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Balancing Duty and Welfare: A Study of Leave Utilization Trends within the Marine Corps

June 2024

Capt Conor R. McCandless, USMC

Thesis Advisors: Dr. Yu-Chu Shen, Professor
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Department of Defense Management

Naval Postgraduate School

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Prepared for the Naval Postgraduate School, Monterey, CA 93943.

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ABSTRACT

Recent expansions to the Marine Corps' Parental Leave Policy now allow up to 12 weeks of leave for new parents, but the annual leave (AL) program has seen little revision and lacks comprehensive analysis. This study utilizes data from the Total Force Data Warehouse to examine the impacts of deployments, military occupational specialty (MOS), rank, and demographics on AL usage, AL loss, and sick leave among Marines. Employing logistic regression, the research estimates the likelihood of leave loss and sick leave usage, while a Linear Probability Model assesses the amount of leave taken by individual Marines. Findings indicate that officers lose annual leave three to five times more frequently than enlisted Marines, and those deployed or stationed in non-combat zones are likelier to lose leave. These results suggest the need for further research into cultural differences between officer and enlisted ranks and the influence of non-combat zone deployments on leave usage. I further recommend that research be conducted to determine the effects of the new parental leave policy on AL usage.

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LIST OF ACRONYMS AND ABBREVIATIONS

AL	annual leave
CTZE	combat zone tax exclusion
DD	difference-in-difference
DDD	difference-in-difference-in-difference
DMDC	Defense Manpower Data Warehouse
DOD	Department of Defense
FMLA	Family and Medical Leave Act
MOL	Marine Online
MOS	military occupational specialty
MPO	Military Policy Office
PFL	paid family leave
PL	parental leave
SCL	secondary caregiver leave
SLA	special leave accrual
TFDW	Total Force Data Warehouse
TIS	time in service
USMC	United States Marine Corps

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I. INTRODUCTION

In November 2021, General David H. Berger, then Commandant of the United States Marine Corps (CMC), unveiled Talent Management 2030 (TM2030). This pivotal document marked a critical shift, highlighting the outdated nature of personnel management within the USMC and calling for a comprehensive overhaul. General Berger emphasized the need to shift from a traditional recruit-and-replace approach to a more retention-focused strategy, aiming to better preserve and utilize the existing talent within the Corps.

Three years after the publication of TM2030, its influence is evident in the implementation of numerous policy changes, particularly those expanding parental leave benefits. In January 2023, in line with TM2030's directives, the USMC extended parental leave to all parents, allowing up to 12 weeks of leave following the birth or adoption of a child. This policy change represents a significant step towards enhancing the attractiveness of a career in the USMC, encouraging talented personnel to continue their service.

Despite these advancements, the utilization of annual leave (AL)—the military equivalent of paid time off (PTO) in the civilian sector—remains underexplored. Utilizing panel data from the Total Force Data Warehouse (TFDW) spanning January 2017 to November 2023, this thesis studies AL utilization within the USMC to assess its effectiveness under current policies. My research answers the following questions:

1. Are all Marines fully utilizing their leave days?

2. Do any groups within the Marines experience disproportionate effects when taking leave due to factors like deployment to combat or non-combat zones, Military Occupational Specialty (MOS), rank, gender, marital status, and race?

3. Do any of these factors affect the total amount of leave that Marines take?

4. Are other types of leave disproportionately utilized by certain populations of Marines?

Past studies, including those focused on the implications of expanded parental leave policies, have primarily looked at leave take up and associated outcomes related to leave take up. They found that civilian parents whose employer's offered little or no job protected leave following the birth of a child used accrued vacation or sick leave to care for the child (Ruhm, 1998). Similar results were found in studies using Marine Corps personnel where Marines used accrued AL to supplement the previous maternity leave allotment of 6 weeks (Bacolod et al., 2022). Little research has been conducted on the broader scope of AL utilization within the military context. Notably, a study by the Center for Naval Analysis (CNA), commissioned by the Military Policy Office (MPO) at Headquarters Marine Corps, investigated leave balances across different Marine populations. They found that more senior ranking enlisted Marines and Officers carried higher AL balances than junior enlisted Marines and Officers (P. Rost, personal communication, 5 Jan. 2024).

The dataset used for this thesis is at the individual Marine and year level. The primary outcome of interest is whether a Marine loses leave at the end of the fiscal year by exceeding the carryover limit of 60 days of annual leave (AL). This outcome serves as a key indicator of underutilization of AL. Secondary outcomes include the usage of sick leave and the number of days of annual leave and combat leave taken each fiscal year. To analyze these outcomes, I employ logistic regression models to determine the likelihood of a Marine losing leave and using sick leave, while Ordinary Least Squares (OLS) regression is used to examine the amount of annual and combat leave utilized.

Initial findings from my trend analysis suggests that officers lose leave at a rate three to five times higher than that of enlisted personnel. Further logistic regression analysis indicates that deployments to non-combat zones increase the likelihood of losing leave for both Officers and Enlisted Marines compared to non-deployed individuals. Contrarily, those deployed to combat zones were surprisingly less likely to lose leave. Additionally, an examination of sick leave usage revealed that senior Enlisted Marines such as pay grades from E6-E9 are more likely to take sick leave than their junior enlisted counterparts. While Field Grade Officers are more likely to take sick leave than Company Grade Officers, General Officers were less likely to take sick leave.

An OLS regression analysis on the annual and combat leave days used showed that Officers and Enlisted Marines who deployed to any zone took significantly more leave days annually than non-deployers. This finding contradicts the initial hypothesis that deployment restricts a Marine's ability to utilize leave compared to non-deployers. The results lead me to conclude that current leave policies adequately afford deployers who deploy to combat zones adequate opportunity to utilize leave, but further research should investigate the impact of overseas assignments and deployments to non-combat zones on leave take-up.

The rest of the thesis is organized as follows. Chapter II describes the institutional background on the governing policies surrounding annual leave and recent policy changes relevant to its usage. Chapter III summarizes the literature that explores the usage of different types of leave in both the civilian and military workforces. It also describes literature surrounding the implications of changes to leave policy on military manpower planning and examines a recent study on leave usage conducted by CNA. Chapter IV explains the data and methods used to conduct my analysis. Chapter V discusses my findings. I offer my conclusions and recommendations in Chapter VI.

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II. BACKGROUND

Leave policy in the United States Marine Corps (USMC) has undergone perhaps the most drastic change in the last 10 years compared to other policies. The cultural shift in attitudes surrounding childcare after birth event has resulted in the introduction of expanded leave benefits for both mothers and fathers in the USMC. Additionally, world events such as the COVID-19 pandemic affected Marines' ability to utilize their leave requiring the implementation of temporary policies allowing greater leave accrual balances for all Marines. This chapter describes the institutional background on the USMC Leave and Liberty program by covering relevant leave types afforded to Marines and highlight some of the administrative requirements for leave approval by both Marines Corps leadership and individual Marines.

A. ANNUAL LEAVE AND SPECIAL LEAVE ACCRUAL

The cornerstone of military leave policies is annual leave (AL), where service members accrue up to 30 days each year, at a rate of 2.5 days per month per 10 U.S.C. § 701. The significance of AL is emphasized in the Marine Corps Leave and Liberty Order (MCO 1050.3J), which states, "An aggressive leave program is an essential military requirement. Vacations and short periods of rest from duty provide benefits to morale and motivation that are essential to maintaining maximum effectiveness." This policy mandates that service members must utilize their leave within the fiscal year, with a maximum carryover of 60 days to the next year; any excess is forfeited.

Per MCO 1050.3J, Commanders are charged with ensuring adherence to this policy, actively encouraging their personnel to use their leave for rest and recuperation, in line with mission constraints. This approach underlines the balance between operational readiness and personal well-being.

B. SPECIAL LEAVE ACCRUAL (SLA)

SLA caters to those serving under specific conditions, such as extended deployment in Combat Zone Tax Exclusion (CZTE) areas, or on deployable ships and units, allowing

for a leave balance of up to 90 days. This is necessary, because Marines deployed to CTZE areas are not typically able to utilize the leave they accrue while deployed creating situations where they accumulate leave over the 60-day limit. SLA affords them the opportunity to carry up to 90 days of leave at the end of the fiscal year without the prospect of forfeiting unused leave. Other circumstances in which Marines are unable to utilize their annual leave must be verified by a commander in the pay grade of O6 or above. Notably, during the FY20 and FY21 COVID-19 pandemic, the SLA policy temporarily expanded, permitting Marines to accumulate up to 120 days of leave. This policy was revised in 2023, standardizing the maximum SLA leave accumulation back to 60 days, reflecting a return to pre-pandemic regulations (U.S. Marine Corps, 2023).

C. PARENTAL LEAVE

In the last decade, the Department of Defense (DOD) has seen significant shifts in personnel policies, with Parental Leave (PL) updates being among the most impactful. In 2015, the Marine Corps published MARADMIN 421/15 which authorized birth mothers up to 18 weeks of maternity leave (U.S. Marine Corps, 2015). Prior to this policy, birth mothers were authorized only 6 weeks of maternity following the birth of a child. However, the policy was updated only a year later reducing maternity leave for birth mothers to 12 weeks as part of a broader policy recalibration (U.S. Marine Corps, 2016). An additional update in 2018 authorized competent medical authorities to grant an additional 42 days of convalescent leave to birth mothers to be used alongside Maternity leave (U.S. Marine Corps, 2018). That same update also authorized secondary caregivers, often fathers, up to two weeks of secondary caregiver leave (SCL) following a birth or adoption.

In 2022, MARADMIN 048/22 increased the secondary caregiver leave to three weeks reflecting an ongoing commitment to supporting USMC families (U.S. Marine Corps, 2022). The culmination of the evolution of parental leave policy was realized by the publication of MARADMIN 051/23. This groundbreaking policy update expanded the Parental Leave program by authorizing all parents the ability to take up to 12 weeks of leave following a birth or adoption (U.S. Marine Corps, 2023).

Of note, while Marines are executing PL, they receive their full pay, entitlements, and health care. Unlike AL, which accumulates over time, PL is initiated by the event of a birth or adoption, as outlined in MCO 1050.3J. Marines have up to one year to use all their PL but may request a waiver for a longer period of use if they are unable to execute the leave due to operational requirements (U.S. Marine Corps, 2023). While PL can be used incrementally, the increments must be in periods of at least 7 days (U.S. Marine Corps, 2023). This evolution reflects the DOD's recognition of the importance of work-life balance and family well-being among its service members.

D. OTHER LEAVE TYPES

Convalescent leave was discussed previously within the context of maternity leave, but it applies to any medical situation where a competent medical authority recommends time away from work. Unlike the civilian sector, convalescent leave cannot be accrued and the amount of time recommended is based on the expertise of the competent medical authority.

In April 2023, the Marine Corps updated the leave and liberty policy by introducing bereavement leave. This authorizes 14 days of leave only in the case of death of the Marines' spouse or dependent to make appropriate arrangements for the deceased person's funeral, burial, or memorial service (U.S. Marine Corps, 2023). The leave must be taken as one continuous increment and can be taken in conjunction with annual leave should the Marine have enough accrued (U.S. Marine Corps, 2023). Of note, Marines are not authorized bereavement leave if the death was a result of their own misconduct or in the case of a stillbirth or miscarriage during a pregnancy.

E. LEAVE ADMINISTRATION AND PROCEDURES

Individual USMC units may have their own policies on the administration of leave, but unit policies may not contradict MCO 1050.3J. All leave requests must be processed through the "Leave and Liberty" portal on Marine Online (MOL). This is to ensure leave is properly accounted for and tracked across the entire force. Only commanders with the delegated authority may approve leave request and they are encouraged to make every effort to do so barring operational and mission requirements. Once leave is approved,

Marines may use MOL to "Check themselves in and out" of leave which initiates and ends their leave periods. This function ensures the appropriate amount of leave is deducted from the Marines' leave balance in accordance with the actual number of days taken. Some units may require Marines to check in with Command Duty Officer or with their leadership when they are departing for or returning from leave.

F. INFORMAL LEAVE PROTOCOLS AND ETIQUETTE[1]

MCO 1050.3J describes the proper processes for submitting and approving leave, however there are some informal norms surrounding leave that are common knowledge among Marines. For example, Marines should discuss their leave and obtain informal agreement from their leadership prior submitting the request in MOL. This is important to note when studying leave utilization because all approved and unapproved leave is captured in MOL and Commanders must provide a reason as to why it is not approved (i.e., upcoming exercises). Therefore, the assumption can be made that the existence of the informal process of leave approval to the official request means that anyone studying leave utilization is unlikely to determine how much leave is unsubmitted by Marines due to a verbal decision made by their leadership.

With this comprehensive overview of evolving USMC leave policies as the backdrop, the next chapter is a literature review where I explored how these changes reflect broader trends in military and civilian personnel leave and parental leave policies.

[1] Note: The observations presented in this section regarding informal leave protocols are based on the author's personal experiences and should not be construed as universally representative of the experiences of all Marines.

III. LITERATURE REVIEW

This chapter reviews the literature on family leave policy for both the civilian and military populations as well as research on the effects of leave policies on employers and the DOD. Despite limited research on AL utilization in the military, recent expansions to PL policies have sparked interest in understanding the effects of leave policies on take-up rates, employment, wages, career progression, and health outcomes. A smaller literature studies the impacts of expanded leave on the military services and employers in terms of the negative effects on manpower readiness.

A. TAKE-UP OF LEAVE—CIVILIAN

The Family and Medical Leave Act (FMLA) was passed in 1993 and was the first federal law that provided maternity leave rights to American women, though not all women qualified (Waldfogel, 1999). Prior to its inception, the U.S. was the only industrial country without federal protections guaranteeing maternity leave (Waldfogel, 1999). FMLA guarantees eligible employees 12 weeks of job protected leave within a 12-month period to care for a newborn or adopted child, but FMLA does not mandate that the employer must pay the employee during this period (Ruhm, 1998). This means that employees must use accrued vacation and sick leave to cover some or all the time they are caring for their child. Under FMLA, a person is eligible for this benefit if they have been with an employer for at least 12 months.

While FMLA was a step forward for maternity rights, the effectiveness of the legislation has been debated since its inception. Ruhm (1997) determined that the FMLA did not result in significant advantages for employees, nor did it lead to substantial burdens for employers. Using 1995 survey data from employers and employees, Ruhm (1997) found that there was a marginal increase in leave up-take based on the new policy. The author does clarify, however, that the conclusions in this study should be viewed as "tentative" due to the limited period FMLA had been in effect (Ruhm, 1997). That said, subsequent work by Waldfogel (1999) also found that FMLA had little effect on women working in large firms perhaps because large firms already provided leave regardless of

state or federal mandates. While both Ruhm (1997) and Waldfogel (1999) agree that the effect on leave take-up is minimal for women in large firms, Waldfogel (1999) found higher take up among women working at medium and small firms. The study used data from March 1992–1995 to analyze the effects that FMLA had on the take-up of leave. The analysis focused on women in very small firms (1 to 24 employees), small firms (25-99 employees), medium firms (100-499 employees) and large firms (500+ employees) (Waldfogel, 1999). Differences in effects based on size of the firm indicates that FMLA could be more effective for smaller firms due to the potential lack of existing maternity leave policies as opposed to large firms.

B. EFFECT OF LEAVE ON LABOR MARKET OUTCOMES—CIVILIAN

A parent's ability to take time off work both before and after birth is a significant factor in the decision to have a child. The availability of maternity leave policies affects both the employment of parents who use leave and their wages. Ruhm (1998) examined the impact of paid parental leave policies on labor market outcomes in nine European countries between 1969 and 1993 using labor market data. The main method employed involved a Triple Difference (DDD) model to assess variations in the gender gap within labor market outcomes in relation to alterations in leave entitlements. He found that access to paid parental leave was associated with an increase in female employment. Blau and Kahn (2013) expanded on Ruhm's (1998) research by looking at sample data from 17 high income European countries from 1990 to 2010. They performed linear regression analyses of labor force participation rates of women, men, the difference between male and female participation rates, and the log of the male-female participation rate ratio. They found that gender gaps in employment shrink with improved parental leave rights, benefits, right of part-time work, and equal treatment legislation. Both studies face limitations stemming from their focus on European data and their findings are hard to generalize outside of the European context. (Olivetti and Petrongolo, 2017).

Leave policies affect not only women's employment but also their wages. Ruhm (1998) concluded that shorter leave periods have little effect on wages while longer leave periods resulted in lower wages. Additionally, Waldfogel (1999) hypothesized that the

existence of maternity leave as an extra benefit could lead to women accepting lower wages. Using difference-in-difference (DD) analysis, the study found that there was an increase in wages for women working in very small firms and small firms. Of note, this increase could be due to the ability for women to return to their jobs and is thus connected to the positive effects on the employment from the inception of the policy. The study further found that the only positive effects on wages for large firms occurred in states with no previous maternity leave laws in place (Waldfogel, 1999). Waldfogel's (1999) analysis provides valuable insights to the positive impacts of FMLA on labor market outcomes in the United States. If these positive effects are seen given the limited scope of FMLA, what are the potential effects of a more robust parental leave policy?

The primary research discussed thus far centered around the effects of leave policy on outcomes relating to the individual, but not the employer. Bartel et al. (2021) hypothesize that one of the reasons for the lack of federal policy for Paid Family Leave (PFL) is the perceived burden the law would have on employers. This study looked at the introduction of New York's PFL policy which took effect in January 2018 and its effect on employers. The data they used was from samples of firms with 10 to 99 employees in New York and Pennsylvania from 2016–2019. They used a DD analysis to compare the employee ratings of their firm before and after the policy's implementation among states that previously had PFL policies in place and those that did not. The approach is effective due to the organic treatment and control groups that already exist due to differing policies across states. They concluded that the policy does not impose large burdens on firms due to the lack of meaningfully adverse impacts on employer ratings by employees (Bartel et al., 2021). This finding confirms a previous finding by Applebaum and Milkman (2011); California businesses surveyed from 2009 to 2010 reported the state Paid Family Leave program had either a positive effect or no noticeable impact on productivity, profitability, employee turnover and morale. Applebaum and Milkman's (2011) study is limited in that the sample size of employers was only 253 establishments and their individual survey only included 500 respondents.

The positive effects of parental leave on the labor market are significant, but its effects on workers themselves are another important outcome of these policies, specifically

on their health. Persson and Rosin-Slater (2023), studied the impacts of Sweden's "Double Days" paternity leave reform on the health of mothers which granted parents an additional 30 days of leave in the first year after their child's birth. The intent of the policy was to provide mothers the opportunity to seek medical attention post-partum without needing to find childcare. Eligibility for the policy also increases the likelihood that fathers use at least one day of leave on the same day the mother has an encounter with the health care system (Persson and Rossin-Slater, 2023). Using data from Swedish birth records, population register data, parental leave claims, inpatient, outpatient, and prescription drug claims from 2000 to 2016 they found a 12 percent decrease in likelihood of maternal health care encounters which suggests that the ability for fathers to stay home while mothers seek medical care averts future health complications (Persson and Rossin-Slater, 2023). Despite Sweden's small size, the study's extensive temporal scope resulted in a substantial sample of 222,638 observations, enhancing its credibility. Bullinger (2019) examined California's PFL policy by analyzing data from the National Survey of Children's Health for 2003, 2007, and 2011. Employing a DD methodology, Bullinger assessed the impact of PFL on parent and child health, identifying notable improvements in maternal mental health outcomes. A key limitation of the study is its exclusive focus on California residents, attributed to the state's unique provision of PFL. This raises questions about the generalizability of the findings to other states without similar policies.

C. TAKE-UP OF LEAVE—MILITARY

Following the expansion of maternity and parental leave in the DOD, numerous studies have examined the impact on service members' leave utilization. For example, Balsar (2020) researched the effects of the maternity leave change from 6 to 18 weeks in the Army and Air Force. Using administrative data such as leave usage, separation and promotion information from the Defense Manpower Data Center (DMDC), the study concluded that the change in policy resulted in leave usage increasing by nearly 5 weeks across the board. Bacolod et al. (2022), investigated the effects of the same maternity leave policy changes in the Marine Corps using administrative data from the TFDW from 2018–2022. The study used a DD approach to look at the take-up of leave before and after the increase in maternity leave from six weeks to 12 weeks. They concluded the increase in

allotted maternity leave resulted in an overall increase of leave duration, but also led to a crowding out of other forms of leave. This means that service members did not use other types of leave (i.e., annual leave) to supplement the 12-week period like they otherwise would have if only given six weeks of leave after the birth of a child. Bacolod et al. (2022) highlight the omission of the crowding-out effect in Balsar's (2020) study. The increase in leave utilization was observed in Persson and Rossin-Slater's (2023) study on the implementation of the Swedish "Double Days" policy. The crowd-out effect resulting from the implementation of paternity leave is an important consideration when looking at annual leave utilization in the USMC.

D. EFFECTS OF MILITARY LEAVE POLICIES ON OUTCOMES

Leave policy in the military does not have the same labor market outcomes as the civilian market. Service members are paid the same wages by rank throughout the entire 12 plus weeks they are on leave and their employment status is not affected by the leave they take. But there are effects on outcomes within the military labor market such as career progression. Balsar (2020) concluded there was a negative impact on the likelihood of promotion for women servicemembers within a year after birth. He suggests that while the policy successfully facilitates leave taking, it might have unintended consequences for women's career progression within the services. Bacolod et al. (2022) found that Marine Officers used less leave before and after birth and used less of the total 18 weeks of leave they were allotted. They use this finding to hypothesize that the degree to which the leave is utilized is potentially tied to differing degrees of career attachment and organizational commitment between female enlisted and officer personnel. This hypothesis would not only support Balsar's (2020) theory about negative career progression but may even indicate an acute awareness of it by women in the USMC.

Most literature on leave take-up revolves around the effects of the employee and offers little analysis on the effects of employers and services. Chamberas (2023) investigated the manpower implications of the expanded DOD parental leave policy on the U.S. Navy, illustrating potential organizational impacts of such policies. In contrast, Ruhm (1998) theorized that a standardized leave policy can be detrimental to firms, suggesting

that handling leave on an individual basis is preferred. This juxtaposition highlights the ongoing debate about the best approaches to leave policies within organizations. Chamberas (2023) used data detailing all unique parental leave occurrences granted to active-duty sailors from June 2018 to April 2023. The study produced three leave uptake models (low, medium, and high), and compared the leave uptake rates to the Navy's budget for transient personnel. Chamberas (2023) found that parental leave usage made up anywhere from 21 to 30% of the transient personnel budget meaning that there is the potential for billets to be vacant for significant durations of time. She recommends members from the U.S. Navy's Active Reserve Force could be used to bolster the billet vacancies while both parental leave and transient service members are unable to work. This well-designed and executed study paves the way for future research into the effects of parental leave on manpower planning.

Finally, the Center for Naval Analysis conducted a short-term active-duty Marine AL analysis for the Manpower Military Policy Office (MPO) (P. Rost, personal communication, 5 Jan. 2024). They investigated the end of fiscal year AL balances for all active-duty Marines and looked at differences in total balances across various sub-populations. Data from the TFDW was used from FY18 through FY22. Their methodology included summary statistics and multinomial regression analysis with the amount of leave used as the outcome variable. The study revealed that junior enlisted Marines and Officers typically had the lowest AL balances, whereas more senior enlisted and Officer personnel maintained higher balances. Specifically, 71.5% of enlisted Marines with less than 4 years of service had less than 30 days of leave at fiscal year-end, compared to 82% of those with 12 to 20 years of service who had more than 30 days. A similar pattern was observed among Officers, where 61.9% with less than 4 years of service had under 30 days of leave, and 89% with 12 to 20 years of service had over 30 days. The study did not explore the reasons behind these trends or the impact of deployments on leave balances. I explore both of these issues in my study.

E. CONCLUSION

My thesis focuses on the loss of AL within the USMC because of Marines carrying balances over 60 days. The established literature studying outcomes of PL in both the civilian and military workforce provides valuable context to a servicemembers' ability to use AL. They largely find positive effects on outcomes of PL policies such as female employment rates and in addition to positive effects on maternal health post birth. Lastly, the few published studies on the effects of long-term Parental Leave/PFL provide valuable perspective on the costs of reduced manpower from the service/employer perspective such as the potential gaps in key billets and other staffing issues. My thesis contributes to this literature by providing analyses on leave utilization across the USMC specifically and on effects of recent deployments on leave take-up.

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IV. DATA AND METHODOLOGY

A. DATA

This thesis uses data that covers the population of active-duty Marines from January 2017 to November 2023 obtained from the TFDW. The data comprises three datasets: two monthly snapshots of individual Marines and one annual snapshot of leave data in September. The monthly snapshots include demographic information (date of birth, race, ethnicity, rank, marital status, occupational specialty, etc.) and leave data (leave periods, type of leave, and monthly leave balances). I aggregate these datasets to fiscal year observations corresponding to one observation per individual Marine with information of leave type used and number of leave days used during a given fiscal year. I also aggregate these datasets to the fiscal year level to create a comprehensive view of individual Marines, capturing both demographic information and leave-related variables and to capture excess leave taken at the end of each fiscal year. The aggregated dataset contains 906,875 observations and 383,091 unique individuals.

B. VARIABLES

The key dependent variables in my analysis are lost leave, which I define as any Marine who lost leave at the end of the fiscal year due to carrying a leave balance over 60 days and not being approved for SLA. An important correlate of the ability to take leave is location. Deployments reduce the ability of Marines to take traditional annual leave consistently due to the operational requirements throughout a deployment. Leave types were divided into four categories and they are defined as follows: AL days are days that were used throughout the fiscal year that were accrued as annual leave. Combat Leave Days is defined as leave days that were used and were accrued due to deployment in a CTZE. PL days used are leave days that were used coded under Primary Caregiver Leave (PCL) and SCL due to the change in PL policy during our observation period as well as the current code for PL giving Marines 12 weeks of PL. Marines who use sick leave days due to placement on convalescent leave or in a sick-in-quarters status are defined as “sick

days used." I sum up the number of days that Marines used each type of leave by the fiscal year and calculate the mean days of each leave used.

Having outlined the key dependent variables in my analysis, including the various types of leave taken by Marines, it is essential to consider the independent variables that may influence these outcomes. Location contains two variables: Marines who deployed to a combat zone and Marines who were either deployed or stationed overseas and not to a combat zone. I make the distinction between Marines serving in combat MOS's and those who were not, using an indicator variable equal to one for Marines assigned to the "Combat MOS" category if they belong to the infantry, artillery, combat engineer, or tank communities. USMC Naval Aviators were similarly assigned if they fell within the "75XX" MOS code.[2] Lastly, I create an indicator variable equal to one for Marines who did not fall under Combat or Aviation and assigned them to the "Support MOS" variable.

I divide Marines into categories by rank to analyze their effects on leave outcomes. For Enlisted Marines, I define "Junior Enlisted" as Marines falling within a paygrade of E1-E3, "Non-commissioned Officers" as Marines falling within a paygrade of E4-E5, and "Staff-non-commissioned Officers as Marines falling within a paygrade of E6-E9. For Officers, I define "Company Grade Officers" as Officers falling within a paygrade of W1-O3 (this includes Warrant Officers), "Field Grade Officers" as Officers falling within a pay grade of O4-O5 and "General Officers" as Officers falling within a pay grade of O7-O10.

I include demographic information in my analysis to test for differences in leave lost based on gender, marital status, age, and race. I define gender using a binary variable which equals one if a Marine is male and zero if a Marine is female. Married Marines are defined as Marines who were Married at the time the data was collected and assigned a value equal to one if married and a zero otherwise. The age variable is calculated using Marines' dates of birth and each Marine assumes the last age they appeared at within the dataset. Similarly, I assign binary indicator variables for race using race codes designated by TFDW. Because "Hispanic" Marines are captured under the "White" code in TFDW, I break them out separately using ethnicity codes designated by TFDW ensuring they were

[2] Note: Enlisted Marines are not eligible to become Naval Aviators in the USMC.

not double counted under both variables. I create additional binary indicators for race, specifically for "Black" and "Asian" Marines and assign them values equal to one if they were listed under each variable and zero otherwise. I define a final race variable as "Other" for Marines who do not fall into any race category above.

I generate dummy variables for each fiscal year in my dataset from Fiscal Year (FY) 2018 to FY 2024. They are binary variables which assume a value equal to one if the observation occurred within a given fiscal year and a zero otherwise. This allows me to analyze leave lost by year and control for any annual variations that may affect leave policies or external factors influencing Marine leave usage. The dummy variables provide a systematic way to account for time-specific effects, ensuring that the analysis can distinguish between trends over time and the impact of the variables of interest.

C. METHODOLOGY

1. Logistic Regression

The logit model is used to predict the probability of leave loss, with the binary dependent variable (lost leave) indicating whether a Marine lost leave (Massenkoff, 2024). My dependent variable is a binary variable that assumes a value of one if a Marine ever loses leave as a result of carrying a balance of 60 days at the end of the year and a zero otherwise. My key independent variables are the two deployment indicators capturing deployments to combat and non-combat locations. Other control variables include MOS type, rank, demographics (marital status, gender, age and race), and fiscal year dummies. Because no Marines lost leave during Fiscal Years 2020 and 2021 those years were dropped from the regression. The data set only goes until November 2023 and since no Marines lost leave that early in the fiscal year, I exclude observations from 2024 as well.

2. Secondary Analysis—Sick Leave

I further examine leave usage in the USMC by using the same logit model to predict the probability of Marines using Sick Leave. To do this, I create a binary variable for sick leave where Marines who used any sick leave in a fiscal year were assigned a value equal to one and those who did not were assigned a value equal to zero. This now serves as my

dependent variable and I use the logit model to regress sick leave on the same independent variables previously.

3. Ordinary Least Squares—AL and CL Days Used

Finally, I combine the number of AL days and CL days into a single variable and regressed number of leave days used in a Linear Probability Model (LPM). I use this model to explore how the various independent variables influence the total number of leave days used.

The results of the data and approaches described in this chapter are presented in Chapter V.

V. RESULTS

A. WHO LOSES LEAVE?

Table 1 provides the percentage of those who lost leave and those who did not across variables described in Chapter IV. Between Officer and Enlisted personnel, Officers lost leave at a higher rate than did enlisted personnel in that 31.8% of total leave lost was by Officers compared to 68.2% of leave lost by Enlisted Marines. These results are measured against the general proportion of Officers and Enlisted personnel in the Marine Corps. Between the three MOS categories, Marines in the support MOS category lost the highest percentage of leave with 71.6% followed by Combat MOS at 21.7% and Aviation MOS at 6.7%. As for location, Marines deployed to non-combat zones lost leave at a higher rate than Marines deployed to combat zones, 21.5% to 6.7%. Marines who lost leave spent an average of 1.3 months combat zones and non-combat zones in a given year. 69.9% of Marines who were Married lost leave and 94% of Male Marines lost leave as well. Amongst races who lost leave, 60% were White, 3.6% were Asian, 14% were Black, 15.8% were Hispanic and 7.3% fell into my Other Race variable. Across leave types, Marines who lost leave used an average of 17.8 AL days per year compared to 19.3 for those who did not lost leave. Marines who lost leave and used CL days used an average of 0.1 leave days per year. Finally, Marines who used PL days and sick days used an average of 0.3 and 0.4 days per year respectively.

Table 1. Balance Table of Leave Loss across USMC. Adapted from TFDW (Jan 2017–Nov 2023).

Variable	Whole Sample	Did not lose leave	Lost leave	p-value*
Officer	91151 (10.0%)	84147 (9.7%)	12004 (31.8%)	<0.0001
Enlisted	810724 (89.4%)	785022 (90.3%)	25702 (68.2%)	<0.0001
Combat MOS	219869 (24.2%)	211503 (24.3%)	8186 (21.7%)	<0.0001
Aviation MOS	22646 (2.5%)	20131 (2.3%)	2515 (6.7%)	<0.0001
Support MOS	662540 (73.5%)	637535 (73.3%)	27005 (71.6%)	<0.0001
Deploy to Combat Zone	67526 (7.4%)	65166 (7.5%)	2360 (6.3%)	<0.0001
Months in Combat Zone	1.5 (0.79)	1.5 (0.8)	1.3 (0.6)	<0.0001
Deploy to Non-combat Zone	178839 (19.7%)	170737 (19.6%)	8102 (21.5%)	<0.0001
Months Deploy to Non-Combat Zone	1.3 (0.6)	1.3 (0.6)	1.3 (0.5)	<0.0001
Married	350476 (38.6%)	324251 (37.3%)	26225 (69.6%)	<0.0001
Male	824991 (91.0%)	789478 (90.8%)	35513 (94.2%)	<0.0001
Age	24.97 (6.5)	24.6 (6.2)	33.0 (7.6)	<0.0001
White	538866 (59.4%)	516502 (59.4%)	22364 (59.3%)	0.6610

Variable	Whole Sample	Did not lose leave	Lost leave	p-value*
Asian	30333 (3.3%)	28964 (3.3%)	1369 (3.6%)	0.0016
Black	101365 (11.2%)	96075 (11.1%)	5290 (14.0%)	<0.0001
Hispanic	194854 (21.5%)	188908 (21.7%)	5946 (15.8%)	<0.0001
Other Race	41457 (4.6%)	38720 (4.5%)	2737 (7.3%)	<0.0001
Annual leave Days	19.22 (12.6)	19.3 (12.8)	17.8 (11.3)	<0.0001
Combat Leave Days	0.03 (0.9)	0.04 (0.9)	0.1 (1.1)	0.0002
Parental Leave Days	0.2 (2.8)	0.2 (2.7)	0.3 (3.7)	<0.0001
Sick Days	0.3 (3.2)	0.3 (3.1)	0.4 (4.1)	<0.0001

Number of Observations=906,876, representing 383,091 unique Marines
*P-value compares the difference between those who lost leave and those who did not.

The percentage of lost leave among USMC Officers and Enlisted Marines from FY 2017 to FY 2023 is shown in Figure 2. Officers typically lost leave at approximately three to five times the rate of enlisted Marines. The notable exception to this trend was during the COVID-19 pandemic in FY 2020 and FY 2021, as depicted in Figure 1; no Marines exceeding the 60-day AL accrual limit lost leave during these years. However, in FY 2022, the SLA for AL during the COVID-19 pandemic was rescinded, and the standard 60-day AL balances were reinstated. In the two years following the pandemic, both Officers and Enlisted Marines lost leave at higher rates than in the pre-pandemic years of this study (U.S. Marine Corps, 2023). The increase in lost leave could be attributed to Marines

accruing large amounts of AL that they were unable to utilize sufficiently to stay under the 60-day limit once the policy was updated in FY 2022.

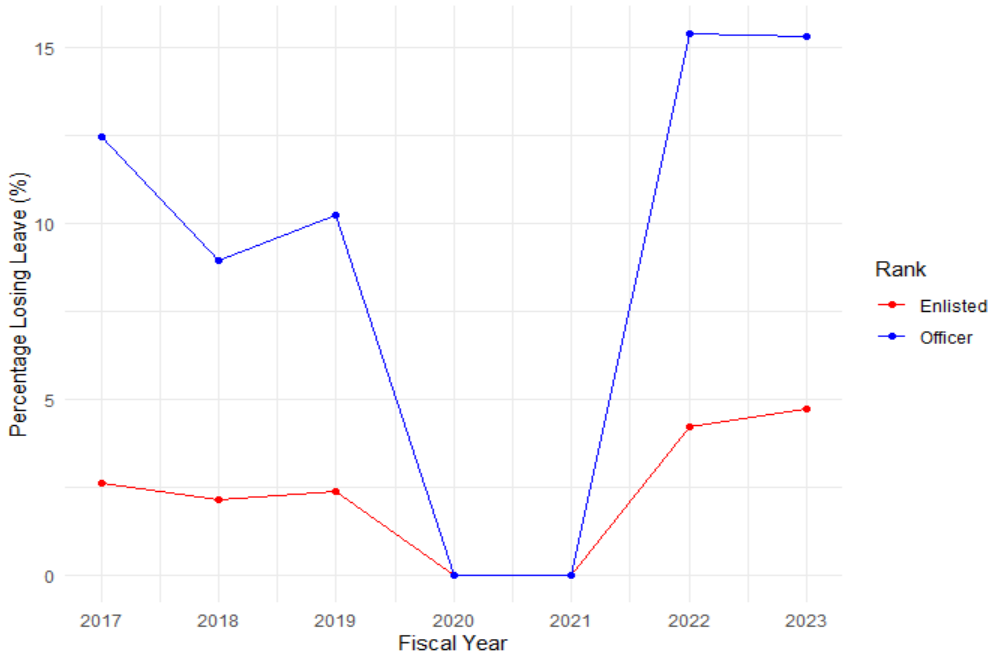

Figure 1. Percentage of Leave Lost per Fiscal Year in USMC

B. LOGISTIC REGRESSIONS—LOST LEAVE

Given the differences in the patterns of lost leave across of Officers and Enlisted Marines that lost leave as shown in Figure 1, I estimate logistic regressions separately for Officers and Enlisted Marines on the probability of losing leave based on deployments, MOS, Rank, and Demographics. In Model 1 below, I estimate the probability that an individual loses leave given that they have deployed to a combat zone or a non-combat zone. Model 2 estimates the effect on lost leave by MOS type. Model 3 estimates the effect of rank and is divided by rank category. Finally, Model 4 controls for demographic variables such as marital status, gender, age, and race. All models include dummy variables for each fiscal year in the dataset except for FY 2020 and FY 2021 to reduce the impact that the COVID-19 pandemic had on leave loss. Results are reported using odds ratios.

In Table 2, I first estimate the probability of losing leave among only USMC Officers. Surprisingly, Officers who deployed to combat zones were less likely to lose leave than those who did not. This remains constant throughout all four models with coefficients ranging from 0.79-0.84. Officers who deployed or were stationed in non-combat zones were more likely to lose leave than those who did not deploy with coefficients ranging from 1.02-1.04. Notably, in Model 2 Officers in Combat MOS's were 1.29 times more likely to lose leave when compared to Marines in a Support MOS and Marine Aviators were less likely to lose leave with a coefficient of 0.91.

In Model 3, General Officers and Field Grade Officers were more likely to lose leave than Company Grade Officers with coefficients of 11.45 and 4.16, respectively. This trend could be due to the fact that Field Grade Officers and General Officers having had more time in their careers to accumulate leave than Company Grade Officers, thus making them more likely to carry balances over 60 days. Additionally, the effects of rank on the probability of losing leave were diminished with the introduction of Model 4. Black and Asian Officers were more likely to lose leave than White Officers with coefficients of 1.14 and 1.07 respectively. Lastly, Officers were more likely to lose leave in FY 2022 and 2023 than FY 2018 and FY 2019. The higher probabilities of lost leave in FY 2022 and 2023 could be due to the removal of authorized SLA balances over 90 days and the inability of those Officers to use enough leave to get under the 60-day threshold by the end of each fiscal year.

Table 2. Analysis of Lost Leave in Marine Corps among Officers

	Dependent variable:			
	Annual leave Ever Lost			
	Deployed	+ MOS	+ Rank	+ Demographic
	(1)	(2)	(3)	(4)
Deployed to Combat Zone	0.81***	0.79***	0.81***	0.84***
	(0.04)	(0.04)	(0.04)	(0.04)
Deployed to Non-Combat Zone	1.04***	1.02***	1.03***	1.04***
	(0.03)	(0.03)	(0.03)	(0.03)
Combat MOS		1.29***	1.24***	1.45***
		(0.03)	(0.03)	(0.03)
Aviation MOS		0.91***	0.87***	1.10***
		(0.03)	(0.03)	(0.03)
Field Grade Officers			4.16***	1.92***
			(0.02)	(0.03)
General Officers			11.45***	2.30***
			(0.12)	(0.14)
Age				1.07***
				(0.002)
Married				1.53***
				(0.04)
Male				1.07***
				(0.05)
Asian				1.07***
				(0.06)
Black				1.14***
				(0.05)
Other Race				0.99***
				(0.05)
Hispanic				0.99***
				(0.05)
FY2018	0.69***	0.69***	0.76***	0.83***
	(0.03)	(0.03)	(0.03)	(0.03)
FY2019	0.80***	0.80***	0.79***	0.80***
	(0.03)	(0.03)	(0.03)	(0.03)
FY2022	1.27***	1.28***	1.43***	1.65***
	(0.03)	(0.03)	(0.03)	(0.03)
FY2023	1.26***	1.26***	1.27***	1.34***
	(0.03)	(0.03)	(0.03)	(0.03)

	Dependent variable:			
	Annual leave Ever Lost			
	Deployed	+ MOS	+ Rank	+ Demographic
	(1)	(2)	(3)	(4)
Constant	0.14***	0.14***	0.08***	0.01
	(0.02)	(0.02)	(0.03)	(0.08)
Observations	96,151	96,151	96,151	96,151
Log Likelihood	-35,904.73	-35,829.52	-33,232.92	-32,373.35
Akaike Inf. Crit.	71,823.45	71,677.03	66,487.83	64,782.70

Note: *p**p***p<0.01

Clustered standard errors in parentheses at individual Marine level.

** p < 0.05; *** p < 0.01.

In Table 3, I estimate the probability of losing leave among Enlisted Marines. Consistent with previous tables, the coefficients for deployments change minimally across all four models. The likelihood of those who deployed to a combat zone losing leave decreases from 0.87 in Model 1 to 0.77 in Model 4. Given that no enlisted Marines are Marine Aviators, the Aviation MOS variable is omitted from this analysis. Consequently, in Model 2, Marines in Combat MOS's were less likely to lose leave (0.80) compared to the baseline in Support MOS's.

In Model 3, more senior Marines experienced higher probabilities of leave loss, though the effects of ranks are once again diminished with the introduction of Model 4. This is similar to the results observed in Table 2 for Officers. Male Marines were 1.65 times more likely to lose leave than female Marine and Married Marines (0.88) were less likely to lose leave than un-married Marines. In Model 4, Black Marines were the most likely to lose leave with a coefficient of 1.52 when compared to their White counterparts of similar operational tempo. The effects by fiscal year were similar to those observed in Table 2 for Officers. In the next section, I expand my analysis by looking at different aspects of leave taking such as the effects on lost leave with sick days used and the total number of leave days used.

Table 3. Analysis of Lost Leave in Marine Corps among Enlisted Marines

	Dependent variable:			
	Annual leave Ever Lost			
	Deployed	+ MOS	+ Rank	+ Demographic
	(1)	(2)	(3)	(4)
Deployed to Combat Zone	0.87***	0.91***	0.76***	0.77***
	(0.03)	(0.03)	(0.03)	(0.03)
Deployed to Non-Combat Zone	1.27***	1.30***	1.20***	1.18***
	(0.02)	(0.02)	(0.02)	(0.02)
Combat MOS		0.80***	0.98***	1.00***
		(0.02)	(0.02)	(0.02)
Non-commissioned Officers			11.47***	10.62***
			(0.03)	(0.04)
Staff non-commissioned Officers			51.19***	31.25***
			(0.03)	(0.04)
Age				1.04***
				(0.002)
Married				0.88***
				(0.02)
Male				1.65***
				(0.03)
Asian				1.30***
				(0.04)
Black				1.52***
				(0.02)
Other Race				1.22***
				(0.03)
Hispanic				1.17***
				(0.02)
FY2018	0.82***	0.82***	0.93***	0.97***
	(0.02)	(0.02)	(0.02)	(0.02)
FY2019	0.92***	0.92***	0.91***	0.92***
	(0.02)	(0.02)	(0.02)	(0.02)
FY2022	1.63***	1.64***	1.99***	2.08***
	(0.02)	(0.02)	(0.02)	(0.02)
FY2023	1.87***	1.87***	1.93***	1.95***
	(0.02)	(0.02)	(0.02)	(0.02)
Constant	0.03*	0.03*	0.002	0.0005
	(0.02)	(0.02)	(0.03)	(0.06)

	Dependent variable:			
	Annual leave Ever Lost			
	Deployed	+ MOS	+ Rank	+ Demographic
	(1)	(2)	(3)	(4)
Observations	810,724	810,724	810,724	810,724
Log Likelihood	-112,508.60	-112,399.90	-94,395.28	-93,486.12
Akaike Inf. Crit.	225,031.20	224,815.80	188,810.60	187,006.20
Note:				*p**p***p<0.01
	Clustered standard errors in parentheses at individual Marine level.			
	** p < 0.05; *** p < 0.01.			

C. SECONDARY RESEARCH—SICK LEAVE

In Table 4, I estimated the probability of using sick leave among Marine Officers using logistic regression, similar to previous models but with "Sick Leave Ever Used" as the dependent variable. The results indicate that Officers who were deployed to a combat zone and non-combat zone were less likely to use sick leave compared to those not deployed. This trend could be attributed to high operational tempos during deployments which may inhibit Marines' ability to seek medical attention for illnesses and injury.

In Model 2, Officers in both a Combat MOS and Aviation MOS were less likely to take sick leave when compared to Marines in a support MOS. In Model 3, Field Grade Officers were more likely to take sick leave than Company Grade Officers (1.19), but General Officers were less likely to take sick leave with a coefficient of 0.77. This increase could indicate a greater awareness or willingness to access medical benefits as Marines increase in rank at the Field Grade Level. The decrease in probability at the General Officer level could be due to a reduction in available time to attend to personal medical matters due to the increase in responsibilities.

In Model 4, the introduction of demographic variables diminish the likelihood that Field Grade Officers took sick leave from 1.19 in Model 3 to 0.73 in Model 4. Married Officers were 2.31 times more likely to use leave when compared to unmarried Marines. Additionally, given the Officer was Male, they were less likely to take sick leave when compared to females with a coefficient of 0.57, suggesting gender differences in sick leave usage. Lastly, Asian, Black and Hispanic Officers were less likely to take sick leave when

compared to White Officers. This result could indicate differences in comfortability utilizing sick leave among non-white Officers.

Table 4. Analysis of Sick Leave Use by Officers in USMC

	Dependent variable:			
	Sick Leave Ever Used			
	Deployed	+ MOS	+ Rank	+ Demographic
	(1)	(2)	(3)	(4)
Deployed to Combat Zone	0.59***	0.60***	0.60***	0.61***
	(0.13)	(0.13)	(0.13)	(0.14)
Deployed to Non-Combat Zone	0.70***	0.69***	0.69***	0.68***
	(0.09)	(0.09)	(0.09)	(0.09)
Combat MOS		0.89***	0.88***	1.00***
		(0.08)	(0.08)	(0.08)
Aviation MOS		0.64***	0.63***	0.75***
		(0.08)	(0.08)	(0.08)
Field Grade Officers			1.19***	0.73***
			(0.06)	(0.09)
General Officers			0.77	0.34
			(0.50)	(0.52)
Age				1.03***
				(0.01)
Married				2.31***
				(0.09)
Male				0.57***
				(0.10)
Asian				0.78***
				(0.18)
Black				0.99***
				(0.12)
Other Race				1.06***
				(0.11)
Hispanic				0.89***
				(0.11)
FY2018	0.63***	0.63***	0.64***	0.68***
	(0.12)	(0.12)	(0.12)	(0.12)
FY2019	1.99***	1.99***	1.99***	2.02***
	(0.08)	(0.08)	(0.08)	(0.08)

	Dependent variable:			
	Sick Leave Ever Used			
	Deployed	+ MOS	+ Rank	+ Demographic
	(1)	(2)	(3)	(4)
FY2022	0.70***	0.70***	0.70***	0.76***
	(0.11)	(0.11)	(0.11)	(0.11)
FY2023	0.73***	0.72***	0.72***	0.74***
	(0.10)	(0.10)	(0.10)	(0.10)
Constant	0.01	0.01	0.01	0.01
	(0.07)	(0.07)	(0.07)	(0.19)
Observations	96,151	96,151	96,151	96,151
Log Likelihood	-6,099.11	-6,082.54	-6,078.58	-5,979.03
Akaike Inf. Crit.	12,212.23	12,183.09	12,179.16	11,994.06
Note:				*p**p***p<0.01
	Clustered standard errors in parentheses at individual Marine level.			
	** p < 0.05; *** p < 0.01.			

In Table 5, I used the same logistic regression estimating the probability of using sick leave, but among only the Enlisted Marine population. The results indicate that Enlisted Marines who were deployed to a combat zone or a non-combat zone were less likely to use leave compared to those not deployed. This is similar to results depicted in Table 4, however the coefficients were lower for Enlisted Marines than Officers with results from 0.49-0.60 for those deployed to a combat zone and 0.60 to 0.67 for those deployed to a non-combat zone. Just as in Table 4, the operational tempo of deployments could be a factor in the ability for Enlisted Marines to use sick leave.

In Model 2, Enlisted Marines in a Combat MOS were less likely to take sick leave when compared to Marines in a Support MOS. In Model 3, it was evident that all ranks above the Junior Enlisted category were more likely to take sick leave when compared to Junior Enlisted Marines. Just as with Field Grade Officers, the increase in rank and experience could lead to a greater willingness to prioritize personal health.

In Model 4, the introduction of demographic variables slightly diminishes the likelihood that higher ranking Enlisted Marines took sick leave, but both NCOs (2.31) and SNCOs (2.02) were more still more likely to take sick leave. Married Marines were 2.32

times more likely to use leave when compared to unmarried Marines. Additionally, given a Marine was Male, they were less likely to take sick leave when compared to females with a coefficient of 0.51, once again indicating differences in sick leave usage between genders. Lastly, all races were less likely to take sick leave when compared to White Marines. This result could indicate differences in comfortability utilizing sick leave among non-white Marines.

Table 5. Analysis of Sick Leave Use by Enlisted Marines in USMC

	Dependent variable:			
	Sick Leave Ever Used			
	Deployed	+ MOS	+ Rank	+ Demographic
	(1)	(2)	(3)	(4)
Deployed to Combat Zone	0.59***	0.60***	0.49***	0.54***
	(0.05)	(0.05)	(0.05)	(0.05)
Deployed to Non-Combat Zone	0.66***	0.67***	0.60***	0.67***
	(0.03)	(0.03)	(0.03)	(0.03)
Combat MOS		0.88***	0.94***	1.00***
		(0.03)	(0.03)	(0.03)
Non-commissioned Officers			3.44***	2.31***
			(0.03)	(0.03)
Staff non-commissioned Officers			5.16***	2.02***
			(0.03)	(0.05)
Age				1.03***
				(0.002)
Married				2.32***
				(0.03)
Male				0.51***
				(0.03)
Asian				0.87***
				(0.07)
Black				0.93***
				(0.04)
Other Race				0.95***
				(0.05)
Hispanic				0.97***
				(0.03)
FY2018	0.88***	0.88***	0.95***	0.99***
	(0.04)	(0.04)	(0.04)	(0.04)
FY2019	2.47***	2.47***	2.48***	2.54***
	(0.03)	(0.03)	(0.03)	(0.03)
FY2022	1.00***	1.00***	1.11***	1.17***
	(0.04)	(0.04)	(0.04)	(0.04)
FY2023	1.27***	1.27***	1.28***	1.33***
	(0.04)	(0.04)	(0.04)	(0.04)
Constant	0.01	0.01	0.003	0.003
	(0.03)	(0.03)	(0.04)	(0.07)

	Dependent variable:			
	Sick Leave Ever Used			
	Deployed	+ MOS	+ Rank	+ Demographic
	(1)	(2)	(3)	(4)
Observations	810,724	810,724	810,724	810,724
Log Likelihood	-45,466.96	-45,454.64	-43,876.11	-43,057.03
Akaike Inf. Crit.	90,947.93	90,925.27	87,772.22	86,148.07
Note:				*p**p***p<0.01
	Clustered standard errors in parentheses at individual Marine level.			
	** p < 0.05; *** p < 0.01.			

D. ORDINARY LEAST SQUARES—ANNUAL LEAVE DAYS USED

In Table 6, I conduct a linear regression using OLS to estimate the factors affecting the number of annual leave days used by Officers. This analysis incorporates the same control variables as earlier models. The results demonstrate variations in leave usage based on these controls. Notably, Officers deployed to combat and non-combat zones used an additional 1.97 and 2.09 leave days, respectively, compared to their non-deployed counterparts. Officers in Combat and Aviation MOS categories used more leave than those in Support MOSs, and higher-ranking Officers used less leave than Company Grade Officers, 1.60 less for Field Grade Officers and 9.50 less for General Officers. Each additional year of age corresponded to an increase of 1.24 leave days, underscoring the influence of age on leave usage. Married Officers used 1.76 more leave days and male Officers used 0.48 fewer leave days than their unmarried and female counterparts. Regarding racial differences, Black, Hispanic, and Marines of other races used fewer leave days respectively than White Marines The analysis of fiscal year impacts revealed an increase in leave usage from FY's 2018 and 2019 compared to FY's 2022 and 2023. This could be due to Marines feeling pressure to utilize AL due to high balances and the reduction in SLA.

Table 6. OLS Regression of Annual Leave Days Used by Officer

	Dependent variable:
	Annual Leave Days Used Officers
Deployed to Combat Zone	1.97***
	(0.14)
Deployed to Non-Combat Zone	2.09***
	(0.11)
Combat MOS	0.83***
	(0.11)
Aviation MOS	1.42***
	(0.10)
Field Grade Officers	-1.60***
	(0.13)
General Officers	-9.50***
	(0.63)
Age	0.46***
	(0.01)
Married	1.76***
	(0.10)
Male	-0.48***
	(0.15)
Asian	0.01
	(0.21)
Black	-0.38**
	(0.18)
Other Race	-0.44***
	(0.16)
Hispanic	-0.22
	(0.15)
FY2018	6.42***
	(0.12)
FY2019	7.26***
	(0.10)
FY2022	9.50***
	(0.13)
FY2023	11.01***
	(0.12)

	Dependent variable:
	Annual Leave Days Used
	Officers
Constant	-4.22***
	(0.30)
Observations	96,151
R^2	0.14
Adjusted R^2	0.14
Residual Std. Error	12.57 (df = 96133)
F Statistic	945.09*** (df = 17; 96133)
Note:	*p**p***p<0.01
	Clustered standard errors in parentheses at individual Marine level.
	** p < 0.05; *** p < 0.01.

In Table 7, I conduct a linear regression using OLS to estimate the factors affecting the number of annual leave days used by Enlisted Marines. Like Table 6, Marines who deployed to either a combat zone or non-combat zone used more leave than those who did not deploy. Marines in a Combat MOS used more leave than those in Support MOSs. Contrary to Officers, higher-ranking Enlisted Marines generally used more leave than Junior Enlisted Marines, with NCOs using 6.47 more leave days and SNCOs using 8.27 more leave days. Each additional year of age corresponds to an increase of 0.18 leave days, a smaller effect than was seen with Officers. Married Marines and male Marines used 1.15 more and 0.37 fewer leave days, respectively, than their unmarried and female counterparts. Black Marines and Marines of other races used 0.35 and 0.17 fewer leave days, respectively, than White Marines. The same trend across fiscal years is seen with Enlisted Marines as it was with Officers in Table 6.

Table 7. OLS Regression of Annual Leave Days Used by Enlisted Marine

	Dependent variable:
	Annual Leave Days Used Enlisted Marines
Deployed to Combat Zone	2.89***
	(0.05)
Deployed to Non-Combat Zone	3.03***
	(0.04)
Combat MOS	1.87***
	(0.03)
Non-commissioned Officers	6.47***
	(0.04)
Staff non-commissioned Officers	8.27***
	(0.10)
Age	0.18***
	(0.01)
Married	1.15***
	(0.04)
Male	-0.37***
	(0.05)
Asian	0.02
	(0.08)
Black	-0.35***
	(0.05)
Other Race	-0.17**
	(0.08)
Hispanic	0.07**
	(0.04)
FY2018	6.56***
	(0.03)
FY2019	8.07***
	(0.03)
FY2022	11.59***
	(0.04)
FY2023	12.35***
	(0.04)
Constant	-2.76***
	(0.14)

	Dependent variable:
	Annual Leave Days Used
	Enlisted Marines
Observations	810,724
R^2	0.23
Adjusted R^2	0.23
Residual Std. Error	12.09 (df = 810707)
F Statistic	$14{,}956.87^{***}$ (df = 16; 810707)
Note:	$^{*}p^{**}p^{***}p<0.01$
	Clustered standard errors in parentheses at individual Marine level.
	** p < 0.05; *** p < 0.01.

E. LIMITATIONS

This study is subject to certain limitations that may affect the reliability and generalizability of the results. One significant limitation arises from potential measurement errors in calculating deployment days. Although individual location codes provide detailed tracking of Marine movements, this analysis depends on the accurate and timely reporting by individual unit administrative sections. Inaccuracies in these reports could skew the estimates of effects of deployment on leave utilization, and the extent of this impact remains uncertain. Future studies should explore methodologies to verify or correct reported location data to mitigate this issue.

There are limitations in this study related to the impact of family formation. While my dataset includes the marital status of Marines, it does not include dependents. The omission of this variable could lead to some measurement error as the existence of dependents could affect a Marines' ability to take leave.

The timeframe of my dataset could be an additional limitation to the results in this thesis. Figure 1 depicts a higher rate of leave loss for both Officers and Enlisted Marines in FY 2023, however the dataset ends in early FY 2024 potentially omitting critical leave data which could be further used to analyze the effects of the COVID-19 pandemic and the subsequent roll back of permissible SLA accrual.

Moreover, while this research quantifies the probability of leave loss among various demographic groups within the Marine Corps, it does not delve into the underlying causes of why certain groups, such as Officers, are more prone to losing leave compared to Enlisted Marines. The results indicate significant disparities, but without deeper qualitative analysis or additional data on internal Marine Corps practices and culture, the reasons for these disparities remain speculative.

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VI. CONCLUSION AND RECOMMENDATIONS

This study provides an important initial launching off point for future analysis in this area. A key finding in the study conducted by the CNA in November of 2023 was that both higher ranking enlisted Marines and Officers tended to carry greater balances of leave throughout the year (P. Rost, personal communication, 5 Jan. 2024). My study corroborated the CNA finding using the logit model and resulted in General Officers and Field Grade Officers having a higher probability of losing leave (11.45 and 4.16 respectively) when compared to Company Grade Officers and NCO's and SNCO's (11.47 and 51.19 respectively) when compared to Junior Enlisted Marines. This effect could be due to the greater amount of responsibility thrust upon Marines as they rise through both Officer and Enlisted ranks. Higher ranking individuals tend to be placed to billets that are "one-of-one" meaning that they are the only individual within a given unit given certain responsibilities. Junior Enlisted Marines tend to have several peers assigned to handle similar responsibilities meaning that if one were to take leave, the other Marines are likely to cover down on their responsibilities. Additionally, higher ranking Marines and Officers have served for longer and thus had more time to accumulate AL making them more likely to accrue high leave balances a susceptible to leave forfeiture.

This study also found that Officers lost leave at three to five times a higher rate than did Enlisted Marines. This finding could be correlated with the smaller Officer population with respect to Enlisted Marines and potentially a cultural phenomenon within the Officer population itself with respect to attitudes surrounding leave taking.

I further explored the role that deployments had on leave loss and found that Enlisted Marines and Officers who deployed to non-combat zones were more likely to lose leave than those who deployed to combat zones relative to Marines who did not deploy. This finding could be due to Marines who are deployed to non-combat zones or stationed in non-combat zones not being afforded or able to take significant amounts of AL. The cost associated with travel in non-combat zones could be a factor as well making the prospect of taking leave less desirable.

Lastly, this study found that Marines were more likely to lose leave in the years following the COVID-19 pandemic (FY 2022-FY 2023) than before (FY 2018-FY 2019). This could be correlated with Marines carrying higher leave balances after the pandemic due to an inability to use AL resulting in more Marines losing leave in the subsequent fiscal years.

There are disparities in leave usage among races throughout all regressions. All non-white Marines were more likely to lose leave than White Marines. Similar results are observed in the usage of sick leave where all non-white races were less likely to use sick leave when compared to their white counterparts. While these disparities are observed, the mechanisms for why they are occurring are beyond the scope of this study.

Lastly, OLS regression results surprisingly revealed that Enlisted Marines and Officers who deployed used more AL and CL days than Marines who did not deploy. This result ran contrary to my original hypotheses that deployments negatively impact a Marines' ability to adequately use leave days. The effect could be due to built in leave blocks before and after deployments where all Marines are afforded the opportunity to adequately take accrued leave. The results reveal that both Officers and Marines appear to be managing their leave effectively.

This study provides a first look at the usage and factors surrounding the loss of AL. The significant difference in lost leave between Officers and Enlisted Marines requires more in-depth studies on the cultures surrounding leave taking in those respective groups. These studies should also further explore the role of race on leave take-up to attempt to determine causality between race and leave take-up. Additionally, it appears as though current policies do an adequate job of affording Marines who deploy to combat zones ample opportunity to take leave. It is recommended that unit commanders of units stationed in non-combat zones emphasize the importance of using leave to their Marines. Future studies in this field should explore the role of the expanded parental leave policy on AL usage/loss and different methods to assess its impact on the Marine Corps leave taking.

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