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EVALUATION OF INITIAL MINIMUM PERIOD OF SERVICE ON GENDER DIFFERENCES ON RETENTION IN THE ROYAL AUSTRALIAN NAVY

by

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This thesis investigates the determinants of separation rates among Royal Australian Navy officers and enlisted sailors, focusing on the impact of Initial Minimum Period of Service (IMPS) lengths and gender differences. Using an individual dataset of naval officers and enlisted sailors, I use Cox proportional hazards to examine the influence of initial obligation lengths and gender on separation rates. I find that shorter IMPS lengths are associated with higher separation rates among officers and enlisted sailors. Additionally, females have higher separation rates than males, particularly in specific IMPS categories. I also find workgroup-specific differences, suggesting that occupational roles significantly influence retention. IMPS lengths and gender emerge as significant predictors of separation. Personnel retention efforts identify the mid-length service, especially the 6-year mark, as a critical point. The higher propensity for separation among females indicates the need for targeted support strategies. These findings advocate for the development of nuanced retention policies that consider the complex interplay of IMPS length, gender, and occupational roles.

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LIST OF ACRONYMS AND ABBREVIATIONS

ADF	Australian Defence Force
ADFA	Australian Defence Force Academy
ATA	Aviation Technician Aircraft
ATV	Aviation Technician Avionics
ET	Electronics Technician
IMPS	Initial Minimum Period of Service
MT	Marine Technician
PQ	Primary Qualification
RAN	Royal Australian Navy
RANC	Royal Australian Naval College
SWPA–N	Strategic Workforce Planning and Analysis–Navy
USN	United States Navy
USNA	United States Naval Academy

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I. INTRODUCTION

A. OVERVIEW

The military depends on the commitment and continuing service of its members. The stability of any military relies on crucial factors such as recruiting enough personnel to sustain an adequate workforce to conduct operations and retaining its members throughout their service period. Whilst military retention, including first term contract retention, has been a subject of extensive research, the specific impact of the Initial Minimum Period of Service (IMPS) on retention in the Royal Australian Navy (RAN), particularly concerning gender differences, remains an understudied area. This thesis examines how IMPS policy affects retention rates and explores the nuanced gender-specific IMPS within the context of RAN service.

B. PURPOSE OF STUDY

The concept of IMPS, defined as the initial minimum duration a service member must serve, is a fundamental aspect of recruitment policies worldwide (Hoglin & Barton, 2015). IMPS policies vary across workgroups, influencing the duration of military service and the member's commitment to their service. The effects of IMPS, especially those concerning gender differences in retention rates, are not thoroughly researched in the RAN. With an increasing number of women joining the navy, it is therefore essential to understand how the IMPS policy affects their retention. Figure 1 shows the survival estimates of length of service by gender, and we can see that there is a difference in the early years of service that coincide with IMPS length between males and females. The existing literature on Australian military recruitment and retention policy have primarily focused on broader factors such as changes to recruitment strategies (Kitchin, 2012), separation profiles (Dodds, 2018), job satisfaction (Batayola, 2020), deployment experiences (Groot, 2015), and family support (Ashen, 2022). A gap exists concerning the specific assessment of IMPS policy and its influence on gendered retention patterns. This thesis aims to address the gap.

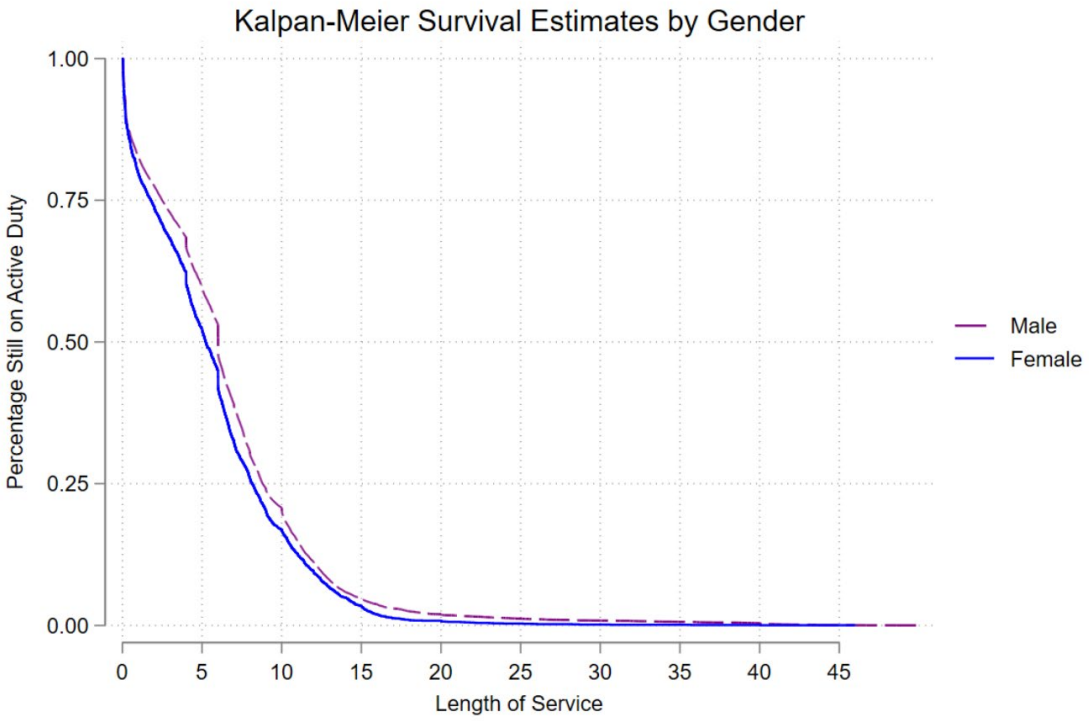

Figure 1. Survival estimates of whole navy by gender.

C. SCOPE AND LIMITATIONS

I confine the scope to analyze the available dataset of service members, focusing on variables such as IMPS length, gender, age, marital status, and educational attainment. One limitation is the absence of qualitative data that could provide context for the quantitative findings. My investigation aims to explore the correlation between short and long IMPS lengths and the likelihood of personnel separating from service, and to examine how IMPS length specifically impacts separation rates among female service members. This research addresses two key questions:

- Do service members on short versus long IMPS lengths have a higher or lower likelihood of separation?
- Do females on short versus long IMPS lengths have a higher or lower likelihood of separation?

D. METHODOLOGY

This thesis uses Kaplan-Meier and Cox proportional hazards to model the risk of separation. These statistical methods are chosen because of their robustness in handling time-to-event data and their ability to accommodate censored cases and control for various confounders. The analyses are being conducted using a dataset reflecting a broad range of service members' backgrounds and service conditions.

E. FINDINGS

Using data on personnel from January 1, 2003, to May 31, 2023, I find significant differences in the separation rates by IMPS length, with shorter lengths of 2-years associated with higher risks of separation. There is an inverse relationship between the length of IMPS and separation rates, with longer service commitments correlating with lower separation likelihood.

I find inconsistent significance of gender as a standalone predictor of separation, suggesting that the interplay between gender and separation is influenced by multiple factors, not solely IMPS length. Age and having a degree appear to influence the likelihood of separation, potentially indicating that younger individuals or those with higher educational attainment may have different career trajectories or retention patterns. The large chi-square statistics and low p-values indicate that the models are finding significant relationships between the predictors and separation, but the exact nature of these relationships requires further investigation.

F. STRUCTURE OF THE STUDY

This thesis is structured into several chapters, each focusing on a specific aspect of recruitment, IMPS-related retention, and the gender-specific implications. Chapter II provides an institutional background on the RAN's recruitment and retention policies. Chapter III provides an academic literature review, combining existing knowledge on navy retention and IMPS policies. Chapter IV outlines the methodology, detailing the research design, data collection techniques, and analytical methods I am using. Chapter V presents the quantitative results and analysis, exploring the impact of IMPS on retention from a

statistical perspective, and is a discussion of the findings and how they relate to prior literature. The final chapter, Chapter VI, draws my conclusions, and offers recommendations for potential policy changes and further work.

II. BACKGROUND

Australia is an island nation; therefore, the role of the RAN is to ready naval strength and facilitate the joint force during times of peace and conflict. As the maritime service of the Australian Defence Force (ADF), the RAN plays a vital role in the Defence Mission of defending Australia and its national interests by ensuring the preparedness of seaworthy, airworthy, and battleworthy ships, submarines, aircraft, and specialized personnel. By deploying these assets, the navy ensures the preservation of Australia's sovereignty and security in its region (Department of Defence, 2023).

The RAN's effectiveness at executing this mission hinges on its ability to attract, train, and retain a skilled, motivated, and diverse workforce. Recruiting efforts are multifaceted and targeted, aimed at appealing to individuals with a wide range of skills, backgrounds, and aspirations. Since the RAN is an all-volunteer force with approximately 16,000 members, the RAN faces an enduring challenge in retaining its personnel, that underscores the need for policies that effectively incentivize long-term commitment and service from its members.

This chapter describes the relevant background about the, including methods of entry into the RAN, initial service duration, women in the RAN, and retention policies. Since my thesis explores the initial period of service and associated retention of RAN personnel, this chapter reviews RAN policies on recruitment, female specific policies, and retention of service members.

A. ENTRY INTO THE ROYAL AUSTRALIAN NAVY

During the recruitment process, prospective applicants choose the occupation they want to do in the navy, provided they meet the required entry standard. Then at accession, new members are categorized into occupational families based on their functional employment classification workgroups. In total there are 16 officer workgroups (called Primary Qualifications), and 26 sailor workgroups (called rates or categories).

Within the RAN, there are different methods of entry, each with specific service commitments. These commitments vary to accommodate different career paths and levels

of experience. All officers complete basic training at the Royal Australian Naval College (RANC). If ab-initio officers have already completed tertiary education at entry, they will proceed to their Primary Qualification (PQ) employment training following their graduation from the RANC. They are commissioned[1] into the RAN through either the Direct Entry (for active service) or Reserve Officer entry pathways (ADF Careers, n.d.-a).

Ab-initio officers without tertiary education enter the RAN through either the Australian Defence Force Academy (ADFA)[2] or the Undergraduate Entry pathways as they are still required to hold an undergraduate degree. ADFA entry officers proceed to their PQ training after they graduate, while Undergraduate Entry officers earn their RAN-funded degrees from civilian institutions before they are given basic military training and PQ training (ADF Careers, n.d.-a).

The avenue of entry for all sailors is through the RAN Recruit School for basic training before category school (equivalent to the USN 'A' school) for employment specific training, having completed high school education (ADF Careers, n.d.-a).

B. INITIAL MINIMUM PERIOD OF SERVICE

IMPS[3] stands as a cornerstone in the RAN's personnel management strategy. IMPS is the minimum contracted period where members are required to stay and serve for a specific period. During this initial period, new members receive training and gain experience in their roles within the RAN. Once this minimum period is completed, they have the choice to leave the navy or decide to continue serving based on their preferences. Therefore, the length of an individual's IMPS is designed to cover basic training and PQ/ category training, as well as the return of service (return on investment) needed because of that training, education and experience gained while in service (G. Carroll, personal communication, June 12, 2023). This policy was created to ensure the optimization of training and education investments made by the RAN in its officers and sailors. Table 1

[1] The nuance in the RAN is that officers are appointed their commission at entry, while sailors (enlisted personnel) are enlisted into the Navy.

[2] ADFA is the ADF's equivalent to military academies such as the US Naval Academy.

[3] IMPS is equivalent to first-term contracts in the US military.

shows the method of entry by workgroup and IMPS length. It specifically focuses on individuals who have directly joined from civilian life, and for whom the IMPS length has not been tailored to individual circumstances. I will now discuss Table 1.

The length of IMPS is tailored to the member's method of entry, specific job roles, and whether they serve as officers or sailors. For ADFA entry officers, commitments are 9 years for Engineers (Aeronautical, Mechanical, Weapons Electrical), Intelligence, Maritime Logistics, and Maritime Warfare officers; while Maritime Aviation Warfare Officers and Pilots have extended commitments of 12 and 14 years as they have extensive training programs (ADF Careers, n.d.-a).

Within the Sailor Entry category, IMPS commitments also vary depending on the member's job, training, and education. Dental Assistants and Musicians have a 3-year service commitment as they enlist having already completed tertiary education. Rates such as Aviation Support, Boatswain's Mate, Hydrographic Survey Operator, Maritime Logistics, Marine Technician, and Naval Police Coxswain require a 4-year service commitment. In more specialized rates, the IMPS is 6 years for Aviation Technicians, Electronics Technicians, Marine Technicians, Acoustics Warfare Analysts, Clearance Divers, Combat Systems Operators, and medical positions (ADF Careers, n.d.-a). Furthermore, female sailors also have the option to serve as Aviation Technicians, Electronics Technicians, or Marine Technicians for 2 years (ADF Careers, n.d.-a).

Indigenous candidates also have the option to enlist through the Defence Indigenous Development Program, which only requires a 6-month commitment (ADF Careers, n.d.-a). furthermore, the RAN offers a Gap Year program, open to both Sailors and Officers, enabling them to serve for a year. This initiative provides a unique experience, allowing individuals to contribute to the navy's operations while gaining valuable skills and insights into military life in a 'try-before-you-buy' type of program (ADF Careers, n.d.-a).

Table 1. Length of IMPS with respect to method of entry. Adapted from ADF Careers (n.d.) and Gray Carroll (personal communication, June 12, 2023).

Method of Entry for Officers	Functional Employment Categorization (Workgroup)	IMPS Length
ADFA	Engineering Officer (Aeronautical, Mechanical, Weapons Electrical), Intelligence Officer, Maritime Logistics Officer, Maritime Warfare Officer	9 years
	Maritime Aviation Warfare Officer	12 years
	Pilot	14 years
Direct Entry Officer, Undergraduate Entry Officer	Engineering Officer (Aeronautical, Mechanical, Weapons Electrical), Medical,[4] Dental, Nursing, Chaplain, Legal, Maritime Spiritual Warfare Officer, Training Systems Officer	3 years (no PQ training requirement)
	Intelligence officer, Maritime Logistics Officer, Maritime Warfare Officer, Remote Pilot Warfare Officer	6 years
	Maritime Aviation Warfare Officer	8 years
	Pilot	11 years
Reserve Entry (SERCAT 2, 3, 5)[5]	Management Executive Navy Information Effects Officer	3 years
Method of Entry for Sailors	Functional Employment Categorization (Workgroup)	IMPS Length
Sailor Entry	Defence Indigenous Development Program	6 months
	Aviation Technician (Aircraft, Avionics), Electronics Technician, Marine Technician	2 years (Option is only for females)
	Dental Assistant, Musician	3 years
	Aviation Support, Boatswain's Mate, Hydrographic Survey Operator, Maritime Logistics (Cook, Personnel, Supply Chain, Support), Marine Technician, Naval Police Coxswain	4 years
	Aircrewman, Acoustics Warfare Analyst (Submarines), Clearance Diver, Combat Systems Operator (Above, Below, Mine Warfare), Communications and Information Systems, Cryptologic (Linguist, Networks, Systems), Electronics Technician, Electronic Warfare, Medical	6 years
Gap Year	Sailors and Officers	1 year

[4] For direct entry medical officers only. Undergraduate and Graduate Medical Program officers have IMPS tailored to match their individual length of sponsorship (e.g., medical residency/internship, legal articles).

[5] SERCATs are explained in Chapter II, Section D.

Although these nuanced and diverse methods of entry underscore the RAN's commitment to accommodating a wide array of jobs, career aspirations and individual preference. However, separations at the end of IMPS are a common occurrence, not unlike what is seen in the U.S. military. Research by Dodds (2018) shows that sailors at the end of their IMPS were more likely to separate at a rate of 4.9% for non-technical jobs, and 6.6% for technical trades. Females are 14–82% more likely to separate during these early years. Additionally, length of service profiles show reduction in service that coincide with the end of IMPS (Dodds, 2018), which is like the profiles for the USN (Rodney, 2017) where the separations coinciding with the completion of first-term contracts are significant.

Recognizing the significance of IMPS-related separations, this thesis examines the workforce management implications of changes in IMPS policy on retention of RAN personnel, specifically changes to IMPS for females.

C. WOMEN IN THE RAN

The involvement of women in the RAN has undergone substantial changes over time. In its initial years, the navy offered women limited opportunities, primarily centered around administrative and support roles (Reghenzani, 2016). However, societal changes and a growing recognition of women's capabilities led to a broader range of opportunities for female personnel. In 1985, the Australian government disbanded the Women's Royal Australian Naval Service and integrated females into the RAN. In 2011, the navy not only recognized female contributions but also strategically tapped into a broader pool of talent by lifting all restrictions for females serving in combat/frontline roles (Reghenzani, 2016).

For some occupations, IMPS is seen as a barrier to entry. Therefore, in a bid to increase female participation, in 2014 the RAN offers female sailors the option to enlist under a shorter IMPS for the technical trades, thereby reducing their IMPS from 6 or 3 to 2 years (detailed in Table 1). For example, a female aviation technician can enlist under a two-year IMPS, while their male counterparts must enlist under a 6-year IMPS (ADF Careers, n.d.-a). Female officers are not offered reduced IMPS, likely due to having better retention rates (Department of Defence, 2022).

Currently, women constitute approximately 24% of the RAN's workforce. Emphasizing its dedication to creating a more diverse and inclusive environment, the RAN has set a goal to achieve 35% female representation by 2035 (Department of Defence, 2022).

D. RETENTION

The total active-duty service members for the ADF were 60,330 in FY21 and 59,803 in FY22, with a rolling separation rate of approximately 9.5% for FY21 and 11.2% for FY22 (Department of Defence, 2022). Table 2 details the breakdown of separation types in FY21 and FY22 between officers and enlisted. Compared to the U.S. military which has 1,335,848 active-duty service members (Department of Defense, 2021), the ADF is significantly smaller than the U.S. military, constituting only about 4.5% of its size. As a result, any separation within the ADF has a proportionally larger impact.

Table 2. ADF total separations for FY21 and FY22. Source: Department of Defence (2022).

		Voluntary Separations	Involuntary Separations	Age Retirement	Trainee Separations	Total
FY21	Officers	497	222	73	144	936
	Enlisted	2236	1692	59	747	4734
FY22	Officers	663	257	114	145	1179
	Enlisted	3010	1709	85	567	5371

For comparison to the wider ADF, Table 3 shows the total separations for the RAN in FY21 and FY22. During these time periods, the RAN had 15,464 members and a rolling separation rate of 7.2% in FY21, and in FY22, there were a total of 15,442 members with a rolling separation rate of 9.7% (Department of Defence, 2022).

Table 3. RAN total separations for FY21 and FY22. Source: Department of Defence (2022).

		Voluntary Separations	Involuntary Separations	Age Retirement	Trainee Separations	Total
FY21	Officers	105	41	24	41	211
	Enlisted	393	348	15	150	906
FY22	Officers	119	52	32	51	254
	Enlisted	649	437	21	104	1211

The retention of personnel is crucial for maintaining a cohesive and effective naval force. While recruitment brings fresh talent, retention ensures continuity, experience, and institutional knowledge. However, the RAN, like other modern militaries, faces many retention challenges. An independent report on the RAN's recruitment and retention of specialist skills found that the RAN relied heavily on retention bonuses as a means of retaining members in the short term, and there were still shortfalls in critical occupation (Australian National Audit Office, 2014).

The factors negatively influencing retention include career advancement opportunities, work-life balance, deployment frequency, job satisfaction, and the overall quality of the work environment. The RAN has implemented a range of strategies to address these challenges, including offering flexible work arrangements, providing support for military families, enhancing professional development programs, and fostering an inclusive organizational culture (Department of Defence, 2016).

The Total Workforce System (TWS), detailed in Figure 2, was introduced in 2016 to give members more flexibility with how they serve (Department of Defence, 2020). This system allows members to balance their careers with their personal lives by granting active service (SERCAT 6/7) and reservists (SERCAT 3/4/5) an opportunity to laterally transition to a service category that best suits them and the service.

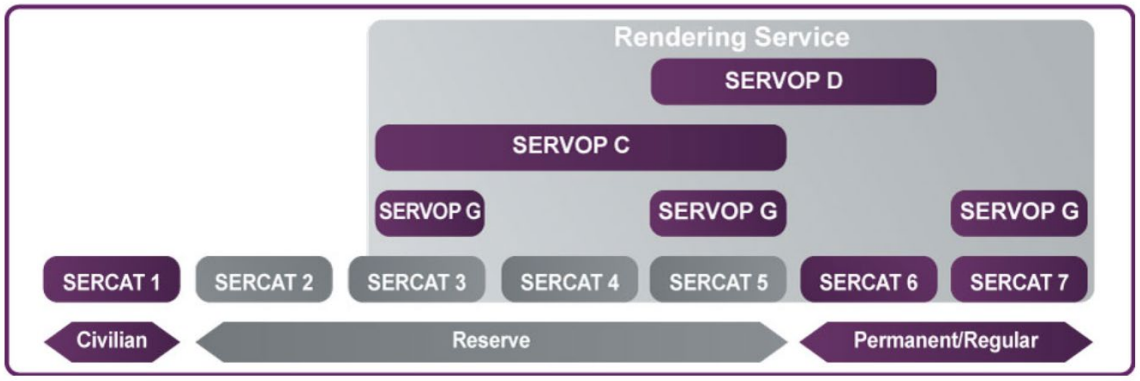

Figure 2. ADF Total Workforce System. Source: Department of Defence (2020).

The TWS provides the RAN with enhanced flexibility in responding to variations in recruitment and retention. This is made possible by enabling members and their career managers to tailor career paths to the unique life stages of each member, all while fulfilling service needs and strategic objectives.

As discussed, this chapter explores the challenges the RAN faces in retaining its members, particularly the impact of the initial service period on female retention.

III. LITERATURE REVIEW

While there has been limited research on IMPS in the RAN or gender difference in IMPS retention, I review the large literature on first term contracts and gender differences in recruitment and retention in this chapter. I conclude with a focus on specific studies relating to the RAN case.

A. RECRUITMENT

The demand for military manpower in most Western countries experienced significant changes following the end of the Cold War. There were substantial cutbacks in the military workforces across the U.S. and Europe due to the decreased demand for labor (Asch et al., 2007), and the supply of labor into the military due to the end of conscription in many Western countries, including Australia.[6] Military recruitment was further affected by the increased number of enlistment-aged individuals wanting to go to colleges and universities. The change from mandatory service to an all-volunteer force not only reshaped the composition of Western militaries but also prompted these countries to change their recruitment strategies and invest in innovative approaches to attract and retain skilled and motivated volunteers, ensuring the military remained capable and resilient in the face of evolving global challenges.

The recruitment strategies between the military and civilian sectors changed because incentives, monetary and non-monetary benefits, became critical to an individual's decision to serve. For example, the U.S. military recruits candidates with high-quality qualifications, including education levels and high Armed Forces Qualification Test (AFQT) scores. Then if there are periods of economic growth, such as that seen in the U.S. during the 1990s, military recruitment is likely to decrease (Asch et al., 2007). Additionally, for high schoolers, since this is the U.S. military's focus for potential candidates, the interest in enlisting declined as their years of schooling increased (Marshall & Brown, 2003).

[6] National Service Act 1964 was amended in 1973, thus ending conscription in Australia (National Archives of Australia, n.d.).

Successful recruitment happens when the utility from military service is greater than that of civilian employment (Asch et al., 2007). So, for recruitment to be successful the monetary benefits (e.g., wages) and non-monetary benefits (e.g., quality of life) must be greater than the monetary and non-monetary benefits of working in the civilian sector. Understanding how people behave in response to these incentives is crucial to understanding the dynamics of military recruitment in the face of evolving economic growth and other social factors. Figure 3 illustrates the key factors impacting U.S. military recruitment and retention, providing a comprehensive overview of the influential elements in this context.

Figure 3. Factors influencing U.S. military recruitment and retention. Source: United States Government Accountability Office (2023).

A tool for understanding the changes in an organization's recruitment strategies is called the workforce recruitment framework (Muchinsky, 2004). This framework revolves

around selection criteria, training performances and standards. The primary objective is to optimize the selection of individuals who align with the organization's values and have the potential for success within the organization's training continuum. Connected to this framework is the concept of organizational fit (Thomas & Bell, 2007) and perceived fit (Uggerslev et al., 2012). In the context of an all-volunteer military, which has a closed labor market, organizational fit refers to the organization's efforts to select the person that can fit into the organizational culture, to do the right type of work, at the right time.

From the national or organizational perspective, Ivey (2014) examined the commitments associated with an all-volunteer military, focusing on four key promises implicitly given in the Gates Commission when it transitioned the U.S. military from a conscription force. The first commitment is about the promise of individual freedom, arguing that a volunteer military aligns better with personal choice and societal morality, when compared to a conscription draft. The second commitment looks at fairness, with supporters promising that an all-volunteer military would promote equity, avoiding disproportionate impacts on disadvantaged individuals. The third commitment, called the pragmatic promise, says that a volunteer military would effectively meet workforce needs and maintain professionalism. However, manpower challenges developed during the prolonged wars in Afghanistan and Iraq, leading to the relaxation of military enlistment standards and the use of private military companies. The fourth commitment relates to the economic promise, which stresses the overall costs related to military service. Despite these promises, the implementation of an all-volunteer military has faced challenges. Reservists were deployed for extended periods, previous enlistment standards were relaxed, and private military companies were hired, raising concerns about fulfilling military needs without demanding broad personal sacrifices from U.S. citizens. Additionally, veterans and service members face social challenges at higher rates when compared to civilians, highlighting the unexpected consequences of the all-volunteer military model. These social challenges include veteran unemployment, homelessness, and suicides.

From the candidate's perspective, they enter the military with certain expectations about the job, quality of life and the conditions of service. These expectations are based on an evolving psychological contract (promise) they have with their service throughout their

career (Hastings, 2023). Additionally, candidates and their service need to have a personal interest in the results of their careers. This personal interest is called the 'Skin in the Game' theory (Hastings, 2023). Hastings (2023) proposed that to maintain a positive connection between the service and the member, the service must fulfill its commitments to the member to retain them. While recruiters may secure the candidate's signature, it falls upon the entire service to ensure the member remains within the organization.

As discussed earlier, the military, particularly the RAN, invests significant resources in recruiting individuals who meet specific criteria and align with the organization's values and goals. The fulfillment of these expectations forms the foundation of a positive psychological contract (Naweed et al., 2021), leading to increased job satisfaction, commitment, and retention. However, when these expectations are not met, whether due to a perceived lack of career progression, inadequate work-life balance, or other unmet promises, it can result in a breach of the psychological contract. This breach can lead to dissatisfaction, changes in attitudes, reduced morale, and eventually impact retention rates within the military (Naweed et al., 2021). Figure 4, from Naweed et al.'s (2021) research, presents a schematic detailing the intricate dynamics involved in the formation and breach of psychological contracts seen in the ADF.

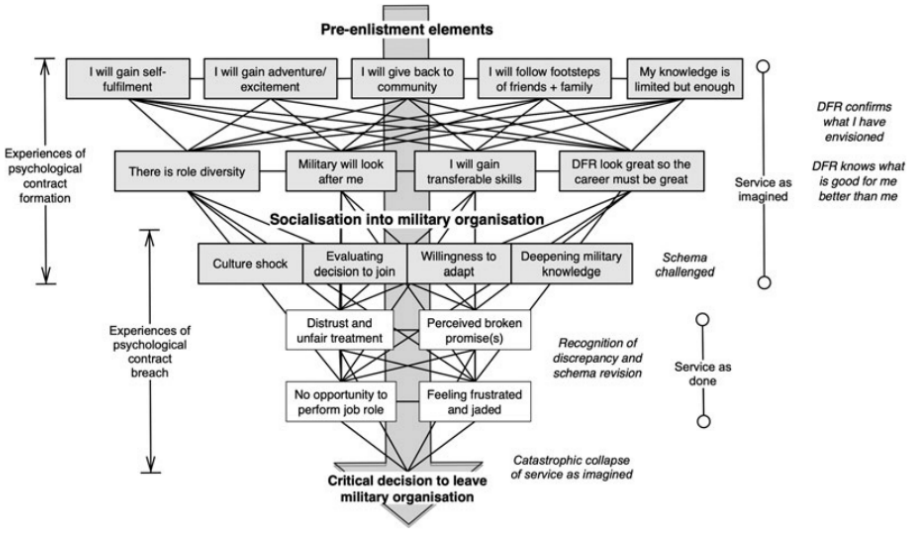

Figure 4. Schematic for the form and breach of psychological contract. Source: Naweed et al. (2021).

Understanding and managing these psychological contracts are crucial in not only attracting the right candidates but also in retaining them, which is explored further in the subsequent section on retention.

B. RECRUITMENT AND GENDER

Historically, military recruitment preferred male candidates, limiting women's participation in various roles. However, initiatives by military organizations such as the RAN, have aimed at encouraging female participation in traditionally male-dominated occupations (Reghenzani, 2016). Service restrictions were lifted on women serving in combat and front-line roles in the Canadian Armed Forces in 2001 (Baral, 2018), followed by the U.S. military in 2015 (Schwartz & Lubold, 2015), ADF in 2016 (Reghenzani, 2016), and the UK Armed Forces in 2018 (Fieldhouse & O'Leary, 2023). This change was a significant milestone in promoting gender equality within military recruitment practices. Additionally, all these nations have implemented pay parity, ensuring equal compensation for men and women in similar roles at entry into the military (ADF Careers, n.d.-b; Government of Canada, n.d.; MOD Crown, 2023; Rostker, 2006; Royal Air Force, 2023; Royal Navy, 2023). Since jobs are available and the pay for females is the same as for males, it then becomes crucial to explore the motivations and experiences of female accessions.

Research into the motivations and experiences of U.S. female veterans found that some women chose military service as a lifelong career, having been drawn in by the financial stability, training, and leadership development it offered, since they felt that these were factors that were missing in the civilian workplace. Many veterans valued the structured military environment and associated benefits. The research shows the importance of developing policies that consider the motivations of females to enlist, retention strategies, and post-military support required for female veterans. This is significant when thinking about the military's goal to increase female participation. The research also highlights the challenges faced by some women in translating their military skills into civilian jobs, highlighting the complexities of job and skill transfer after service (Mankowski et al., 2015).

Examining how young men and women perceive various benefits emphasized in U.S. military recruitment campaigns, Marshall and Ulysses (2003) analyzed intrinsic and extrinsic benefits of military service. Their results showed that males presented a stronger preference for 'combat and firearms training.' Additionally, intrinsic rewards for 'adventure' and 'having a disciplined lifestyle' showed no significant difference between males and females, which suggests these are of similar importance to both men and women when they are considering military service. However, there were gender differences in intrinsic rewards like 'training in the job I choose,' 'belonging to a team,' and 'to make life-long friendships,' where females valued these benefits more than males. There were also gender differences in the available financial benefits like 'VA home loan benefits' and 'guaranteed medical care' as females gave higher importance to these than males, possibly due to the perceived necessity and challenges associated with medical costs in American civilian life and the continuing low pay in many traditionally female jobs (Marshall & Ulysses, 2003). Free medical is a benefit that is also touted in the ADF.

In comparing gender-specific policies across various navies, including the USN, Royal Navy, Royal Canadian Navy, and the RAN, similarities and distinct differences emerge. All four navies have maternity/paternity leave and benefits policies, single parent or dual-military couple policy, family planning, career development and pathways, fitness standards, shipboard living conditions and limitations. It is important to note that the RAN is the only service that offers mentoring, leadership, and networking programs specifically for females (Eitelberg et al., 2014). Furthermore, the Royal Navy and USN both offer support for childcare services to their members (Eitelberg et al., 2014), something that the RAN does not as it relies on support from the Australian Government directly to the members.

C. RETENTION AND SEPARATION

Retaining skilled members is essential for the effectiveness of any nation's military. With a total of 1,335,848 active-duty service members, the U.S. military had a separation rate of 11.7% in 2021 (Department of Defense, 2021). Figure 5 shows the breakdown of separation types, of which 49.4% of members separated voluntarily in 2021.

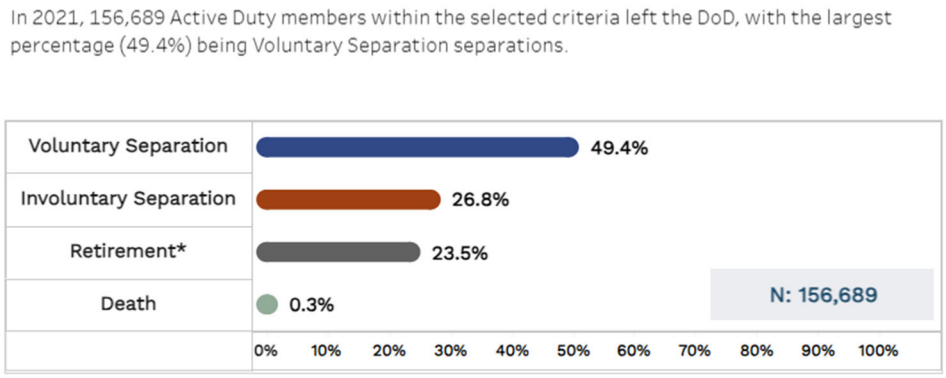

Figure 5. Total active-duty members and separations for the U.S. military in 2021. Source: Department of Defense (2021).

The retention of service members is crucial for sustaining organizational stability and operational effectiveness. Job satisfaction, work-life balance, family formation and avenues for career advancement significantly influence retention rates (Eitelberg et al., 2014).

Jordan et al. (2015) studied the factors impacting turnover, focusing on qualities such as generalized self-efficacy, grit (signifying perseverance and consistent effort), and perceived organizational support. The study assessed how these traits influence a cadet's decision to contract, indicating their commitment to join the U.S. military after graduation from their university's Corps of Cadet program. These decisions are significant because they reduce workforce turnover and support retention rates amongst officers. The study proposed a trial decision-to-contract framework, investigating whether grit correlates positively with the cadet's contracting decision. Using logistic regressions, the study shows that self-efficacy and grit did not demonstrate any significant relationships with the cadet's contracting choices. But the cadet's decisions to contract was linked to their perceived organizational support. This result contradicts prior research by Suazo and Stone-Romero (2011), who showed that the perceived organizational support was an intermediary in relationships relating to psychological contract breach outcomes. In this case, higher perceived organizational support increased the likelihood of negative outcomes because of the breach in their psychological contract. This suggests that while the perceived

organizational support might lower the adverse effects of a breach for new accessions, it could increase the impact of psychological breaches later for veterans (Jordan et al., 2015).

Marrone (2020) did a comparative analysis across military services to find out if individuals who eventually leave the military can be distinguished from those who will continue to serve at the time of their accession. The study used data from all enlisted accessions in the U.S. Army, U.S. Air Force, U.S. Marine Corps, and USN from fiscal years 2002 to 2013. Female soldiers in the U.S. Army had higher attrition rates when compared to their counterparts in the other services, and individuals without a high school diploma in the USN were more susceptible to attrition. Moreover, married recruits showed a higher likelihood of leaving within the first 12 months, although those who served beyond this period experienced reduced attrition rates later. These findings emphasized the complexity of attrition, with individual traits and experiences interacting to influence attrition rates during different stages of the initial contract period. The study highlighted the inadequacy of simplistic screening policies based on attrition probabilities, as a significant portion of military attrition remained unpredictable, likely because of unobservable factors related to an individual's suitability for military life, specific services, roles, or units. Additionally, individuals who left the military not long after initial entry often had extended service periods after they reenlisted. These results underscored the need for tailored recruitment strategies for each service, considering the unique demands of each branch, and effective attrition reduction strategies that align with the recruits' traits and service-specific expectations. The dynamic relationship between recruit suitability, service expectations, and culture played a decisive role in shaping separation rates within the military (Marrone, 2020).

Gender specific challenges influence retention rates, especially for female personnel. Research (Bridges et al., 2020; Smith & Rosenstein, 2017) indicates that the conditions of service, quality of work-life balance, career advancement opportunities, deployment frequency, discrimination, professional mentorship and overall work environment and culture significantly influence the retention decisions of women. When these factors are viewed through a gendered lens, then the disparities in retention rates are highlighted, showing the need for targeted retention policies.

Smith and Rosenstein (2017) studied the challenges faced by women in male-dominated fields, specifically focusing on military roles where female retention rates are lower than men's. This is often due to family-related matters. Social psychosocial factors such as self-efficacy, stereotype threat, and bias play a role in the challenges women face in continuing their careers in unconventional fields like science and technology. This research investigates the impact of role models on the career aspirations of women in military and service academies using ordinary least squares regressions. Surveys from U.S. Naval Academy (USNA) students show that peers have a more significant impact on the career aspirations of female midshipmen than family or officers. Therefore, the research analyzes the relationship between work and family expectations, considering factors such as work-family conflict, gender ideology, and family planning. It stresses the importance of tackling social and organizational factors that affect women's career decisions and longevity in male-dominated fields. The study specifically analyses career attitudes and intentions during early socialization at USNA. Notably, both men and women leave the military due to family related issues, highlighting the importance of addressing these challenges for all service members. The research uses diverse metrics, including assessing intended years of military service and analyzing the impact of role models on career intentions, as well as considering participants' family plans such as marriage and children.

In another study, Asch et al. (2016) demonstrated the impact of work-family dynamics on the career advancement of female officers. Using the Blinder-Oaxaca decomposition, they found that female officers, when compared to their male counterparts, were less likely to have graduated from military academies, often held administrative positions, and were either unmarried or dual-military spouses with fewer dependents than male officers. Notably, family status, particularly marital status, and dependents, significantly influenced gender gaps at specific career milestones. This was due to the common trend observed in educated women, to postpone marriage and childbirth, which mirrors civilian employment patterns; while married men enjoyed more promising career outcomes. Furthermore, female officers faced disadvantages in terms of occupational roles and cumulative deployment months. The study highlighted the complex gender-specific

effects on career progression, stressing that family status tended to hinder female officers, contributing to the gender gap in O3 retention and O4 promotion.

D. AUSTRALIAN STUDIES

Examining Australian military-specific studies offers insights into the effectiveness of targeted interventions and their implications for broader military settings. In the first study, Hoglin and Barton (2015) look for ways to identify pre-enlistment characteristics that could forecast IMPS attrition within the ADF. They conducted a distinctive analysis using data for the Electronic Psychology Record and Information System (recruitment data) and the ADF's human resource system (in-service data), examining 11,372 ab-initio sailors, soldiers, airmen, and airwomen who enlisted between July 1, 2002, and July 1, 2007. Using a logistic regression model, they found that specific pre-enlistment factors could predict early attrition. Specifically, individuals with lower pre-enlistment levels of education, aptitude scores, and psychologist interview ratings at enlistment were more likely to experience first-term attrition. This finding is like that seen in the U.S. studies listed above. Hoglin and Barton (2015) also highlighted that recruits enlisting into combat roles were more likely to separate early when compared to those enlisting into administrative or logistics positions, often because of injuries sustained during training. They also found that unlike in the U.S. studies where black recruits had a higher likelihood of completing their first term, Australian Aboriginal and Torres Strait Islander recruits had higher separation rates and were less likely to complete their IMPS with only 66% completion when compared to non-Indigenous Australian-born recruits.

The study by Thomas and Bell (2007) on recruitment and retention in the ADF, using secondary data from Defense Exit and Attitude Surveys, found that after 15 years of service, personnel were less likely to leave for civilian careers which aligns with the ADF's bonus retention strategy. However, the study highlighted that money is not a key factor for female retention. Non-pay strategies like education and location stability are recommended to encourage ADF members to stay beyond 15 years. Applying Levinson's life stage concept, the study found reasons for leaving change with service length. Those with less than 5 years cited job dissatisfaction, while those with 10–15 years aimed for a career

change, and those with over 15 years desired stability. The study emphasizes flexibility in HR practices for effective retention, considering the diverse labor market. The article introduces a conceptual framework showing HR practices' impact on ADF outcomes. Recruitment strategies balance culture and structure for organizational fit, but a focus on fit risks creating a homogenous workforce. Selectivity in recruitment aims for a high-quality workforce, requiring the ADF to be an employer of choice. The study underscores the need to align HR practices with the market, manage expectations, and develop tailored strategies for diverse ADF sub-groups. Effective psychological contract management is crucial for organizational commitment, performance, and reduced turnover.

Cole (2019) looks at the difficulties the RAN faces in recruiting, training, and keeping sailors, especially those in technical roles. Cole (2019) uses advanced computer programs, with a focus on the Linear Support Vector Machine (SVM) model, to analyze surveys from sailors who left between 1999 and 2018 after serving for four to eight years. The aim is to understand why sailors decide to leave, especially at important career milestones like IMPS. Machine learning proves better at figuring out why technical and non-technical sailors leave compared to older methods. Cole (2019) discovered that non-technical sailors were primarily concerned about pay, time at sea, and a lack of recognition, while individuals with technical skills were worried about their inability to use their skills and their awareness of the value of those skills outside the RAN. Cole (2019) also suggests asking specific questions in interviews and looking at how groups of people work together to predict if someone might leave. The analysis also found differences in feelings and behaviors between technical and non-technical sailors. Additionally, this study looked at how sailors at different ranks feel at two important points in their careers: after four to five years and six to seven years. This is when they can choose to leave. Understanding these feelings can help the navy know how to keep sailors satisfied and prevent losing important skills at critical times.

Dodds (2018) conducted an extensive analysis of length-of-service/survival profiles by RAN occupational workgroups. The research considered factors such as rank, workforce category, gender, age group, and enlistment cohort, aiming to comprehend service duration patterns. Dodds (2018) analyzed transactional data for 21,820 service

periods involving 21,495 members using Kaplan-Meier and Cox proportional hazard methods to determine the impact of these factors on separation behavior. The research showed there was a 10.3% separation rate within the first year, indicating potential workforce mismatches for new RAN members. Additionally, the research stressed the role of rank in separation behavior, in particular sailor rank at enlistment and separation. Dodds (2018) also found non-linear relationships between gender, age group, and length of service. On average, females were 10% more likely to separate than males throughout the analysis period, with gender differences being noticeable in the early years of service. This could be influenced by life cycle factors like childbearing and child-rearing responsibilities. The study recommended that efficiency gains could be achieved through targeted retention measures at specific years of service. Furthermore, optimizing limited resources could involve focusing retention policies on lengths of service at 4 and 6-years and implementing gender-specific retention policies in the early years of service. To address gender balance within the RAN workforce, the study recommended policy changes for gender diversity be focused on women with less than 10 years of service, as their separation behavior beyond this period did not significantly differ from males. Rank was also a vital workforce factor. The study recommended that more effort is made to incentivize sailors to extend their service beyond their 4 and 6-year IMPS terms, rather than just training new recruits. Additionally, Dodds (2018) recommended targeted incentives for officers in their initial three years of service, which coincides with their highest rates of separation. The study also recommended a review to balance the increased recruiting costs against the outcomes achieved, including the removal of bad workforce matches as the highest separation rate is seen in the first year of service for both officers and sailors. Further research was proposed to find out if the observed gender gaps in separation behavior during the initial years of service are specific to only particular workgroups or are applicable across the entire RAN.

The studies reviewed in this chapter highlighted mismatched occupation assignments, unpredictable deployments, and limited resources significantly affect retention rates. Furthermore, these studies showed substantial gender disparities in military career progression. Female officers encountered obstacles in retention and promotion when

compared to their male counterparts, with family status, marriage, dependents, educational background, and occupational factors playing pivotal roles in shaping their careers. To gain deeper insights, some studies used statistical methods like the Blinder-Oaxaca decomposition and survival analysis techniques such as Kaplan-Meier and Cox proportional hazards to analyze military data comprehensively, enabling them to draw meaningful conclusions about retention, promotion, and separation behaviors among military personnel.

This literature review highlights a research gap. While many studies have explored recruitment, first-term contracts, and retention, often through a gendered lens, in Western militaries like the U.S., few studies have looked at the RAN. My thesis fills this gap by examining the influence of IMPS on retention in the RAN and assessing potential gender variations in its impacts.

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IV. DATA AND METHODOLOGY

In this chapter, I am describing the dataset and variables used in this thesis, along with the methodology I am using.

A. SOURCE OF DATA AND PREPARATION

My data is provided by the RAN, through the Strategic Workforce Planning and Analysis–Navy (SWPA–N). The datasets cover the period from January 1, 2003, to May 31, 2023, encompassing all separations from the RAN and population data for active service personnel taken as a snapshot on May 31, 2023. A notable constraint in RAN research on IMPS separations, as well as separations in general, stems from insufficient data availability and suitable variables for analysis. While separation rates at the workgroup/occupation level have been broadly tracked, the characteristics of individuals who separate or remain have rarely been systematically and collectively recorded with adequate validity. Additionally, the human resource information systems from which the ADF data warehouse draws its information, was originally designed for individual-level details, and is not configured to provide panel or longitudinal data, thus necessitating significant data restructuring (Hoglin & Barton, 2015).

After cleaning the datasets and excluding Warrant officers (E9 and E10) and senior officers (O7-O9), I retain 26,389 unique individuals, who were in active-duty service in the RAN at any point from 2003 to 2023. To ensure I consider only the first enlistment spell consistent with my research question, with the initial entry into the navy as the focal point of observation, I exclude any subsequent enlistments, separations during those subsequent enlistment spells, or changes in occupation from this analysis. Consequently, each person has at most one (initial) enlistment and one separation (if any associated with that initial enlistment).

The final extract incorporates details such as separation dates, reasons for separation, and marital status, number of dependents, and tertiary education attainment observed at data extraction and separation. I exclude E9s, E10 and senior officers from my

analysis, as they have served well past their IMPS obligation and would not significantly impact my results. I also exclude members with missing gender indicators.

B. VARIABLES

For my analysis, I first create an indicator variable to identify whether a member has separated from the service; this variable serves as the dependent variable for my analysis. Then I create additional dependent variables, beginning with indicator variables to distinguish officers from enlisted sailors and males from females.

Using the IMPS lengths listed in Table 1, I assign the IMPS type categorical variables to match the method of entry and workgroup. I make another variable for IMPS to differentiate between officer and enlisted sailor IMPS; those currently in service; those who have fulfilled their IMPS obligation; and those who have separated with an outstanding IMPS commitment.

I make a categorical variable to represent the different workgroups for officers and enlisted sailors as the variable for workgroup in its original form consists of 52 unique occupations. Therefore, after the split, I have 25 workgroups for officers and 27 for enlisted sailors. As outlined in Chapter II, career flexibility in terms of occupation and service changes is not uncommon in the RAN, therefore, this thesis focuses solely on the initial workgroup and its associated IMPS term. While incorporating occupation and service changes as variables is possible, the former is intricately linked to time and demands separate considerations. While overlooking changes in occupation (and service changes) might result in some error, my research questions specifically focus on the likelihood of IMPS completion based on enlistment characteristics within the initial service period, encompassing considerations of conditional separation probabilities. Therefore, I believe that using the original occupation and IMPS variable is more suitable for the intent of this thesis.

I include an indicator variable to determine if members have tertiary education at data extraction and separation. The ADF's human resource information systems regularly update the education field, along with other fields, when members report changes in their education credentials. This process overwrites previous information. Consequently, my

indicator variable reflects the most recent known education qualification rather than the qualification at the time of enlistment. I then create indicator variables for marital status at data extraction and separation, and if the members have dependents. To capture age at data extraction and separation, I create indicators for age groups such as from less than 20 years, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, 60–64, to 65–69. These demographics match those identified in the literature as being significant for why people separate from the military.

The duration of naval service, referred to as 'time in service,' is a continuous variable measured in years, covering the period from a member's enlistment or commission in the RAN up to the census date of May 31, 2023. Following this, I create a continuous variable representing the length of service in years from first entry into the RAN to separation.

C. SUMMARY STATISTICS

Currently, the RAN has 14,432 active service members, of which 72.4% are enlisted sailors. The summary statistics in Tables 4 and 5 show the mean values for the key variables I use in my analysis for officers and enlisted sailors.

In Table 4, the summary statistics for officers show that there is a difference between male and female officers, with males having a slightly higher average time in service at 14.6 years compared to females at 12.7 years. The standard deviations, denoted in parentheses, show that there is considerable variability in the years of service within both male and female groups. Looking at the IMPS indicators, officers with shorter IMPS durations (1 year, 3 years, and 6 years) constitute a larger proportion compared to those with longer durations. The largest proportion for males, at an average of 29.2%, are those on 6-years IMPS, while for females the largest proportion is at the 9-year IMPS, at 28.0%. Separation for the entire sample stands at an average of 31% for both male and female officers.

The breakdown of officer career characteristics based on workgroup indicators shows variations in representation across different occupational roles, and I have provided summary statistics for the five largest workgroups. The largest workgroup, Maritime

Warfare Officers, has an average of 16.6% male and 14.9% female officers, while the workgroup for Pilots has 4.9% male officers and 1.5% female officers. Female representation is higher in the Maritime Logistics Officer workgroup at 10.5%, than males at 4.5%.

In terms of demographics, female officers constitute an average 23.6% of the total sample. A significant percentage of officers are married or in a recognized relationship, with a higher average proportion among males at 44.5%. The representation of officers with dependents is comparatively smaller at 9.1% and 5.7%, respectively, for males and females. Additionally, an approximate average of 40% of officers hold a tertiary degree, with a higher proportion among females (43.8%).

Table 5 is the summary statistics for enlisted sailors. Like Table 4, I only include representative workgroups. The average time in service for enlisted personnel reveals a distinct gender-based difference, with males averaging approximately 11.42 years and females averaging 9.68 years.

The analysis of IMPS indicators shows variations in the representation of enlisted personnel with shorter IMPS durations. Females show a higher proportion of being in the 2-year category at an average of 3.5% compared to males at 0.2%. The mean separation is comparable between male and females at 49.6% and 48.6%, respectively. Workgroup indicators reveal distinct role-specific patterns within the enlisted workforce, particularly in technical trades. In the Aviation Technician Aircraft (ATA) workgroup, there is a relatively balanced representation between males and females at averages of 4.4% and 3.0%, respectively, compared to the Aviation Technician Avionics (ATV) workgroup that has a higher proportion of males (3.8%) compared to females (1.9%). Electronics Technicians (ETs) show notable differences with an average of 15.4% males and 4.8% females. The largest contingent of enlisted sailors is found in the Marine Technician (MT) workgroup, which has 22.8% males and 6.2% female representation. Note from Table 1 that these workgroups are the ones that offer a reduced IMPS length for females. For the non-technical occupation, the Communications Information Systems workgroup exhibits a higher mean representation of females at 13.5%, compared to males at 6.2%.

For enlisted demographics, marriage or in a recognized relationship is observed in 25.5% of male enlisted sailors, while females have a lower mean percentage at 20.6%. The proportion of individuals with dependents remains consistent between genders, each accounting for 10%. Furthermore, a small percentage of enlisted sailors possess a tertiary degree, with figures standing at an average of 1.9% for males and 2.9% for females. The age distribution among enlisted personnel shows varied representation across different age brackets. A noteworthy trend is the large presence of enlisted personnel under the age of 30, followed by a gradual decline in representation in older age groups—a pattern mirrored in Table 4 for officers. Next, I outline the methodology I use to assess the relationship between IMPS and separation.

Table 4. Summary statistics – Officers

Summary statistics – Officer

Variable	Full Sample	Male	Female
Time in service (in years)	5,770	14.571 (10.511)	12.717 (9.018)
IMPS indicators			
1 year	5,305	0.161 (0.368)	0.140 (0.347)
3 years	5,305	0.077 (0.267)	0.113 (0.316)
6 years	5,305	0.292 (0.455)	0.259 (0.438)
8 years	5,305	0.024 (0.155)	0.016 (0.127)
9 years	5,305	0.213 (0.410)	0.280 (0.449)
11 years	5,305	0.017 (0.128)	0.012 (0.109)
12 years	5,305	0.007 (0.084)	0.010 (0.098)
14 years	5,305	0.019 (0.136)	0.010 (0.098)
Separated	5,770	0.310 (0.463)	0.306 (461)
Officer career characteristics Workgroup indicators			
Marine Engineer	5,770	0.083 (0.275)	0.034 (0.182)
Maritime Logistics Officer	5,770	0.045 (0.208)	0.105 (0.307)
Maritime Warfare Officer	5,770	0.166 (0.372)	0.149 (0.357)
Pilot	5,770	0.049 (0.215)	0.015 (0.120)
Weapons Electrical Engineer	5,770	0.079 (0.270)	0.024 (0.154)
Demographics Female	5,770	0	1
Married	5,770	0.445 (0.497)	0.352 (0.478)
Has dependent(s)	5,770	0.091 (0.287)	0.057 (0.232)
Has a degree	5,770	0.399 (0.490)	0.438 (0.496)
Age Group			
< 20	5,770	0.041 (0.197)	0.073 (0.261)
20-24	5,770	0.172 (0.378)	0.230 (0.421)
25-29	5,770	0.191 (0.393)	0.192 (0.394)

Variable	Full Sample	Male	Female
30-34	5,770	0.156 (0.363)	0.158 (0.365)
35-39	5,770	0.130 (0.334)	0.128 (0.335)
40-44	5,770	0.089 (0.285)	0.077 (0.267)
45-49	5,770	0.080 (0.271)	0.063 (0.243)
50-54	5,770	0.073 (0.260)	0.056 (0.230)
55-59	5,770	0.053 (0.224)	0.020 (0.141)
60-64	5,770	0.014 (0.117)	0.003 (0.053)
Observations	5,770	4,337	1,433

Note: Standard deviations in parentheses. The table displays summary statistics for representative workgroups. Age group 65–69 not presented due to its limited representation.

Table 5. Summary statistics – Enlisted.

Summary statistics – Enlisted

Variable	Full Sample	Male	Female
Time in service (in years)	20,619	11.418 (7.370)	9.677 (6.163)
IMPS indicators			
1 year	20,368	0.146 (0.353)	0.168 (0.374)
2 years	20,368	0.002 (0.048)	0.035 (0.184)
3 years	20,368	0.011 (0.105)	0.014 (0.118)
4 years	20,368	0.281 (0.449)	0.375 (0.484)
6 years	20,368	0.493 (0.500)	0.373 (0.484)
Separated	20,619	0.496 (0.500)	0.486 (0.500)
Enlisted career characteristics			
Workgroup indicators			
Aviation Tech Aircraft	20,619	0.044 (0.205)	0.030 (0.171)

Variable	Full Sample	Male	Female
Aviation Tech Avionics	20,619	0.038 (0.192)	0.019 (0.136)
Communications Information Systems	20,619	0.062 (0.241)	0.135 (0.342)
Electronics Technician	20,619	0.154 (0.361)	0.048 (0.213)
Marine Technician	20,619	0.228 (0.420)	0.062 (0.241)
Demographics			
Female	20,619	0	1
Married	20,619	0.255 (0.434)	0.206 (0.405)
Has dependent(s)	20,619	0.100 (0.300)	0.100 (0.301)
Has a degree	20,619	0.019 (0.136)	0.029 (0.169)
Age Group			
< 20	20,619	0.065 (0.247)	0.083 (0.277)
20-24	20,619	0.253 (0.435	0.321 (0.467)
25-29	20,619	0.281 (0.450)	0.290 (0.454)
30-34	20,619	0.171 (0.376)	0.162 (0.369)
35-39	20,619	0.094 (0.292)	0.074 (0.261)
40-44	20,619	0.053 (0.224)	0.038 (0.191)
45-49	20,619	0.036 (0.187)	0.016 (0.124)
50-54	20,619	0.032 (0.176)	0.011 (0.104)
55-59	20,619	0.013 (0.115)	0.005 (0.070)
60-64	20,619	0.002 (0.040)	0.001 (0.029)
Observations	20,619	15,812	4,807

Note: Standard deviations in parentheses. The table displays summary statistics for representative workgroups. Age group 65–69 not presented due to its limited representation.

D. METHODOLOGY

My analysis begins by determining the different average lengths of service by IMPS types for officers and enlisted sailors separately. I first use univariate kernel density estimation to show these differences by providing a visual representation of the distribution of lengths of service within the enlisted and officers' workgroups, segmented by IMPS length. Duong (2007) describes kernel density estimation as a non-parametric way to estimate the probability density function of a random variable and visualize its distribution. The equation for kernel density estimation is

$$\hat{f}(x) = \frac{1}{n}\sum_{i=1}^{n} K\left(\frac{x-x_i}{H}\right), \quad (1)$$

where $\hat{f}(x)$ is the estimated probability density at point x_i; n is the number of data points; x_i is the length of service, the index i denotes the various values of length of service; K is the kernel function; and H is the bandwidth, which is an important parameter that affects the trade-off between bias and variance in the estimation.

I use kernel density estimation to show whether certain IMPS lengths are more common or have a wider variance in one group versus the other, which can suggest differences in retention (or separation tendencies). I plot the kernel density for the length of service variable separately for females and male officers, and male and female enlisted sailors, with the output presented as distinct graphs based on their IMPS length in years. The y-axis represents the density of the data points, illustrating the probability of the length of service for that IMPS type. I then plot the length of service variable for female enlisted sailors by their 2-year, 4-year, and 6-year IMPS types.

One limitation to using kernel density estimation to characterize lengths of service for female enlisted sailors is the small sample size. This may result in less reliable density estimates over some points of the distribution.

Next, I use Kaplan-Meier survival analysis to estimate the survival function of length of service. Read (1997) describes this type of analysis as a non-parametric statistical method used to estimate the probability of survival over time. In this instance, it is the

probability of remaining in active service over time by examining the time until the separation events occur, using this equation:

$$S(t) = \Pr(T \geq t). \tag{2}$$

This survival analysis helps me describe and estimate service members' survival probabilities over time, particularly in characterizing separation profiles based on years pf service. Using the Kaplan-Meier estimator, I estimate the survivor function, $\mathrm{S}(t)$, using this equation:

$$S(t) = \prod_{j \leq t} \left(\frac{n_j - d_j}{n_j} \right), \tag{3}$$

where the number of people, n_j, is at risk at time, j, and d_j is the number of failures in time j. This analysis involves plotting survival curves to illustrate the probability of retention at each time point. I use these plots to visualize the survival profiles of officers and enlisted sailors based on their IMPS lengths, providing conditional probabilities of separation. Drops in the survival curves at the end of specific IMPS periods highlight a propensity for service members to leave upon fulfilling their initial service obligations. I exclude members with IMPS completion dates after May 31, 2023.

I then map survival curves for IMPS lengths among officers, enlisted sailors, and enlisted females based on their length of service. Separating officers and enlisted sailors in distinct curves allows for a direct comparison of survival probabilities. This approach assesses whether officers with longer IMPS exhibit distinct retention rates compared to those with shorter IMPS, and whether a similar pattern holds for enlisted personnel. Kaplan-Meier curves visually display these differences, while the log-rank test evaluates the statistical significance of length-of-service differences.

I find that Kaplan-Meier survival analysis has limitations that directly impact my research questions. Small sample sizes, particularly in subsets with rare events, such as females in the 2-year IMPS type or females in aviation jobs within the 11 to 14-years IMPS types, can compromise its performance. As a non-parametric method, Kaplan-Meier lacks

insights into the hazard function's shape and the underlying distribution. To address this limitation, I use the Cox proportional hazards model.

The Cox proportional hazard model, as outlined by Deo et al. (2021), is a statistical method for survival analysis, exploring the relationship between the time until an event (such as separation) and one or more independent variables. The hazard function equation is

$$h(t) = h_0(t)e^{b_1X_1+b_2X_2+\cdots+b_pX_i}, \quad (4)$$

where, h represents the expected hazard at time t and $h_0(t)$ is the baseline hazards when all the covariates X_i, are equal to zero. I use Cox proportional hazards models to evaluate factors influencing the timing and likelihood of separation, giving hazard ratios for various IMPS lengths, while considering predictor variables such as gender, age, family status, and educational achievement.

A limitation to using Cox proportional hazards is it assumes that the hazard ratios for different levels of a covariate remain constant over time (proportional hazards). If hazards for distinct groups, such as IMPS types and gender, do not remain proportional over time, the model may give biased hazard ratios, impacting the accuracy of conclusions drawn about the influence of IMPS type and gender on the risk of separation. Also, in small datasets with a limited number of separation events, the model's hazard ratio estimates may show wide confidence intervals, which makes it hard to draw robust conclusions.

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V. RESULTS

In this chapter, I use kernel density estimation and Kaplan-Meier survival estimates to present the average length of service for officers and enlisted sailors. Then, I present results from Cox proportional hazards showing gender differences in separation.

A. LENGTH OF SERVICE

1. Average Length of Service

Figure 6 shows kernel density curves for officers and enlisted sailors by gender. Peaks in the curves represent concentrated service lengths, with higher peaks indicating more members at those lengths. Most curves are skewed to the left, indicating shorter service lengths are more common. Flatter portions of the curves show wider variation in service lengths beyond IMPS obligations. When the curves are close, it suggests minimal differences in service length distribution between genders, especially after completing IMPS. Service patterns between genders show distinctions, with the blue lines (females) being shorter and peaking higher in the early years of service compared to the orange lines (males). Female officers exhibit higher peaks in their initial years of service, particularly for those with 8 and 11-year IMPS. The kernel density for enlisted sailors on the right shows similar peaks to officers, but the curve is influenced by the larger enlisted sailor population.

In Figure 7, I present just the kernel density for female enlisted sailors on the short 2-year IMPS and compare them to females on the longer 4 and 6-year IMPS types. The left-skewed orientation of all the kernel density curves is evident, representing higher frequencies at the early stages of service, and reaching their peaks around the time of IMPS completion. The highest peak of this graph occurs at the two-year mark and has an approximate density of 0.33. This is expected since this IMPS category is the smallest among the enlisted sailors.

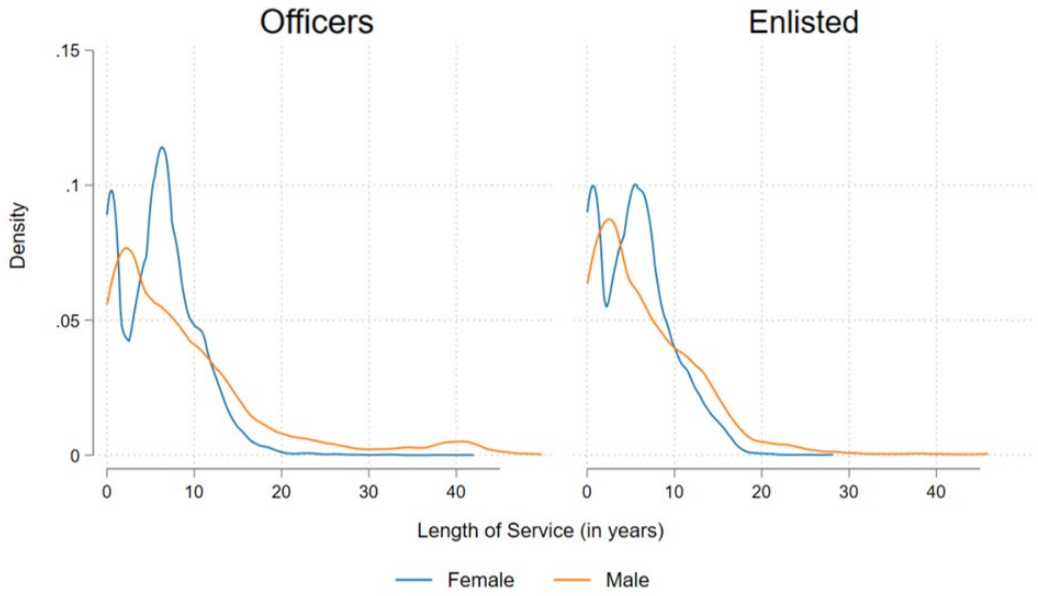

Figure 6. Kernel density estimations for officer and enlisted length of service (in years), by gender.

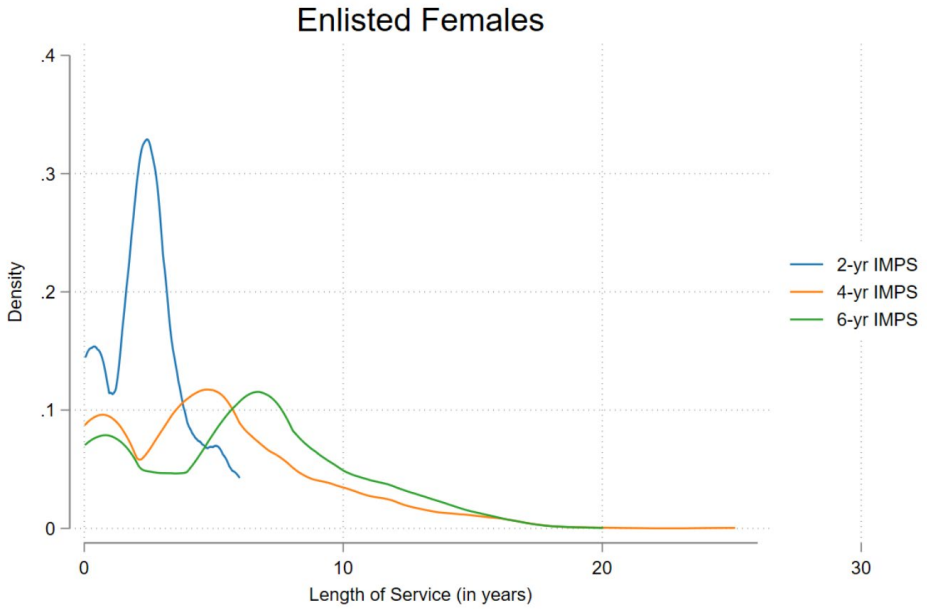

Figure 7. Kernel density estimations for female enlisted sailors.

2. Kaplan-Meier Survival Estimates

Figure 8 shows survival profiles for officers based on their IMPS lengths, using Kaplan-Meier graphs to show the likelihood of remaining in service over time. These graphs reveal step-downs, indicating instances of separation. Officers on 3-year IMPS exhibit higher survival rates than those on longer IMPS obligations. After three years of service, 86.7% of 3-year IMPS officers remain in the navy, compared to only 63.9% for those on 9-year IMPS. This pattern persists when comparing officers on 11-year and 14-year IMPS (pilots with different entry methods), with 82.8% of 11-year IMPS pilots remaining at three years, as opposed to 62.1% of 14-year IMPS pilots. At the six-year mark, 44.4% of 12-year IMPS pilots remain, while 14-year IMPS pilots reach 0% survival.

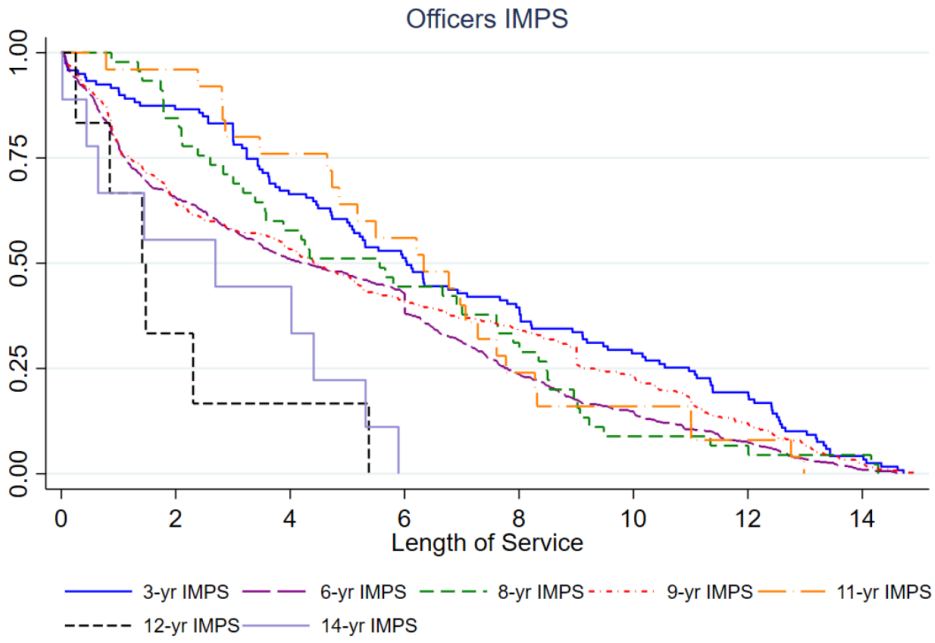

Figure 8. Kaplan-Meier survival curve – Officer IMPS

Note that officers under the 12-year IMPS obligation belong to a small workgroup (aviation officers), where the separation of even one person can significantly impact the survival curve. Therefore, Figure 8 illustrates that longer IMPS durations tend to have a

higher likelihood of separation when compared to shorter IMPS types, as indicated by the curves for 12 and 14-year IMPS being below the others.

While the concept of reaching 0% survival may raise concerns, it is essential to highlight that Kaplan-Meier analysis calculates survival estimates based on the number of individuals at risk of separating during each time interval. If we censor individuals from the data (i.e., the observation period ends while an individual is still serving their IMPS), we no longer consider them when calculating the survival estimate once they reach their maximum years of service. Thus, despite some officers having a lower average length of service due to censoring, the Kaplan-Meier survival estimates account for and adjust for this effect.

Additionally, the drops in the survival curve align with the conclusion of IMPS periods. For example, we observe the most substantial drops at the 3, 6, and 9-year marks, corresponding to the respective IMPS type curves. There is no drop at 8 years for the 8-year IMPS, and the sharpest decline in the survival curve occurs between 2 and 4 years of service. These drops in survival curves may suggest self-selection effects. In such cases, the sample observed in my thesis is not randomly drawn from the population but instead reflects individual choices or characteristics. This situation can result in a non-random sample that may not be representative of the broader population, potentially introducing bias into parameter estimation and affecting the validity of conclusions.

The average length of service cannot be directly determined from Figure 8. We can infer from the graph that officers with longer IMPS types tend to have longer average lengths of service, as indicated by the slower declines in their survival probabilities. However, there are clear differences between the lengths of service. The survival curves suggest that officers with shorter IMPS obligations (e.g., 3 years) tend to separate sooner than those with longer obligations (e.g., 14 years for pilots). This seems like an obvious conclusion, but it implies that self-selection may be a factor.

I list the results of the log-rank test for Figure 8 in Table 6. We can see that the p-value for the chi-square statistic indicates the probability of observing a chi-square statistic as extreme as, or more extreme than, the one calculated if the null hypothesis was true. A

p-value of 0.0000 suggests that the differences observed in the survival functions are statistically significant.

The results from this log-rank test implies a significant difference in survival between officer IMPS types, suggesting that the observed variations are unlikely to be random. Therefore, I reject my hypothesis at the 5% level as officer IMPS types significantly influence the length of service for officers.

Table 6. Log-rank test post Kaplan-Meier graphs for officer IMPS lengths.

Officer IMPS lengths	Events observed	Events expected
3	165	261.58
6	726	647.45
8	49	44.68
9	457	452.40
11	29	30.01
12	6	1.69
14	9	3.19
Total	1441	1441.00
	$Chi^2(6)$ =	69.59
	$Pr > Chi^2$ =	0.0000

In Figure 9, I present the enlisted IMPS survival curves. We can see drops in the curves at the conclusion of the 2, 4, and 6-year IMPS terms. For instance, the 3-year IMPS has a survival estimate of 89.6% at 3 years of service, which decreases to 58.5% at 6 years. Initial steep declines may reflect training challenges faced during recruit school (e.g., boot camp) and initial category training (e.g., 'A' school), followed by a consistent decrease until the IMPS term ends. This pattern could imply self-selection among enlistees, although we lack data on their characteristics and choices.

Survival probability declines from 95% in the first year to 27.5% in the sixth year for IMPS less than 2 years. The 2-year IMPS type shows a drop from 78.1% to 26.8% between the first and third years. The 3-year IMPS maintains a survival probability of over 89.6% for the first 3 years but decreases afterward. The 4 and 6-year IMPS show expected declines over time, with the 6-year IMPS maintaining a higher probability of service throughout the observed years compared to the 4-year IMPS.

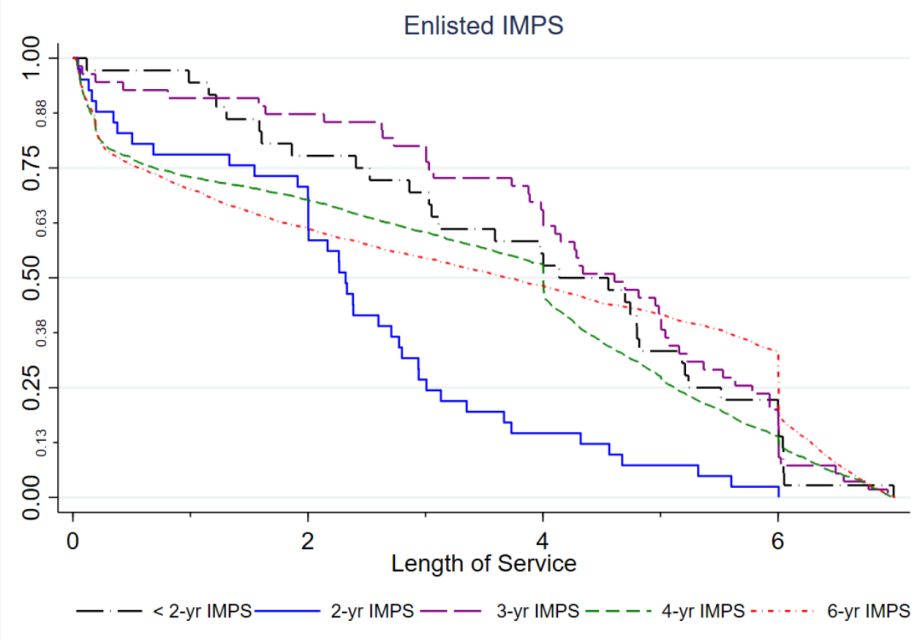

Figure 9. Kaplan-Meier survival curve – Enlisted IMPS

I use the log-rank test to assess the statistical significance of these differences and test my hypothesis regarding survival between different enlisted IMPS types. I list the results of the log-rank test in Table 7.

Table 7. Log-rank test post Kaplan-Meier graphs for officer IMPS lengths.

Enlisted IMPS lengths	Events observed	Events expected
0	40	46.44
2	41	11.67
3	106	161.25
4	4006	3324.42
6	5797	6446.22
Total	9990	9990.00
	$Chi^2(6)$ =	303.15
	$Pr > Chi^2$ =	0.000

With a p-value of 0.000 for the chi-square statistic in the log-rank test, I reject the hypothesis at the 5% level, indicating that enlisted IMPS types significantly influence the length of service for enlisted sailors.

As Figure 9 shows the survival curve for all male and female enlisted sailors, and enlisted sailors are the only ones with gender-specific IMPS types, I now compare female enlisted sailors to male enlisted sailors to observe the effect of the gender-specific IMPS policy.

Figure 10 shows survival curves for each IMPS type. Females on 4 and 6-year IMPS follow similar patterns until 2.5 years, where their curves diverge. As Chapter III describes, despite the reduced IMPS options being available for females in technical trades (ATA, ATV, ET, and MT), they continue to have limited adoption. Females who choose a 2-year IMPS tend to serve until their obligation ends, as indicated by the decline starting at 2 years (68.3% survival) and dropping at 3 years (26.8% survival). This suggests a predisposition to commit to a shorter service term from the start, despite the navy's gender-specific IMPS policies.

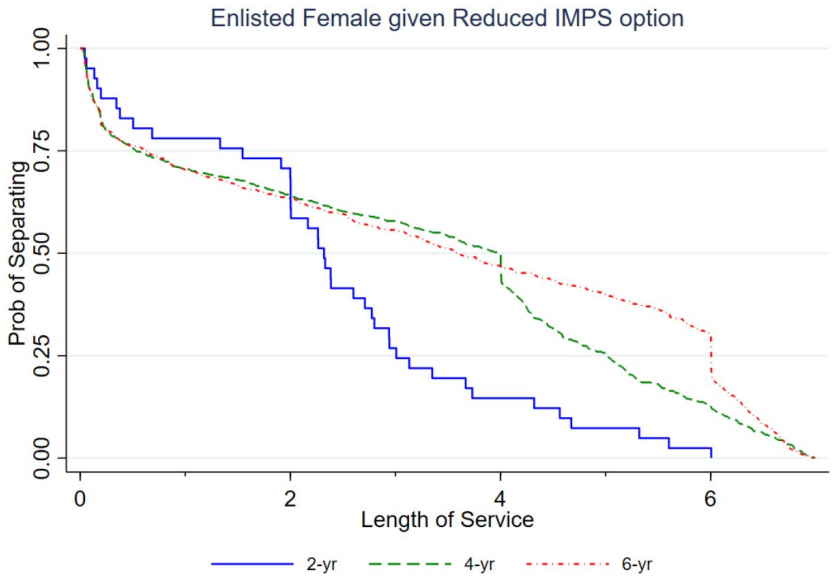

Figure 10. Kaplan-Meier Survival Curve – Enlisted females given reduced IMPS option.

I performed a log-rank test to assess survival differences between different enlisted IMPS types for females. The results, detailed in Table 8, suggest that the likelihood of separation varies with IMPS length. The 4-year IMPS has more observed separations than expected, indicating a higher separation rate, while the 6-year IMPS has fewer observed separations than expected, suggesting a lower separation rate. These differences may be influenced by factors like incentives and job satisfaction, impacting individuals' decisions to continue or end their service at different IMPS lengths. The Chi-square statistic confirms statistically significant of these differences, indicating significant variations in the separation rate variations among different IMPS lengths. The result shows the Chi-square statistic as 27.0, with a p-value of 0.0000, indicating a significant result. I reject my hypothesis at the 5% level because there is a difference in length of service by IMPS types.

Table 8. Log-rank test post Kaplan-Meier graphs for officer IMPS lengths.

Enlisted IMPS lengths	Events observed	Events expected
2	41	22.74
4	774	718.57
6	675	748.69
Total	1490	1490.00
	$Chi^2(6)$ =	26.98
	$Pr > Chi^2$ =	0.0000

3. Summary of Results

The analysis for average lengths of service revels that officers and enlisted sailors show varied average lengths of service based on their respective IMPS commitments. The interaction between workgroups and IMPS types appears as a factor that influences these variations. Members in specific workgroups, inherently tied to IMPS obligations, show unique length of service patterns. Notable, there are distinct survival probabilities for officers and enlisted sailors on shorter versus longer IMPS lengths.

The log-rank test results, along with the Kaplan-Meier graph, indicate that the length of IMPS significantly impacts separation rates among officers and enlisted sailors. The numerical differences between the observed and expected events across different IMPS lengths suggest that the actual separation pattern does not align perfectly with what

the models expectations. This implies that factors affecting retention vary depending on the length of service commitment.

B. GENDER DIFFERENCES

1. Cox Proportional Hazards

Table 9 shows my final Cox proportional hazards models that I use to examine the relationship between time to separation and several predictor variables. The two models estimate hazard ratios for different levels of enlisted and officer IMPS lengths, comparing them to the reference group which is the 1-year length for enlisted sailors, and 3 years for officers. I include the other variables as covariates in the model. Note that there is no explicit control group specified in the regressions, and the reference levels for categorical variables serve as the reference for comparison.

Looking at Table 9, we can see that enlisted sailors on the 2-year IMPS have a hazard ratio of 2.208, meaning they are 120.8% more likely to separate compared to the reference group. Sailors with a 3-year IMPS have a hazard ratio of 1.581, indicating that they are 58.1% more likely to separate compared to the reference group. As the length of service increases, hazard ratio decreases, suggesting that shorter obligations are associated with a higher likelihood of separation. For officers, the hazard ratios are lower than for enlisted sailors, indicating that officers are less likely to separate than enlisted personnel at equivalent IMPS lengths.

In terms of characteristics, having dependents significantly decreases the likelihood of separation for both enlisted (hazard ratio = 0.733) and officers (hazard ratio = 0.698). This means that those with dependents are approximately 30% less likely to separate than their counterparts without dependents. Having a tertiary education does not have a significant impact on the likelihood of separation for enlisted sailors (hazard ratio = 1.001), but for officers, it is lower (hazard ratio = 0.704). When considering age group alone, both enlisted and officers in the younger age groups have higher hazard ratios, indicating a higher likelihood of separation. This likelihood decreasing as age increases.

For enlisted sailors, being female has a hazard ratio close to 1 (hazard ratio = 1.019), suggesting that there is no significant difference in the likelihood of separation compared

to males. However, among officers, being female is associated with a lower likelihood of separation (hazard ratio = 0.831), which means they are 16.9% less likely to separate than their male counterparts.

In the model for enlisted sailors, IMPS lengths of 2 years and 3 years have significantly higher hazard ratios than the longer IMPS lengths, suggesting that those with shorter obligation lengths had a higher hazard of separation. For officers, IMPS lengths of 6 years and beyond have significantly lower hazard ratios, indicating a lower hazard of separation compared to the baseline. Numerically, enlisted females have a hazard ratio of 1.019, indicating that there is no significant difference in the likelihood of separation in short versus long IMPS. When comparing the hazard of separation between female enlisted sailors with 2-year and 6-year IMPS lengths, we can see a statistically significant difference ($chi2(1) = 21.64$, $p < 0.0000$) at the 5% significance level.

However, for officers, females have a hazard ratio of 0.831, suggesting they are less likely to separate than males with shorter IMPS length. Testing the hazard of separation between female officers with 3-year and 11-year IMPS lengths yields a result ($chi2(1) = 2.76$, $p < 0.0968$) that is not considered statistically significant at the 5% level. This indicates that there is no statistically significant difference in the hazard rates between short and long IMPS lengths for officers.

In summary, these models are assessing the factors that influence the timing and likelihood of separation. They show that shorter IMPS lengths are associated with a higher likelihood of separation (research question 1), and having dependents is associated with a lower likelihood of separation for both officers and enlisted sailors. Females, especially in the officer category, are less likely to separate than males. As for the age, younger service members are more likely to separate than older ones.

Table 9. Cox regression for all IMPS lengths.

	Enlisted		Officer	
	Hazard Ratio	(95% CI)	Hazard Ratio	(95% CI)
IMPS indicators				
2 years	2.208*** (0.505)	(1.410 – 3.456)		
3 years	1.581* (0.316)	(1.068 – 2.340)		
4 years	1.396* (0.235)	(1.004 – 1.941)		
6 years	1.055 (0.178)	(0.758 – 1.467)	0.928 (0.116)	(0.727 – 1.185)
8 years			0.667* (0.129)	(0.457 – 0.973)
9 years			0.428*** (0.058)	(0.329 – 0.559)
11 years			0.676 (0.159)	(0.426 – 1.073)
12 years			0.447 (0.193)	(0.192 – 1.041)
14 years			0.559 (0.202)	(0.275 – 1.134)
Characteristics				
Female	1.019 (0.025)	(0.971 – 1.070)	0.831** (0.055)	(0.731 – 0.946)
Has dependent(s)	0.733*** (0.020)	(0.694 – 0.774)	0.698*** (0.054)	(0.599 – 0.813)
Has a degree	1.001 (0.092)	(0.843 – 1.209)	0.704*** (0.049)	(0.615 – 0.806)
Age Group				
20-24	0.130*** (0.006)	(0.119 – 0.143)	0.205*** (0.024)	(0.163 – 0.259)
25-29	0.031*** (0.002)	(0.028 – 0.035)	0.052*** (0.007)	(0.040 – 0.068)
30-34	0.012*** (0.001)	(0.011 – 0.014)	0.018*** (0.003)	(0.013 – 0.024)
35-39	0.012*** (0.001)	(0.011 – 0.014)	0.020*** (0.003)	(0.014 – 0.027)
40-44	0.018*** (0.002)	(0.015 – 0.021)	0.019*** (0.004)	(0.012 – 0.028)
45-49	0.027*** (0.003)	(0.022 – 0.032)	0.046*** (0.010)	(0,031 – 0.070)
50-54	0.023*** (0.003)	(0.018 – 0.029)	0.026*** (0.007)	(0.015 – 0.043)
55-59	0.013*** (0.003)	(0.008 – 0.019)	0.012*** (0.004)	(0.006 – 0.023)
60-64	0.006*** (0.002)	(0.003 – 0.010)	0.008*** (0.003)	(0.004 – 0.015)
Observations	9,719		1,251	
Log likelihood	-75550.908		-7153.090	
Likelihood ratio	7988.55		1046.78	

Note: Standard error in parentheses * p<0.05 ** p<0.01 *** p<0.001. CI is confidence interval. Married/recognized relationship output dropped due to small number of females in some workgroups.

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VI. CONCLUSION

A. SUMMARY OF FINDINGS

The findings from the Kaplan-Meier and Cox proportional hazards analyses address the research questions by quantifying the risk of separation for different IMPS lengths and examining how gender and IMPS length interact to influence the conditional probability of separation.

For Research Question 1: *Do service members on short versus long IMPS lengths have a higher or lower likelihood of separation?* The data indicates that service length, as measured by IMPS, is a significant factor in determining separation rates. Both officers and enlisted personnel on shorter IMPS have higher separation rates compared to those on longer IMPS lengths. This trend is particularly evident among enlisted personnel, where we observe the highest separation rates at the mid-length service markers, notably at the 6-year IMPS. The Cox proportional hazards analysis for officers also shows that shorter IMPS lengths are associated with a higher hazard of separation.

The analysis of service members' likelihood of separation based on their IMPS types and gender shows that, for officers and enlisted sailors, shorter IMPS lengths correlate with a higher likelihood of separation. Enlisted sailors on a 2-year IMPS are 120.8% more likely to separate compared to the reference group. Enlisted sailors on 3-year IMPS are 58.1% more likely to separate than the reference group. This trend of increased separation likelihood with shorter IMPS lengths is consistent but less pronounced among officers.

For Research Question 2: *Do females on short versus long IMPS lengths have a higher or lower likelihood of separation?* The impact of IMPS length varies between enlisted sailors and officers among female service members. Female enlisted sailors show no significant difference in separation likelihood compared to males when considering overall IMPS lengths (hazard ratio = 1.019). However, when comparing shorter (2-year) to longer (6-year) IMPS lengths among female enlisted sailors, we can see a statistically significant increase in separation rates for shorter IMPS lengths. In contrast, for female

officers, the IMPS length does not significantly affect the likelihood of separation compared to their male counterparts. Female officers, on average, show a lower likelihood of separation (16.9%) compared to their male counterparts, regardless of IMPS length.

Other factors, such as having dependents and age, are also influencing separation likelihood. Service members with dependents are 30% less likely to separate than those without, for both enlisted sailors and officers. Younger service members across both groups are presenting a higher likelihood of separation, with the separation likelihood decreasing with age.

B. CONCLUSIONS AND CONSIDERATIONS

The role of self-selection plays a significant role in these patterns, adding to the interpretation of the data and the importance of considering service member characteristics and choices in understanding retention dynamics. In the data and analysis, we are only observing those who choose to join the navy, and we lack information about individuals who decide not to enlist. Because we lack knowledge about the reasons why a person opts for a longer IMPS when a shorter one is available, any modification in the navy's recruitment and retention policies aimed at attracting and retaining members results in a change in the composition of individuals willing to enlist.

The findings suggest a need to reevaluate IMPS policies, especially when considering the distinct patterns observed between different service lengths and genders. Adjusting IMPS lengths or offering more flexible terms might have an influence on retention rates. The distinct trends observed among female service members highlight the importance of developing gender-specific retention strategies, particularly for enlisted females.

Furthermore, the lower likelihood of separation among service members with dependents suggests that policies supporting these individuals can positively impact retention. Meanwhile, the higher separation rates among younger service members indicate a potential area of focus for retention efforts, possibly through targeted engagement and support programs. The conclusion points toward a need for policies that are sensitive to the varying motivations and life circumstances of service members.

C. RECOMMENDATIONS FOR FUTURE WORK

The results suggest that further exploration of the interaction between gender and IMPS length is warranted. Future research should continue to refine these findings, explore the underlying causes of separation, and evaluate the effectiveness of retention strategies. Additional studies could explore the underlying reasons for the higher separation rates among those with shorter IMPS lengths and among certain demographic groups, providing insights for policy development.

Further work into the reasons for separation among females with short versus long IMPS lengths is warranted, potentially incorporating qualitative data to complement the quantitative analyses. The qualitative data should be used in an investigation into psychological contracts in the RAN and use the 'Skin in the Game' theory from Hastings (2023). It should also control for possible confounding variables that may influence or obscure the relationship between gender, IMPS length, and separation rates.

Furthermore, future study should incorporate variables relating to well-being and mental health to understand their impact on service continuation decisions. Since military service is demanding not just for the service member but also for their families, investigating the influence of family dynamics on service continuation could be beneficial.

Finally, since separation likelihood varies with IMPS length, conducting longitudinal studies can help us understand how career progression, promotions, and other time-varying factors influence the decision to separate. As the age group appears to be a significant factor, further analysis can segment age groups more finely or investigate age-specific policies that might affect career longevity rather than just by age groups.

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