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An Analysis of the Attrition Behavior of Military Medical Corps Officers

March 2024

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

ACQUISITION RESEARCH PROGRAM
DEPARTMENT OF DEFENSE MANAGEMENT
NAVAL POSTGRADUATE SCHOOL

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ABSTRACT

This thesis investigates the determinants influencing the retention of active-duty physicians within the Military Health System. Given the competitive landscape with the private healthcare sector, retaining experienced military physicians poses a significant challenge exacerbated by the unique lifestyle demands inherent in military service. These retention challenges directly impact the continuity of care within the MHS and the readiness of our warfighters.

Attrition behavior was examined across demographics, branches of service, and physician types through survival and regression analyses. The analyses indicated a 31% attrition rate, with General Medical Officers more likely to leave earlier in service, compared to specialists. Analysis revealed a pronounced attrition for the Air Force immediately following the completion of initial service obligations, while the Army and Navy struggled with retention at later stages of service. Moreover, females, minorities, and physicians with dependents exhibited heightened attrition probabilities, underscoring the need for targeted interventions.

This study recommends targeted interventions tailored to address the diverse needs of specific physician groups at critical decision points within their career trajectories. The Department of Defense can bolster its ability to maintain a skilled medical workforce and ensure effective healthcare delivery to warfighters and their families by addressing the identified retention challenges.

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First and foremost, I want to acknowledge my beloved wife, whose unwavering support and boundless love sustained me through my 24 years of naval service and continues to inspire me even in her absence. I am forever grateful for her encouragement, guidance, and the strength she continues to provide from heaven. To my three beautiful daughters, your love, understanding, and patience have been my pillars of strength. Your unwavering belief in me has been a constant source of motivation, and I am immensely proud of the remarkable individuals you are becoming. I would also like to extend my appreciation to my thesis advisors, Dr. Jesse Cunha and Dr. Yu-Chu Shen, for their invaluable guidance, expertise, and support throughout this academic endeavor.

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LIST OF ACRONYMS AND ABBREVIATIONS

AAMC	Association of American Medical Colleges
AFHPSP	Armed Forces Health Professions Scholarship Program
AFMS	Air Force Medical Service
AMEDD	Army Medical Department
ASP	Additional Special Pay
CONUS	Continental United States
DHA	Defense Health Agency
DMDC	Defense Manpower Data Center
DMHRSi	Defense Medical Human Resources System– internet
DMIS ID	Defense Medical Information System–Identifier
DOD	Department of Defense
DODOCC	DOD Occupational Code
FAP	Financial Assistance Program
GAO	Government Accountability Office
GME	general medical education
GMO	general medical officer
MHS	Military Health System
MOS	Military Occupational Specialty
MTF	military treatment facility
NHHC	Naval History and Heritage Command
USUHS	Uniformed Services University of the Health Sciences

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I. INTRODUCTION

The Military Health System (MHS) plays a crucial role in providing healthcare services to active duty servicemembers, their families, and retirees. Within this system, the Medical Corps serves as a distinctive cohort, comprising approximately 15,000 physicians across three branches of the military, the Army, Navy, and Air Force (Government Accountability Office [GAO], 2023). These physicians form the backbone of primary healthcare delivery, supporting not only wartime and deployment scenarios but also ensuring comprehensive care during peacetime.

However, the landscape within which military physicians operate is not insulated from external forces. The civilian physician labor market, influenced by factors such as higher salaries and better work-life balance, exerts significant pressure on the availability and retention of military physicians. As the civilian sector evolves to meet shortages in supply, the equilibrium wage for physicians rise, directly competing with the military's ability to retain its medical corps. Factors such as burnout, undesirable assignments, or a general disillusionment with military life can sway physicians towards leaving the service. This attrition not only disrupts continuity of care but also poses challenges in maintaining a skilled and experienced medical workforce within the military.

I attempt to address the following research objectives within this thesis:

- What are the key factors influencing the attrition behavior of military physicians within the MHS? This involves exploring demographic trends, geographical assignments, occupational variables, and other pertinent factors to uncover drivers and challenges with physician retention.
- What are the differential attrition patterns between General Medical Officers (GMOs) and specialists? A key research objective is to segregate military physicians into distinct categories and unveil the nuanced trajectories unique to each cohort.

In this thesis, I delved into the dynamics of physician retention within the Military Health System to answer these research questions. I employed a comprehensive analysis, drawing from datasets spanning from January 2016 to April 2023, to explore the factors influencing the stay-leave decision of military physicians. Using Kaplan-Meier survival analysis and regression analysis, I dissected the intricate interplay of demographics, geographic locations, and occupational factors in shaping retention patterns.

The primary dataset, derived from the Defense Medical Human Resources System–Internet (DMHRSi), offered a detailed snapshot of active-duty medical personnel. Through meticulous data manipulation and integration with the Defense Enrollment Eligibility Reporting System (DEERS), I constructed a robust dataset encompassing variables such as sex, race, age, years of service, rank, number of dependents, physician type, branch of service, and geographic assignments. The study delineates distinct stay-leave decision periods, mirroring the various stages of military service obligations and career progression. By segregating physicians into General Medical Officers (GMOs) and specialists, I discerned nuanced differences in retention trajectories, shedding light on the challenges and motivations unique to each category.

The ensuing analysis unveiled several key insights with implications for policy and decision-making. Notably, I observed higher attrition rates among GMOs compared to specialists, particularly within the 3 to 12-year service window. Additionally, disparities among sex emerged as a concern, with female physicians exhibiting heightened attrition probabilities during specific career phases. Furthermore, the impact of dependents on attrition underscored the intersection of professional and familial responsibilities in military life. Lastly, another noteworthy takeaway is the attrition behavior observed among Air Force physicians, both GMOs and specialists, particularly evident from three to seven years of service. Addressing these challenges necessitates a multifaceted approach, encompassing targeted retention strategies, support systems for work-life balance, and proactive measures to mitigate attrition hotspots across different branches of the military.

As I navigated through the intricacies of physician retention within the Military Health System, my findings offer actionable insights to fortify the resilience and

sustainability of the medical corps, ensuring unwavering commitment to the health and well-being of our nation's warfighters and their families.

This thesis includes six chapters, with the first being the introduction, followed by Chapter II, which provides a background of the Medical Corps. Chapter II also includes background information on the different pathways of entry for military physicians, a comparison of salaries and lifestyles between military and civilian physicians, and a discussion about the national physician shortage the United States is facing. Chapter III provides a literature review of peer-reviewed articles as well as previous empirical studies evolved around the retention behavior of military healthcare professionals. Chapter IV describes the data and methodologies used in this study, to include descriptive statistics, Kaplan-Meier survival estimates, and multiple regression analysis. Chapter V presents the results of the aforementioned analyses. Lastly, Chapter VI provides a conclusion, recommendations, and suggestions for future research.

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II. BACKGROUND

This chapter provides an overview of the military's medical corps including the history, current strength, paths of entry and service obligations, and a comparison of the way of life between military physicians and civilian physicians. This chapter also summarizes the methods used in this research and the differences in compensation between military and civilian physicians.

A. THE MEDICAL CORPS

Currently there are over 108,000 active-duty healthcare professionals serving in the Military Health System (GAO, 2023). Of those, there are approximately 15,000 physicians providing care to servicemembers, their families (also called beneficiaries), and retirees. Military physicians make up a unique corps within each branch (excluding the Marine Corps) called the Medical Corps. The Medical Corps meets the DOD's mission of providing primary healthcare to support wartime and other deployments, as well as care during peacetime. The origin of the Army Medical Corps dates back to 1775, when the Continental Congress established the Army Hospital, essentially a corps of physicians, to coordinate medical care during the Revolutionary War. From that time to 1818, Congress only enacted an Army medical organization during times of war. Congress did not make the official designation of the Medical Corps until 1908 (Army Medical Department [AMEDD], 2023). Currently the Army Medical Corps consists of over 5,000 physicians.

The Navy Medical Corps has a similar history with physicians serving in the Continental Navy and later in the U.S. Navy Department, which was established in April 1798. In actuality, the first physicians embarked upon warships on 9 March, one month before the U.S. Navy was officially founded (Sobocinski, 2021). It was not until 3 March 1871 that the Appropriations Act gave Navy physicians a rank and acknowledged their role as a staff corps, creating the Navy Medical Corps (Naval History and Heritage Command [NHHC], 2021). Today the Navy Medical Corps consists of over "4,300 active duty and reserve physicians who are practicing or training in 23 medical and surgical specialties with more than 200 subspecialties" (NHHC, 2021, p. 1). They not only serve aboard Navy

vessels and MTFs around the world, but also care for their counterpart, the warfighters, and their families within the U.S. Marine Corps, which does not have a healthcare component.

According to the Air Force Medical Service (AFMS) History and Heritage Office, military physicians were trained as military pilots in the armed forces as early as 1911, but officially became known as the U.S. Air Force pilot-physician program when founded in 1947; in 1948 the Air Surgeon convinced President Harry S. Truman that the Air Force required its own medical service, separate from the Army (Air Force Medical Service [AFMS], n.d.a). In 1949, Air Force General Order No. 35 officially established the AFMS, consisting of five personnel components, of which included the Medical Corps (AFMS, n.d.a).

The Medical Corps comprises of commissioned medical officers who have obtained a Doctor of Medicine degree or a Doctor of Osteopathic Medicine degree and are licensed in one of the 50 states. Military physicians practice in three main areas: operational, clinical, or research. Additionally, they are classified as a general medical officer (GMO) or a specialist. A GMO is similar to its civilian counterpart, a general medical practitioner, while a specialist has completed additional training and education in a specific field of practice. GMOs can diagnose and treat all diseases, whereas specialists have a narrower focus and treat patients for particular issues within that focus area.

B. PATHWAYS TO ENTRY

There are three primary pathways to enter the Medical Corps, each having its own unique requirements and service obligations. They are the Armed Forces Health Professions Scholarship Program (AFHPSP), the Uniformed Services University of the Health Sciences (USUHS), and a direct commission.

The AFHPSP and USUHS "programs provide education and pay to medical students in return for an active-duty service obligation" (GAO, 2018, p. 1). "Under the services' AFHPSP program, DOD pays for tuition, books, and fees, plus a monthly stipend for AFHPSP students enrolled in civilian medical schools" (GAO, 2018, p. 6). In 2023, students received an annual salary of $34,000 while attending medical school, which

included the stipend of $2,728 per month for 10 and a half months (AFMS, n.d.b). The DOD accepts students in either the allopathic or osteopathic civilian medical programs. After completion of their degree and internship, a student must commit to an initial service obligation in one of the three Medical Corps. The service obligation is based on the number of months the student received benefits with an equal payback in six-month intervals, but with a minimum of two years (Department of Defense [DOD], 2016). Students who receive a four-year HPSP scholarship receive a $20,000 signing bonus, while those who receive a three-year scholarship may receive the bonus if they incur a four-year commitment (AFMS, n.d.b). The USUHS participants get paid as military officers at the paygrade of O-1 while attending medical school. The school is at no cost to the student, and they receive benefits similar to an active duty officer, but must obligate to a seven-year commitment in the uniformed services after graduation (GAO, 2018; Uniformed Services University of the Health Sciences [USUHS], n.d.).

In addition to these two programs, the DOD also recruits fully qualified physicians through direct accession. These recruits have already obtained the required degree requirements through a non-DOD affiliated medical school and may already have previous experience in practicing medicine. There are several programs for direct commissioning, but the most common are the Financial Assistance Program (FAP) and the Health Professions Loan Repayment Program. FAP "provides annual grants up to $45,000 and monthly stipends of more than $2,000 for physicians" (GAO, 2018, p. 50) who are eligible to enter directly into a military residency program. FAP participants must incur a minimum of two years of obligated service or six months of obligation for every six months of FAP sponsorship, whichever is greater (GAO, 2018). The loan repayment program provides repayment of educational loans for fully qualified physicians and other healthcare professionals and comes with an obligation of one year for each year of repayment or a two-year obligation, whichever is greater. The maximum loan repayment amount is $40,000 per year up to a total of $250,000.

Another advantage of direct accession programs is that most allow physicians to enter active duty at a paygrade commensurate to their civilian education and experience. Per DOD 6000.13 (2016), constructive service credit is used to compute the paygrade upon

entry based on "each year of graduate level education toward their first professional degree completed when that degree is required for appointment in the professional specialty being entered" (p. 12). Additionally, credit for one-half year for each year of experience in a health profession may be used as constructive service credit. There is a maximum credit allowed per DOD 6000.13 (2016), but most doctors of medicine, doctors of osteopathic medicine, doctors of dental surgery, doctors of dental medicine, and doctors of veterinary medicine have sufficient education to be appointed to the grade of O-3. Constructive service credit can only be used to determine the "initial grade, rank in grade, and service in grade for promotion eligibility" (DOD, 2016, p. 11).

As outlined in Figure 1, regardless of the accession program, a military physician must complete "an undergraduate education, medical school, and 1 year of graduate medical education (GME) training, known historically as an internship or first year of residency" (GAO, 2018, p. 7). GMOs can typically start practicing medicine after the one year of GME, but those who decide to become a specialist may pursue further training, known as fellowships.

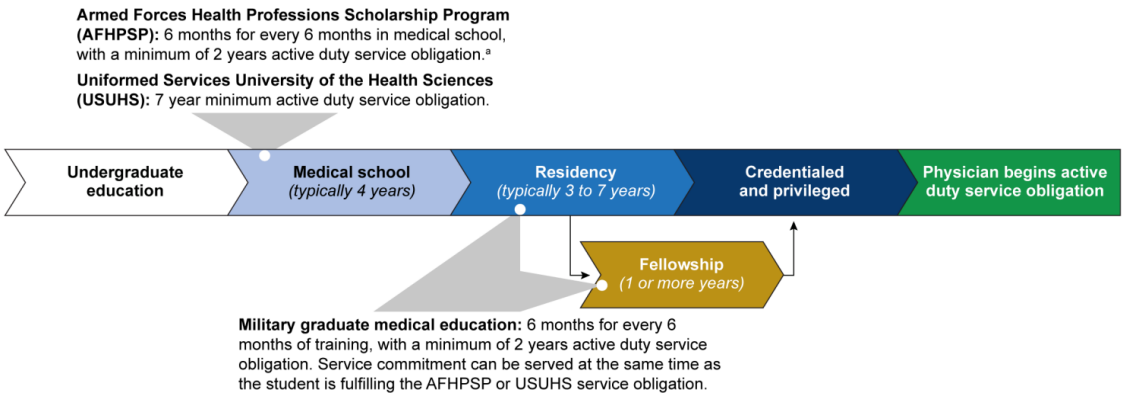

Figure 1. Path of Becoming a Military Physician through AFHPSP and USUHS. Source: GAO (2018).

Understanding the path of accession of military physicians may have implications on their level of commitment to the armed services and play a role in their stay-leave decision at the end of their obligated service. Given that each accession program, direct or otherwise, has its own unique requirements, obligations, and program structure, we can

expect to see differences in costs and benefits to the services and the participants. For example, on average the cost of a student attending USUHS is much higher than paying back a qualified physician's student loans for four years, as USUHS bears the full burden of the student's costs as opposed to only covering tuition (John et al., 2019). However, does the military obtain greater utility from the USUHS student, e.g., increased retention, better educated and trained in military specific medicine, etc.? In fact, a 2003 study by the Center for Naval Analysis found just that; although a USUHS student costs the DOD much more relative to the AFHPSP program, USUHS graduates were the most cost-effective source in filling O-6 billets, due to increased retention (John et al., 2019). More regarding costs and benefits of accession programs will be discussed later in this chapter.

C. COMPENSATION COMPARISON OF MILITARY AND CIVILIAN PHYSICIANS

Military physician compensation differs from that of the civilian sector in that their salaries are based primarily on military rank. In addition to their base salary, military physicians receive other monetary benefits, such as housing and sustenance allowances. According to Stortz et al. (2021), physicians going through a military residency program receive a total salary that exceeds the resident salary in the civilian setting. The differences in residency compensation could influence the decision to enter residency training in the military, thus impacting recruiting and retention (Stortz et al., 2021).

Physicians of the Medical Corps also receive various other pay and bonuses designed to narrow the gap between civilian and military compensation. According to the Defense Finance and Accounting Service (DFAS) (2023), physicians who become board certified receive an additional $8,000 per year, prorated monthly. The incentive special pay (ISP) is provided to incentivize retention and address shortages of critical wartime specialties and varies among specialties up to $75,000 for any 12-month period (Defense Finance and Accounting Service [DFAS], 2023). Retention bonuses (RB) are discretionary pay that should be used as needed to address retention difficulties within each specialty. A military physician who signs a written agreement to remain on active duty for a period of two, three, four, or six years may be paid an annual RB depending on the length of the contract and the specialty. Another monthly pay that is described in Title 37 of the U.S.

Code was implemented as a broad-based incentive to increase the number of active-duty physicians, regardless of specialty, is the variable special pay that ranges from $1,200 to $12,000 a year, paid monthly, and determined by years of service (Military Pay and Benefits website, 2024). According to the Military Pay and Benefits website (2024), the DOD also provides an additional special pay (ASP), a flat $15,000, "for all medical officers on active duty who have completed internship or initial residency training, regardless of specialty, if they agree to remain on active duty for additional 12 month period." The ASP was designed to address that critical stay-leave decision point when a physician completes their obligated service and has the opportunity to leave the military and be eligible for higher pay in the private sector.

Even with the various special pays and retention bonuses, the military-civilian pay disparity is quite substantial among attending physicians once they complete their residencies. Table 1 shows the difference between pay within three specialties: OB/GYN, general surgery, and family practice. Stortz et al. (2021) included the board certification pay, the median housing allowance, allowance for sustenance, and the specialty-specific bonus to obtain a total military compensation of $177,204, $175,24, and $166,204, respectively, across the three specialties, as seen in Table 1. This equated to a 45% pay differential for senior military OB/GYN physicians, 58% for general surgery, and 32% for family medicine. Although military residents have a positive pay differential, the total difference over a four-year residency is quickly surpassed by a civilian physician in the first two years of practice (Stortz et al., 2021). The military retirement plan may be an added benefit that may contribute to military physicians staying in the service past their obligation period. There is a large percentage of physicians in the legacy high-3 retirement plan in which they will receive a generous percentage of their pay upon completion of a 20-year vest with the armed forces. Even the new blended retirement system (BRS) provides a defined benefit upon completion of 20 years, although it is a smaller percentage of the legacy retirement plan. Both retirement plans play an important role in the stay-leave decision of military physicians. Active-duty physicians must weigh the trade-off of leaving the service early without the 20-year defined benefit pension or plan to make up that opportunity cost by earning more in the private sector. The Center for Naval Analysis found

that as Navy physicians accrue more years of service, it becomes more lucrative, therefore increasing motivation to stay for the 20-year pension (Brannman, 2000).

Table 1. Military-Civilian Pay Differential in 2018.
Source: Stortz et al. (2021).

Pay and allowances	OB/GYN	General Surgery	Family Medicine
Junior staff base pay	$74,862	$74,862	$74,862
Senior staff base pay	$89,208	$89,208	$89,208
BAS (yearly total)	$3,048	$3,048	$3,048
Junior staff BAH (yearly total)	$23,346	$23,346	$23,346
Senior staff BAH (yearly total)	$24,948	$24,948	$24,948
IP (1-year rate)	$54,000	$52,000	$43,000
BC pay	$6,000	$6,000	$6,000
Total compensation			
Junior staff	$161,256	$159,256	$150,256
Senior staff	$177,204	$175,204	$166,204

Note: AAMC = Association of American Medical Colleges. MGMA = Medical Group Management Association

Civilian physician compensation appears to still be on the rise according to the *Medscape Physician Compensation Report* (Medscape, 2023). Medscape reported an overall physician compensation of $299,000 in 2018 and $352,000 in 2023, with specialists earning $120,000 more than general practice providers. The highest paid specialists are plastic surgeons at $619,000 annually, followed by orthopedics, cardiology, urology, and gastroenterology, all in the $500,000 mark. The increase in compensation has been driven by supply and demand. A growing physician shortage and high rates of burnout have caused healthcare organizations to realize that if they want good candidates, they must make good offers, leading to higher compensation since the COVID pandemic. Prior to COVID, 55% of civilian physicians felt they were fairly compensated, compared to only 52% are satisfied with their compensation in 2023 (Medscape, 2023).

The pay disparity between men and women is still significant in the private sector with male primary care physicians earning 25% more than females and male specialists earning 27% more than female specialists, a slight improvement over recent years, but still a substantial difference (Medscape, 2023). African American/black physicians earn 13% less than Caucasian/white and Asian American physicians. Additional pay disparities occur geographically across the United States. California, the Great Lakes states, Missouri, New Jersey, and the lower Atlantic coast are of the states with the highest compensation, while Maryland, Colorado, Virginia, Arizona, and Washington are of the states with the lowest compensation.

D. LIFESTYLE COMPARISON OF MILITARY AND CIVILIAN PHYSICIANS

It is important to consider non-monetary differences between military and civilian physicians and not just view differences through a financial lens. Quality of life concerns and job satisfaction should also be considered due to the unique lifestyle demands inherent in military service. One consideration is job security. Military physicians have a guaranteed job placement immediately after graduating from their medical school, whether through the AFHPSP or USUHS programs, while civilians do not have that guarantee upon graduating from their civilian medical school. Job security in the military is provided through contractual commitment, which may not be enticing to some physicians who prefer the freedom of not being tied to a multi-year contract. Additionally, military physicians face geographical constraints and may be required to practice medicine in an undesired location and most likely will require relocation, sometimes multiple relocations depending on length of service obligation. Deployment of military physicians is common and necessary for servicemembers to sustain military operations and fulfill their missions. When not on deployment, military physician work hours, 40 to 60 hours per week (Fromson, 2012), are aligned with civilian physician work hours, 44.1 to 57.7 hours per week (Medscape, 2023). The Medscape (2023) report also found that 13% of those surveyed said the most challenging part of their job was dealing with Medicare and/or other insurers and getting fair reimbursement, which is not a concern within the military.

In addition to women having lower compensation than men, women also report they are more overworked than their male colleagues. The pay disparity may contribute to a higher burnout rate among women, with 92% of women reporting they are overworked, compared to 83% of men in a physician compensation report by Doximity (2023). The study also reports that 73% of women are considering early retirement, a career change, or looking for another employer because of being overworked, compared to 63% of men.

Serving as a military physician can be viewed as a rewarding experience, gaining valuable skills in leadership, and an opportunity for unique training otherwise not found in the civilian sector. A civilian physician lifestyle has more flexibility and direct control over their career choices and workplaces. These lifestyle and job satisfaction differences have an impact on the stay-leave decision that military physicians face as well as deciding to serve in the military in the first place.

E. NATIONAL PHYSICIAN SHORTAGE

The Association of American Medical Colleges (AAMC) is projecting a shortage of primary care physicians of between 17,800 and 48,000 and a shortage of specialists of between 21,000 and 77,100 by 2034 (2021). Figure 2 shows the projected shortage range of all full-time equivalent physicians from 2019–2034. The shortage can be attributed to many reasons, but a primary driver is the demographics of the U.S. population, which is both growing and aging. The AAMC (2021) projects that the population will grow by 10.6% to 363.0 million by 2034, with the population aged 65 and older growing by 42.4% and 75 and older by 74.0%. These projections portend high growth in the demand for specialists who predominately care for older patients (Association of American Medical Colleges [AAMC], 2021). Not only is the population aging, but so are the practicing physicians. AAMC (2021) reports that two of five currently practicing physicians will be 65 or older within the next decade. Supply projections are sensitive to workforce decisions, which will be greatly impacted by this older physician population. COVID-19 had short- and long-term consequences for the physician workforce through training and education disruptions, regulation changes, workforce exits, and impacts to well-being through short- and long-term burnout and moral injury (AAMC, 2021).

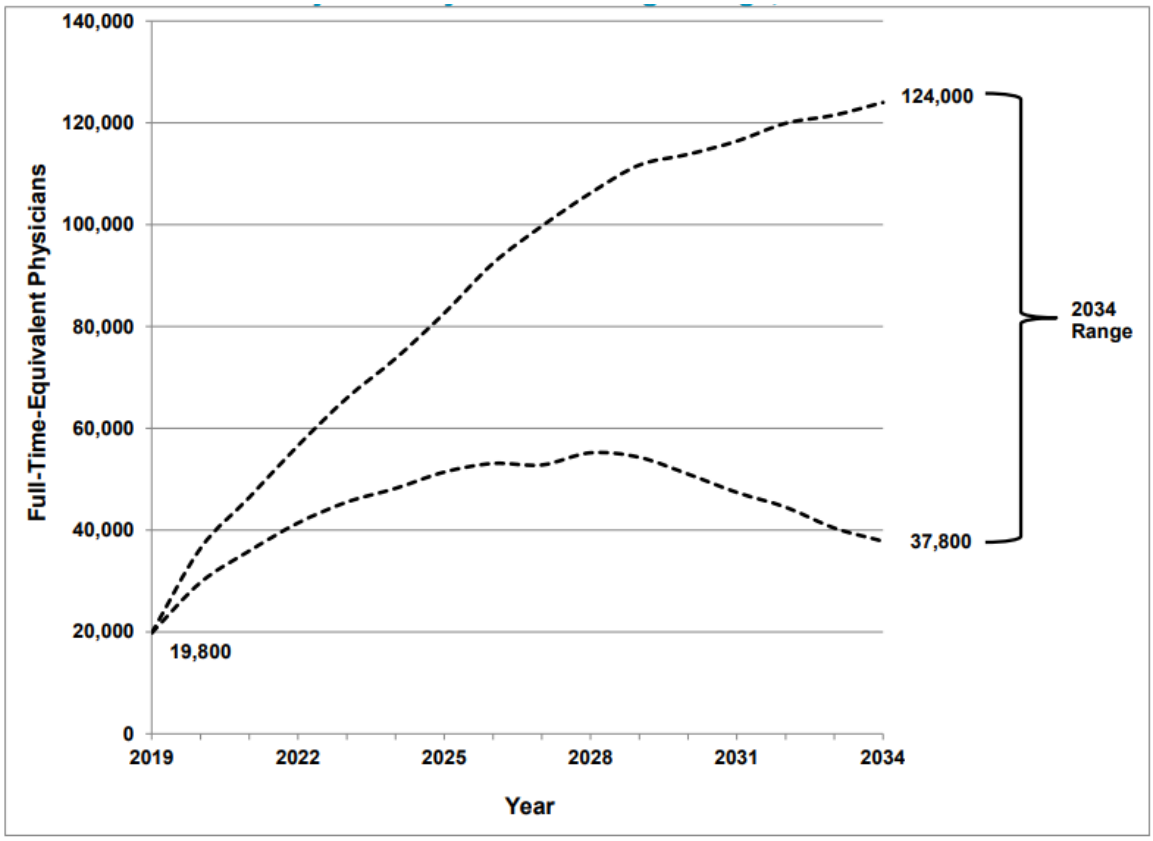

Figure 2. Total Projected Physician Shortage Range, 2019–2034. Source: AAMC (2021).

The military physician labor market will continue to be affected as the civilian physician labor market continues to evolve to address the needs of society. Restrictions in the supply of physicians, especially due to specialized training and licensing requiring them to work in a particular profession, allow physicians to demand higher wages. The demand for physicians accompanied by a restriction in supply increases the equilibrium wage. This direct competition with the civilian labor market has substantial impact to the military medical corps. The increase in real wages and incentives offered by civilian employers may attract military physicians who are at a stay-leave decision point in the service, especially if they have experienced burnout, been assigned to undesired locations, developed a lack of taste for the military, or any other negative experience that is particular to the military operation environment.

III. LITERATURE REVIEW

This chapter summarizes the literature on retention of military healthcare professionals and the military-civilian pay gap. In this section, I also discuss the findings of those studies, along with their implications and limitations.

A. RETENTION OF MILITARY HEALTH PROFESSIONALS

As with any civilian healthcare organization, the Military Health System (MHS) struggles with the retention of high-quality healthcare professionals, including physicians. A recent Government Accountability Office (2018) report identifies an alarming gap between authorized and funded billets of military physicians at Military Treatment Facilities (MTFs). The report further breaks out the gap by specialty, with some specialties being over 80% below authorized strength. While new accessions can fill these gaps, it is extremely costly to either train a physician or directly access a trained physician. For example, a recent peer-reviewed article in *Military Medicine* (Luan et al., 2021) states the Department of Defense spends over $1 million to educate each physician who attends the Uniformed Services University School of Medicine. A more cost-effective solution to maintain a fully manned physician corps is to retain more of the existing stock of trained military physicians.

Previous empirical studies have analyzed various factors that affect retention of military healthcare professionals. Using active-duty Navy Nurse Corps officers' data from 2000 to 2020, Looker (2022) found the military-civilian wage gap among nurses varied at different years of experience and geographic region, notably a 6.9 to 12% gap between one to 10 years of experience in the South Atlantic region and up to 6.7% in the Pacific region. Looker (2022) further analyzed the retention of military nurses through a survival analysis divided into nursing specialties, indicating the likelihood a nurse "will remain on active duty between one and 10 years of service" (p. 50). Critical care nurses have a 0.38 probability of staying on active duty at the 10-year mark, followed closely by psychiatric and emergency health nurses with a probability between 0.38-0.40. Perioperative nurses have a 0.54 probability of being retained, which is significantly higher than the other

critical wartime specialties. Looker's (2022) research implies to policymakers that targeted recruiting and retention policies at the specialty, time period, and geographic level could be used to close the gap between the military-civilian pay disparities.

While Looker (2022) focused only on the Navy Nurse Corps, other research focuses on other healthcare workforce segments. Paone (2020) looked at the civil service healthcare workforce and found that all subpopulations from the years of 2014–2018 are "likely to attrite during the first five work years" (p. xxiv). Furthermore, she found that females and minorities are even more likely to attrite during this time period. Paone (2020) observed that the following characteristics have a higher probability of exhibiting attrition behavior over others: "recently employed worker (fewer than five work years), young age-at-hire worker who is also recently employed, retirement eligible nurse, medical officer in a high-value income per-capita location, recently employed female worker who is young age-at-hire, and recently employed female in a high-value income-per-capita location" (p. xxiv).

B. MILITARY-CIVILIAN PAY DISPARITY AND RETENTION

The MHS faces more difficult challenges with recruiting and retention when there is a substantial military-civilian wage gap, which is common during periods of economic prosperity. For example, Alshehri and Brossard (2013) look at how the effect of the military-civilian pay gap impacts the retention of Navy physicians. They examine 19 specialties within the Navy Medical Corps. The overall conclusions suggest that the military-civilian pay gap does have an impact on the retention of Navy physicians, especially when their specialty is directly transferable to the private sector. More specifically, their probit model results indicate that as the compensation gap gets wider, it becomes more challenging to retain Navy physicians. Using data from Bureau of Medicine and Surgery and Medical Group Management Association from 2002 to 2011, Alshehri and Brossard (2013) found an annual average military-civilian pay gap of $98,787 between civilian and military providers, yet 67% of physicians made the decision to remain on active duty past their first obligation period. Of the specialties examined, OB/GYN was the most sensitive to the pay gap and pediatrics was the least responsive to the gap. Alshehri and Brossard (2013) found that a $1,000 increase in the military-civilian pay gap above the

average results in a .24% (0.16 percentage point) reduction in retention rate. Simply stated, the retention rate would increase by 23.5% if the current average pay gap was reduced to zero (Alshehri & Brossard, 2013).

Through logistic regression, Looker (2022) also found that the military-civilian wage gap significantly affected the retention decision and "an increase of $1,000 in a Navy nurse's annual salary would increase the odds of a nurse remaining on active duty by 17.2 percent at the three-year decision point…" (p. 3), while holding other variables constant. Retaining unobligated medical specialists is critical to the military and survivability of the warfighters. The research by Alshehri and Brossard (2013) and Looker (2022) allows for better assessment of its manning projections and setting more accurate special and incentive pay rates targeting the retention of the various specialists.

Similar to Alshehri and Brossard (2013), Gray and Grefer (2013) examine the retention of U.S. Military Physicians when comparing military career earnings to civilian career earnings. They identify three distinct career points namely, the first year after their obligated service is complete or the first year of unobligated service, the period between the first year of unobligated service to before retirement eligibility at 20 years, and the period after 20 years, or retirement eligible. Using data from DMDC from 1991 to 2005, Gray and Grefer (2013) found that comparable civilian compensation has considerable effect on the retention of military physicians, largely in those physicians in the first period. The study also finds that this effect varies across physician specialties within the three periods. For example, orthopedic surgeons have lower retention rates than family practice physicians as surgeons see some of the largest differences in compensation between the military and private market across their careers. As in the previous research, Gray and Grefer (2013) suggest that matching military physician pay to comparable civilian salaries would improve retention.

C. OPERATIONAL TEMPO, BURNOUT, AND MORAL INJURY ON RETENTION

There are many non-monetary factors that can also affect military physician retention, to include sensitivity to deployments, burnout, and experiencing moral injury

due to the unique operational environment of the military. Bristol (2006) investigated the effect of increased operational tempo on the retention behavior of Navy physicians. Combining a difference-in-difference (DID) model with data on Navy physicians from the DMDC database and Health Manpower Personnel Data System from 1999 to 2005, Bristol (2006) observed the effects of increased operational tempo between two groups of physicians, those before the attacks of 9/11 and the invasion of Iraq and Afghanistan, and physicians after the attacks. He found that the second group, due to a substantial increase in deployments, had a negative effect on the continuation behavior of both General Medical Officers (GMO) and specialists. Although GMO retention behavior was not significant, specialists had a significant eight-percentage point decrease in retention. Bristol's (2006) research implies to policy makers that specialists are more sensitive to increased operational tempo and that an increased focus on policy changes and/or incentives for specialists may be warranted.

The increase in operational tempo could result in physician burnout or moral injury. Using past research, Day et al. (2021) discussed how burnout and moral injury are two distinct, but interconnected phenomena experienced by physicians and that they each are significant factors affecting physician retention behavior. Burnout stems from an individual's imbalance between the rewards they receive, e.g., compensation, and the energy they expend, resulting from various causes. Moral injury occurs when a physician's personal moral beliefs or moral code are violated. Although interconnected, they represent two distinct categories of harm. Moral injury has been recognized in combatants for centuries, Day et al. (2021) continues. Military physicians, over their civilian counterparts, are more susceptible to moral injury as a function of their military medical service, specifically due to not being able to maintain the usual level of care due to the unique operational environment. This was highly documented in physicians and medical workers in the Vietnam era, where the use of unconventional care was often given due to constrained resources and the constant influx of injured military personnel. Day et al. (2021) imply that burnout and moral injury are typically addressed by changing career fields or by drastically changing the environment in which they perform their jobs and in the case of military physicians, discontinuing their military service.

D. SUMMARY

Past research has focused on a single area of research, where I plan to use a multi-faceted approach that will examine attrition behavior across various demographics, branches of service, and occupational characteristics. The research by Bristol (2006) and Day et al. (2021) applies to my study, as it implies that physician reactions to burnout and moral injury may be a factor in deciding to stay in the Navy or separate with the goal of quitting medicine altogether or practice in an environment where their moral injury would not be violated. Going beyond Bristol who only looked at an increase in operational tempo and whether burnout was a factor in retention, I will seek to understand how the military physician retention decision varies over time, across geographic locations, and across physician specialties. Additionally, with the research of Alshehri and Brossard (2013) and Gray and Grefer (2013) being over a decade old, I will empirically study the influence of factors on the retention decisions of military physicians using updated data. In the intervening decade, the nature of both the civilian and military job markets have changed drastically. My study will use data on military physicians up to and including April 2023, and will fill in this significant gap in our knowledge of how specific factors impact the retention decision. The research by Looker (2022) and Paone (2020) analyze the effect of the military-civilian pay gap and other impacts to retention, but was limited to specific segments of the military healthcare force, specifically the Navy Nurse Corps and civil healthcare professionals, respectively. The significance of their findings within those specific groups could be indicative of the attrition behavior of my target population, the military physician workforce, therefore I will further seek to understand how the military physician retention decision varies across demographics, over time, across geographic locations, and across physician specialties.

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IV. DATA AND METHODOLOGY

In this chapter, I describe the data and methodologies used for the analysis of the retention decision of military physicians. Specifically, I mention where the datasets are derived from, as well as how I identify and define the key variables used in the analysis. I describe the methodologies, to include the Kaplan-Meier survival analysis and regression analysis.

A. DATA SOURCES

1. Medical Corps Data

I first obtained all active-duty medical personnel data from the Defense Medical Human Resources System – Internet (DMHRSi). The dataset was panel data with a quarter-year snapshot of each assignment that occurred between January 2016 and April 2023 and included basic demographic data, service-related data, and occupational information to include the skill type. I then identified military physicians by the variable skill type and kept all personnel data with the physician skill type code of 1P. Additional demographic and geographic data were needed; therefore, I merged the dataset with the Defense Enrollment Eligibility Reporting System (DEERS) obtained from the Defense Health Agency. The datasets were used for the construction of additional variables to include sex, race, years of service, number of dependents, and location. A total of 15,195 unique physicians were included in this dataset.

Military physician specialties are identified via two main occupation codes, the Military Occupational Specialty (MOS) code and the DOD Occupational Codes (DODOCC). The MOS code is more granular as it is a service-specific categorization of occupation types, while the DODOCC is a more broadly defined and most often a higher-level classification of occupation types. For example, all military medical professionals have a DODOCC which begins with "26," and there are approximately 75 unique DODOCCs starting with "26" that pertain to physicians. On the other hand, there are roughly 200 unique MOS codes pertaining to physicians across the services (Army, Air Force, and Navy). An important early task in my analysis was to properly identify

physicians by their specialty and categorize them into meaningful groups. Those groups included the specialty and the general category of each DODOCC, i.e., an infectious disease physician in the general category of pathology.

I then separated them into two broader categories, General Medical Officers (GMOs) and specialists. As will be discussed in the results section, this designation allowed me to identify if GMOs or specialists are more likely to attrite from the service. Knowing if they are specialists or general physicians also allowed me to identify their service obligation following their graduation from medical school more accurately. Time spent in a military residency or fellowship does not count towards their service obligation. GMOs complete a one-year general medical education (GME) residency and can immediately start fulfilling their service obligation following the GME. The physicians who seek to become a specialist must complete an additional fellowship after GME that could be up to seven additional years in postgraduate medical training.

In order to focus on the three military branches that have a Medical Corps (Army, Navy, and Air Force), I dropped observations that fell under the Coast Guard. I was left with 15,195 unique physician and a total of 280,666 observations after cleaning the dataset.

2. Time Period Variables

Because of the different service obligations by program of entry, I created variables that binned years of service into four distinct stay-leave decision periods. Similar to Gray and Grefer (2011), period 0 is at the accession point, when a person made the decision to accept the military scholarship. Period 1 is the range of service obligation requirements from the various programs of entry, which varies from 3–7 years of service. We would expect to see minimal attrition before three years of service, as it would most likely be for adverse reasons. Attrition is expected after the third year, as some GMOs are completing their service obligation, followed by specialists who have short-term fellowships, and lastly by specialists with longer fellowships. The first decision point in which the physician must decide to stay or leave the service comes after the physician's service obligation is fulfilled. If a physician decides to stay in the military at that point, the typical obligation is an additional four to five years, therefore Period 2 would begin after period 1 and go up to 12

years of service. Period 3 will begin after Period 2 and go up to retirement eligible at 20 years of service. Period 4 is 20 or more years of service.

It is important to briefly discuss the Blended Retirement System (BRS), which allows military members to leave the service with retirement funds any time after two years of service. The BRS still retains the traditional retirement defined benefit that is awarded after 20 years of service. Although that payment is reduced from the legacy high-3 retirement plan, it is still a significant amount and may play an important role in the stay-leave decision through the 20-year mark. My research is focused on why physicians may attrite before retirement eligible, therefore I have excluded physicians from my analysis who are at or above 20 years of service.

Period 0 will also not be included in the analysis, and I will empirically address only the retention decision periods, but it is beneficial to understand the decision behind accepting a military scholarship in the first place. Choosing a military scholarship comes with an opportunity cost of attending a civilian medical school. When considering the two options at the beginning of period 0, one must consider the military option in which the student will receive the full dollar value of the scholarship, an annual allowance, and military wages during the residency and throughout the service obligation period and the civilian alternative that may include a civilian scholarship, student loans, or to pay out of pocket. For the military scholarship, the worth of the future wages must be deflated by the student's personal discount rate, so the expected discounted total value "is the summation of all discounted annual military wages for the period of residency and service obligation, which ends at the next retention decision point" (Gray & Grefer, 2011, p. 53). Additionally, Gray and Grefer (2011) discuss how the military physicians determine if they have a "taste for military service" (p. 53), in which they will gain a utility value that should be included in the equation. This utility value would need to be positive to even consider the military option and will play a role in the future retention decision periods.

Contrarywise, the student who chooses the civilian option will receive the value of a civilian scholarship (if awarded), future wages that would be obtained during their civilian residency and for the length of the service obligation had the person chosen the military option. Lastly, the civilian option would provide the decision maker with the taste

of a civilian lifestyle along with its utility value (Gray & Grefer, 2011). Unfortunately, I do not have the data on all of these variables, but if I did an inequality equation could be developed that could tell us when a person will favor the military option. According to Gray and Grefer (2011), a person "will choose the military option when the total dollar value of the military-civilian differential for the medical school, residency program, and future service obligation is greater than the differential of relative taste for military and civilian lifestyle through the program" (Gray & Grefer, 2011, p. 54). Additionally, one who chooses the military option, on average, would have a greater relative taste for military life over a civilian lifestyle, which is an important consideration when looking at the stay-leave decision in the following periods.

3. Geographic Location Variables

I also wanted to research if serving in a particular geographic location may affect the stay-leave decision of military physicians. In order to accomplish this, I used the Defense Medical Information System (DMIS) Identifier (ID) table from the Military Health System's official website. The original dataset from DMHRSi also had the DMIS ID for each physician, therefore merging these two datasets allowed me to capture the location and type of MTF. After a successful merge, I was able to create a categorical variable that identified the region where the physician was stationed. Table 2 lists the duty station region variable and definition. The division into these regions were obtained from the U.S. Census Bureau (2023), but due to the lack of observations in the West and East North Central regions, I combined them into one region named North Central. I did the same for the West and East South Central regions, as well as the Middle Atlantic and New England regions, which I named South Central and North Atlantic respectively.

Table 2. Geographic Location of Physician's Last Assignment by Region

1	Pacific	Includes the states of California, Oregon, Washington, Alaska, and Hawaii
2	Mountain	Includes the states of New Mexico, Arizona, Utah, Nevada, Colorado, Wyoming, Idaho, and Montana.
3	North Central	Includes the states of Ohio, Indiana, Illinois, Wisconsin, Missouri, Iowa, Michigan, Minnesota, North Dakota, South Dakota, Kansas, and Nebraska
4	South Central	Includes the states of Louisiana, Mississippi, Alabama, Tennessee, Kentucky, Oklahoma, Arkansas, and Texas
5	North Atlantic	Includes the states of Maine, New Hampshire, Rhode Island, Connecticut, Vermont, New Jersey, New York, Pennsylvania, and Massachusetts
6	South Atlantic	Includes the states of Florida, Georgia, South Carolina, North Carolina, West Virginia, Virginia, Washington D. C., Maryland, and Delaware
7	Other	Physician duty station is unknown or overseas

B. METHODOLOGY

1. Kaplan-Meier Survival Analysis

I used the Kaplan-Meier curve to analysis duration data and survival times for military physicians during the time period of this dataset. My duration variable was years of service (YOS) with a failure variable that identifies when the physician attritted from military service. Since some of the physicians remained on active duty at the end of this data collection period, their stay-leave decision is said to be right-censored, as we do not know if and when they attritted or retired. I created a variable, *ever_attrit*, to identify those that left the service at any point during this study period and then generated a censor variable *cens* if *ever_attrit* equals zero. The Kaplan-Meier curve estimates the survival function of each physician using the following model, where $S(t)$ is the chance that a

physician does not attrite for the first t quarter/years of their military service, n_j is the number of physicians still at risk of attritting at time j, d_j is the number of failures at time j, and the product is over all observed failure times t:

$$S(t) = \prod_{j \le t} \left(\frac{n_j - d_j}{n_j} \right)$$

I applied the Kaplan-Meier survival curve to five different scenarios. First, I examined if GMOs and specialists have varying attrition behavior at the three periods: Period 1 at 3–7 years of service, Period 2 at 8–12 years of service, and Period 3 at 13–19 years of service. Second, I investigated the survival estimates of physicians by sex. Third, I differentiated the survival curve by race, which included white, black, Hispanic, and Asian to determine if a particular race is more likely to attrite over the others and at what periods. I then analyzed differences in survival time by the branch of service and lastly, I examined survival by the geographic region of the last duty station.

In addition to the Kaplan-Meier survival estimates, I also performed a log-rank test on each of the five analyses. A log-rank test tests the equality of survivor functions across two or more groups (Stata, 2023). The Stata 18 User's Guide (2023) describes how the test uses each distinct failure time of the observations and calculates an expected number of deaths in each group and then uses that to obtain a test statistic that is a weighted standardized sum of the difference between those observed deaths and the expected deaths. The log-rank test is used to test the null hypothesis that there is no difference between the survival experience of two or more groups (Stata, 2023). The null hypothesis is as follows, where the $\lambda(t)$ is the hazard function at time t:

$$H_o : \lambda_1(t) = \lambda_2(t) = \cdots = \lambda_r(t)$$

The alternative hypothesis is that at least one of the $\lambda_i(t)$ is different for some t_j (Stata, 2023). Simply stated, this test looks at whether there is a difference in the time it takes for a failure (attrition) to occur between groups, i.e. GMOs and specialists or male and female physicians.

2. Regression Model

The dataset mainly consists of dummy or binary variables that contain the value of either one or zero. I used a linear probability model (LPM) with the attrition decision being the dependent variable. The variable is binary with a value of one if the physician decided to attrite at any point in the time period of this dataset, zero if the physician remained in the service during my study period. I wanted to compare the attrition behavior of GMOs and specialists at each stay-leave decision period, so I regressed attrition per period on physician type. I also included multiple controls that may also affect the decision of a physician to leave the military. Those included how many dependents they had, sex, race, age, and years of service. I was also interested in whether GMOs and specialists are more likely to attrite from one branch of service over another and whether the geographic location affected the attrition behavior of physicians. I used the following regression model to analyze the continuation behavior of military physicians where y_{it} is the attrition behavior of each physician in the various periods. I ran three models, replacing the dependent variable with each period, Period 1–3. Robust standard errors were used since the homoskedasticity assumption does not hold true when using LPM.

$$y_{it} = \beta_0 + \beta_1 gmo_i + \beta_2 female_i + \beta_3 age_{it} + \beta_4 minority_i + \beta_5 dependents_{it} + \beta_6 yos_{it} + \beta_7 army_i + \beta_8 airforce_i + \beta_9 region\_pacific_{it} + \beta_{10} region\_mountain_{it} + \beta_{11} region\_north\_central_{it} + \beta_{12} region\_south\_central_{it} + \beta_{13} region\_north\_atlantic_{it} + \beta_{14} region\_south\_atlantic_{it} + e_i$$

As most regression models cannot capture everything that affects the dependent variable, I must note that several variables were not included in the dataset that may explain some of the residual. For example, I was not able to capture the marital status of the physicians. Being married could cause a physician to either remain in the service or leave the service. It could also have a relationship with other independent variables, such as dependency status. The DEERS dataset did capture the number of dependents, in which the spouse counts as a dependent. Another variable that I was unable to observe was whether the physician had a taste for the military and family history of military service. A higher taste for the military or more risk-tolerant physicians may have a causal relationship with remaining in the military. Similarly, physicians that have parents or other family

members that served in the military may also have a relationship with the dependent variable. Lastly, I was not able to capture deployment data, which could have a causal impact on the stay-leave decision of military physicians. Although missing some variables that may have a positive or negative relationship with the dependent variable, the variables used in my analysis are relevant and adequate for use in a multiple regression model.

V. RESULTS

This chapter describes the results of the quantitative analysis, starting with descriptive statistics of the Medical Corps data separated by GMO and specialty physicians, followed by the Kaplan-Meier survival estimates and the multivariate regression models that explores the effects of demographics, geographical locations, and the effects of being a GMO or specialist on the retention across several stay-leave decision points during a physician's commissioned service.

A. DESCRIPTIVE STATISTICS

Since I compared two groups, GMOs and specialists, it was important to ensure the two samples are similar within the two groups as well as across the three branches of service. The summary statistics for the military's Medical Corps sample population are outlined in Table 3. The table is divided into the three branches of service, looking at the demographic information of GMOs and specialists in each service. The demographic variables include sex, race, and number of dependents, as well as the last geographic region in which the physician served.

Table 3. Summary Statistics of the Medical Corps Sample by Branch and GMO/Specialist

	Army		Navy		Air Force	
	GMO	Specialist	GMO	Specialist	GMO	Specialist
	N=1,480	N=4,057	N=1,815	N=2,767	N=1,877	N=3,199
Variables	**Mean**	**Mean**	**Mean**	**Mean**	**Mean**	**Mean**
Demographics						
Female	0.243	0.265	0.282	0.295	0.310	0.325
White	0.716	0.736	0.693	0.735	0.673	0.658
Black	0.064	0.048	0.047	0.045	0.047	0.032
Asian	0.104	0.107	0.096	0.090	0.086	0.074
Hispanic	0.038	0.027	0.063	0.053	0.042	0.038
Other race	0.080	0.082	0.101	0.077	0.152	0.198
# Dependents	1.653	1.677	1.192	1.676	1.525	1.535
Duty Station Census Region						
Pacific	0.173	0.231	0.354	0.361	0.150	0.155
Mountain	0.057	0.033	0.016	0.005	0.173	0.122
North Central	0.080	0.041	0.020	0.018	0.184	0.158
South Central	0.293	0.331	0.037	0.016	0.187	0.327
North Atlantic	0.041	0.019	0.033	0.021	0.023	0.013
South Atlantic	0.347	0.336	0.515	0.556	0.270	0.215
Other	0.009	0.008	0.026	0.023	0.013	0.009

Female GMOs range from 24 to 31% and female specialists range from 26 to 33% of all physicians across the three branches, with the Air Force having a slightly higher female population. White physicians are more dominant across all branches at 66 to 76% of the population. Asian physicians are next with 7–10%, followed by black and Hispanic physicians, both ranging from 3–6%. The average number of dependents appears to be closer to two in both GMOs and specialists and across the branches, with the exception of Navy GMOs having an average of only one dependent.

The census among the geographic regions varies significantly, but can be explained by the mission requirements of the different services. Navy physicians, both GMOs and specialists, are prominent in the Pacific and South Atlantic regions due to the Navy's need to be located on the coastal states. The Navy's personnel and resources must be located near the oceans for protection and security of our nation as well as the necessity to deploy quickly and efficiently from the Pacific and Atlantic coasts. The Army and Air Force bases are more inland and do not have the predominant need to be located near the oceans. The

Air Force, specifically, has nearly the same average physician population in all regions except for the North Atlantic region, with only 1–2% of their physicians serving in that area, and the South Atlantic region average being only slightly higher than the other regions.

A unique observation is the difference in Air Force GMOs and specialists in the South Central region with the average number of specialists almost double that of GMOs. There are many Air Force bases located in that region, to include the 59th Medical Wing (MDW) located in San Antonio, Texas. According to Military One Source (n.d.), The 59th MDW consists of the largest medical facility in the Air Force, Willford Hall Ambulatory Surgical Center (WHASC), which houses the most Air Force's physicians. Additionally, the 59th MDW is a large medical education and research hub of the Air Force, all of which these facts could explain the increased number of specialists in this area (Military One Source, n.d.). Army physicians are also more geographically dispersed than the Navy, with the majority in the South Atlantic, South Central, and Pacific regions. There is a slight increase in specialists in those same regions compared to the other regions where there are more GMOs than specialists. The Army Medical Department website (n.d.) lists the nine Army physician residency programs, of which six are located in those three regions; three in Texas, two in Georgia, and one in Washington, which could account for the increase in specialists.

The summary statistics of the Medical Corps' attrition behavior by period and GMO/specialists are presented in Table 4. The same demographics in Table 3 are analyzed here, but instead of the percentage of the population, this table tells us the percentage of physicians that leave the service during each decision period, Periods 1–3, separated by GMOs and specialists.

Table 4. Summary Statistics of the Medical Corps Sample by Period Attrition and GMO/Specialist

	Period 1 Attrition		Period 2 Attrition		Period 3 Attrition	
	GMO	Specialist	GMO	Specialist	GMO	Specialist
	N=451	N=473	N=739	N=1,385	N=425	N=1,191
Variables	**Mean**	**Mean**	**Mean**	**Mean**	**Mean**	**Mean**
Demographics						
Female	0.335	0.351	0.368	0.359	0.274	0.293
White	0.514	0.460	0.704	0.706	0.643	0.707
Black	0.047	0.033	0.062	0.047	0.079	0.053
Asian	0.118	0.079	0.088	0.089	0.090	0.093
Hispanic	0.047	0.024	0.037	0.035	0.035	0.024
Other race	0.275	0.404	0.109	0.123	0.153	0.122
# Dependents	1.196	1.454	1.439	1.560	1.960	2.184
Branch of Service						
Army	0.164	0.257	0.315	0.466	0.393	0.424
Navy	0.288	0.104	0.487	0.301	0.301	0.281
Air Force	0.547	0.628	0.197	0.231	0.295	0.295
Duty Station Census Region						
Pacific	0.223	0.165	0.300	0.243	0.222	0.257
Mountain	0.125	0.094	0.071	0.047	0.075	0.060
North Central	0.093	0.106	0.061	0.072	0.072	0.059
South Central	0.211	0.310	0.150	0.235	0.200	0.251
North Atlantic	0.038	0.014	0.038	0.017	0.025	0.015
South Atlantic	0.305	0.310	0.371	0.379	0.405	0.354
Other	0.004	0.001	0.009	0.007	0.002	0.004

The overall attrition was 4,664 military physicians in all three periods, resulting in an average of 30.7% attrition rate over the entire study period. GMOs had a slightly higher average attrition at 31.23% with specialist attrition averaging 30.42% over the entire study period. At the first decision point, Period 1 at three to seven years of service, GMOs have a higher average percentage of attrition than specialists, 8.7% compared to 4.7%. Period 2, eight to 12 years of service, saw an average attrition rate of 14.29% among GMOs and 13.82% among specialists. Period 3, 13–19 years of service, had an average attrition rate of 8.22% among GMOs and 11.88% among specialists. A higher attrition rate was observed by GMOs in Period 1 and Period 2, while specialists had a higher attrition rate in the last seven years of service before retirement eligible.

On average across both GMO and specialists and all decision periods, most physicians that attrite from military service are male (63-73 percent), white (46-70 percent), and have one to two dependents. Eight to 12% of Asian physicians leave the service compared to black and Hispanic physicians, 3 to 8% and 2 to 5%, respectively.

In all three periods, more specialists attrite from the Army and Air Force relative to GMOs, but more GMO's attrite from the Navy. Most attrition for the first stay-leave decision point for physicians, Period 1, is seen in the Air Force with 54.7% of the GMO attrition and 62.8% of the specialists that attritted in that period, relative to the other two services. GMOs have less attrition in the Navy compared to specialists in Period 1, but specialists in the Army have a higher percentage of attrition compared to GMOs. Period 2 saw the opposite of Period 1, with the Army and Navy both having a higher average percentage of attrition among both GMOs and specialists, relative to the Air Force. The GMOs, once again, saw a higher attrition rate than specialists in the Navy, while the Army and Air Force experienced a higher rate of specialist attrition. In Period 3, a higher rate of attrition for both GMOs and specialists were observed in the Army, relative to the other two branches of service. The Navy and Air Force had nearly equal attrition in Period 3.

It is more difficult to discern any key information from the region attrition averages. The survival and regression analysis will be more useful, but I will point out that the South Atlantic region clearly has the highest attrition averages among both GMOs and specialists across all three decision periods.

B. KAPLAN-MEIER SURVIVAL ANALYSIS

For the survival analysis, I used Kaplan-Meier survival estimates to analyze the retention or survival behavior of military physicians. First, I wanted to see if GMOs or specialists had a significantly different survival rate than each other. Second, I wanted to look at the survival curves within certain demographics, specifically gender and race. Third, I performed a Kaplan-Meier survival analysis on the branch of service and lastly one on the geographic region.

1. Kaplan-Meier Survival Estimates by GMOs and Specialists

I first plotted two curves, one for GMOs and one for specialty physicians. Although it is rare, it is important to note that a physician may not remain a GMO throughout their career, therefore the category may not be constant over time. Some GMOs do not choose a specialty until much later in their career. Whether the physician stays or leaves the service, the category of GMO or specialty will be credited to their status at the snapshot in time that this dataset was obtained. The x-axis in the Kaplan-Meir survival curve is the probability of remaining in the service and the y-axis if the years of service of the physicians. The curves tell us the percentage of physicians that have remained in the service or "survived" at each year of service; this statement will remain true for Figures 3–7.

Figure 3 shows us that at the end of the first decision period, Period 1, approximately 88% of specialists are still in military service, compared to 79% of GMOs. Sixty-five percent of specialists remained in the service at the end of Period 2, relative to GMOs with approximately 60%. The lines converge at approximately 17 years of service and decline at nearly the same rate with a slight divergence at the end of Period 3, with approximately 42% of GMOs and 41% of specialists remaining. In Period 4, it appears that specialists are more likely to retire quicker than GMOs, as the two curves separate even further and specialists having the steeper slope of the two curves. I can assume that the disparity between GMOs and specialists in Period 1 can be attributed to the shorter service obligation GMOs have compared to specialists. GMOs face their first stay-leave decision slightly earlier than most specialists. In Period 2, they both seem to be declining at nearly the same rate. The GMO curve quickly levels out and actually converges with the specialist curve in Period 3. A log-rank test was performed to test the null hypothesis that there is no significant difference in the survival experiences of the groups (Stata, 2023). The log-rank test at the 95% confidence level, generated a p-value < 0.05, therefore specialists are at significantly lower risk of attrition, relative to GMOs.

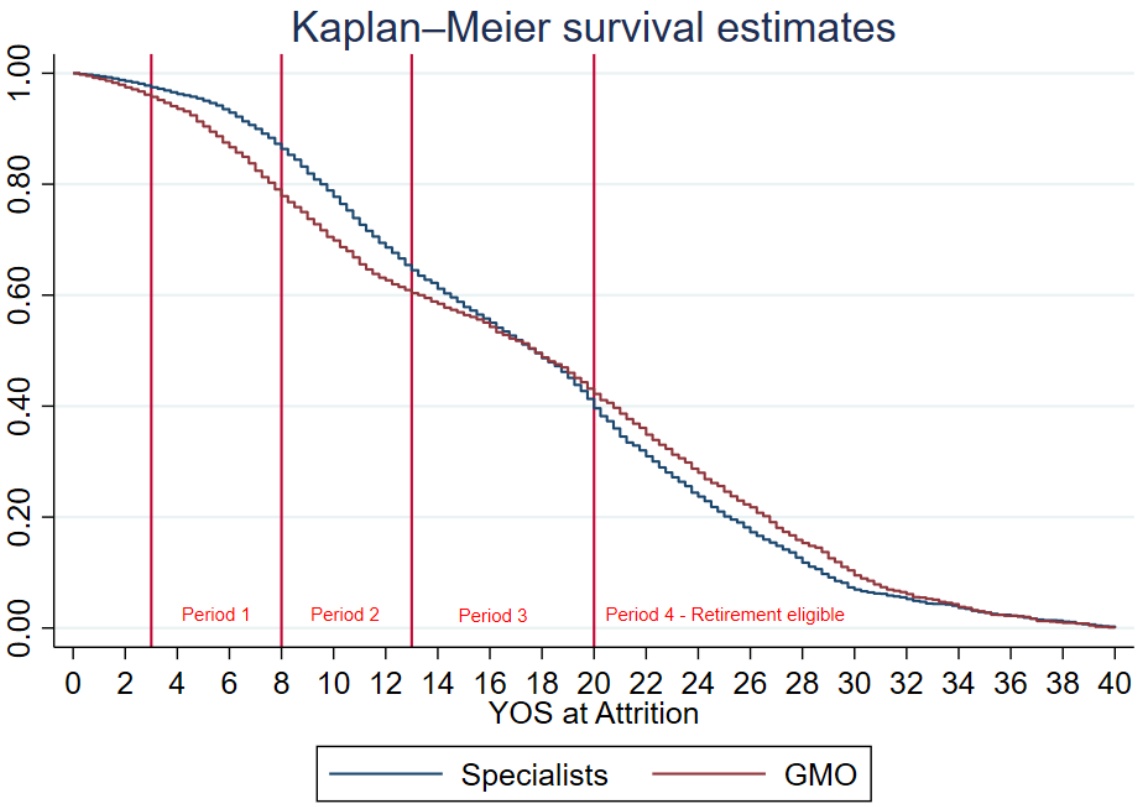

Figure 3. Kaplan-Meier Survival Curves for General Medical Officers and Specialists

2. Kaplan-Meier Survival Estimates by Sex

In Figure 4, I compare the retention behavior of female physicians to male physicians. Approximately 86% of male physicians remain in the service at the end of Period 1, compared to 81% of female physicians. The two curves continue to diverge with 68% of males and 58% of females remaining at the end of Period 2. At the end of Period 3, male physicians continue to out-survive females with 45% compared to 35% surviving. Checking the equality of survivor functions with a log-rank test at the 95% confidence level, I obtained a p-value < 0.05, therefore male physicians are at significantly lower risk of attrition, relative to female physicians.

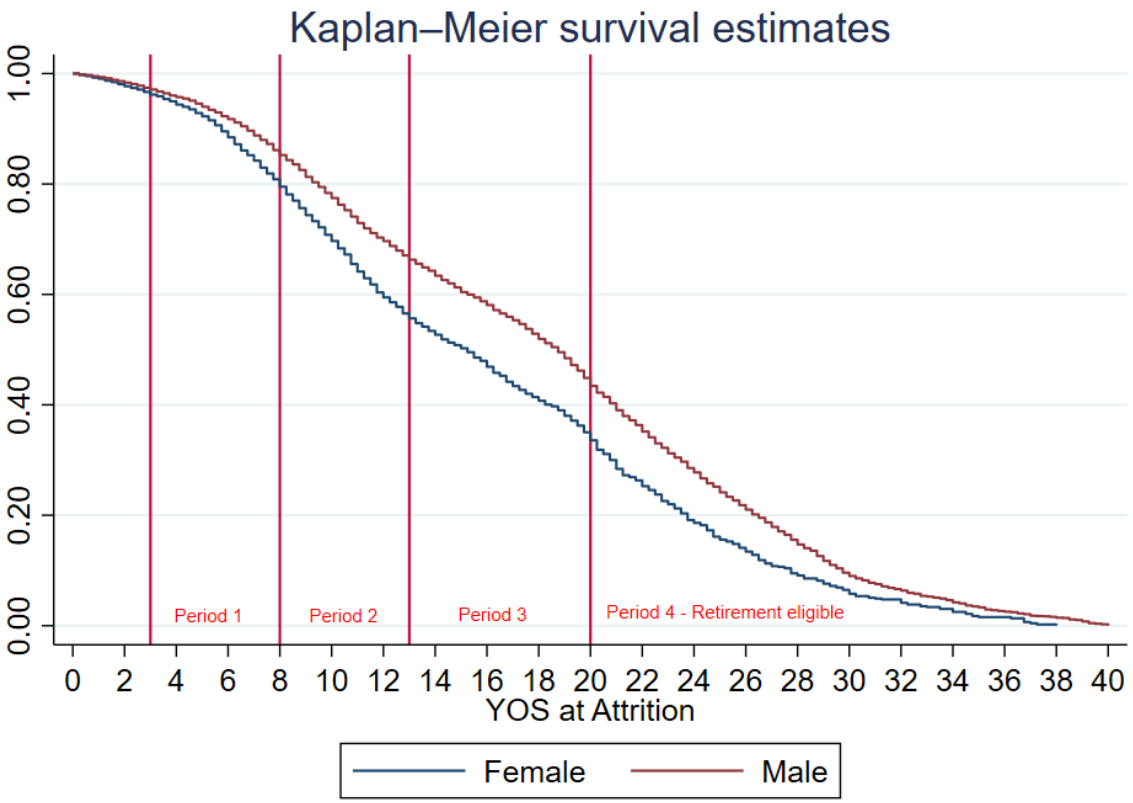

Figure 4. Kaplan-Meier Survival Curves for Military Physicians by Sex

3. Kaplan-Meier Survival Estimates by Race

Figure 5 compares the retention behavior of military physicians by race. Clearly the "other" race is less likely to remain in the service, but I was unable to identify the makeup of that category and will only focus my analysis on the identified race categories (Asian, black, Hispanic, and white). Between 82–85% of all race categories remain in the service at the end of Period 1, with white physicians having a slightly higher percentage of survival, followed closely by Hispanic physicians. The curves begin to diverge throughout Period 2 ending with black physicians at a 59% survival rate, Asian physicians at 62 percent, and Hispanic and white physicians at 68%. The rate of decline for all curves seems to level off slightly in Period 3 as they approach retirement eligible. The Hispanic physician curve overtakes the white physician curve at the beginning of Period 3 and continues to have a higher survival rate throughout. The black and Asian physician curves converge at approximately 16 years of service, but black physicians surpass Asian physicians near the

end of Period 3. Asians have a sharp decline once retirement eligible, while the others remain fairly constant with each other. The log-rank hypothesis test shows that the distributions of these groups are not the same and there is a significant difference in the retention behavior of these groups.

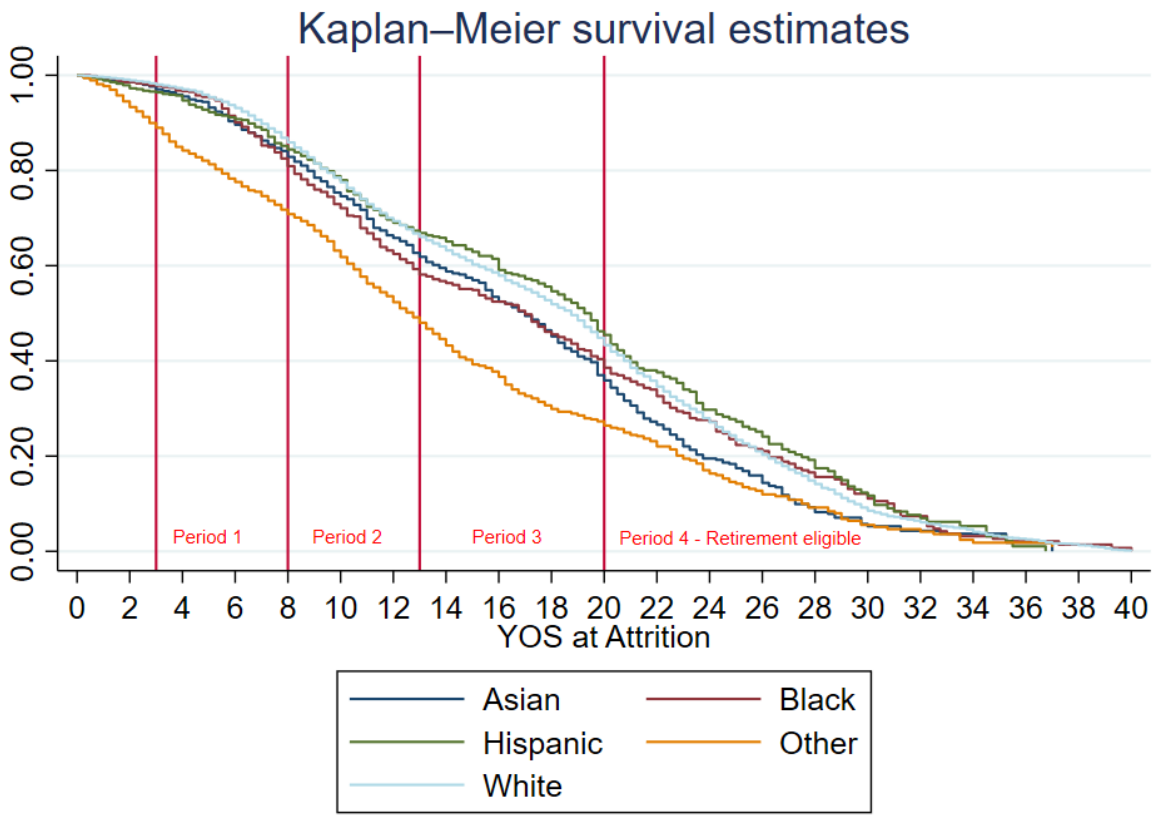

Figure 5. Kaplan Meier Survival Curves for Military Physicians by Race

4. Kaplan-Meier Survival Estimates by Branch of Service

Figure 6 looks at the Kaplan-Meier survival estimates for military physicians by branch of service (Army, Navy, and Air Force). There is an immediate divergent of the Air Force physician curve, which is aligned with the descriptive statistics in Table 4. The Air Force has a substantial percentage of attrition in Period 1, while the Army and Navy led the way in physician survival. As the service obligations end in Period 1, we do see a steeper negative slope for the Army and Navy near the end of Period 1, reducing the gap

with the Air Force from its max of 8% in the middle of Period 1 down to 5% at the end. Although the Air Force does have a lower survival rate at the end of Period 1, the steep slope of decline in the Army and Navy, shows a significant attrition issue at the end of the initial service obligation period. In Period 2, the Army and Navy continue to have a steeper decline in survival converging with the Air Force at approximately 11 years of service. All branches of service end Period 2 at approximately 65% remaining in the services. Lastly, in Period 3, the Army and Air Force decline at nearly the same rate, while the Navy curve separates and has a much less steep slope, thus having the higher survival rate in Period 3 at 45%. The log-rank test provides a p-value < 0.05, showing that there is a significant difference in attrition between the three branches, with the Navy having a lower risk of attrition.

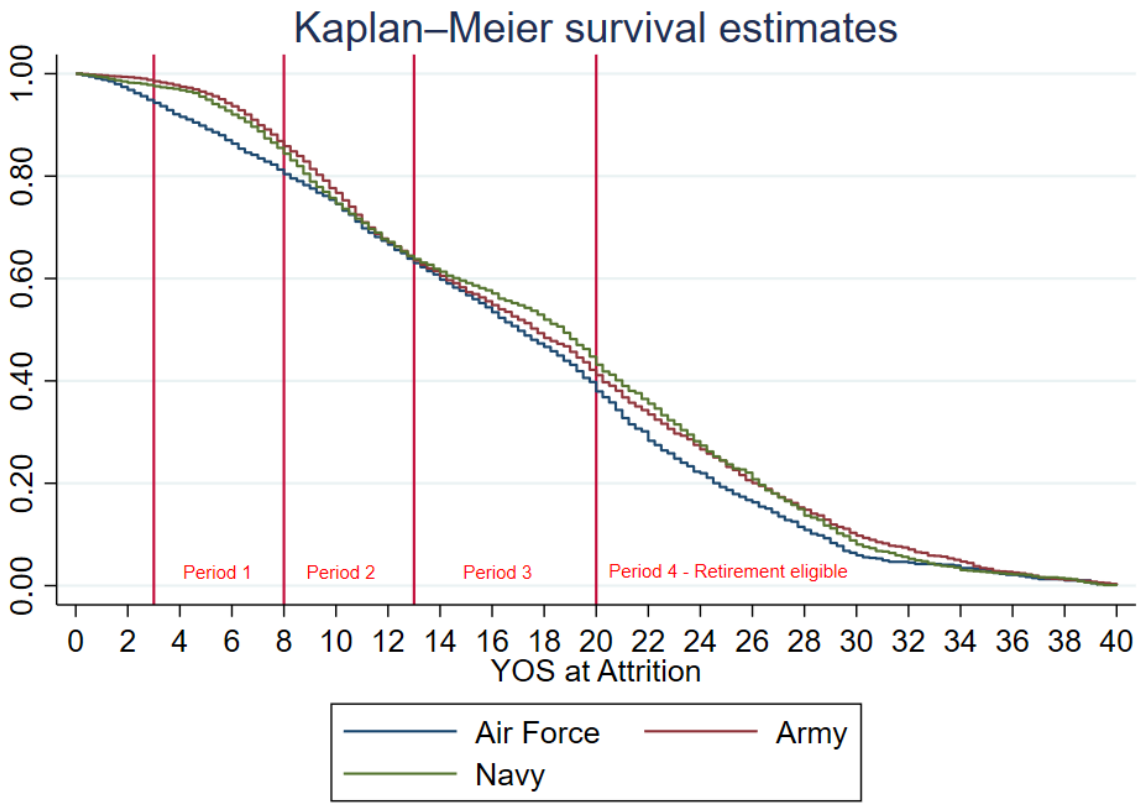

Figure 6. Kaplan-Meier Survival Curves for Military Physicians by Branch of Service

5. Kaplan-Meier Survival Estimates by Geographic Region

Figure 7 contains the Kaplan-Meier survival estimates for military physicians by geographic region over their years of service. The region "other" mainly consists of overseas locations, where attrition does not occur as often as within the continental United States (CONUS). Although attrition can occur overseas, most military members are assigned to a base in CONUS to complete the separation process. My analysis will not examine the attrition behavior of physicians in the "other" region. The curves North Central, Mountain, and North Atlantic have 80% of physicians remaining in the service and South Central, South Atlantic, and Pacific have 84–85% of physicians remaining at the end of Period 1. North Atlantic and North Central fall below 60% survival at the end of Period 2, while the South Atlantic and Pacific regions end at approximately 65–66%. Period 3 ends with South Atlantic having the strongest survival percentage at 45 percent, with North Central and Mountain having the lowest at 35%. The log-rank test shows there is a significant difference in the distribution of these groups. In other words, the retention rate among the regions is statistically different.

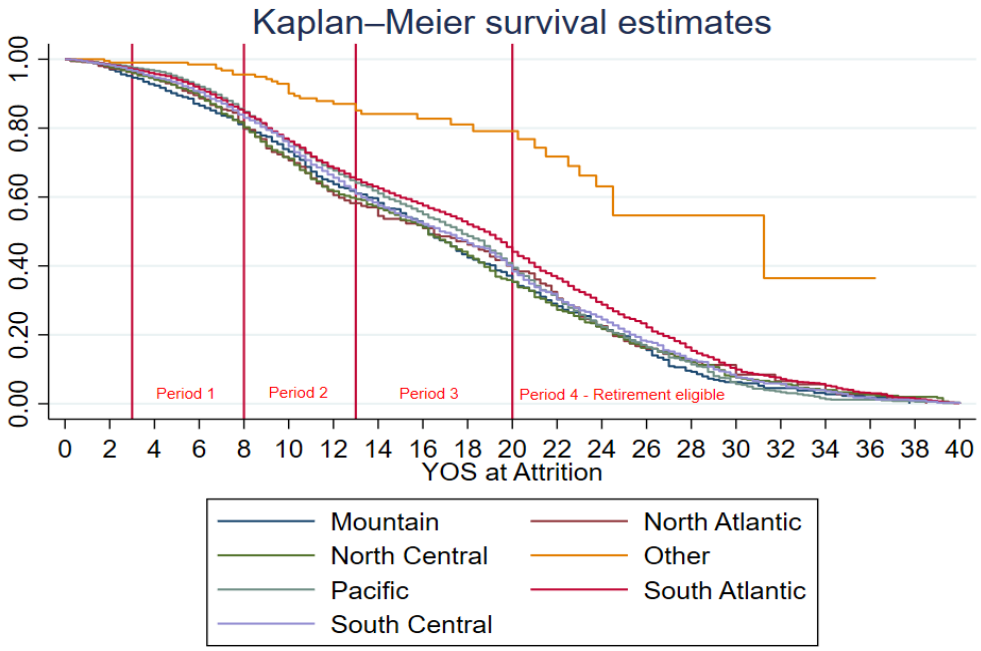

Figure 7. Kaplan-Meier Survival Curves of Military Physicians by Geographic Regions of Last Duty Station

C. REGRESSION ANALYSIS

I ran three LPM regression models, replacing the dependent variable with each period, Period 1–3. Robust standard errors were used since the homoskedasticity assumption does not hold true when using LPM. The results are displayed in Table 5. The first column displays the attrition behavior of physicians in Period 1, 3–7 years of service; the second column displays attrition behavior in Period 2, 8–12 years of service; and the third column displays the attrition behavior of physicians in Period 3, 13–19 years of service.

Table 5. Regression Analysis of Military Physicians by Period

	(1) Attrite in Period 1	(2) Attrite in Period 2	(3) Attrite in Period 3
GMO	0.019***	0.018***	-0.021***
	(0.001)	(0.001)	(0.001)
Female	-0.002*	0.028***	0.012***
	(0.001)	(0.001)	(0.001)
Age	0.005***	-0.000**	-0.000**
	(0.000)	(0.000)	(0.000)
Minority	0.029***	-0.008***	0.012***
	(0.001)	(0.001)	(0.001)
# Dependents	0.002***	0.010***	0.018***
	(0.000)	(0.000)	(0.000)
Years of Service	-0.011***	-0.008***	0.001***
	(0.000)	(0.000)	(0.000)
Army	-0.030***	0.070***	0.017***
	(0.001)	(0.001)	(0.001)
Navy	-0.032***	0.077***	0.007***
	(0.001)	(0.002)	(0.001)
Pacific	-0.020***	-0.023***	-0.014***
	(0.002)	(0.003)	(0.003)
North Central	-0.027***	-0.013***	-0.019***
	(0.003)	(0.003)	(0.003)
South Central	-0.015***	-0.027***	-0.014***
	(0.002)	(0.003)	(0.003)
North Atlantic	-0.016***	-0.010	-0.022***
	(0.003)	(0.005)	(0.004)
South Atlantic	-0.019***	-0.028***	-0.019***
	(0.002)	(0.003)	(0.002)
Other region	-0.039***	-0.059***	-0.051***
	(0.003)	(0.004)	(0.003)
Constant	0.003	0.165***	0.058***
	(0.003)	(0.005)	(0.004)
# Person-Quarters	280666	280666	280666
Unique Physicians	15195	15195	15195
Outcome Mean	0.040	0.103	0.078
R^2	0.090	0.050	0.017

Robust standard errors in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Compared to a specialist, a GMO has 1.9 percentage points higher probability of attrition in Period 1, 1.8 percentage points higher probability in Period 2, but in Period 3 it changes to GMOs having 2.1 percentage points lower probability of attrition than specialists, holding other variables constant. All periods are statistically significant with a p-value lower than 0.001. Even though female physicians had a lower average attrition at the end of Period 1 in the survival analysis, it does not mean the probability of attrition was greater in females. The regression analysis provides the probability. For instance, a female physician has a 0.2 percentage point lower probability of attritting compared to a male physician (significant at the 95% confidence level and ceteris paribus). In Periods 2 and 3, females become more likely to attrite, with 2.8 and 1.2 percentage points higher probability of attrition respectively, relative to male physicians, and statistically significant at a 99% confidence level.

For the multiple regression analysis, I generated a variable named "minority," which combined the race categories of Asian, black, Hispanic, and other. A minority physician is more likely to attrite in Periods 1 and 3, but less likely to attrite in Period 2, relative to white physicians (all statistically significant and holding other variables constant). The number of dependents a physician has is less impactful on the stay-leave decision point in Period 1, although statistically significant, but as the physician moves into Period 2, the impact is greater. For every additional dependent a physician has in Period 2, the physician's probability of attritting increases by one percentage point and nearly two percentage points in Period 3. The age and years of service of a physician plays a role in the probability of leaving the service in Period 1 but becomes less significant as the physician moves into Period 2 and 3. This could be attributed to the persuasion of the retirement benefit as the longer a physician stays in the military, they may feel more obligated to stay to reach retirement eligibility.

When analyzing attrition on the branch of service, I chose the Air Force as the omitted variable to avoid multicollinearity. Interestingly, the Army and Navy both have three percentage points lower probability of physician attrition in Period 1, compared to the Air Force, ceteris paribus. In Period 2, physicians are seven to eight percentage points more likely to leave the Army and Navy respectively, compared to the Air Force. This is

consistent with the steep slope of the Army and Navy survival curves in the Kaplan-Meier survival estimates for Period 2. Although only one to two percentage points, Period 3 continues with Army and Navy physicians more likely to leave the service than the Air Force, holding other variables constant. All results regarding branch of service attrition are statistically significant at the 99% confidence level.

The Mountain region was left out to address multicollinearity. In all periods, physicians in every region are less likely to leave the service, compared to the Mountain region. Besides overseas locations, physicians in the North Central region are less likely to attrite than all other regions in Period 1, but South Atlantic physicians are less likely in Period 2. In Period 3, all regions are very similar in attrition, ranging from 1.4 to 2.2 percentage points less likely to attrite, compared to the Mountain region, holding all variables constant.

D. KEY FINDINGS

My analysis has led me to several key takeaways that could assist decision-makers in addressing attrition issues among military physicians. First, the descriptive statistics, survival analysis, and regression analysis all show that GMOs are more likely to leave the service between 3 and 12 years of service, compared to specialists. Specialists are more consistent in staying in the military, possibly because of the longer training pipeline and obligation period, allowing more time to acquire a taste for the military compared to GMOs. Second, there are a couple of obvious concerns regarding female physicians. First, is the proportion of female to male physicians in the military and second is the higher probability of attrition between 8 and 19 years of service, compared to males. A third key takeaway is how significantly the number of dependents affect the probability of attrition from 8 to 19 years of service, which may be attributed to childcare issues, dislike or fear of separation from family, or other family associated conflicts with military life. Lastly, there is a clear attrition issue for Air Force physicians, both GMOs and specialists, from three to seven years of service.

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VI. CONCLUSION AND RECOMMENDATIONS

This thesis provided valuable insights into the dynamics of physician attrition and retention in the MHS. Through rigorous quantitative analysis, I have identified key factors influencing stay-leave decisions among military physicians, including demographic trends, geographic assignments, occupational variables, and disparities among sex. Notably, the findings highlight higher attrition rates among General Medical Officers (GMOs) compared to specialists, as well as the impact of family responsibilities on retention. Furthermore, we observed concerning attrition behavior among Air Force physicians within specific service windows.

Addressing these retention challenges is paramount for ensuring the sustainability and effectiveness of the military medical corps. The analysis underscores the need for targeted retention strategies, support systems for work-life balance, and proactive measures to mitigate attrition hotspots. By equipping military leaders and policymakers with actionable insights, I aim to fortify the resilience of the MHS and enhance its capacity to deliver high-quality healthcare to servicemembers and their families.

Using data on the Medical Corps of the Army, Navy, and Air Force, my thesis set out to address the following research objectives:

- What are the key factors influencing the attrition behavior of military physicians within the MHS? This involved exploring demographic trends, geographical assignments, occupational variables, and other pertinent factors to uncover drivers and challenges with physician retention.
- What are the differential attrition patterns between General Medical Officers (GMOs) and specialists? A key research objective was to segregate military physicians into distinct categories and unveil the nuanced trajectories unique to each cohort.

A. RECOMMENDATIONS

There are several recommendations I make, based on the key findings of my analyses. Developing tailored retention initiatives for GMOs is essential to address attrition challenges effectively. These initiatives should focus on the initial and secondary stay-leave decision points within their career track. Offering personalized career development opportunities, mentorship programs, and incentives can significantly enhance job satisfaction and retention rates among GMOs. By providing targeted support at critical decision junctures, the military can cultivate a more resilient and committed medical workforce.

Establishing comprehensive support systems is crucial to facilitate a healthy work-life balance for military physicians. This includes implementing childcare services, flexible scheduling options, and telework opportunities to accommodate the demands of military service and family responsibilities. Additionally, providing counseling services and mental health resources can address burnout and stress among physicians, promoting their overall well-being. Enhancing family support programs further alleviates the impact of deployments and separations on physicians and their families, fostering a supportive environment conducive to retention.

I also recommend implementing robust equity initiatives within the MHS as it is imperative to promote diversity, inclusion, and equitable career advancement opportunities for female physicians. This entails conducting targeted outreach and mentorship programs to support female physicians in navigating career challenges and achieving professional success. Moreover, addressing systemic barriers and biases that may contribute to disparities among sexes in retention and career progression is essential for fostering a more inclusive and equitable environment within the MHS.

Lastly, identifying and addressing attrition hotspots within each branch of the military is critical for mitigating retention challenges effectively. Targeted interventions should be deployed to address specific attrition patterns, such as the pronounced attrition observed in the Air Force upon the end of the initial service obligation and in the Army and Navy at future decision points. Branch-specific analyses are necessary to understand

the underlying factors driving attrition and to develop tailored strategies to address them. Enhancing communication and transparency regarding career progression opportunities, deployment cycles, and assignment preferences is vital for improving retention outcomes and fostering a supportive environment for military physicians.

B. SUGGESTIONS FOR AREAS OF FUTURE RESEARCH

I suggest supplement quantitative analysis that includes the monetary factors and the military-civilian pay disparity and its effect on retention behavior of physicians. I recommend including qualitative research methods, such as interviews and focus groups, to gain additional insights into the subjective experiences and motivations driving physician attrition. Furthermore, I suggest conducting longitudinal studies to track the career trajectories and retention outcomes of military physicians over time, enabling a deeper understanding of the factors influencing stay-leave decisions. Further comparative analyses should be performed between the different branches of service and across healthcare specialties to identify additional hotspots of attrition and areas for improvement. Lastly, I suggest exploring opportunities for cross-sector collaborations between military and civilian healthcare systems to address common retention challenges and best practices.

By addressing these recommendations and exploring future research avenues, we can further advance our understanding of military physician retention and strengthen the resilience of the Military Health System in fulfilling its mission of providing exceptional healthcare to our nation's warfighters and their families.

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LIST OF REFERENCES

Air Force Medical Service (AFMS). (n.d.a). *Creation of the Air Force Medical Service*. https://www.airforcemedicine.af.mil/AFMSHeritage/#:~:text=The%20effective%20date%20of%20the,a%20part%20of%20the%20AFMS.

Air Force Medical Service (AFMS). (n.d.b). *Health Professions Scholarship Program (HPSP) Fact Sheet.* https://www.airforcemedicine.af.mil/Media-Center/Fact-Sheets/Display/Article/425437/hpsp-fact-sheet/

Alshehri, A. S., & Brossard, H. T. (2013). *Retention elasticity and projection model for U.S. Navy Medical Corps officers*. [Master's thesis, Naval Postgraduate School]. NPS Archive: Calhoun. https://hdl.handle.net/10945/32787

Army Medical Department (AMEDD). (n.d). *Army medical training & residency facilities.* https://www.goarmy.com/careers-and-jobs/specialty-careers/health-care/residency-locations.html

Army Medical Department (AMEDD). (2023). *History of the Office of Medical History.* https://achh.army.mil/history/history

Association of American of Medical Colleges (AAMC). (2021). *The Complexities of Physician Supply and Demand: Projections from 2019 to 2034.* AAMC. https://www.aamc.org/data-reports/workforce/data/complexities-physician-supply-and-demand-projections-2019-2034

Brannman, S. (2000). *Comparison of Navy and private-sector physicians' total compensation, by medical specialty (supplement to annotated briefing on provider satisfaction).* Center for Naval Analysis. https://www.cna.org/CNA_files/PDF/D0002053.A1.pdf

Bristol, R. M. (2006). *Effect of increased operational tempo (post 9/11) on the retention of Navy Medical Corps officers*. [Master's thesis, Naval Postgraduate School]. NPS Archive: Calhoun. https://hdl.handle.net/10945/2852

Day, P., Lawson, J., Mantri, S., Jain, A., Rabago, D., & Lennon, R. (2021). Physician moral injury in context of moral, ethical and legal codes. *Journal of Medical Ethics 48*, 746–752. doi:10.1136/medethics-2021-107225

Defense Finance and Accounting Service (DFAS). (2023). *Medical Corps Board Certification Pay, Incentive Pay (IP) and Retention Bonus (RB) – FY2024*. https://www.dfas.mil/MilitaryMembers/payentitlements/Pay-Tables/HPO4/

Department of Defense (DOD). (2016). *Accession and retention policies, programs, and incentives for military Health Professions Officers (HPOs)* (DOD Instruction 6000.13). https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodi/600013p.pdf?ver=2019-01-29-115231-883

Government Accountability Office (GAO) (2018). *Military personnel: Additional actions needed to address gaps in military physician specialties. February 2018 report to congressional committees* (GAO-18-77). https://www.gao.gov/products/gao-18-77

Government Accountability Office (GAO) (2023). *Defense health care: Additional assessments needed to determine effects of active duty medical personnel reductions* (GAO-23-106094). https://www.gao.gov/products/gao-23-106094

Gray, B. M., & Grefer, J. E. (2012). Career earnings and retention of U.S. military physicians. *Defence and Peace Economics 23*(1), 51–79. http://dx.doi.org/10.1080/10242694.2011.562371

John, S. K., Bishop, J. M., Hildreth, L. A., Lindly, J. M., Luan, W. P., Minneci, M., & Prugh, G. M. (2019). *Analysis of DOD Accession Alternatives for Military Physicians: Readiness Value and Cost* (IDA Paper P-10815). Institute for Defense Analysis. https://www.ida.org/-/media/feature/publications/a/an/analysis-of-dod-accession-alternatives-for-military-physicians-readiness-value-and-cost/p-10815.ashx

Looker, M. K. (2022). *An analysis of Navy Nurse Corps specialties and the effects of the civilian market wages on retention*. [Master's thesis, Naval Postgraduate School]. NPS Archive: Calhoun. https://hdl.handle.net/10945/69675

Luan, W. P. et al. (2021). A methodology for estimating the cost of educating military physicians at the Uniformed Services University. *Military Medicine, 186*(3/4), 437–441.

Medscape. (2023). *Medscape Physician Compensation Report 2023: Your Income vs. Your Peers'.* https://www.medscape.com/slideshow/2023-compensation-overview-6016341#1

Military Pay and Benefits webpage. (2024). *Special and Incentive Pay Index.* https://militarypay.defense.gov/Pay/Special-and-Incentive-Pays/Index/#retention

Military One Source. (n.d.). *Joint Base San Antonio (Lackland, Randolph, Sam Houston) – Health Care Overview: Medical Services.* https://installations.militaryonesource.mil/military-installation/joint-base-san-antonio-lackland-randolph-sam-houston/health/health-care#:~:text=Wilford%20Hall%20Ambulatory%20Surgical%20Center,at%20Lackland%20Air%20Force%20Base.

Naval History and Heritage Command. (2021). *Navy Medical Corps.* https://www.history.navy.mil/browse-by-topic/communities/navy-medicine/med-corps.html

Paone, S. M. (2020). *Characteristics of the current civil service military healthcare workforce and determinants of workforce turnover and attrition*. [Master's thesis, Naval Postgraduate School]. NPS Archive: Calhoun. https://hdl.handle.net/10945/64881

Sobocinski, A. B. (2021). *The Formative Years of the U.S. Navy Medical Corps, 1798–1871.* Naval History and Heritage Command. https://www.history.navy.mil/browse-by-topic/communities/navy-medicine/navy-med-history.html

StataCorp. (2023). *Stata 18 User's Guide*. College Station, TX: Stata Press. https://www.stata.com/manuals13/stststest.pdf

Stortz, S. K., Foglia, L. M., Thagard, A. S., Staat, B., & Lutgendorf, M. A. (2021). Comparing Compensation of U.S. Military Physicians and Civilian Physicians in Residency Training and Beyond. *Cureus 13*(1): e12931. DOI 10.7759/cureus.12931

Uniformed Services University of the Health Sciences (n.d.). *Commissioning.* https://medschool.usuhs.edu/academics/md-program/commissioning

United States Census Bureau. (2023). *Census Regions and Divisions of the United States.* https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf

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