaby	0.094
Female*Everbaby	-0.177
Number of kids	0.108
(Number of kids) ²	-0.005
(AFQT_score) ²	0.000
Fitness_recent	-0.015
Some college	-0.022
College	-0.017
Age	0.064
(Age) ²	-0.001
Time in service	0.001
African-American	-0.026
Hispanic	-0.012
Officer	-0.036
Combat_mos	0.010
AVN_mos	-0.012
_cons	-0.837
Observations	9,765

The table displays variables deemed relevant by the LASSO method to predict former Dual-mils in the data. The variable *Everbaby* is an indicator variable for whether the Marine was observed having a child in the data: 1 for Marine has a child and 0 otherwise. Number of kids, Age, and Time in service (measured in months) are continuous variables. All other variables are indicators.

B. FATHERS

1. Event Study Regressions

The event study regressions examine health outcomes for parent groups (see Figures 3–4 and 6–7). The graphs display monthly estimates for combined and first-class fitness scores. All estimates are relative to 10 months before birth, and the dotted line in the center of the figures represent the month a child is born (birth = 0). The x-axis is a measurement of time in months, and the y-axis is measured in standard deviations from the mean. The gray areas of the figures represent the standard errors within the regression. I do not observe the birth month for either gender, as both groups are typically executing some amount of parental leave during this month. Additionally, I omit 10 months pre-birth and 7 months post-birth for females due to the pregnancy and postpartum exemption from fitness standards. This study captures the former postpartum exemption of 6 months; in February 2021 the policy expanded the period to 12 months. Table 6 is a reference for parents’ average fitness scores in the sample.

Table 6. Average PFT/CFT Scores for Parents

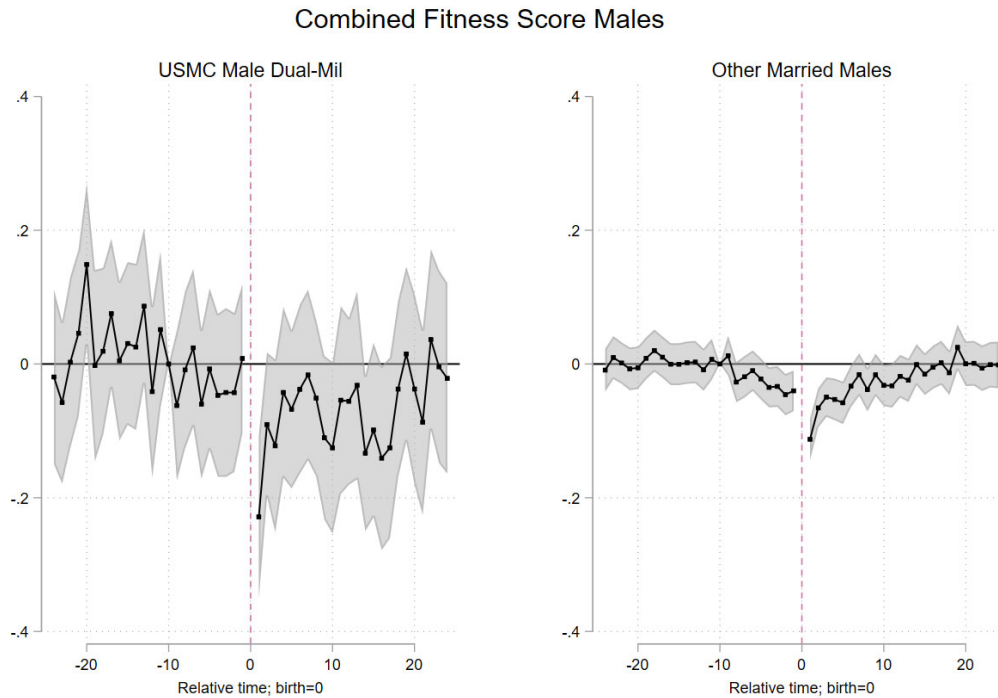
	Dual-mil Parents		Other Married Parents	
	PFT	CFT	PFT	CFT
Fathers	259.68 (27.59)	285.24 (18.59)	254.87 (29.61)	283.60 (19.07)
Mothers	254.03 (32.06)	282.21 (19.93)	254.32 (32.36)	282.37 (19.27)

Table displays averages for both PFT and CFT, with averages measured separately for each group. Data source: Total Force Data Warehouse.

Job performance event study regression results are displayed in Figures 5 and 8. Job performance is a standardized rating because junior enlisted ranks receive a different type of evaluation than senior enlisted and officers. Junior Marines (ranks E-1 to E-4) receive PROCON scores, and officers and E-5 and above receive FITREPs. Job

performance outcome is measured in standard deviations from the mean (pre-birth trends), just like combined fitness score (mean = 0, standard deviation = 1); this was the best way to structure this outcome since there is no consistent interpretation across evaluation scores. FITREPs and PROCON scores cover performance over a period, and pregnancy/birth does not exempt Marines from observation and evaluation. Therefore, the drops observed post-birth in the regression could be a result of Marines' performance before, during, or after pregnancy/birth. Although drops in job performance cannot be exclusively attributed to the birth of a child, any drop in performance can have an impact on individuals' promotions and careers.

Figure 3 illustrates that both father groups suffer an immediate drop to combined fitness scores following birth (Month 1). Other Married fathers, on average, experienced a 0.113 standard deviation drop in combined scores relative to pre-pregnancy scores, which is a 2-point drop in the CFT and a 3-point drop in the PFT. On average, Dual-mil fathers experienced an even larger drop of 0.229 standard deviations or a 4-point drop in the CFT and a 6-point drop in the PFT after birth. In Month 2, both father groups begin their recovery to pre-birth levels. Based on the point estimates, Other Married fathers returned to their pre-birth average at 14 months after birth. Dual-mil fathers took a little longer to recover, returning to their pre-birth average at 18 months post-birth. The Dual-mil estimate is much noisier than the Other Married fathers' analysis due to sample size. The smaller sample size triggered large standard errors and prevented me from concluding that Dual-mil fathers return to normal after 2 months and that Other Married fathers return to pre-birth levels at Month 7 post-birth. This highlights the need to use the formalized approach in my parsimonious models, which allows for statistical testing of groups of months.



Graph displays monthly coefficients from event study (time series) regression. The outcome combines standardized PFT and CFT scores (mean = 0, SD = 1). Treatment groups are parents observed at least 12 months pre-/post-birth, and the control group are Marines observed not having a baby (their monthly estimates are not displayed). Month 0 is the birth month; standard errors are represented by the grey area and all estimates are relative to 10 months prior to birth. Data source: Total Force Data Warehouse.

Figure 3. Fitness Outcomes Among Marine Fathers

The first-class fitness outcome illustrated in Figure 4 is interpreted as percentage point changes in the probability that a Marine achieves a first-class score (y-axis); estimates are relative to 10 months before the birth event (x-axis). Marines achieve a first-class score by scoring 235 points or higher in the PFT and CFT. Results show that all fathers' probability of achieving first-class fitness scores drop following childbirth. Dual-mil fathers' probability of achieving a first-class score in the PFT or CFT drops by 5.6 percentage points and continue to be below their pre-birth level until Month 4, while Other Married fathers' probability only decreases by 1.6 percentage points immediately following birth. At 2 months post-birth, Other Married fathers begin their recovery to pre-birth levels. By Month 7 they return to these levels, and by Month 9 they exceed their pre-

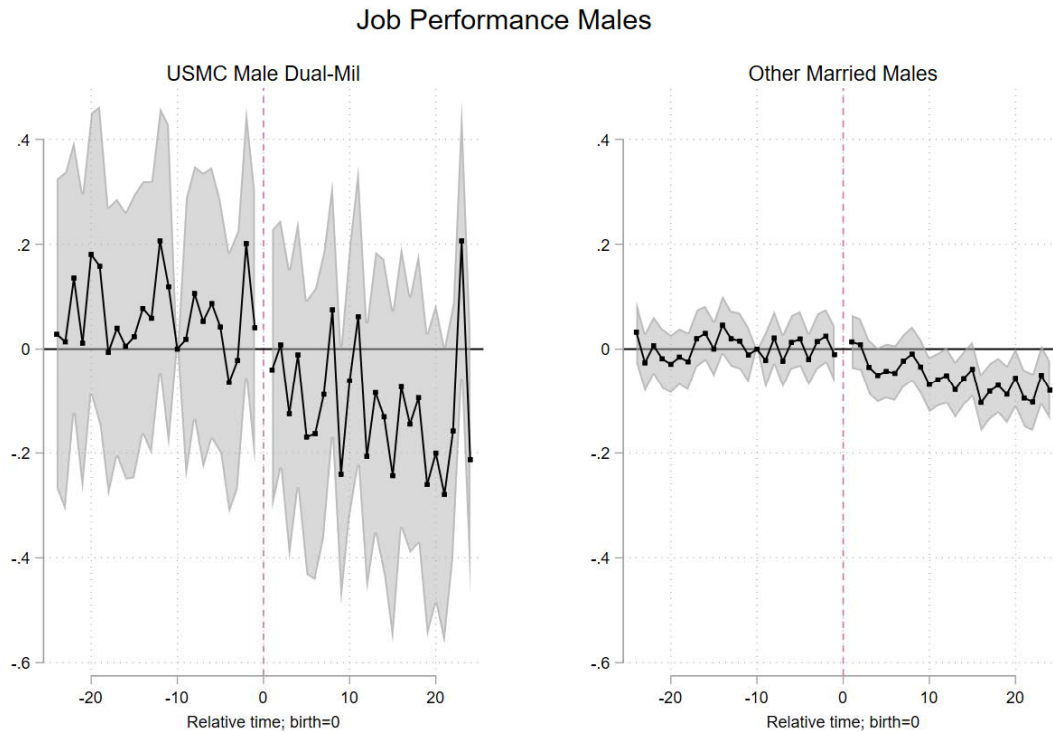
pregnancy levels. After Month 9, Other Married fathers continue to increase their probability of achieving first-class scores; Months 16 to 24 are all statistically significant. At the end of the observation window these fathers increased their chances of scoring a first-class score by 5.4 percentage points. Dual-mil fathers also begin their recovery to pre-birth levels at Month 2 and eventually return to their pre-birth levels at Month 13. Although we see monthly estimates for Dual-mil fathers that exceed their pre-birth level, these results are not as consistent or significant as Other Married fathers.



Graph displays monthly coefficients from event study (time series) regression. The outcome combines standardized PFT and CFT scores (mean = 0, SD = 1). Treatment groups are parents observed at least 12 months pre-/post-birth, and the control group are Marines observed not having a baby (their monthly estimates are not displayed). Month 0 is the birth month; standard errors are represented by the grey area and all estimates are relative to 10 months prior to birth. Data source: Total Force Data Warehouse.

Figure 4. First-Class Fitness Outcomes Among Marine Fathers

Male job performance is illustrated in Figure 5. The results immediately following birth illustrate that there is no statistically significant difference between fathers' performance relative to their pre-birth levels. As fathers become more removed from birth, they begin a downward trend and move further away from their pre-birth performance levels. It is not until 10 months post-birth that Other Married fathers displayed statistically significant drops in performance; this drop persists for the remainder of the observation window. The smaller population and observations in Dual-mil fathers made for less statistically significant differences from pre-birth trends. Both fathers experienced drops around the same time after birth, Dual-mil fathers experienced a statistically significant difference at Month 9. Dual-mil fathers had a 0.241 standard deviation drop in performance, which is 3 times larger than the 0.069 standard deviation drop Other Married fathers experienced 10 months post-birth. The delayed drop in job performance is possibly due to the fact that fathers are only allotted 14 days of parental leave post-birth. The brief absence from the workplace requires little to no reintegration for fathers and may be the cause of delayed performance. This highlights that parental support immediately following a birth may not be as effective and that sustained support may be necessary to ensure high job performance for the duration of fathers' careers.



Graph displays monthly coefficients from event study (time series) regression. The outcome is the standardized job performance rating (mean = 0, SD = 1). Treatment groups are parents observed at least 12 months pre-/post-birth, and the control group are Marines observed not having a baby (their monthly estimates are not displayed). Month 0 is the birth month, standard errors are represented by the grey area, and all estimates are relative to 10 months prior to birth. Data source: Total Force Data Warehouse.

Figure 5. Job Performance Outcomes Among Marine Fathers

2. Parsimonious Model

The benefit of the parsimonious model is that it can group months together to give the statistical model the power to test for differences from pre-pregnancy levels; it also allows for testing the difference between the Dual-mil parents versus Other Married parents. Tables 7 and 8 display my parsimonious models; the models analyze different time periods throughout pregnancy. I observed parents for two different observation windows; the first is 12 months pre- and post-birth, and the second is 24 months pre- and post-birth. The 12-month window is displayed in the odd columns and the 24-month window in the even columns. The outcomes in this model are the same as the event regression from

earlier. Additionally, all estimates are relative to 10 months prior to birth or earlier; this allows the model to capture any departures from pre-birth levels. The time period variables represent coefficients for Other Married parents. The coefficients for Dual-mil parents is the product of the time period variables and the Dual-mil spouse indicator variable; this is the interaction of how being a Dual-mil impacts parenthood.

Table 7 displays results for fathers; results revealed that Other Married fathers suffered no significant drops in combined fitness score for either sample during the months prior to birth. However, the restrictive sample (Column 2) results show that Dual-mil fathers exhibit a statistically significant drop in the months prior to birth; these fathers experienced a 0.036 standard deviation drop in their scores (or 1-point drop in PFT and CFT). At 1–2 months post-birth, Other Married fathers experienced a 0.049 standard deviation drop (1-point PFT and CFT), while Dual-mil fathers experienced a statistically significant 0.134 standard deviation drop (3-point PFT, 2-point CFT). These drops statistically differ from one another and from these fathers' pre-pregnancy periods. By 3–12 months post-birth, Other Married fathers recover to pre-birth levels and increase their scores by 0.057 standard deviations. After 2 months, Dual-mil fathers do not exhibit any significant differences from Other Married fathers or their pre-pregnancy period.

Immediately following birth, only Dual-mil fathers exhibited a significant impact to first-class scores relative to their pre-pregnancy period. The less restrictive sample (Column 3) shows a 4-percentage point drop for these fathers. Other Married fathers return to their pre-birth levels from months 3–24. By the end of the observation window, these fathers increase their probability of achieving a first-class score by a statistically significant 2.6 percentage points. For the remainder of the post-birth months, Dual-mil fathers' increase in first-class fitness score probability did not differ from their pre-pregnancy period.

Like the event study results, fathers in the parsimonious model also exhibit a delayed drop in performance. In Column 5 Other Married fathers experienced increases in job performance in the months prior to and immediately following birth relative to their pre-pregnancy period. Conversely, in Column 6, Dual-mil fathers experienced an immediate performance drop 1–2 months post-birth for the restrictive sample. These

fathers show a statistically significant 0.164 standard deviation difference from their pre-pregnancy period. At Month 3 and onward, Other Married fathers' job performance begins to suffer. By the end of the observation window, these fathers' job performance saw a 0.023 standard deviation drop relative to their pre-pregnancy level. After 1–2 months post-birth, Dual-mil fathers do not exhibit any statistically significant differences in performance from their pre-pregnancy period.

Overall, the parsimonious models indicate that both father groups experienced statistically significant drops in combined fitness immediately following birth. After that Dual-mil fathers show no statistically significant differences from their pre-pregnancy period in months 3–24 post-birth. For the first-class fitness outcome, only Dual-mil fathers experienced a statistically significant drop in probability (relative to their pre-pregnancy period) at 1–2 months post-birth. Lastly, Other Married fathers show a delayed job performance drop (Months 3 and onward post-birth) whereas Dual-mil fathers experienced a statistically significant job performance drop at 1–2 months post-birth (relative to their pre-pregnancy level).

Table 7. Parsimonious Results for Fathers

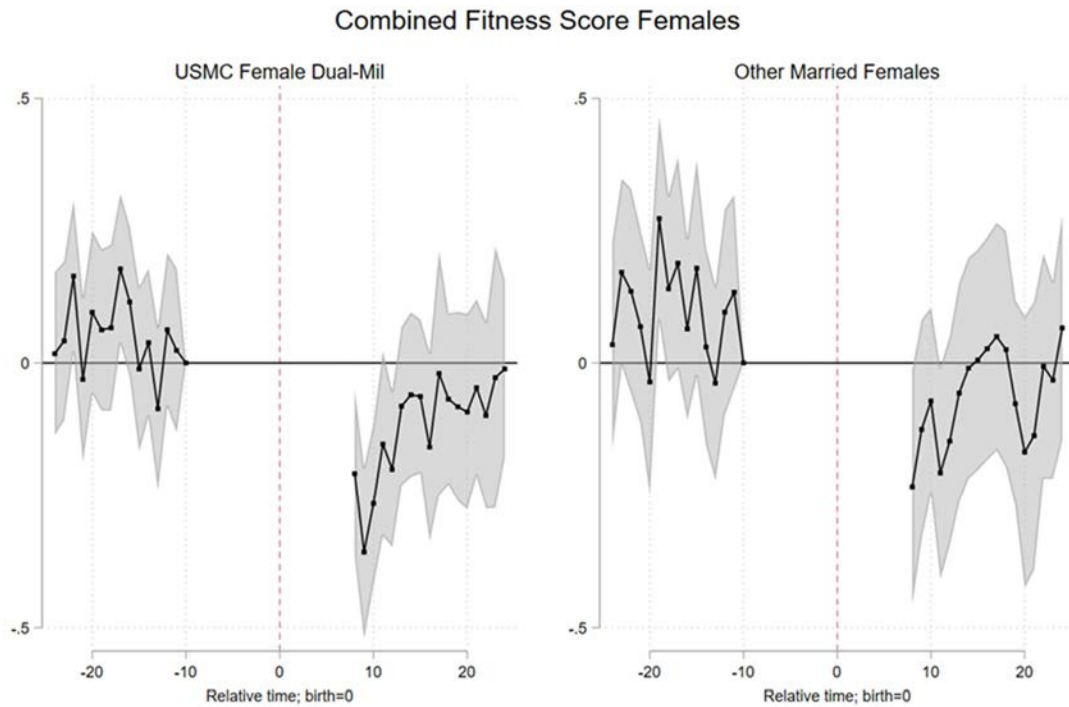
	(1) Combined Fitness Score	(2)	(3) First Class Fitness Score	(4)	(5) Job Performance	(6)
Relative months to birth						
9 to 1 months pre-birth	-0.007 (0.005)	0.007 (0.006)	0.004* (0.002)	0.004+ (0.002)	0.031*** (0.009)	0.015 (0.011)
1-2 months post birth	-0.082*** (0.008)	-0.049*** (0.010)	-0.003 (0.003)	0.001 (0.004)	0.045*** (0.013)	0.032+ (0.017)
3-12 months post birth	0.067*** (0.008)	0.057*** (0.010)	0.012*** (0.003)	0.014*** (0.004)	-0.014 (0.012)	-0.014 (0.015)
13-24 months post birth	0.081*** (0.008)	0.078*** (0.010)	0.021*** (0.003)	0.026*** (0.004)	-0.023+ (0.013)	-0.023 (0.016)
Interaction term between Dual-Mil and birth month indicators						
9 to 1 months pre-birth	-0.031 (0.021)	-0.043+ (0.025)	-0.017+ (0.009)	-0.013 (0.010)	0.001 (0.045)	0.015 (0.053)
1-2 months post birth	-0.068+ (0.036)	-0.085* (0.042)	-0.037* (0.016)	-0.028 (0.018)	-0.081 (0.071)	-0.179* (0.085)
3-12 months post birth	0.004 (0.037)	0.026 (0.043)	0.015 (0.017)	0.012 (0.019)	-0.032 (0.067)	0.123 (0.081)
13-24 months post birth	-0.010 (0.038)	-0.014 (0.043)	0.024 (0.016)	0.016 (0.018)	-0.037 (0.077)	0.139+ (0.085)
Constant	0.006*** (0.001)	0.002*** (0.001)	0.857*** (0.000)	0.859*** (0.000)	0.195*** (0.002)	0.212*** (0.001)
Observations	811,677	738,491	811,677	738,491	384,929	349,905
R ²	0.639	0.638	0.460	0.459	0.554	0.556

This table presents parsimonious time series regression coefficients for Other Married fathers and Dual-mil fathers. Dual-mil fathers' coefficients are calculated by adding the interaction coefficient and the Other Married coefficient. Outcomes displayed are the first-class fitness score percentage point change probability, standardized fitness scores, and job performance ratings (mean = 0, SD = 1). Odd columns observe parents +/-12 months, and even columns observe +/-24 months. All estimates are relative to 10 months before birth and earlier (-24 to -10). All variables in the table are indicators for time frames. Pregnancy is the period before birth, -9 to -1 months, Birthjump1 is 1-2 months post-birth, Birthjump2 is 3-12 months post-birth, and Birthjump3 is 13-24 months post-birth. The remaining variables are interactions with the Dual-mil spouse indicator variable (equal to 1 for Dual-mil parents); time periods remain the same. Standard errors in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Data source: Total Force Data Warehouse.

C. MOTHERS

1. Event Study Regressions

Like fathers, both groups of Mothers experienced a drop in fitness post-birth. The drops experienced by all mothers and Dual-mil fathers is almost double that of Other Married fathers. Figure 6 reveals that Dual-mil mothers experienced a 0.209 standard deviation decrease at 8 months post-birth; this translates to a 7-point drop in the PFT and a 4-point drop in the CFT. Dual-mil mothers continued to exhibit a statistically significant difference from Months 9 to 12 post-birth. Other Married mothers experienced a 0.234 standard deviation drop or a 8-point PFT drop and a 5-point CFT drop; by Month 11 these mothers begin their return to pre-birth levels. Dual-mil mothers began their recovery at Month 9 but never return to their pre-birth levels. The larger gray areas in the figures represent higher standard errors for Other Married mothers, Dual-mil mothers, and fathers. Although the point estimates show immediate drops in fitness scores, the data does not illustrate significant statistical differences from previous outcomes.

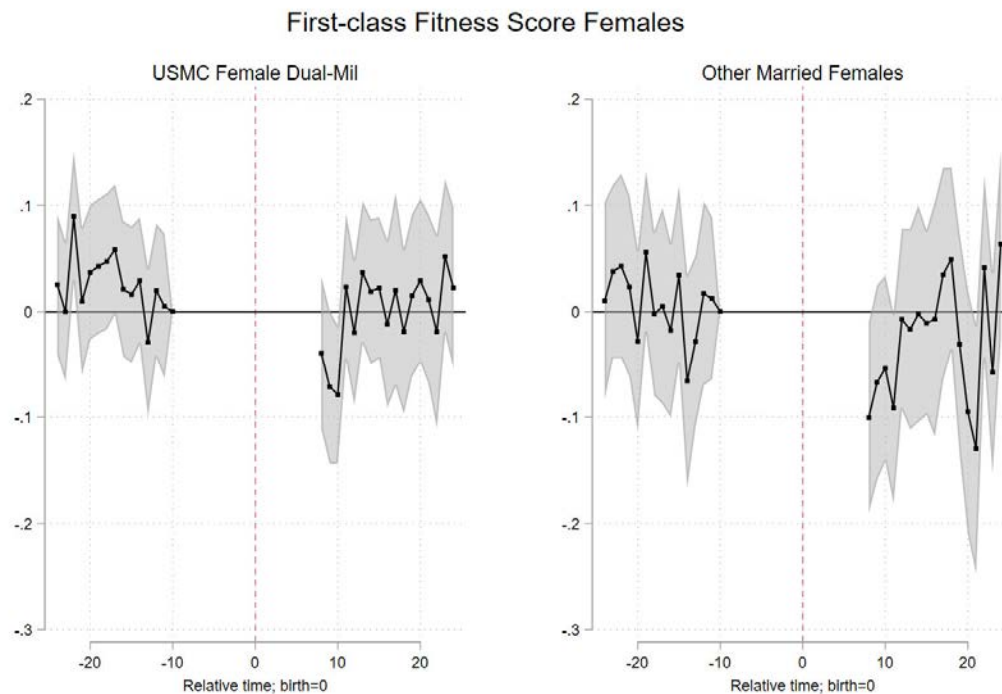


Graph displays monthly coefficients from event study (time series) regression. The outcome combines standardized PFT and CFT scores (mean = 0, SD = 1). Treatment groups are parents observed at least 12 months pre-/post-birth, and the control group are Marines observed not having a baby (their monthly estimates are not displayed). Month 0 is the birth month, standard errors are represented by the grey area, and all estimates are relative to 10 months prior to birth. Data source: Total Force Data Warehouse.

Figure 6. Fitness Outcome Among Marine Mothers

Figure 7 illustrates that Dual-mil mothers experienced a statistically significant 7.1 percentage point drop in achieving first-class scores 9 months post-birth. At 8 months post-birth, Other Married mothers suffered the largest drop in first-class scores at 10 percentage points, making Other Married fathers drop the smallest. Dual-mil mothers begin recovery to first-class scores at Month 10 and return to pre-birth levels by Month 11. For the remaining months of observation, Dual-mil mothers maintained and exceeded their pre-birth probabilities of achieving a first-class fitness score. Other Married mothers begin their recovery at Month 11 and return to pre-birth levels at Month 17. These results are again somewhat noisy due to a small sample size, but results for Dual-mil parents in both outcomes demonstrate that they recover at different rates than Other Married parents. The

periods in which Dual-mil parents fall behind Other Married parents highlights times when Dual-mil parents could use additional support from the Marine Corps.

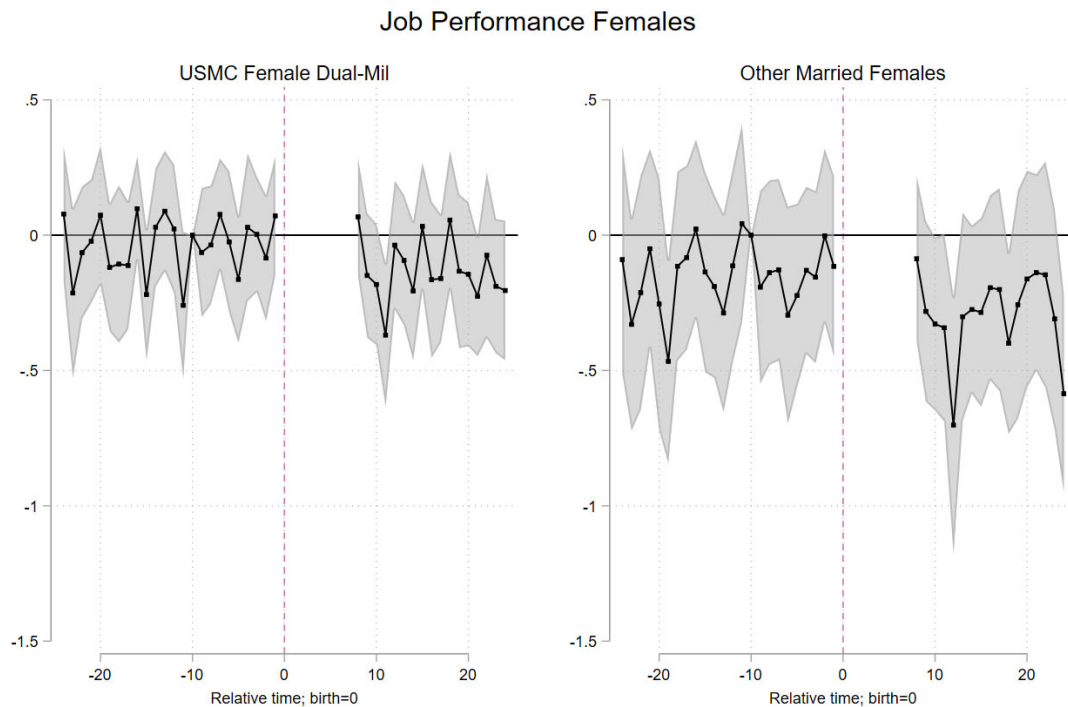


Graph displays monthly coefficients from event study (time series) regression. The outcome interprets percentage point changes in the probability that a Marine achieves a first-class score. Treatment groups are parents observed at least 12 months pre-/post-birth, and the control group are Marines observed not having a baby (their monthly estimates are not displayed). Month 0 is the birth month, standard errors are represented by the grey area, and all estimates are relative to 10 months prior to birth. Data source: Total Force Data Warehouse.

Figure 7. First-Class Fitness Outcomes Among Marine Mothers

Female job performance results illustrate a similar time frame for drop in performance as males. However, this is due to the fact that the model only observes females starting at 8 months post-birth to account for the exemption period from fitness, height, and weight standards. Figure 8 illustrates that Other Married mothers experienced a statistically significant drop in performance in months 9 to 14 post-birth. At Month 9, they experienced a 0.282 standard deviation drop in job performance and do not return to their pre-birth levels for the remainder of the observation window. At 11 months post-birth,

Dual-mil mothers experienced a distinguishable difference by dropping 0.369 deviations from their pre-birth levels. Unlike fathers, mothers do have to reintegrate when they return to duty. In addition to reintegrating in the workplace, mothers are also adjusting to postpartum bodies and fitness while caring for a newborn. The early drops in job performance upon return to work highlights that current resources lack parental support.



Graph displays monthly coefficients from event study (time series) regression. The outcome interprets percentage point changes in the probability that a Marine achieves a first-class score. Treatment groups are parents observed at least 12 months pre-/post-birth, and the control group are Marines observed not having a baby (their monthly estimates are not displayed). Month 0 is the birth month, standard errors are represented by the grey area, and all estimates are relative to 10 months prior to birth. Data source: Total Force Data Warehouse.

Figure 8. First-Class Fitness Outcomes Among Marine Mothers

2. Parsimonious Model

Table 8 illustrates changes to mothers' health and performance; significant results are minimal due to the size of the observation windows and the small fraction of women

that make up the service. There are no estimates for female health in the months prior to birth due to the exemption period; therefore, we also do not observe mothers until at least 8 months post-birth. Columns 1 and 2 display significant estimates for Other Married mothers in both samples. At 8 to 12 months post-birth, Other Married mothers dropped 0.243 standard deviations in combined fitness relative to their pre-pregnancy period; this translates to an 8-point PFT drop and a 5-point CFT drop. The decrease experienced by Other Married mothers in this model are consistent with the estimates in the event study regression. Although Dual-mil mothers do not display statistically significant estimates from Other Married mothers, the results suggest that Dual-mil mothers in the restrictive sample drop their scores by 0.219 standard deviations relative to their pre-pregnancy period (or 7-point PFT drop and 4-point CFT drop). Like the event study model, both groups of mothers fail to return to their pre-birth fitness score levels in any observation window. Estimates for the probability of first-class score achievement in the less restrictive sample (Column 3) show that Other Married mothers drop 4.8 percentage points 8 to 12 months post-birth, and Dual-mil mothers exhibited a 5-percentage point drop in the same post-birth time period; the results for Dual-mil mothers do not statistically differ from their pre-pregnancy period.

The estimates in Columns 5 and 6 suggest that pregnancy has no impact to mothers' job performance in the months leading up to birth. The drops in mothers' job performance post-birth is much smaller than those reported in the first model. Results in the 12-month window show that Other Married mothers experienced a drop in performance from Month 8 and onward; at the end of the window these mothers saw a 0.054 standard deviation drop. Dual-mil mothers job performance in the less restrictive sample followed the same pattern and dropped 0.009 standard deviations relative to pre-pregnancy. However, from months 13–24, Dual-mil mother job performance increased by 0.026 standard deviations. These results are not statistically significant, nor do Dual-mil mothers statistically differ from Other Married mothers. Overall, parsimonious results for females illustrated that mothers never return to their pre-birth fitness levels. Additionally, both groups of mothers suffered similar drops in combined fitness, first-class fitness, and job performance relative to their respective pre-pregnancy periods.

Table 8. Parsimonious Results for Mothers

	(1) Combined Fitness Score	(2) Combined Fitness Score	(3) First Class Fitness Score	(4) First Class Fitness Score	(5) Job Performance	(6) Job Performance
Relative months to birth						
9 to 1 months pre-birth					0.035 (0.040)	0.101+ (0.056)
8-12 months post birth	-0.214*** (0.038)	-0.243*** (0.048)	-0.048** (0.017)	-0.018 (0.021)	-0.012 (0.053)	0.005 (0.078)
13-24 months post birth	-0.074* (0.037)	-0.089* (0.043)	-0.002 (0.016)	0.019 (0.018)	-0.054 (0.053)	-0.000 (0.077)
Interaction term between Dual-Mil and birth month indicators						
9 to 1 months pre-birth					0.004 (0.008)	-0.016 (0.012)
8-12 months post birth	-0.061 (0.053)	0.024 (0.067)	-0.002 (0.023)	-0.008 (0.028)	0.003 (0.074)	-0.120 (0.101)
13-24 months post birth	-0.014 (0.048)	0.047 (0.056)	0.010 (0.020)	0.003 (0.023)	0.080 (0.073)	-0.014 (0.098)
Constant	0.035*** (0.003)	0.051*** (0.001)	0.839*** (0.001)	0.843*** (0.001)	0.143*** (0.006)	0.161*** (0.004)
Observations	53,062	48,860	53,062	48,860	30,927	27,514
R ²	0.652	0.647	0.485	0.473	0.537	0.537

This table presents parsimonious time series regression coefficients for Other Married mothers and Dual-mil mothers. Dual-mil mothers' coefficients are calculated by adding the interaction coefficient and the Other Married coefficient. Outcomes displayed are the first-class fitness score percentage point change probability, standardized fitness scores, and job performance ratings (mean = 0, SD = 1). Odd columns observe parents +/-12 months and even columns observe +/-24 months. All estimates are relative to 10 months before birth and earlier (-24 to -10). All variables in the table are indicators for time frames. Pregnancy is the period before birth, -9 to -1 months. Birthjump is 8-12 months post-birth, and Birthjump2 is 13-24 months post-birth. The remaining variables are interactions with the Dual-mil spouse indicator variable (equal to 1 for Dual-mil parents); time periods remain the same. Standard errors in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Data source: Total Force Data Warehouse.

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V. RECOMMENDATIONS AND FURTHER RESEARCH

A. DISCUSSION

1. Former Dual-mils

My findings illustrate that there is an upward trend in the number of Dual-mils present in the Marine Corps. Although my analysis does not allow causal reasoning for the trend, I assume that the steady increase is the result of transformative and progressive policy over the past 5 years. However, there is room for improvement as illustrated in my other findings. The exploration of former Dual-mils in the data suggests that there is a substantial population of service members that could still be in the service today. The number of Dual-mil Marines would almost be double if the other partner in the former Dual-mil couple had remained in USMC. The Marine Corps uses various retention tools to retain talent, and it seems it has fallen short when it comes to Dual-mil Marines. My LASSO model indicates that in Dual-mil marriages, females are the service member most likely to end active service, particularly if they are mothers. The reasons behind these individuals' end of active service are unknown, but their existence in the data suggests that they are still subject and possibly partial to the Marine Corps. Insight on when, how, and why Dual-mil families decide to turn into single active-duty member families will have positive impacts on talent retention. Moreover, it can provide insight on the effectiveness of current policies or lack thereof.

2. Parenthood and Health

All the parents observed in my models are subject to the same performance evaluations, fitness standards, height/weight standards, and parental and maternity leave policies. The common parenthood impacts to health and performance are present for both parent groups in my study and, therefore, the estimates discovered in my models can be attributed to the fact that Dual-mil parents are unique when compared to other parents in the Marine Corps.

Immediately following birth all parents exhibited drops, on average, in combined fitness and first-class fitness, with a much larger drop for mothers than fathers. Dual-mil

fathers experienced a greater drop in combined fitness scores than Other Married fathers. Mother groups suffered larger drops than males and experienced the same size drop in fitness. Although not surprising this result highlights that all parents are adapting to a lifestyle change when a baby arrives and this new addition to their household can create competing priorities for their fitness. The finding that Dual-mil fathers suffered a larger drop in both fitness outcomes is possibly a result of the different home, marriage, and/or family dynamics within a Dual-mil marriage. The typical household construct for a Marine family is one active-duty member and a civilian spouse. In general, household and family care responsibilities fall on the civilian spouse. In a Dual-mil household, responsibilities may be split more equally since each spouse's job requires the same level of demand and time. The difference between father groups became more evident when results illustrated that Other Married fathers returned to pre-birth fitness levels earlier than Dual-mil fathers. It is clear that parenthood has a larger effect on Dual-mil fathers' fitness and that during this time these fathers may require either more resources or more time to adapt to the new change in their lives.

Like Larson (2020), I also discovered that, on average, mothers did not return to pre-birth fitness levels after giving birth. Our analysis evaluated females after 7 months, which was the previous pregnancy fitness exemption. Females never returning to their pre-birth fitness levels highlights the fact that birth can have lasting impacts on mothers' bodies. Additionally, the female fitness drop indicates that females may require more fitness resources, time, and support post-birth—and even before birth—to ensure healthy and safe recoveries.

3. Parenthood and Performance

Findings illustrate that both mother groups experienced a significant drop in job performance following birth, and that their drop was larger than males. This is most likely a result of the reintegration that females experience after being absent from work for convalescent and primary caregiver leave. The first 6 months following birth can be extremely hard for mothers due to the pressure to return to fitness and height/weight standards. Mothers are adapting to a lifestyle and body change; returning to work adds

another layer of complication. In addition to the physical demands, mothers may also experience changes in hormones, which could impact their mental health. Policies to exempt mothers from performance evaluations are not an option. However, the scrutiny or lens under which mothers are evaluated can be improved.

Dual-mil fathers suffered no immediate drop in job performance prior to or immediately following birth; their performance drop was delayed until Month 9. Other Married fathers also experienced a delayed job performance drop; however, it was smaller than Dual-mil fathers. This highlights that parental support for Dual-mil fathers immediately following birth is not effective and that sustained support may be necessary to ensure high job performance for the duration of their careers. After birth, fathers are absent from work for only a short amount of time; therefore, the immediate impact of childbirth has little effect on their performance. Then, as time goes on and the responsibilities of fatherhood increase, their performance declines. This is because after the secondary caregiver leave is afforded to fathers, there are no other official support resources. The support fathers receive is dependent on their command climate, culture, and environment. As mentioned earlier, Dual-mil fathers are under unique pressures due to their family dynamics, and they are also the minority among their counterparts. Current resources in place are underserving fathers, and Dual-mil fathers are the most underserved by the lack of resources.

B. RECOMMENDATIONS

Based on my key findings, I make the following recommendations on Dual-mil parents and overall parenthood in the Marine Corps.

1. Former Dual-mils

The discovery of former Dual-mils demonstrates that there is a significant population that is unknown to the Marine Corps; learning about these individuals provides the Marine Corps with more retention and recruitment opportunities. I recommend that the Marine Corps begin tracking former Dual-mils in their own category instead of under the civilian spouse category. Continued tracking of these individuals can provide the Marine Corps with another recruiting population. Additionally, the Marine Corps is always

searching for female talent, and my research shows that most of the former Dual-mil population is male with prior female active-duty spouses. Recruiting is costly due to the risk of attrition; recruiters do their best to identify the most qualified and potentially successful recruits, but attrition is always a possibility. By recruiting former Dual-mil spouses, the risk of attrition is slightly reduced since former Dual-mil spouses have already experienced the Marine lifestyle and understand the demands of the job.

As time passes and more information is collected on former Dual-mils, I recommend that the Marine Corps conduct further research on how this population is impacted by current and future policies such as 1-year maternity leave, pregnancy, and postpartum and parental leave. For example, the proposal of 1-year maternity leave provides females and all families with flexibility in their careers and lives. I predict this will have an even larger impact on Dual-mil parenthood as it could reshape how Dual-mil Marines career and family plan.

2. Parenthood

Fitness is a priority to most of the Marine Corps and my findings illustrated that parenthood causes it to decline for a period following birth. For all fathers, this drop is immediate; although it was not statistically significant my analysis suggests that Dual-mil fathers suffered a larger drop and took even longer to recover than Other Married fathers. Results also indicated that fathers suffer a delayed drop in performance, with Dual-mil fathers experiencing the larger drop. I recommend that the Marine Corps consider extending paternity leave or provide more support resources to all fathers. As discussed earlier, Dual-mil fathers experience an increased share of household and family responsibility due to their spouse being a Marine. As time progresses, I believe more single active-duty member families will experience a similar dynamic as Dual-mil households, meaning that more civilian spouses are becoming employed. Therefore, more fathers will have similar challenges as Dual-mil fathers. It is logical to assume that the increased presence of Dual-mil or dual-income households will have effects on more fathers in the Marine Corps; a consideration towards extending paternity leave and/or expanding parental

support resources can drastically improve fathers' fitness and ease their life-changing transition.

In every outcome, mothers experienced greater drops than males, and following birth neither of the mother groups returned to their pre-birth levels. The Marine Corps has already taken steps towards addressing the unique challenges mothers face. In April 2020, the Marine Corps published Marine Corps Order (MCO) 5000.12F, *Marine Corps Policy Concerning Parenthood and Pregnancy* (USMC, 2020). The updated order is inclusive and direct, outlining the roles of the command and parents, including guidance for single, Dual-mil, and adoptive parents. In addition, the Marine Corps has published a *Pregnancy and Postpartum Physical Training Guidebook* (Department of the Navy, 2019) and *Pregnancy and Postpartum Physical Training Handbook* (Training and Education Command, n.d.). I recommend the Marine Corps take it a step further and adopt the Artemis program on all Marine Corps bases. Artemis was launched in February 2021 aboard Camp Pendleton; it is a "Navy-medicine and research-informed program that is tailored to where female Marines and Sailors are at in their career and where they are at in their prenatal and postpartum experience" (USMC, 2021). Pregnancy and motherhood can be isolating for Marines, so a resource of this scale provides mothers with the physical and mental support group they need to be successful pre-, and post-birth.

Lastly, I recommend that the Marine Corps continue to learn about parenthood and the demands of families. A shift in the perception and culture surrounding pregnancy and parenthood is occurring, to bolster the change leaders of Marines need to ensure that they are making resources accessible to Marines.

C. FURTHER RESEARCH

The Marine Corps is the smallest service component; furthermore, the number of Marine Dual-mils included in my analysis was even smaller. To further investigate my significant results, research could be expanded to Dual-mils of all services. Evaluating how other services respond to parenthood can provide some interesting insight on parenthood in the Marine Corps or the U.S. military in general. A possible limitation to my research is that it produced large standard errors, possibly due to the impact of outliers in the data.

This limitation can be reduced with continued tracking and data collection on Dual-mils; continued research on Dual-mil parenthood can test the consistency of my results. Finally, as time progresses, I recommend that data be expanded and that this same research is conducted to reflect the most recent parental and postpartum policy changes. For example, in the future these models should evaluate females after 12 months to reflect the expanded postpartum exemption. Additionally, I recommend this model be used to compare the 6-month and 12-month postpartum exemption periods to evaluate the effectiveness of the policy.

D. CONCLUSION

The Marine is and will always remain the Marine Corps' priority, and Marines pride themselves in being physically fit and competent at their jobs. My research provides policy-makers and leaders with information on how parenthood specifically impacts Dual-mil parents' fitness levels and job performance. My findings show that Dual-mil fathers experienced a greater drop in fitness and a delayed drop in job performance compared to other fathers, which highlights that these Marines need more support following the addition of a child into their household. Additionally, results illustrate that Dual-mil mothers experienced the greatest drops across all outcomes. The insights provided shed light on the effectiveness of current policies. If the Marine Corps is to retain these individuals, a viable strategy is needed to entice these Marines with more relevant and expanded parental support resources. Moreover, the increased resources could have lasting benefits on all Marine parents' careers. Improving parents' fitness and job competency makes the Marine Corps a stronger fighting force.

The discovery of the former Dual-mils opened another recruiting population. Retaining and recruiting former Dual-mils provides the Marine Corps with less risky experienced talent. If this is a group of individuals in which the Marine Corps is interested, it is imperative that the Marine Corps continues to track them and evaluate how policies impact the Dual-mil population. Policy is an incredibly useful recruitment and retention tool; the best type of policy to support Dual-mils and all families are ones that are widely flexible to fit the unique demands of many families.

My research has illustrated that Dual-mil parents react and recover from parenthood differently than their peers, and it is universally understood that every Marine parent is different. Therefore, the Marine Corps cannot expect current policies to serve Marines equally. Recent changes to policy have already made large strides in changing the perception and culture surrounding parenthood, but there is always room for improvement. The outcomes in my analysis serve to provide evidence and information for future parental policy changes, changes that prevent Marines from choosing between being the best parent possible and the best Marine possible.

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APPENDIX. OUTCOME DESCRIPTIONS

Physical Fitness Test (PFT): annual fitness exam is taken by all Marines between January and June. The max score one can receive is 300 (100 for each of the 3 events):

- Pull-ups (or push-ups): maximum repetitions
- Crunches: maximum repetitions in a 2-minute time limit
- 3-Mile Run: Marines receive maximum points with a time 18:00 minutes or below (Larson, 2020, p. 69)

Combat Fitness Test (CFT): annual fitness exam taken by all Marines between July and December. The max score one can receive is 300 (100 for each of the 3 events):

- Movement to contact (MTC): 800-meter run
- Ammo Can Lift: shoulder press of a 35lb ammo can in 2-minute timeline
- Maneuver under fire (MANUF): 350-yard obstacle course that simulates combat activities (Larson, 2020, p. 69)

Fitness Report (FITREP): performance evaluation document used for senior enlisted (E5-E9), and all officers. The FITREP evaluates Marines on 11 characteristics from leadership ability to initiative. The report ranges from 0–5 in value. The average in this study is 3.73. The length of observation varies but usually is between 3 and 14 months (Larson, 2020, p. 69).

Proficiency Score (PRO): job performance measure for junior enlisted Marines (E1-E4) (Larson, 2020, p. 69).

Conduct Score (CON): individual conduct measure for junior enlisted Marines (E1-E4), junior Marines receive PRO/CON scores bi-annually (Larson, 2020, p. 69).

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