
# NAVAL POSTGRADUATE SCHOOL

**MONTEREY, CALIFORNIA**

# THESIS

**CONTINUATION OF THE EFFECTS OF DIVERSITY ON RETENTION**

by

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June 2021

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| REPORT DOCUMENTATION PAGE | | | *Form Approved OMB No. 0704-0188* |
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| **1. AGENCY USE ONLY** *(Leave blank)* | **2. REPORT DATE** June 2021 | **3. REPORT TYPE AND DATES COVERED** Master's thesis |
|---|---|---|

| **4. TITLE AND SUBTITLE** CONTINUATION OF THE EFFECTS OF DIVERSITY ON RETENTION | **5. FUNDING NUMBERS** |
|---|---|
| **6. AUTHOR(S)** Wei Y. Wu | |
| **7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)** Naval Postgraduate School Monterey, CA 93943-5000 | **8. PERFORMING ORGANIZATION REPORT NUMBER** |
| **9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)** N/A | **10. SPONSORING / MONITORING AGENCY REPORT NUMBER** |

**11. SUPPLEMENTARY NOTES** The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

| **12a. DISTRIBUTION / AVAILABILITY STATEMENT** Approved for public release. Distribution is unlimited. | **12b. DISTRIBUTION CODE** A |
|---|---|

**13. ABSTRACT (maximum 200 words)**

Diversity and inclusion (D&I) can be a source of competitive advantage, both in the private sector and the U.S. military. Arkes et al.'s 2020 work, "The Effect of the Diversity on First-Ship Assignment on First-Term Retention Decisions," found that increased diversity among peers and immediate supervisors can lead to higher retention. This thesis extends on prior research on retention for minority and non-minority groups in the Navy overall, and across different geographical locations, ship classes, and Navy enlisted communities. Using a large sample on first-term enlisted Sailors' reenlistment decisions made from FY 1998 to FY 2017 in the surface warfare community, and a multivariate statistical analysis approach with a difference-in-difference design, this thesis finds that first-term black Sailors are more likely to reenlist relative to white Sailors in all ports, ship classes, and enlisted communities. However, the results show no evidence that female Sailors experience any different retention rates than their male counterparts. The findings provide a starting point for examining the culture of diversity and inclusion behaviors across the Navy to assess D&I behaviors, identify key inclusion metrics, and refine and implement D&I competencies on education and training in the fleet.

| **14. SUBJECT TERMS** diversity and inclusion, retention, minority groups, non-minority groups, competitive advantage, gender, race, ethnicity, diversity and inclusion metrics | **15. NUMBER OF PAGES** 95 |
|---|---|
| | **16. PRICE CODE** |

| **17. SECURITY CLASSIFICATION OF REPORT** | **18. SECURITY CLASSIFICATION OF THIS PAGE** | **19. SECURITY CLASSIFICATION OF ABSTRACT** | **20. LIMITATION OF ABSTRACT** |
|---|---|---|---|
| Unclassified | Unclassified | Unclassified | UU |

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

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# CONTINUATION OF THE EFFECTS OF DIVERSITY ON RETENTION

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**MASTER OF SCIENCE IN MANAGEMENT**

from the

**NAVAL POSTGRADUATE SCHOOL**
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# ABSTRACT

Diversity and inclusion (D&I) can be a source of competitive advantage, both in the private sector and the U.S. military. Arkes et al.'s 2020 work, "The Effect of the Diversity on First-Ship Assignment on First-Term Retention Decisions," found that increased diversity among peers and immediate supervisors can lead to higher retention. This thesis extends on prior research on retention for minority and non-minority groups in the Navy overall, and across different geographical locations, ship classes, and Navy enlisted communities. Using a large sample on first-term enlisted Sailors' reenlistment decisions made from FY 1998 to FY 2017 in the surface warfare community, and a multivariate statistical analysis approach with a difference-in-difference design, this thesis finds that first-term black Sailors are more likely to reenlist relative to white Sailors in all ports, ship classes, and enlisted communities. However, the results show no evidence that female Sailors experience any different retention rates than their male counterparts. The findings provide a starting point for examining the culture of diversity and inclusion behaviors across the Navy to assess D&I behaviors, identify key inclusion metrics, and refine and implement D&I competencies on education and training in the fleet.

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# TABLE OF CONTENTS

# LIST OF FIGURES

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# LIST OF TABLES

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# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ADSD | Active Duty Service Date |
| D&I | Diversity and Inclusion |
| Diff-in-Diff | Difference-in-Difference |
| DMDC | Defense Manpower Data Center |
| DOD | Department of Defense |
| DON | Department of the Navy |
| EAOS | End of Active Obligated Service |
| ECM | Enlisted Community Manager |
| FE | Fixed-Effect |
| FY | Fiscal Year |
| GAO | U.S. Government Accountability Office |
| LPM | Linear Probability Model |
| NAVMAC | Navy Manpower Analysis Center |
| NETC | Navy Education and Training Command |
| NPC | Navy Personnel Command |
| NPS | Naval Postgraduate School |
| NSS | National Security Strategy |
| OLS | Ordinary Least Square |
| TF1N | Total Force One Navy |
| UIC | Unit Identification Code |
| USC | United States Code |

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# ACKNOWLEDGMENTS

I want to thank the Manpower Systems Analysis program at Naval Postgraduate School (NPS) for providing me with this opportunity for my continued education and life goal fulfillment. After a relatively negative experience from my undergraduate study at a foreign institute, I consider myself lucky to have been accepted for graduate level studies at both the University of New Orleans and NPS. I completed my education at both institutions with distinction and high performance, which allowed me to make good on a dream I have held since a young age. My NPS experience was challenging but highly rewarding and will be a priceless part of my life memory.

I also personally thank my thesis advisors, Dr. Jeremy Arkes, Dr. Simona Tick, and Dr. Robert Eger, for their guidance, encouragement, understanding, and kindness throughout this journey. I am grateful for Dr. Tick's and Dr. Arkes' commitment and professionalism in guiding my research direction and providing substantial assistance as well as serving as a lifeline that I could count on in completing my thesis project. Their caring, patience, and support were instrumental in helping me maneuver through this process. My gratitude also extends to LT Rich Neuer for sharing his insights in personnel management and providing assistance in developing this thesis.

My wife, Cleo, and my little boy, Ryan, have been my strongest supporters throughout my time at NPS. They did not foresee spending most of the tour under lockdown orders due to COVID. Being families of military members means sacrifice, and the pandemic and home-schooling just added more to it. I want to thank them because they accommodated my schedule so I could focus on studying. I could not have accomplished this mission without their love, sacrifice, and unconditional support.

Lastly, I pray that our lives return to "normal" as the COVID pandemic slows. My hope is every person and our communities will regain momentum moving forward.

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# I. INTRODUCTION

The United States is becoming increasingly more racially and ethnically diverse. Diversity brings into the American society different ideas and perspectives, unique talents and skills, and various cultural values. These added technical and cultural elements generate opportunities and inspire creativity and innovation, thus enhancing our national core strengths and resiliency. Diversity and inclusion (D&I) efforts and policies in the workplace can have a positive impact on organizational culture and can become a source of competitive advantage. When people with different backgrounds, experiences, and skill sets work in a team environment, their individual merits and values form a collective strength that is much stronger than what a group of individuals can produce.

The U.S. military has been a leader on D&I compared to its civilian counterpart (DOD, 2020, p. vii). Military leaders emphasize the value of diversity, and make great efforts with deliberate screening processes and training curriculums to ensure that service members understand and embrace a culture of intra- and inter-service D&I. When treated as core values, such culture is vital to accomplishing our missions and enhancing our warfighting capabilities, as well as building a strong and resilient fighting force. As former Navy Secretary Ray Mabus described, "A diverse and inclusive workforce has never been more important to the Department of the Navy (DON)'s success. We are stronger, more effective, and more innovative when our workforce reflects our Nation's rich diversity and our workplace environment fosters respect, dignity, and equal opportunity" (DON, 2016, para. 1).

The Department of Defense (DOD) recognizes D&I as strategic imperatives and is committed to recruiting and retaining the best qualified men and women, regardless of race, gender, ethnicity, religion, creed, or other attributes, to protect our national interests and fulfill national security missions.

Although we have attained substantial achievements in diversifying our forces through decades of efforts in D&I, it remains a challenge especially in the mid-level management and top leadership ranks. It is a common theme that in all U.S. military

branches, minority groups representation diminishes in higher ranks (Office of the Undersecretary of Defense, 2020). As part of our continuous efforts to address D&I challenges, the *Department of Defense Board on Diversity and Inclusion Report* (2020) states that the DOD will continue and reinforce the decades-long D&I policies, programs, and practices with the commitments of creating an inclusive environment for all service members and making D&I part of the DOD's permanent DNA. The D&I Board's statement communicates its vision and commitment to the force:

> We are committed to making the DOD a workplace of choice that is characterized by diversity, equality, and inclusion. We remain steadfast in our commitment to promote an environment free from barriers that may prevent personnel from realizing their potential and rising to the highest levels of responsibility within the Department. To that end, the Department continues to strengthen policies and procedures that promulgate the Diversity and Inclusion and Equal Opportunity missions. We continue to enhance diversity and ensure equality across our entire workforce. We believe diversity is the key to innovation, inclusion is imperative for cohesive teamwork, and equality is critical to Total Force readiness. (p.vi)

The D&I Board has also developed six focused areas of recommendations, providing a strategic framework for D&I policies and practices implementation, for the DOD as a whole to achieve D&I objectives. These recommendations cover the areas of: (1) recruitment and accessions, (2) retention, (3) barriers, (4) career development, (5) organizational climate, and (6) culture, worldview, and identity. The task of retention is a critical D&I area that not only affects the mission of maintaining a stable force structure and continuity by retaining the best talents and experiences, but also competing with the civilian sector for such talents, and not losing Sailors based on low job satisfaction.

## A. PURPOSE

The Department of Defense is committed to developing a force that embraces and leverages all talents and strengths (DOD, 2017). In an effort to encourage and capture the full benefits of a diverse and inclusive culture within the Navy as well as the other services, it is critical that decision makers understand what drives the Sailors' retention decision and use the findings to develop relevant D&I metrics. These findings can then serve as the basis

to establish policies and measures and facilitate education and trainings to achieve better inclusivity and a positive working environment.

This research builds upon and extends on prior research conducted at the Naval Postgraduate School. The previous studies mainly focus on first-term Sailors on various surface warfare platforms (Navy ships). Greene (2019), Terranova (2019), Hernandez-Rodriguez and Serna (2020), and Arkes, Tick, and Mehay (2020) analyze longitudinal individual personnel data to test the relationship between diversity among supervisors and/or peers and first-term enlisted Sailors and Junior Officer's retention. The findings show that increased diversity level among peers, immediate supervisors, and senior command leadership can lead in some cases to higher retention among minority-group and non- minority groups, and do not appear to hurt retention for any group.

For the DON and the DOD to develop D&I metrics to monitor inclusion climate and evaluate the effectiveness of education/training of D&I competencies, various commands can harness the strategic advantages from having greater retention to enhanced mission readiness. My study aims to assess inclusion behaviors within the fleet using the D&I metric of retention of minority groups relative to non-minority groups at various stages of their career. I also attempt to compare retention rates between minority groups, categorized by race, gender, and ethnicity, and non-minority groups to estimate overall Navy effects and by naval base, ship class, and enlisted rating community.

I chose to use the metric of retention of minority groups relative to the non-minority group because it is one measure for diversity and inclusivity at each level. Qualitative research consisting of in-person interview and focus groups presented in Arkes et al. (2020) indicate that minority Sailors may lack career support systems and, therefore, may face more challenges and obstacles in their professional lives. It is reasonable to assume that these factors would negatively affect a minority Sailor's decision to stay in the Navy.

## B. THESIS RESEARCH QUESTIONS

My research questions focus on the comparison of first-term enlisted Sailor reenlistment rates between minority groups—by race, gender, and ethnicity—and non-minority groups across the fleet, as well as on different platforms and communities in the

Navy. Building on previous NPS research findings that diversity can impact underrepresented Sailors' retention, my study attempts to explore the next area of interest, on how different locations, communities, platforms, and the Navy overall performed on retaining minority Sailors. The research outcomes could provide useful insights for the Navy at all levels to identify and evaluate the impact of D&I competencies and incorporate proven D&I competencies into command policies and practices.

In this thesis, I address the following research questions:

1. How does the reenlistment rate of minority groups (by gender, race, and ethnicity) compare with that of non-minority groups?
2. How does the reenlistment rate vary among enlisted communities, geographical locations (naval bases), and platforms (ship classes) for minority groups (by gender, race, and ethnicity) compared to that of non-minority groups?

## C. SCOPE

In this study, I analyze a large sample of active-duty enlisted reenlistment data in the U.S. Navy in the surface warfare community who were active duty from 1998 to 2017. Since enlisted personnel accounts for approximately 82 percent of the total Navy personnel (Kapp, 2021) and the surface warfare community constitutes the main body of the Navy, the data used for this study represents an important population of the Navy.

## D. METHODOLOY

1. This study builds upon the previous NPS research on the topic of diversity and minority retention, using the data set built sequentially by these prior efforts. I focus on comparing the retention rates on minority groups relative to non-minority groups in different communities, locations, and platforms.
2. This study conducts regression analyses using a Linear Probability Model (LPM) with a Difference-in-Difference (Diff-in-Diff) design and fixed-effects control for comparisons on retention between the minority groups

and the reference, non-minority group by communities, homeports, and operational platforms.

## E. SIGNIFICANCE

The findings of this study could provide important insights with respect to the effect of diversity and inclusion on retention and performance across the fleet. The findings could assist the Navy in assessing inclusion behaviors and policies at various operational levels, and further evaluate the impact of education and training of D&I competencies on inclusivity and command climate studies.

The U.S. military is one of the fundamental U.S. national powers. In the 2017 *National Security Strategy* (NSS), military power is recognized as a critical instrument in achieving the U.S. national objectives and realizing the pillar of "peace through strength" (White House, 2017). In the 2021 interim NSS from the Biden Administration, though pivoting to the primacy of diplomacy, it nevertheless recognizes military power as a decisive strategic competitive advantage in achieving our national objectives (White House, 2021). In the core of this power is the most important asset—our personnel who perform all the tasks, they are instrumental in carrying out the missions of protecting United States core interests and checking adversaries' aggression and ambition. It is of great importance to retain the best qualified personnel to maintain a sturdy and capable fighting force signified by lethality and resilience. Without the ability to incorporate robust D&I policy measures, the current workforce will be unable to achieve the highest levels of operational effectiveness and would not promote a sustainable recruiting platform for future accessions to the Navy.

## F. ORGANIZATION OF STUDY

This thesis consists of six chapter. Chapter II provides brief background information related to required institutional knowledge to inform the analysis conducted in this thesis. Chapter III connects this study to the previous literature by referencing methodologies and findings from other studies on similar topics and placing my study as a meaningful element within related specific literatures. Chapter IV describes the data used for this study and verifies this research's modeling design and methodology for validity

and modeling biases control. Chapter V presents the results and findings from the regression analysis. Chapter VI, the last chapter, summarizes the findings and formulates recommendations for the way forward.

# II. BACKGROUND

The purpose of this chapter is to facilitate understanding of analysis framework by providing basic information on the institutional detail and Navy context related to this study.

## A. IMPORTANCE OF MILITARY RETENTION

Personnel is our most important asset among all other resources and serves as the source of our competitive advantage. Retention is one of the key pillars in manpower and talent management in the U.S. military, along with recruiting, training, advancement, and compensation. The Navy Enlisted Retention and Career Development Program emphasizes that retention is crucial to "maintaining personnel stability by retaining top quality Sailors in the proper skills balance and in the required numbers" (Office of the Chief of Naval Operations [CNO], 2012). The Sailor 2025 program also stresses the importance of modernizing the overall personnel system in competing with the private sector for talents and improving warfighting readiness (Navy Personnel Command [NPC], 2017)

As with its sister branches, the U.S. Navy is facing an evolving global geopolitical landscape and an increasingly complex operational environment characterized by the use of advanced technologies and the synchronization of multi-level and multi-facet adversary efforts. Recruiting and retention play a critical role in sustaining a strong force both operationally and financially. We need to maintain a fleet that is properly and adequately manned by investing in top levels of quality and skillsets, in addition to those members who can lead the D&I efforts to optimize our fleet and reduce turnover costs by keeping the investments in years of training and promoting lessons learned from operational experiences.

Farrell (2017) estimated that from 2005 to 2015 the military enlisted over 1.7 million recruits with the average costs of recruiting and training a recruit in the armed forces at approximately $75,000. Marrone (2020) also calculated that the first-term service member attrition rates from fiscal year (FY) 2002 to FY 2013 ranged from 18.5 percent to 29.7 percent across all services. Even using the lowest numbers, the annual average

attrition cost would be $75,000x1,700,000/10x18.5% = $2.36 billion. But this figure has not considered the ongoing training costs, which is also a significant portion of overall attrition/turnover costs (McKensey, 2017). Retention efforts would greatly help reduce first-term attrition costs and maintain force readiness. Although fiscal cost is a primary concern, the time needed to replace Sailors who attrite or choose to leave naval service is not easily recouped. Sailors in certain paygrades and positions have spent years gaining training and experience, so providing the financial resources may allow the recruitment of additional personnel, but a gap in training and experience will remain.

## B. DIVERSITY DEMOGRAPHICS

This section provides an overview of the current diversity demographics in the military, as more thorough information on these very topics can be extracted from Hernandez-Rodriguez and Serna (2020), and Arkes et al. (2020).

### 1. Overall Diversity Trending in the Military

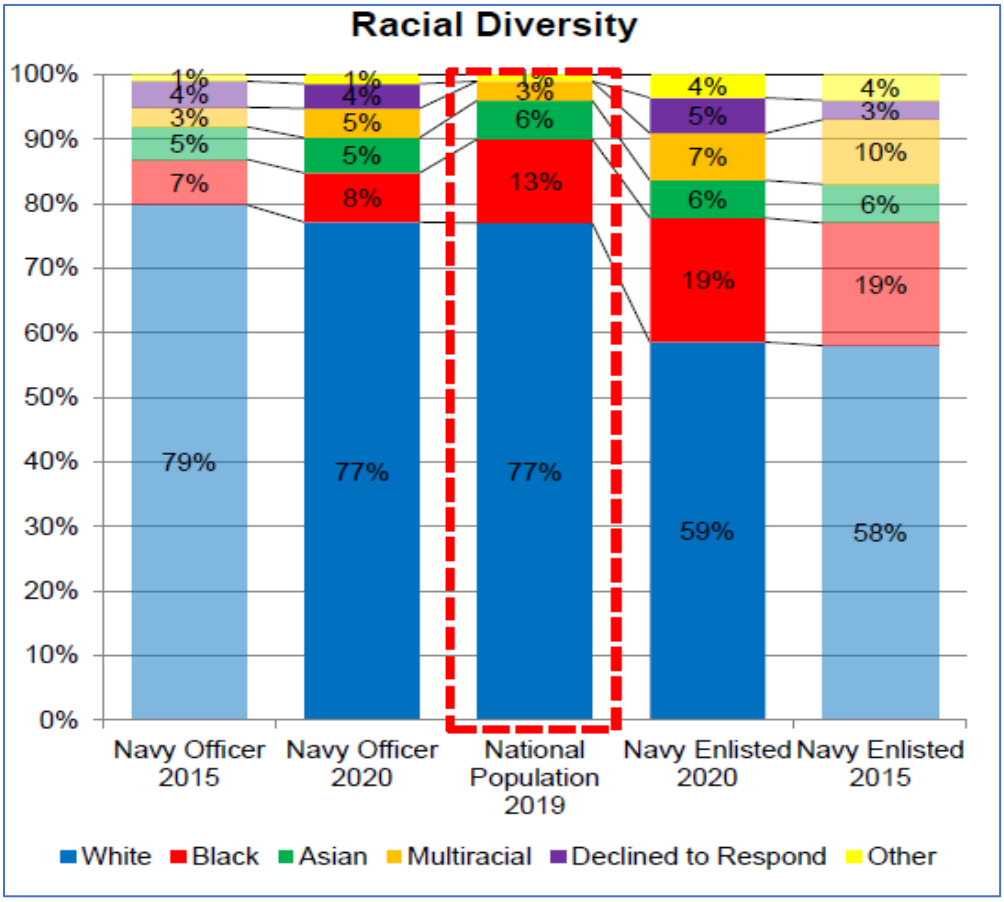
Per the *Task Force One Navy Final Report* (CNO, 2021), the overall diversity trends in the Navy are as follows:

1. Minority groups' representations have greatly improved compared to nearly 20 years ago—the Navy's total female force has increased to 21 percent in 2021 from 16 percent 20 years ago; non-white minority race increased to 38 percent from 31 percent; Hispanic Americans increased to 16 percent from nine percent.
2. Blacks have been doing well on retention in the military, comparing to the general population demographics.
3. Minority groups' representation in all services diminish as rank moves up, especially at the top rank leadership levels. The most under-represented minority category is female.

### 2. Racial Diversity

Figure 1 shows that on in FY 2020, blacks, Asians, multiracial individuals, and other races weighted 19 percent, six percent, seven percent, and nine percent of the military population, compared to 13 percent, six percent, three percent, and one percent of the civilian population, respectively (DON, 2020). It also shows that from 2015 to 2020, overall minority representation in the military has been on a positive trend. In addition, minority representations are slightly better on the enlisted side than officers. It is also worth to note that Asians both historically and currently remain a small percentage of the force, while the blacks' percentage is three times larger as the Asians in today's military.

Figure 1. Racial Diversity of U.S. Officer and Enlisted Force. Source: DON (2020).

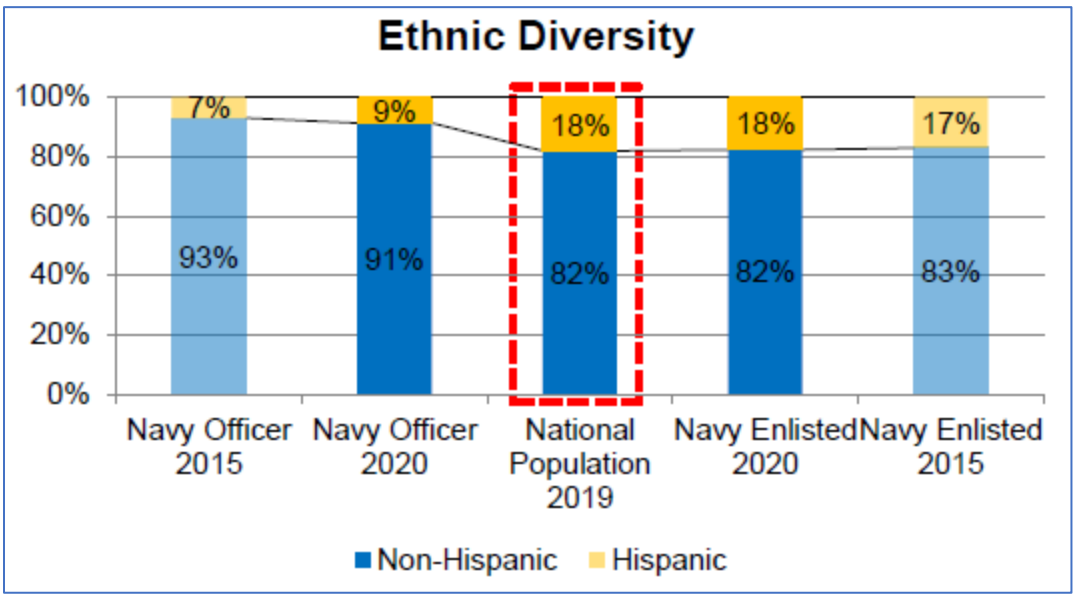


### 3. Ethnic Diversity

Figure 2 shows that ethnic diversity (mainly Hispanic Americans) in the enlisted force is about the same as the civilian population benchmark, at roughly 18 percent. But it is under-represented on the officer side, at an average eight percent, compared to the civilian benchmark of 18 percent.

It is noticeable that the category of ethnicity is not as subdivided as race is. Hispanic is in fact a blanket definition for ethnicity that encompasses many subcategories that fall under Hispanics. This suggests that research at more detailed levels looking further into the Hispanic society are necessary to obtain more thorough understandings and findings for the purpose of developing D&I competencies to improve ethnic diversity.

Figure 2. Ethnic Diversity of U.S. Officer and Enlisted Force. Source: DON (2020).

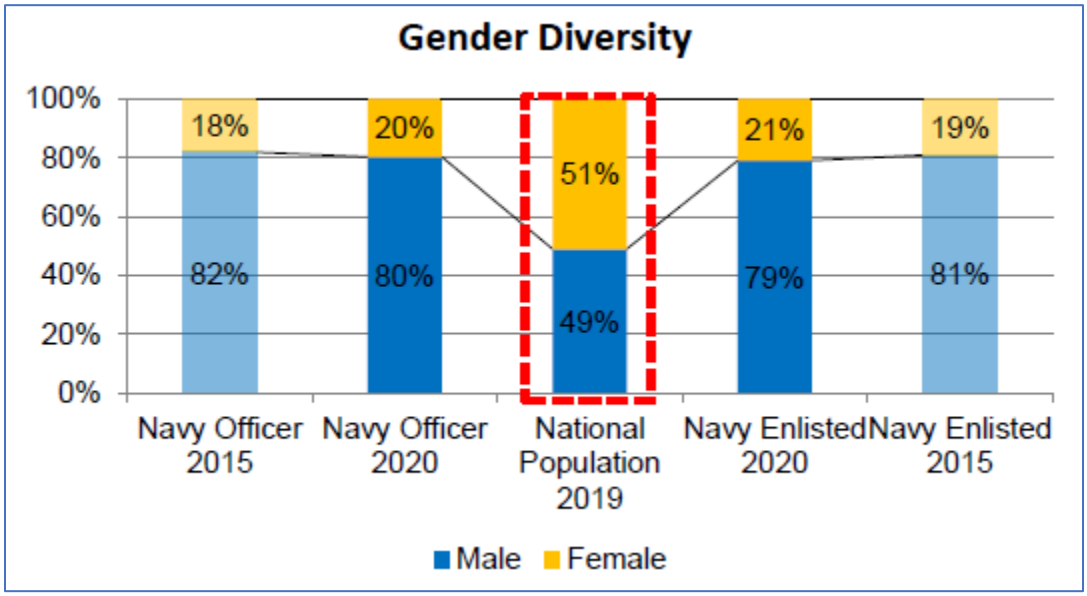



### 4. Gender Diversity

Though female service members percentage in the military has been increasing over the years (NPC, 2021), it remains at a lower number of about 20 percent, compared to that women account for nearly half of the U.S. population. This indicates an area of

improvement and warrants further studies related to women recruitment and retention in the armed forces. Figure 3 shows the comparison of female composition in the military and civilian population both in 2015 and 2020.

Figure 3. Gender Diversity of U.S. Officer and Enlisted Force. Source: DON (2020).




## C. NAVY SURFACE PLATFORMS AND SHIP CLASSES

The Navy Surface Warfare community has several surface force platforms in use: aircraft carriers, amphibious warfare ships, cruisers and destroyers, littoral combat ships, mine countermeasure ships, and patrol boats. These platforms distinguish themselves not only by main functions but also by size and mission. For example, starting with the largest class of ships, aircraft carriers are designed to operate with 6,000 Sailors and Marines onboard; amphibious warfare ships employ approximately 1,000 personnel; while cruisers, destroyers, and patrol boats are small-size ships that can have around 200 to 330 Sailors onboard (Office of the Secretary of the Navy [SECNAV], 2016).

This study uses sizes of ships as one reference criterion in estimating the difference in retention between minority groups and non-minority group. Various sizes of ships differ

by the number of personnel onboard thus accordingly changing the command climates and personnel interaction environment that the Sailors are exposed to. Navy ships classification acts as a "Quasi-experiment" that randomly creates variations in number of personnel across different platforms. My study takes advantage of this randomness and uses ship class as one context variable to run the model.

## D. NAVY ENLISTED COMMUNITIES

Per the Navy Enlisted Classifications Manual (CNO, 2021), the occupations (or "jobs") in the Navy are referred to as "ratings." Ratings describe the nature, occupational requirements, and responsibilities of various jobs in the Navy, and are represented by a two- or three-letter abbreviated title. For instance, a Yeoman is referred to as a "YN" and a Gunnersmate as a "GM." Different ratings have their own manpower determination and manning management (CNO, 2015), career development roadmap (CNO, 2017), and advancement path (Deputy Chief of Naval Personnel [DNPC], 2018).

Certain ratings share a similar nature, they operate in a same working space or collaborate closely in daily operations in fulfilling a same overall function. These ratings are grouped together and categorized into one of the enlisted rating communities, managed and supported by an enlisted community manager (ECM). For instance, the ratings of Yeoman (YN), Personnel Specialist (PS), and Legalman (LN) are grouped under the Administration community; Aviation Machinist's Mate (AD), Aviation Electrician's Mate (AE), and Aviation Ordnanceman (AO) are in the Aviation community; Damage Controlman (DC), Gas Turbine Systems Technician, Mechanical (GSM), and Hull Maintenance Technician (HT) are in the Surface Engineering community, and so forth.

For the purpose of this study, enlisted rating community is used as another context variable as the ratings in a same community share similar working natures and, in most cases, the same working environments. A complete list of enlisted communities and their ratings within is retrieved from (Bowers, 2015) and shown in Table 1.

Table 1. Enlisted Rating Community Groups. Source: Bowers (2015).

| Occupational Rating Group | Ratings Assigned |
|---|---|
| Aviation Maintenance | Aviation Machinist's Mate (AD)<br>Aviation Electrician's Mate (AE)<br>Aviation Structural Mechanic (AM)<br>Aviation Structural Mechanic -Safety Equipment (AME)<br>Aviation Electronics Technician (AT)<br>Aircrew Survival Equipmentman (PR) |
| Aviation Support | Aviation Boatswain's Mate- Equipment (ABE)<br>Aviation Boatswain's Mate- Fuels (ABF)<br>Aviation Boatswain's Mate -Aircraft Handling (ABH)<br>Air Traffic Controller<br>Aviation Support Equipment Technician<br>Aviation Maintenance Administration<br>Aerographer's Mate |
| Administrative | Disbursing Clerk (DK) *merged into PS (2005)<br>Personnelman (PN) *merged into PS (2005)<br>Personnel Specialist (PS)<br>Journalist (JO) *merged into MC (2006)<br>Lithographer (LI) *merged into MC (2006)<br>Photographers Mate (PH) *merged into MC (2006)<br>Mass Communication Specialist (MC)<br>Religious Programs Specialist (RP)<br>Yeoman (YN) |
| Nuclear Field | Nuclear Field Accession |
| Undesignated Personnel | Airman (AN)<br>Seaman (SN)<br>Fireman (FN) |
| Shipboard Maintenance | Boatswain's Mate (BM)<br>Damage Controlman (DC)<br>Electrician's Mate (EM)<br>Hull Maintenance Technician (HT)<br>Interior Communications Electrician (IC)<br>Machinery Repairman (MR)<br>Information System Technician (IT) |
| Shipboard Engineering | Engineman (EN)<br>Gas Turbine System Technician –Electrical (GSE)<br>Gas Turbine System Technician-Mechanical (GSM)<br>Machinist's Mate (MM)<br>Shipboard Engineering Program (SENG) *shipboard engineering rating assigned at RTC |
| Shipboard Operations | Operations Specialist (OS)<br>Quartermaster (QM)<br>Signalman(SM) *merged into QM |
| Hospital Corpsman | Dental Technician (DT) *merged in HM (2005)<br>Hospital Corpsman (HM) |

| Occupational Rating Group | Ratings Assigned |
|---|---|
| Intelligence and Cryptology | Cryptologic Technician-Interpretive (CTI)<br>Cryptologic Technician-Maintenance (CTM)<br>Cryptologic Technician-Networks (CTN)<br>Cryptologic Technician-Collection (CTR)<br>Cryptologic Technician-Technical (CTT)<br>Intelligence Specialist (IS) |
| Supply and Support Services | Culinary Specialist (CS)<br>Logistics Specialist (LS)<br>Mess Management Specialist (MS) *renamed CS (2004)<br>Postal Clerk (PC) *merged into LS (2009)<br>Ship's Serviceman (SH)<br>Aviation Storekeeper (AK) *merged into SK (2003)<br>Storekeeper (SK) *renamed LS (2009) |
| Ordnance, Law, and Weapons Systems | Aviation Ordnanceman (AO)<br>Gunner's Mate (GM)<br>Master-at-Arms (MA)<br>Mineman (MN)<br>Advanced Electronics Computer Field (AECF)<br>*AECF accessions are classified as either Fire Controlman (FC) or Electronics Technician (ET) during training |
| SEABEE Construction | Builder (BU)<br>Construction Electrician (CE)<br>Construction Mechanic (CM)<br>Engineering Aid (EA)<br>Equipment Operator (EO)<br>Steelworker (SW)<br>Utilitiesman (UT) |
| Submarine Volunteer | Culinary Specialist Submarine (CSS)<br>Machinist's Mate Submarine (MMS)<br>Mess Management Specialist Submarine (MSSS) *renamed CSS (2004)<br>Missile Technician (MT)<br>Submarine Electronics Computer Field (SECF)<br>Storekeeper Submarine (SKS) * renamed LSS (2009)<br>Logistics Specialist Submarine (LSS)<br>Yeomen Submarine (YNS) |

## E. UNIT IDENTIFICATION CODE (UIC)

Unit Identification Code (UIC) is a five- or six-character alphanumeric code that identifies each organizational entity in the Navy. With a confirmed UIC, the unit associated with this UIC can be identified as well as its homeport and class (SECNAV, 2018).

## F. ENLISTMENT AND REENLISTMENT DECISION

Per the United States Code (USC), Title 10, an eligible person that enlists in the military—in this case the Navy—is required to fulfill a total of eight years of service obligation. This service may be completed in either an active and/or reserve status, permitting that the combined service obligation is met. (USC, 1956). The typical path involves a period of active duty immediately followed by a reserve service obligation. The initial term of active-duty service could last between two to four years with possible 12- or 24-month extension (DNPC, 2017) based on additional training requirements. In most cases, the active-duty obligation for an enlistee ranges from four to seven years, depending on the nature of a specific rating, the acceptance of an enlistment bonus, as well as the length and intensity of the initial occupational training of that rating to ensure the Navy is able to recoup their return on investment.

Upon joining the Navy, based on preferences and aptitude test scores, an enlistee will normally have the option to select a specific rating within a specific enlisted rating community, those who are not eligible or have no preference will be assigned to the "undesignated" category. Undesignated Sailors are offered opportunities to apply, or strike for a rating after being assigned to their first duty assignment and completing all initial training and earning a fleet recommendation. For Sailors who are initially rated, they are shipped to recruit training and the service "A" and/or "C" school training (if the "A" and "C" schools are required or negotiated). The Sailors are then distributed to his or her first duty assignment to one of the units or commands in the Navy, where they continue to serve their first active-duty service term and are referred to be as a "first-termers."

Before a first-term Sailor approaches the End of Active Service Obligation (EAOS), the Sailor may be furnished an opportunity to continue his or her active-duty service term, or to reenlist, as long as the Sailor meets all reenlistment requirements, including the Commanding Officer's recommendation and the Career Waypoint Reenlistment approval (DNPC 2017). It is then the Sailor's individual decision to reenlist or not, depending on career progression, economic conditions in the civilian sector, personal experience on the military lifestyle, etc. Personal experience, in the form of job satisfaction, is one important factor that influences the reenlistment decision - especially to

minority Sailors, as their experiences on promotion opportunities, career obstacles, and institutional inclusion (or exclusion) within the working environment directly affect their perspective toward overall satisfaction and confidence towards viability in the military lifestyle which affects their desire whether they stay in the service.

The Navy's historical reenlistment rates by minority groups are shown in Figure 4 and 5. Although the data are not the most current (from FY 2000 to FY 2008), they illustrate an issue that first-term minority groups were historically more likely to leave the Navy compared to the majority groups, suggesting an area of improvement with respect to diversity and retention.

My research studies how minority first-term Sailors make reenlistment decisions by the end of their initial obligation, compared to non-minority groups under similar conditions. By "isolating" the effect of diversity and inclusion from the other factors that would also affect reenlistment decision, the findings may provide useful insights on minority retention in the Navy.

Figure 4. Reenlistment Rates by Gender and Zone. Source: MLDC (2010).

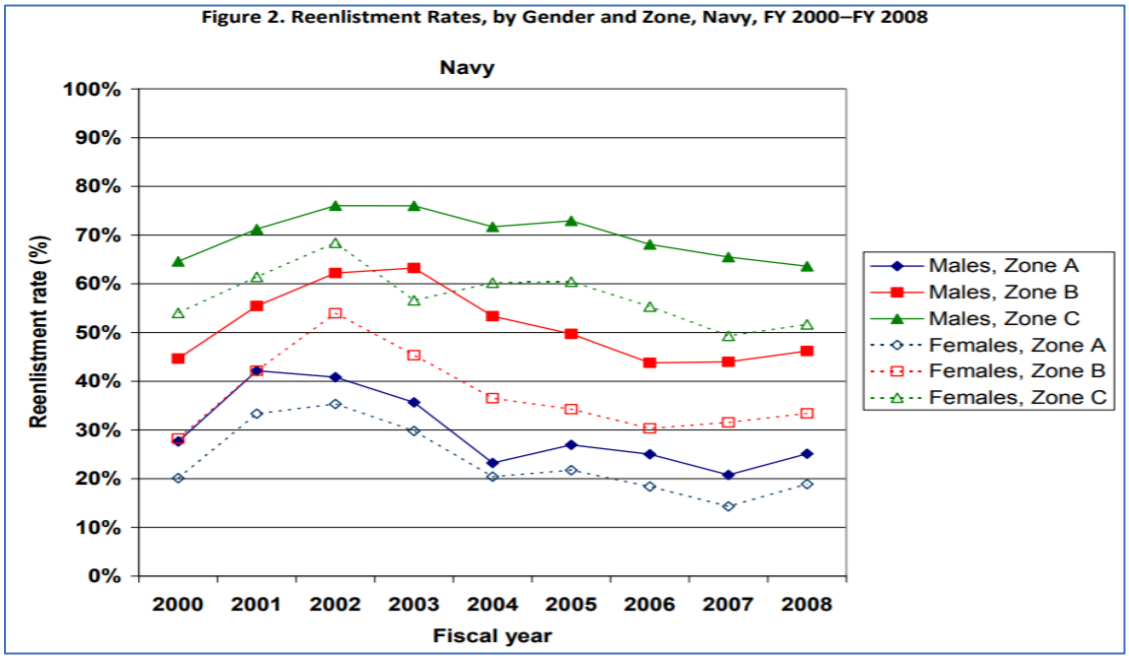
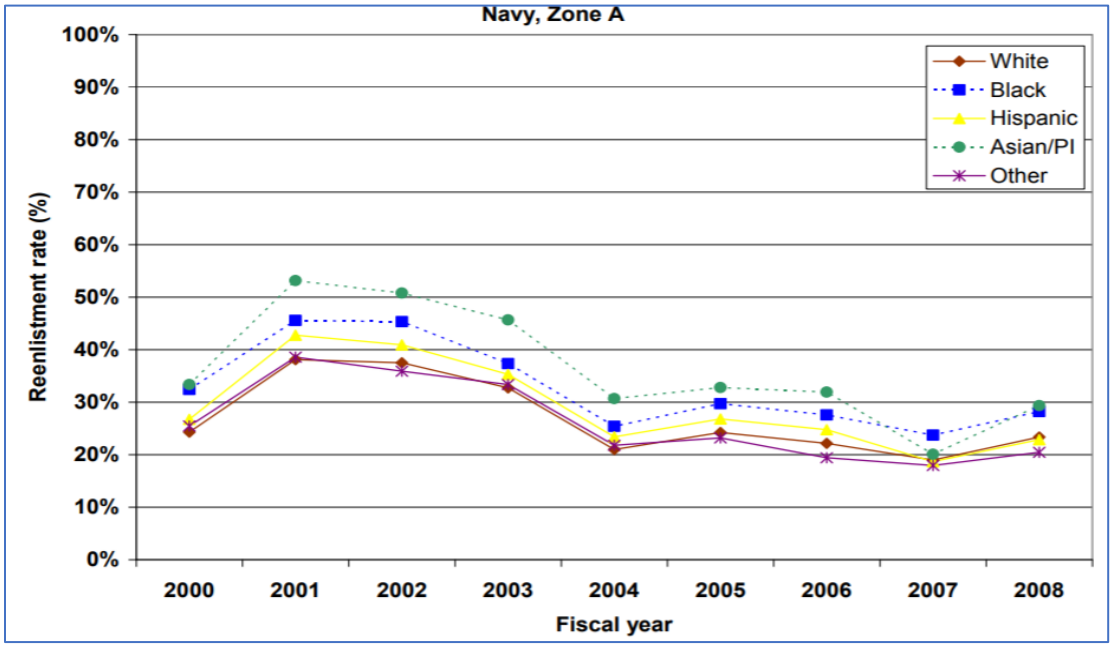


Figure 5. Reenlistment Rates by Race/Ethnicity and Zone A. Source: MLDC (2010).



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# III. LITERATURE REVIEW

In today's American society, D&I is well recognized as one of the critical productive forces that is linked to organizational climate, unit cohesion, performance, and team productivity. The relationship between workforce diversity and employee turnover has been an important research topic explored by numerous scholars from both the civilian world and the public sector. As part of the DON's D&I improvement and integration project, several military researchers conducted research that examines the effect of diversity on servicemembers' retention and analyzes practical D&I metrics. This chapter reviews previous studies on D&I and their findings, and presents how this thesis fits into the grand research construct of this significant topic.

## A. ROLE MODEL EFFECT AND DIVERSITY ON RECRUITMENT

Each year, approximately 41,955 enlisted Sailors are accessed through Recruit Training Command located in Great Lakes, IL (NETC, 2021). This is the culmination of months of recruiting efforts by a highly skilled team of professional talent managers searching for the best and the brightest across our nation. The D&I efforts in the Navy begin with recruitment, as minority representation plays an equally influential role from the very beginning of each possible military accession. The ability for a recruiter to secure an applicant for service in the Navy entails much more than simply walking up to a civilian and asking if he or she would like to join the service. Social and economic factors are embedded in the decision process for all potential recruits. Trust and rapport must be earned by the recruiter for a successful encounter, and when the connection can be based on similar demographic factors, the affinity allows a camaraderie that may not have otherwise been possible.

In an effort to increase the strength and diversity of the Navy, a renewed focus has been placed on the Hometown Recruiter Program. According to Navy Personnel Command, "In an era of Great Power Competition, this program plays a key role in the recruiting of the Sailors of tomorrow in this tightening labor market and provide a great opportunity to highlight the experiences a candidate can gain from the Navy" (NPC, 2020b,

p. 1). According to (Ricard & Neuer, 2020, p.55), "this program offers multidimensional benefits beyond helping achieve recruiting missions. This is a substantial asset to any recruiting station in their recruiting efforts, especially in areas that have specific demographic or ongoing recruiting challenges." The Navy benefits from this program, as it strategically connects a Sailor who already has familiarity with the geographic area and an established community network with potential recruits from within that region. Hometown recruiters are also strategically poised with an opportunity to serve as community role models and someone "who looks like them" with a similar background who has already made a positive impact. When members of a minority group are able to relate to a successful military member of their own "category," I believe they would be more convinced that a similar path is attainable and more realistic. When a civilian is contemplating a potential career in the Navy, similar to any job opportunity, the need for growth potential must be present, and is directly correlated to future job enrichment and satisfaction.

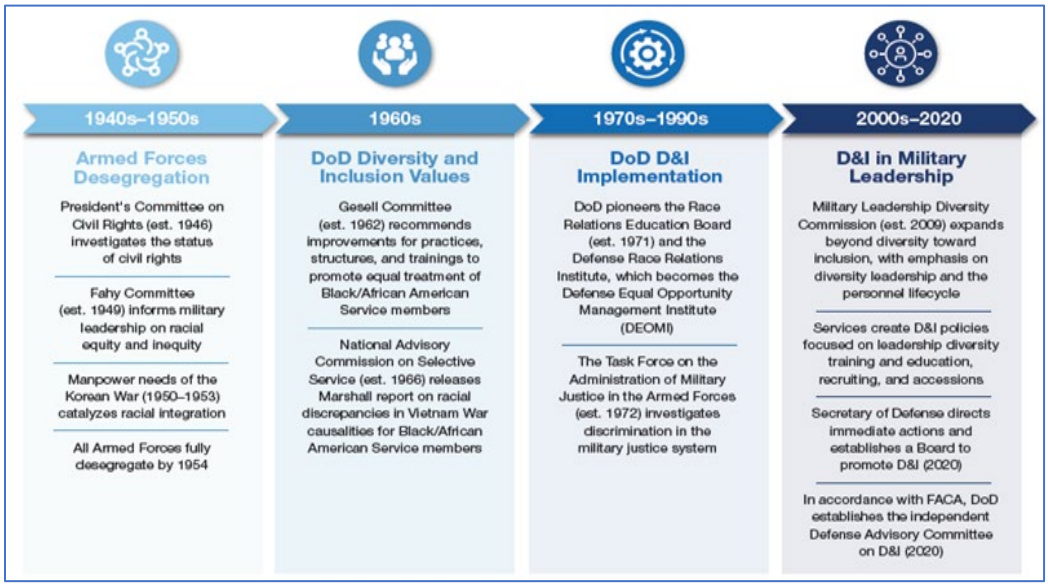
## B. DEPARTMENT OF DEFENSE DIVERSITY INITIATIVES

### 1. DOD Board on Diversity and Inclusion

In June 2020, under the Secretary of Defense's direction, the Department of Defense published a diversity report aimed at better understanding the challenges and opportunities that were present in the Armed Forces in regard to social and cultural issues faced by servicemembers. The report was extremely clear that diversity was a strategic imperative and any deviation from equality was contradictory to the mission and intent (DOD, 2020).

The military has been a leader in D&I initiatives in comparison to the nation writ large, and while the DOD has made impactful progress over the past century, there is still a long way to go to meet a true sense of equality of opportunity. Figure 6 identifies some of the programs implemented and committees established to achieve these goals.

Figure 6. U.S. Armed Forces D&I Progress. Source: DOD Board on D&I (2020)




After extensive analysis, six focus areas emerged as requiring further research and action to remove potential bias and barriers so that all servicemembers have equal opportunity for promotion, career enhancement, and job satisfaction. Figure 7 breaks down the specific recommendations by focus area.

Figure 7. DOD D&I Focus Areas. Source: DOD Board on D&I (2020)

Many of the recommendations stem from policies that were not designed to ostracize or marginalize any demographic group, but due to the lack of adequate resources and opportunities, institutional barriers, or other external factors, some members suffered worse outcomes. The study identified the need for many of the solutions to provide a data-driven accessions and retention strategy to represent all service members. This type of solution will have a profoundly positive impact, as it will likely consider metrics that have not been measured previously.

### 2. Task Force One Navy

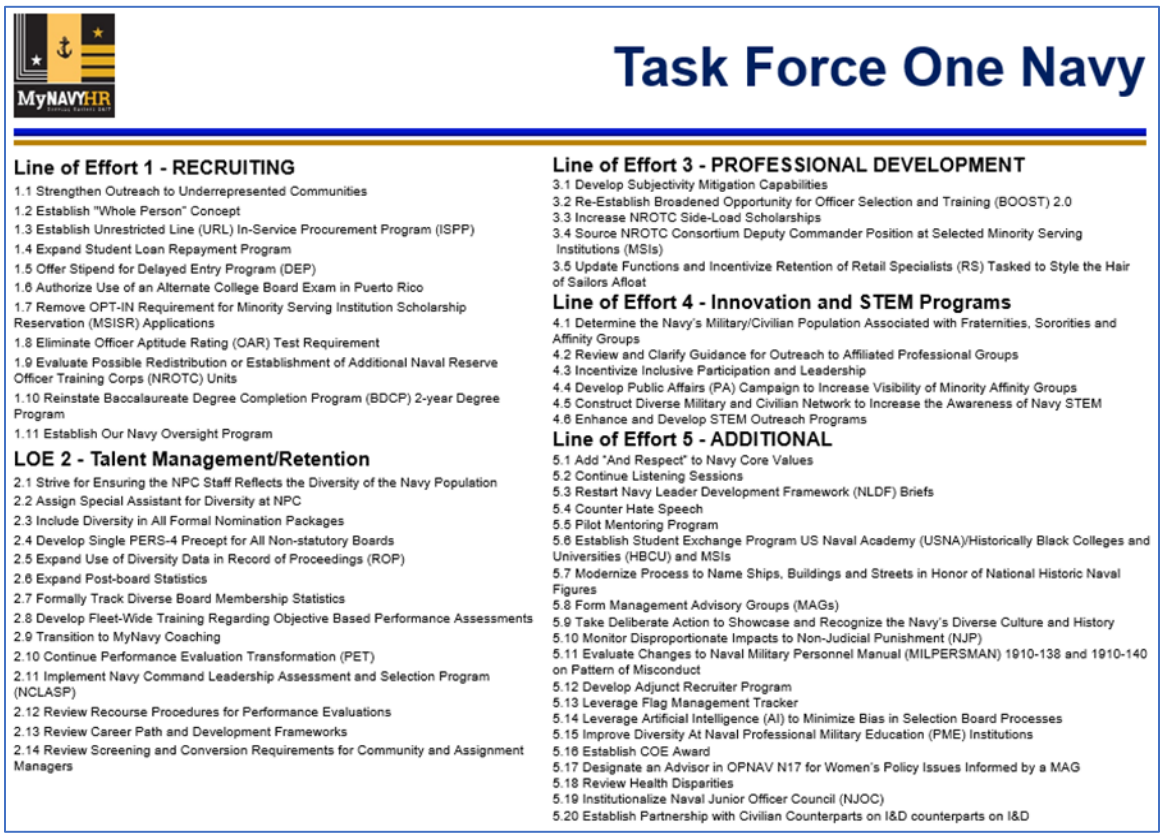
Shortly after the *DOD Board on Diversity and Inclusion Report* was released, the nation had been focused on the civil unrest in almost every metropolitan city based on recent events that centered around social and criminal injustice. The Chief of Naval Operations ordered the review of the previous DOD report and use listening sessions to get maximum participation in addition to standard anonymous surveys.

> The Chief of Naval Operations set out to analyze and evaluate issues in our society and military that detract from Navy readiness, such as racism, sexism and other structural and interpersonal biases to attain significant, sustainable Inclusion and Diversity related reform. TF1N primarily focused on active uniformed Sailors with an ancillary focus on the civilian workforce. TF1N focused on recruiting, leadership training and past/current experiences within the overall Navy command climate and our Navy culture in support of a strategy designed to effectively dismantle barriers to equality, and ultimately move the Navy closer to achieving our desired end-state of warfighting excellence. (CNO, 2020)

Figure 8 lists the 56 recommendations from the five Task Force One Navy (TF1N) Lines of Effort.

The findings are similar to the DOD's version, but some Navy specific language and ideas are presented that allow an expanded set of protections and recommendations that benefits Sailors. Significant proposals include changes to traditional assessments and requirements in which minority demographics may have been disproportionally affected in the recruiting and accession process in addition to in-service issues.

Figure 8. TF1N Recommendations. Source: DON (2020)




The report also addresses that the need for similar representation within the Navy is important, but also embedded in the influential positions at headquarter jobs that affect policy writing an interpretation. The implementation of these types of measures will have a long-lasting benefit for all Sailors as each barriers become less divisive and a true meritocracy emerges.

## C. ROLE MODEL EFFECT AND DIVERSITY ON RETENTION

Various literatures conducted studies in the area of workforce diversity and role model effects on minority employee turnover—in the dimensions of race, gender, and ethnicity. These studies covered both the private sector and the military workforce and used large-scale personnel data to empirically analyze the possible underlying relationship between workforce composition and its effects on minority employee retention. A large portion of these literatures found strong evidence that supports the notion of diversity as

well as role mole effect in workplaces positively promotes retention of both minority groups and non-minority groups. Since my thesis is a continuation research on diversity's effect on retention, I will cover a selection of these literatures in this chapter, while a significant portion of the other studies can be referred to in (Arkes et al., 2020) and other NPS students' work.

### 1. Diversity on Retention in the Civilian Sector

Civilian organizations are not an equivalent comparison for military service, as there are many factors that differentiate the two categories. The ability to gauge future performance in the civilian sector is directly tied to increased efficiencies (cost avoidance/savings) and profits, which is fundamentally different compared to serving in a government agency which operates as a non-profit whereby the individuals are under contractual obligation. These differences prevent human resource managers to utilize similar tools or algorithms to better anticipate personnel issues, organizational climate and other issues that arise with high turnover. These distinctions, however, are not relevant in the context of diversity and I will attempt to show the parallels between the two categories.

Scholars often argue that in the business world "homogeneity imposes financial costs and diversity produces financial gains" (Gompers & Kovvali, 2018). Gompers and Kovvali studied the relationship between diversity of investors and financial performance in the venture capital industry and went on to conclude that "organizations should recognize that subtle, intentional shifts can have ripple effects. Bringing just a few talented women or racial minorities into a group changes the relative balance of power" (Gompers & Kovvali, 2018). One finding suggests that simple adjustments to the hiring process can increase diversity and have marginal effects that over time will become significant by establishing a different demographic employee pool, and relationships begin to change.

On the subject of diversity and minority employee voluntary turnover, Zatziick, Elvira, and Cohen (2003) have made a unique but important contribution to the assortment of research on minority compositions and turnover behaviors. Their motivation of study stemmed from a puzzling fact regarding two seemingly contradicting schools of workforce demography theories, with one being similarity attraction (Byrne et al., 1971), social

contact (Blau, 1977), and social identity theories (Tajhel et al., 1984), which suggest increased same-race representation reduces employee voluntary turnover; and the other being group competition (Blalock, 1967), and group threats theories (Blumer, 1958), which propose that increased racial similarity within minority groups causes competition and frictions thus induces turnover.

Aiming at understanding the true implications from these two systems of theories, Zatzick et al. (2003) employed a logit regression model to analyze a pooled cross-sectional personnel data set that contained 10,235 observations from 1990 to 1993 from one Fortune 500 service entity. Their research results revealed that turnover decreases as same-race minority number increases and as other-race minority number increases, but that decrease also has a diminishing marginal effect as same-race minority presence reaches a certain level. The converging nature of their findings suggests a nonlinear relationship between diversity and minority retention: "members of minority groups with very small representation benefited more from the increased presence of their own race than minorities who already had a substantial presence" (Zatzick et al., 2003). One important implication is that: when racial diversity is increased, the minority workforce appears more robust.

Although Zatzick et al. sourced their data from only one organization, the large sample size and the scale and complex structure of the company mostly maintained the validity of their research. However, the analyzed company was a predominantly female represented organization. As a minority in the dimension of gender, encouraged female retention in this company might be a confounding factor to race minority retention. This situation is likely to introduce reverse causality biases to the analysis, creating a major limitation that could undermine the significance of this research's findings.

A more recent study on diversity and retention is (Nielsen & Madsen, 2017). Like Zatzick et al. (2003), Nielsen and Madsen also mentioned various scholars' disagreement on diversity's effects, but they turned to focus on the analysis on gender diversity and turnover intention. One of (Nielsen & Madsen, 2017)'s findings indicates that "organizational gender diversity among female employees leads to lower turnover intentions." Such finding is generally in confirmation with Zatzick et al.'s research outcomes and can be reasonably considered valid given the large sample size of the survey

data set Nielsen and Madsen used and their diligent efforts in controlling for possible omitted-variable biases that come from factors that could alternatively correlate to both female diversity and turnover intentions.

### 2. Diversity on Retention in the Military

#### *a. Research on the Navy Personnel*

Greene (2019), Terranova (2019), Hernandez-Rodriguez and Serna (2020), and Arkes et al. (2020) have conducted a series of extensive research on the effects of diversity among top leadership ranks, immediate supervisors, and peers on retention of same-minority enlisted Sailors and Junior Officers in the Navy. They used large-scale military personnel data sets that mainly derived from the Navy Surface Warfare community. The findings from their studies are consistent and are summarized as the following:

- Increased diversity among leadership ranks and peer groups positively influences retention of same-minority first-term Sailors. The outcomes estimated that the role model effect in the Navy is significant.
- Black first-term Sailors have the strongest response to diversity.
- Increased diversity also has a positive impact on retention of first-term non-minority Sailors.

Greene (2019) conducted the first research on the topic of the effects of minority command leadership on the retention of minority Sailors. His work paved the ground and built the research framework that enabled the follow-on student studies in the same research area. Terranova (2019)'s thesis provides a great addition to Greene (2019)'s work by exploring the effects of diversity in the Junior Officer population in the Navy. Continuing on Greene and Terranova's efforts, Hernandez-Rodriguez and Serna (2020) significantly extends the previous two theses by expanding the scope and magnitude of research with the goal of pursuing more thorough and conclusive findings. While Greene (2019) focused primarily on medium-size ships in order to ensure sufficient and accurate minority leadership and minority Sailor interaction, Hernandez-Rodriguez and Serna (2020) adopted a larger set of longitudinal military personnel data that encompasses all

ship sizes, which furnished the benefit of using larger-sample observations. Hernandez and Serna (2020) also tested the effect of diversity among peers, in addition to leadership ranks, thus increasing the dimensions of research.

Finally, Arkes et al. (2020) systematically summarizes all three previous NPS student studies on the role model effect in the Navy. The research presented in (Arkes et al., 2020) not only attests to the findings from the quantitative analyses by their students, but also adds a qualitative analysis portion that is supported by surveys and in-person focus-group interviews with junior Sailors onboard Navy ships. The qualitative research portion revealed the reasons and factors that would affect minority Sailors' Navy experiences and their retention decisions; and for that reason, it is particularly important in potentially helping identify D&I metrics and develop D&I competencies for future education and trainings.

Greene (2019), Terranova (2019), Hernandez-Rodriguez and Serna (2020), and Arkes et al. (2020) exercised prudent econometric modeling designs to ensure the models' strength and validity. Their research chose to use Linear Probability Models (LPM) over probit or logit models, due to LPM's advantage in analyzing pooled cross-sectional data in the presence of fixed-effect controls in the models as well as the ease in interpreting regression outcomes. Besides using a Difference-in-Difference approach to control for differences between the target group and reference group caused by factors other than the treatment (Arkes, 2019), and using fixed-effects to control for possible omitted-variable biases, their research harnessed another advantage that comes from utilizing military data. Military personnel data normally has a higher level of "randomness" in contrast to that of the civilian workforces, given the random and involuntary nature of military assignments (Arkes et al., 2020). Such randomness of data would considerably increase the validity of econometric studies.

One potential issue regarding Greene (2019), Terranova (2019), and Hernandez-Rodriguez and Serna (2020)'s research is that, although their models use a Diff-in-Diff approach and control for fiscal year and command (ship), the data sets they used were still only sourced from the Navy Surface Community—one single type of duty. And I would consider type of duty is an important factor. The platform they used are all ships and

submarines, which are considered arduous sea-going duties comparing to shore-based commands. The Navy defines different types of duties based on tasks and operational environments (DNPC, 2017). Separation and attrition rates of junior Sailors are usually higher in seagoing units than shore duty commands due to the higher operational tempo and more challenging working environment. In these previous studies, minority leadership/peers have a positive effect on retention, while type-of-duty have a negative relationship with retention; also, type-of-duty in general have a positive relationship with all leadership effects (that is what leadership does, they step up and be more encouraging and empowering when facing greater challenges). Therefore, not considering the Type-of-Duty variable in the model would cause a downward bias on the estimated outcome. In other words, the models without identifying the type-of-duty variable would underestimate the true effects of minority leadership/peers on minority retention. Adding data from the shore-based commands to the analysis or estimating the same models separately using shore-command data might provide additional insights on Sailor retention. This would help the Navy understand the impact of work environments to Sailor retention and develop solutions such as adjusting the current sea-shore rotation patterns.

Additionally, from a diversity and retention and performance perspective, Sailors' promotion, especially enlisted promotion to E7 and above and officer promotion to O4 and above, would be a good indicator of how diversity affect both minority and non-minority in the Navy. These paygrades are considered very significant and critical career milestones for enlisted and officers, respectively. Results from this estimate could reveal whether diversity among minority leadership and peers can support a sustained model of success for minority Sailors—minority leaders and peers motivate and empower those minority junior Sailors to perform and become leaders.

#### *b. Studies Beyond the Scope of the Navy Population*

In addition to the research on diversity and retention in the Navy population, the influence of minority demographics has also been studied with emphasis placed on the social and behavioral effects of exposure in the college setting at the U.S. Air Force Academy. This is an interesting cross-section of the people we are interested in gaining

more information about as they have met the eligibility criterion required for military service and demonstrated their propensity and commitment to serve in the U.S. Armed Forces.

The study by Carrell, Hoekstra, & West (2019) approached the very subject of diversity from a different perspective, by analyzing the interactive nature between the minority group—black students, and the majority group—the white male student population, in the U.S. Air Force Academy. Rather than following the conventional how-diversity-affects-minority research direction, Carrell et al. (2019) placed their study's focus on the majority group's behavioral and attitude response to the diversity change of their minority counterpart within the same military college environment. Carrell et al. (2019)'s study mainly observed the white male students in the U.S. Air Force Academy. These white male students were randomly assigned ("matched") with black roommates in their freshmen year but were allowed to choose their own roommates in their sophomore year.

The study found strong evidence indicating that the white male students' exposure to their black roommates in freshmen year increases the likelihood of them voluntarily pairing up with a black roommate in their sophomore year, and that exposure to higher-performing black roommates also increases the affinity in future interactions between white and black students. In addition, such positive diversity effects on the majority group concentrated among the individuals with less previous interactive experiences with the minority group, which suggests that the interaction between the two groups, either voluntary or involuntary, is important and conducive to mutual acceptance and inclusion.

Like Arkes et al. (2020) and other military studies, Carrell et al. (2019) exploited one great benefit of using military personnel data for their study, adequately addressing the potential pitfall of self-selection biases in their methodology by taking advantage of the "randomness" of the data. Self-selection biases occur when: (1) the perceived individual treatment effect has a meaningful impact on why subjects chose the treatment (their decision-making); (2) there is a strong enough connection between the perceived effect and actual effect (Arkes, 2019). In Carrell et al. (2019), the subjects are the white male students in the Air Force Academy and the treatment is having a black roommate in freshmen year. Self-selection bias occurs if the freshmen year roommate assignment is not random and the

white male students intentionally choose to have a black roommate (for whatever benefits or reasons), this would negatively bias the outcomes and shadow the validity of the study.

Carrell et al., (2019)'s findings that are concluded with these types of results provide several critical discussion points. First, the exposure of minority to majority groups must sometimes be deliberate, as in some geographical areas are not able to organically attract them from the local population. This experience alone can serve as the fundamental basis for which many of the perceptions of racial attitudes for a different group are established. When exposed to higher ability minorities, majority members may update prior attitudes regarding other groups that were previously based on stereotypes portrayed in the media and other impersonal mediums that have historically perpetrated negative portrayals.

In addition, the study revealed that when exposed to high performing minority students in the freshman year, the probability of selecting a minority roommate the following year increases compared to a low performer. When members are high performing, their demographic background becomes less of an issue and they remain desirable based on their abilities and merit, not a quota and gain additional credibility and reverse negative bias and leads to significant changes in future behavior and reduces the potential for discrimination.

This study is critical to my research question, because if there are a lack of high performing minority members in key positions, the biases and promulgation of racial tensions is likely to exist. In other words, it is not enough to just have an inventory of minority members, but a high functioning cadre. High performing team members of all demographics are a critical tenet of a professional and diverse workforce that can work together to achieve mission accomplishment.

## D. MINORITY RETENTION RELATIVE TO NON-MINORITY

There are many academic research articles that study diversity and minority employee retention, but few of them are with the singular focus on the comparison of minority retention against non-minority retention. Among the few literatures that study minority relative retention in the military settings, similar to my research is Bowers

(2015)'s thesis which analyzes the differences in retention between minority groups and non-minority groups in the Navy.

Bowers (2015) is a comprehensive research in the areas of attrition, retention, and fast-track E5 promotion on Hispanic first-term enlisted Sailors compared to non-Hispanic Sailors in the Navy. Although focusing on only one minority category (Hispanic), Bowers (2015)'s thesis is broad in scope, as it not only aims at estimating the disparities in retention and promotion between the two groups, but attempts to link numerous pre-accession characteristics and first-termer experiences factors to the outcomes in order to furnish explanations. The study used a rich data set that is merged from a Navy recruiting and enlistment data file and a DMDC personnel data file that contains enlisted Sailor career information. The merged data set includes 348,330 observations that accessed in the Navy from FY 2001 to FY 2009 (Bowers, 2015).

Bowers' analysis results estimated that, "Hispanic first-termers are approximately 5.66 percent less likely to attrite, 5 percent more likely to retain in the Navy past the initial enlistment contract obligation (four years), and 5.07 percent less likely to promote to E5 in under four-years, compared to non-Hispanic first-termers" (Bowers, 2015). This suggests that, in general, Hispanic junior enlisted outperform in retention when compared to the non-Hispanic junior enlisted population, though the overall magnitude is mild, with a difference hoovering at about five percent. Despite some differences in objective variables and modeling design, (Bowers, 2015) closely relate to my study and its findings are in conformation with my analysis outcomes, which is that no evidence is found to show Hispanic first-term Sailors' retention is worse than non-Hispanic Sailors.

A major difference between Bowers (2015) and the series of D&I research that my research extended on is the difference in methodology. Bowers (2015) used probit models to estimate the effects as opposed to Linear Probability Models (LPM) employed by my study. Probit or logit models are advantageous at avoiding the drawback of the binary dependent variable(s) having unrealistic values (greater than 1 or less than 0), but also come at the cost of difficult interpretation of outcomes (Wooldridge, 2015). On the other hand, LPMs could have predicted probabilities that may be greater 1 or less than 0 and have marginal probability effects that are sometimes logically impossible but are easier for

estimation and interpretation and the estimated effects and predictions are often reasonably good in practice (Wooldridge, 2015; Arkes, 2019). The tradeoff between a Probit model and a LPM depends on the data set and the objectives of research.

Another study that is relevant to my thesis' focus is the RAND report that was developed by Asch et al. (2012). In their study, Asch et al. reexamined gender, race, and ethnic differences in officer career progression in the military, using a large longitudinal data set that contains administrative information on active-duty officers from the paygrade of O1 to O6 across the Army, Marine Corps, Navy, and Air Force from January 1993 to September 2010. Such a large-size military personnel data set that sources from all military branches preserve randomness and representativeness of data and tend to produce more valid research outcomes.

The findings from Asch et al. (2012) indicate that despite some degree of differences by cohorts, male officers in the minority categories of black, Hispanic, and others are generally less likely to be promoted than white males, also with that likelihood worsened at higher paygrades; but given promotion to a specified rank, minority retention are somewhat greater than that of white males, especially at the rank of O3 and above. For female officers, in general they are somewhat less likely to be promoted compared to the male officers, and when given promotion they are also slightly less likely to retain at each paygrade.

Though Asch et al. (2012) does not specifically concentrate on the area of minority relative retention but instead examine the interactive effect of promotion and retention of officers in different categories at each paygrade, it still offers meaningful relevant insights to my study and provides important implications for future research on D&I in the DOD. Some general implications from this article are that when junior minority members in the military are provided equal opportunities to perform, be recognized, and advance their careers, they are at least as likely to stay in the services as their majority counterparts at each paygrade; and that our organizational climate and inclusion behaviors in the immediate working environment are of very great importance in embracing minority talents and retaining them in our military forces.

## E. MY STUDY

To ensure rigor and validity of research, my thesis uses a difference-in-difference approach and fixed-effect control in estimating interested outcomes. The difference-in-difference method "filters" out the permanent differences portion between the treatment group (minority Sailors) and control group (non-minority Sailors) in my study, thus provides a much better ground for comparison. The fixed-effects in my models control for confounding factors by subcategorizing observations and compare only treatment and control groups that have similar pre-treatment characteristics.

In addition, my thesis looks beyond how diversity affects retention to focus on assessing minority Sailors' retention relative to non-minority Sailors in the Navy at large to focus on retention for different ports, ship classes, and enlisted communities. My study adds to the research area of minority retention in the Navy given that few previous studies have examined this area. The findings of my study could provide additional insight and support to help the Navy develop additional D&I metrics and evaluate the effectiveness of D&I competencies in force inclusion education and training.

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# IV. DATA AND METHODOLOGY

In this study, I focus on Navy first-term enlisted Sailors who served in the surface warfare community. This typically means they were assigned to a Navy ship. The surface warfare community is chosen as the focus for analysis because it is the Navy's primary operational platform and can provide the most representative data.

I use a set of longitudinal Navy first-term enlisted Sailors' reenlistment status files. The data set was previously utilized to address research questions on the effect of greater diversity among leadership and peers on retention of first-term minority and non-minority enlisted Sailors and naval officers (Hernandez-Rodriguez & Serna, 2020) and on how greater diversity could impact the retention of Sailors as well as what major challenges underrepresented groups are facing in the Navy (Arkes et al., 2020). The data set is a combined set of records from two separate files obtained from the Defense Manpower Data Center (DMDC) that contain individual enlisted reenlistment decisions and other background information such as geographical location of ships, rating and enlisted community of each observation, and ship types. The first data file, which contains reenlistment decision information, while the second data file provides command related information for port, enlisted community, and detailed operational platform, was manually created. These two files were then merged together for the purpose of this research, to allow the mapping between individual observations, peer groups, and supervisor groups.

## A. FIRST-TERM SAILORS REENLISTMENT DATA FILE

The first-term enlisted Sailors reenlistment data is the main data set that provides first-term enlisted Sailors' reenlistment decision information for this study. This data has approximately 268,000 observations of individual first-term enlisted Sailors' reenlistment decisions from FY 1998 to FY 2017. It is a pooled cross-sectional data that captures observations in different time periods. Although not panel data, pool cross-sectional data is also very useful in analyzing policies and programs. This data contains over 20 variables including de-identified random individual Sailor identification number (ID), ship UIC (UICX), enlistment contract obligation (OBLIG4), enlisted rating (Rating), Fiscal Year

(FY), Sailor separation or attrition year/month (LossDate), Sailor's reenlistment decision dummy variable (Reenl_1stTerm), Sailor's last race and ethnicity entries in the system (LastRace and LastEth), and Sailor demographics variables for gender, race, and ethnicity (Female, Black1, Hisp, White). It is important to note that, the variables of Reenl_1stTerm, Female, Black1, Hisp, and White are all dummy variables, meaning they take of values of either zero or one.

Descriptive statistics of the main variables in this data file are shown in the following table.

Table 2. Definitions and Summary Statistics for the Variables from the First Data Set (Total Sample: N=268,807)

| Variable Name | Definition | Mean | Std. Dev. |
|---|---|---|---|
| ID | De-identified random identification number for individual Sailors | | |
| UICX | Unit Identification Code. A unique letter and number code for each command | | |
| OBLIG4 | Sailor's enlistment obligation | | |
| FY | Fiscal Year | | |
| LossDate | The date of Sailor's separation or attrition from first term enlistment | | |
| LastRace | The most recent race category recorded in official system for a Sailor | | |
| LastEth | The most recent ethnicity category recorded in official system for a Sailor | | |
| Reenl_1stTerm | Re-enlistment upon first term; takes a value of 1 if Sailor reenlists at the end of first term, 0 otherwise | 0.430 | 0.495 |
| Female | Whether Sailor is a female. Take a value of 1 if Sailor is a female, 0 otherwise | 0.136 | 0.343 |
| Black1 | Whether Sailor is black. Take a value of 1 if Sailor is a black, 0 otherwise | 0.230 | 0.421 |
| Hisp | Whether Sailor is Hispanic. Take a value of 1 if Sailor is Hispanic, 0 otherwise | 0.172 | 0.378 |
| White | Whether Sailor is white. Take a value of 1 if Sailor is white, 0 otherwise | 0.499 | 0.500 |

### 1. Race/Ethnicity Classification Issue

In the data management process for race and ethnicity definition, I ran into three coding issues that Arkes et al. (2020) previously encountered. These issues include the following: (1) due to the coding change and race category expansion, some individual Sailors were classified into more than one race (ethnicity is not much an issue as Hispanics is the only ethnicity variable for this study and it is very well defined); (2) some individual Sailors were assigned with different races over time; and (3) some individual Sailors were missing inputs for race or ethnicity.

Because my research aims to continue and extend on aforementioned prior research conducted at NPS on the topic of diversity's effect on retention, I follow the rationale in Arkes et al. (2020, p. 40) in solving these issues, for both continuity and comparison of research findings. For the third issue, I use the last reported race in the system as the race for the observations. For the second issue, I exclude these observations with missing race/ethnicity value for the analysis since they only account for a minuscule fraction of the population.

### 2. Sample Criteria and Defining Reenlistment Decision

The observations in this data set are for the period from October 1997 to September 2017, with the earliest Active Duty Service Date (ADSD) being October 1997. In most cases, an initial Navy enlistment contract is for four years (or 48 months). A contract could be for five and up to seven years, but these cases are less frequent. Thus, I choose to observe the first 48 months after each observation's ADSD as their first-term period.

The next criterion is to determine the occurrence of reenlistment decisions. When eligible, an enlisted Sailor could reenlist for two, three, four, five, or six years (DNPC, 2017). This study uses the criterion of three years as the signal for a reenlistment, meaning when the new End of Active Obligated Service (EAOS) exceeds the original EAOS by 36 months a first-term Sailor is consider having reenlisted, and the new EAOS would be at the seven-year mark from the ADSD.

However, there is another caveat to consider. The Navy allows Sailors to reenlist as earlier as up to 365 days before his/her original EAOS, as long as the new contract is

greater than the remaining unfulfilled service obligation and meets other certain requirements. If this occurs, the new EAOS would be at the six-year mark from the ADSD due to the Sailor "skipping" a year by reenlisting earlier. To account for this situation, this study considers that whenever an EAOS exceeds the associating ADSD by three years, it signals a reenlistment decision. Therefore, a Sailor could join as late as 72 months before September 2017 in order to be observed for reenlistment decision.

The non-standardized initial enlistment contract length, reenlistment term, and reenlistment timing create measurement errors for the study. However, this type of measurement errors applies to all observations including both minority Sailors and non-minority Sailors and can be largely cancelled out by the Difference-in-Difference designed of the study.

## B. COMMAND INFORMATION DATA FILE

Given the purpose of this study, I create this second data file to map command information, such as homeports (bases), ship types (classes), and enlisted rating community to each individual observation in the first data file. These elements of ports, ship classes, and rating communities are introduced as covariates in the regression analysis. Using the command UICs extracted from the first data file, I linked them to specific command names (ships' names), geographical location (bases/ports), ship classes/types, and enlisted rating communities by cross-referencing these UICs to the current Standard Navy Distribution List (CNO, 2014). I also requested assistance from Navy Manpower Analysis Center (NAVMAC) Afloat Programs Department (Code 40) to verify the accuracy and completeness of such cross-referencing process.

With the command information mapped to the reenlistment data file, the two data sets are merged together to became one combined data file that provides sufficient matching information for the purposes of this research. As the ships in this data set are sourced from a wide timeframe (1998-2017) and diverse platforms, three potential issues need to be discussed, as shown below.

### 1. Ages of Ships (Data) Issue

Some ships in the data set are old and had already been decommissioned (110 out of 342 ships in this data sample have been decommissioned), with the decommission dates ranging from three years ago up to more than 20 years. However, the decommissioning of those old ships does not affect the ships' classification (as their sizes did not alter). The Navy has invested vast amounts of efforts and resources in improving diversity and inclusion from decades ago and has achieved significant accomplishment in this regard. It is reasonable to infer that the inclusive environment and inclusion behaviors today than in the past, and accordingly, minority groups' retention has been positively influenced and improved along the way. Since regression analyses typically provide average effects on the outcomes, conducting analyses using a data set mixed with old and new ships would allow the "old" effects and "new" effects average out, thus weakening the analytical power of the model.

### 2. Homeport (Base) Classification Issue

Another potential issue is the homeport (base) classification issue. It is not uncommon that Navy ships were ordered to conduct homeport change for various mission or operational reasons - in some rare cases a ship could even have a homeport change more than one time during her service life. Within this data set, 28 of the total 342 ships, or 8.2 percent, had had at least one homeport change during their tenures.

There could be two possible criteria in deciding a ship's homeport for this research's purpose: by the ship's last assigned homeport, or, by the length of time that the ship was assigned to the various homeports. Considering that one of the aims of this study is to analyze how being in different ports affects Sailors' reenlistment decisions, it is logical and reasonable to focus on the Sailors' exposure to and interaction with the geographical environment. I decide to choose the length of time a ship homeported to a base as the homeport (base) classification criteria.

Nevertheless, the issue of one ship being associated with different homeports will cause certain levels of biases to the analysis due to measurement errors. Measurement errors typically bias the outcome in the opposite direction, meaning that if the actual effect

between the treatment variable and the dependent variable is strong, measurement errors would weaken it, and if the actual effect is weak measurement errors would "hide" it. The magnitude of biases depends on the scale of errors. For this study, I believe that the threat to validity of research is minor given the small percentage of multi-homeport ships (8.2 percent) and the large sample size (388,000 observations).

### 3. Determining Ship Size for this Study

As far as the ship size is concerned, the criterion for ship size for this study is less restrictive (or selective) as it was for the previous NPS students' research. I decide to include all ship sizes—from small-size ships such as Frigates, to medium size ships such as Cruisers and Destroyers, to large-size ships like Aircraft Carriers. Greene (2019) used only medium-size ships for his regression models to ensure large enough sample sizes to observe the possible targeted effects but also avoid too large platforms where there might not be sufficient interaction between the researched population to produce meaningful outcomes. Hernandez-Rodriguez and Serna (2020) expanded their data selection to include large-size ships such as aircraft carriers to verify and further test the role model effect of minority peers and leadership on minority retention, but they still excluded small ships to avoid measurement errors caused by small-size samples. For my research, my methodology focuses on difference-in-difference comparison instead of interaction, and I believe that it is beneficial to use data on all ships because this increases the sample size for comparison on reenlistment decisions between the treatment groups and the reference groups. I also implemented control on the size of variables that any elements having less than 1,000 observations will be dropped from the main data set to protect the statistical power of the study.

### 4. Descriptive Statistics of this Data Set

Through UIC matching, all observations in the first data file were further classified by the categories of port, ship class, and enlisted community. The observations are grouped under 24 ports, 12 ship classes, and 13 rating communities, respectively, and of which six ports, two ship classes, and one enlisted community have less than 1,000 observations. As discussed, elements with less than 1,000 observations are excluded for the regression

analyses to ensure adequate numbers of observations in each context category to obtain reasonably precise estimates. With such data management in all three groupings (ports, ship classes or communities) in the model, there will be sufficient power to generate precise estimates of how the groups perform on retention.

## C. THE MERGED DATA FILE

The first and second data files are merged into one combined data set. This merged data set captures both reenlistment decision information and the matching port, ship class, and enlisted community information for each observation (or each individual reenlistment decision). This data set also has approximately 268,000 observations in the unit of quarter-Sailor.

To apply the concept of difference-in-difference comparison in the regression model, I create interaction variables between each minority group (by race, gender, and ethnicity) and each context category (port, ship class, and enlisted community) and use them as key explanatory variables for the model. These interaction variables are designed to estimate the differences in reenlistment decisions between minority (the target) groups and non-minority (the reference) groups in each specific context, as an indication of the two groups' different response to the effect of diversity and retention.

Besides the original variables from the first data file, the merged data set is completed with the addition of context variables and interaction variables as the following: homeport or base of ships (Port), platform or type of ships (ShipClass), enlisted community (Enl_Com), interaction variables between the minority group variables and context variables which are – black and port (bp), female and port (fp), Hispanic and port (hp), black and ship class (bt), female and ship class (ft), Hispanic and ship class (ht), black and community (bc), female and community (fc), Hispanic and community (hc), respectively. Accordingly, these interaction variables are also dummy variables, taking the value of either 1 or 0.

Definitions of the newly added variables in the merged data set is provided in the following table.

Table 3. Definition of Added Variables in the Merged Data Set

| Variable Name | Definition |
|---|---|
| Port | Geographic location (homeport or naval base) of ships |
| ShipClass | Type or platform of ships, usually by class |
| Enl_Com | Enlisted rating community to which a rating belongs |
| bp | Interaction variable between the race variable of black and Port |
| fp | Interaction variable between the gender variable of female and Port |
| hp | Interaction variable between the ethnicity variable of Hispanic and Port |
| bt | Interaction variable between the race variable of black and ship class |
| ft | Interaction variable between the gender variable of female and ship class |
| ht | Interaction variable between the ethnicity variable of Hispanic and ship class |
| bc | Interaction variable between the race variable of black and enlisted rating community |
| fc | Interaction variable between the gender variable of female and enlisted rating community |
| hc | Interaction variable between the ethnicity variable of Hispanic and enlisted rating community |

## D. DEPENDENT VARIABLE

The dependent variable for the research questions in this study is Reenl_1stTerm—an enlisted first-term Sailor's reenlistment decision. The reenlistment rate is used as a direct measure of retention in the analyses included in this study. The definition of retention means Sailors decide to extend their naval careers by signing a new contract with the Navy. Under the scope of this study, retention and reenlistment are interchangeable and refer to the same measure.

The dependent variable Reenl_1stTerm is a binary variable that takes a value of 1 if a Sailor decided to reenlist and 0 otherwise. In order to identify the existence of a reenlistment, I use the same reenlistment signaling criteria as used in Hernandez-Rodriguez & Serna (2020), meaning a Sailor is considered reenlisted if his/her latest EAOS exceeds ADSD by 36 months or more, which indicates that a reenlistment occurred.

## E. KEY TREATMENT VARIABLES

The key treatment (explanatory) variables for this study are the interaction of minority indicator variables and the covariates. The interaction variables estimate how well minority groups do on retention (measured by reenlistment rates) relative to non-minority groups by ports, ship classes, and rating communities. These treatment variables do not take continuous values, and instead they are the products of two binary values from their source variables therefore also take a value of either 1 or 0. For instance, if a Sailor is a female and assigned to a ship homeported in port A, then the value of this gender-port interaction variable for this port is 1, and 0 otherwise.

## F. METHODOLOGY

### 1. Difference-In-Difference Model

In regression analysis, a simple difference method is a basic and naïve way to estimate outcomes, meaning solely attributing the observed outcomes to the interested factor while ignoring the possible influences from other factors that could also affect the outcomes. In the case of this study, the observed outcome is the difference in retention between minority groups and non-minority groups. In fact, there are other factors other than diversity and inclusion that could also affect retention rates of all groups; thus, a simple difference method would ignore the effects from those other factors. An improved and unbiased approach is a Difference-in-Difference (Diff-in-Diff) model. A Diff-in-Diff model compares the difference on retention between minority groups and non-minority group while placing these groups in the same research environment: the Diff-in-Diff approach produces an unbiased estimate on the main effect by subtracting out the "side" effects from other factors that could also affect the outcome.

### 2. Fixed-Effect Control

With an unbalanced pooled cross-sectional with sufficient observations, I decide that a fixed-effect (FE) model is preferred to a simple ordinary least square (OLS) model. Therefore, the Fixed-effect approach is included in the model to address omitted-variable biases issue. Fixed-effects are used to account for factors and characteristics outside of D&I that could also affect retention. These factors and characteristics do not alter over time and are context (port, ship class, or enlisted community) specific.

In the models, I use FE to control for within-rating and within-fiscal year characteristics that could also affect the outcome. Although fixed-effects would typically exacerbate biases from measurement errors (Arkes, 2019), given the large number of observations in this study, the benefits of avoiding omitted-variable biases outweigh the drawbacks from the worsening of measurement error biases.

### 3. Econometric Models Used in This Study

Based on the research questions, this study conducts comparisons on reenlistment rates of first-term enlisted minority groups comparative to non-minority groups in various contexts of homeports, ship classes, and communities.

I chose to use a Linear Probability Model (LPM) for the estimates, since LPM is usually the more appropriate model than a Probit or Logit model in the presence of fixed effects (Arkes, 2019).

With FE controls, the generic econometric models is as follows:

$$\begin{aligned}(\text{Retention}) = {} & \textstyle\sum_i \beta_{1i} * (\text{Female}) * (\text{Port i}) \; + \\ & \textstyle\sum_i \beta_{2i} * (\text{Racial ethnic indicators}) * (\text{Port i}) + \beta_3 * (\text{Female}) + \\ & \beta_4 * (\text{Racial/ethnic indicators}) + \beta_4 * (\text{Port indicators}) + a_{ti} + \varepsilon\end{aligned}$$

Due to the numbers of the interaction variables by three different contexts (port, ship class, and enlisted community), including them all in one model would significantly

increase variance and lower the accuracy of estimates. Thus, it is to the benefits of the study to test the results in separate models by the context variables:

$$\text{(Retention)} = \sum_i \beta_{1i} * \text{(Female)} * \text{(Port i)} + \beta_3\text{*(Female)} + \beta_5\text{*(Port indicators)} + a_{ti} + \varepsilon$$

$$\text{(Retention)} = \sum_i \beta_{2i} * \text{(Racial ethnic indicators)} * \text{(Port i)} + \beta_4\text{*(Racial/ethnic indicators)} + \beta_4\text{*(Port indicators)} + a_{ti} + \varepsilon$$

These are typical difference-in-difference models with Fixed-effect controls. The set of coefficient estimates for $\beta_{1i}$ indicates how well each port does for female retention relative to male retention; the set of coefficient estimates for $\beta_{2i}$ reveals similar information on how a port does for under-represented racial/ethnic groups relative to whites (the reference group); $a_{ti}$ represents unobserved context-specific factors that explain retention other than D&I; and $\varepsilon$ is the error term for all unobserved variations in the model.

In addition to the port context, I estimate this model separately based on ship class and enlisted community in order to gain a more complete understanding.

### 4. Sample Size Management for each Research Question

In terms of model estimating power and precision, one caveat is that there might not be enough observations to support reasonably precise model estimates based only one context element. However, as described earlier, this can be well compensated by conducting analysis using comprehensive groupings such as homeports (locations), ship classes, and rating communities. Additionally, elements with less than 1,000 observations are excluded from the analysis.

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# V. RESULTS

This chapter summarizes the findings and limitations from the separate Fixed-effects and difference-in-difference controlled Linear Probability Models that are estimated in order to answer the research questions for this study: how well do unrepresented groups perform on retention relative to non-minority group in the Navy, as well as by homeports, ship classes, and enlisted communities?

The findings include (1) the average effects on retention of minority variables without interactions with context variables, in other words, the "absolute" effects on retention of minority Sailors without being compared to non-minority group at each port, ship class, and enlisted community; and (2) the relative effects between minority groups and non-minority groups by the three context variables.

The estimation results are presented in Figures 9–17 and Appendices A to C and discussed below.

## A. RETENTION EFFECTS WITHOUT COMPARISON

Based on the analysis of this data set, the Navy-wide average minority groups retention effects are shown in Table 4. The full estimates are shown in Appendix A, B, and C.

Table 4. Overall Average Minority Retention Effects

| Minority Variable | Mean Retention Effect | Range of Effects (95% Confidence Interval) | | p-value | Observations (N) |
|---|---|---|---|---|---|
| | | Lower Bound | Upper Bound | | |
| Black | 0.101 | 0.096 | 0.105 | 0.000 | 256,116 |
| Female | -0.005 | -0.010 | 0.001 | 0.082 | 264,482 |
| Hispanic | 0.003 | -0.002 | 0.008 | 0.193 | 252,103 |

These outcomes are the estimated average minority retention effects and are at the overall-Navy level, since they are not interacted with any context variables (port, ship class, or enlisted community). The estimated outcomes suggest that, at the Navy level, black Sailors' reenlistment rates are, on average, about 10 percentage points higher relative to that of the non-minority group (white Sailors). Therefore, black Sailors are found to be doing considerably better at retention than the white Sailor population. The estimated outcome is obtained from a large sample (N=256,116) and is statistically significant ($p$=0.000).

However, for female and Hispanic Sailors, the average estimated effects on their reenlistment rates are less than 0.5 percentage points different than that of the majority group, which are too miniscule to be considered significant or meaningful. Therefore, the estimated models did not find evidence that suggests any significant differences on retention between female and male Sailors, or Hispanic and non-Hispanic Sailors at the all-Navy level.

These outcomes describe a general theme of how well minority groups do on retention relative to their respective reference (majority) groups across the Navy. The results can also be used as rough benchmarks for the next level of analyses where minority relative retention will be estimated at the port, ship class, and enlisted community levels.

As far as statistical significance (indicated by $p$-value) is concerned, Ioannidis (2005), Nuzzo (2014), and Arkes (2019) argue that the $p$-value is not an objective indicator of whether the estimate from regression analysis is truly different from non-existence or zero value, and that the $p$-value is subject to several other factors besides the true statistical significance of the key explanatory variables' effects. The main idea from their argument is that lack of evidence for the estimate does not prove its non-existence. Following this way of thinking, I decide not to overstate the importance of statistical significance in the regression outcomes in this study. While strong significance might strengthen the findings, weak or lack of statistical significance does not necessarily undermine the validity of the estimated outcomes. Therefore, the findings would still support the theories produced by this research regardless of the $p$-values.

## B. RETENTION EFFECTS RELATIVE TO NON-MINORITY GROUP

The section presents the findings on minority Sailors' retention relative to non-minority groups in various contextual settings: by homeports (locations), ship classes, and rating communities.

The discussions on the findings focus more on the nature of the comparison of retention performances between the targeted groups (minority Sailors) and the reference groups (non-minority Sailors), rather than analyzing the magnitudes of such differences on reenlistment rates. Separate research using different data sets that contain diversity composition and individual reenlistment decisions information is required to analyze the magnitudes of relative retention based on the "absolute" retention level of the reference groups (non-minority) to truly understand and quantify those effects.

However, although the discussions regard the relative rather than absolute findings, they adequately address the second research question of this study: how does the reenlistment rate of minority groups (by gender, race, and ethnicity) compare with that of non-minority groups?

In the sections that follow, I present the regression outcomes in bar chart and graph format for the benefits of clarity and simplicity. Appendices A, B, and C presents the full results tables that provide regression outcomes in the form of numeric values. Figures 9–11, Figures 12–14, and Figures 15–17 illustrate the findings on minority groups retention relative to non-minority groups by different ports, ship classes, and enlisted communities, respectively.

### 1. Relative Retention Effects by Ports

#### *a. Black Sailors Relative to Non-Minority Group*

Figure 9 presents how well various ports perform on first-term minority Sailors' retention relative to non-minority Sailors. To restate, the estimating model uses a Difference-in-Difference approach and fixed-effects for rating and FY to address omitted variable bias issues. This means that reenlistment rates of minority Sailors are compared against the rates of their counterparts in the same FY, same ratings, and in the same port.

This modeling control setting remains the same for the other analyses in this study conducted by ship classes, or rating community.

Figure 9. Black Sailors Retention Relative to Non-Minority Group by Ports.

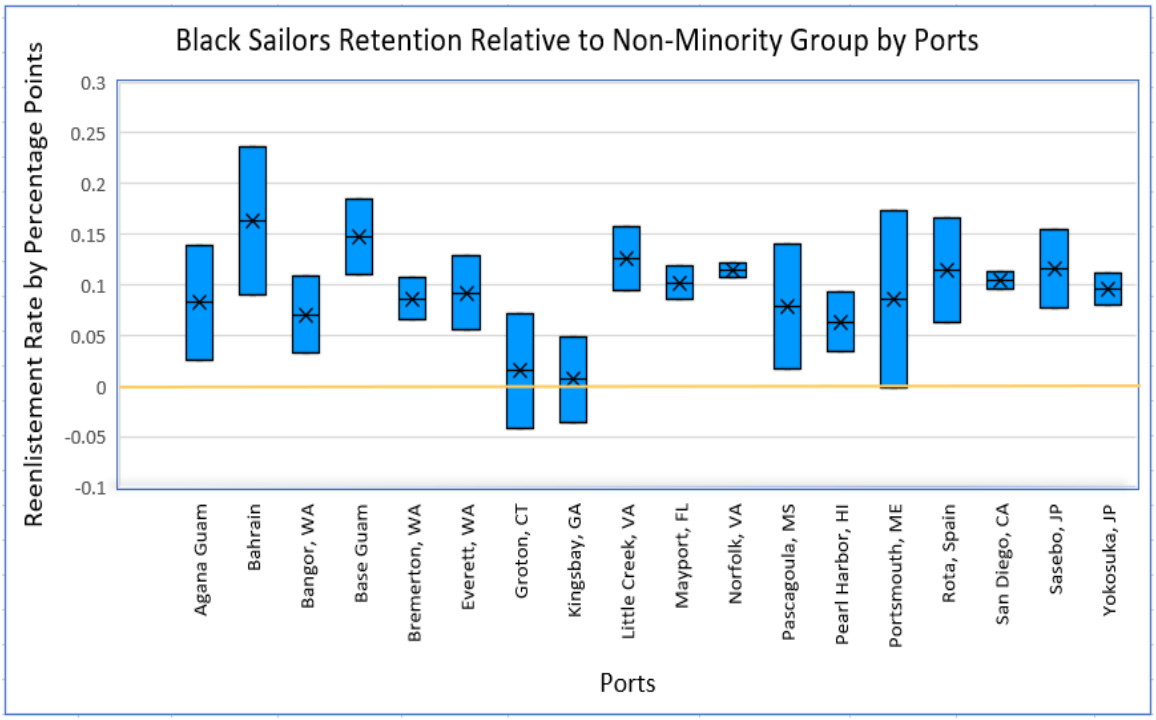


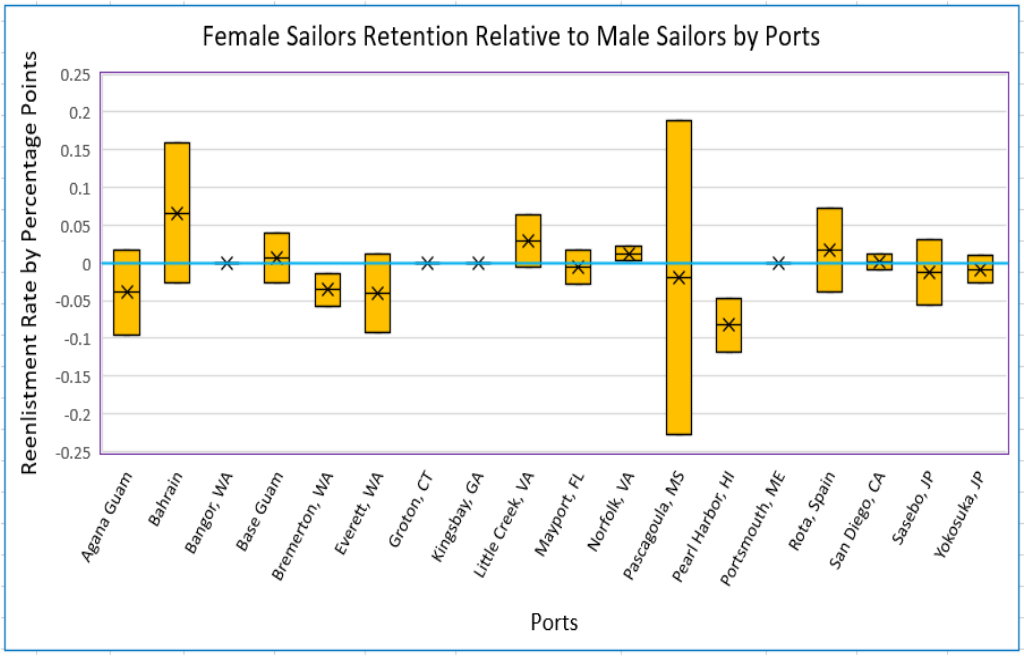

Figure 9 shows that, across all ports, first-term enlisted black Sailors have higher reenlistment rates than the first-term white Sailors population, with the difference ranging from +0.6 to +16.3 percentage points, depending on ports. This is not surprising considering the findings from Greene (2019) and Hernandez-Rodriguez & Serna (2020) that first-term black Sailors positively respond to increase same-minority diversity level changes among their peers, supervisors, and senior leadership. The reasons that black Sailors favor staying in the Navy could be attributed to both, external factors—such as economic conditions and employment opportunities in the private sector, and internal factors—such as Navy's improvements in D&I and the same-minority role model effects these black Sailors experience in their workspace.

This result implies that the Navy's organizational culture and climate at all locations (ports) are positive rather than negative to the black Sailors' experiences.

### *b. Female Sailors Relative to Males*

Figure 10 presents the female retention relative to male retention by port. The results in Figure 10 indicate that the reenlistment rates differences between females and males in each port cluster around the zero (no differences) baseline, with most relative effects being within +/-5 percentage points. In addition, of those ports where female retention is higher or lower than male, no systematic patterns could be identified on overall female first-termers' retention is better or worse than their male counterpart by geographic locations. More importantly, the differences in reenlistment rates for females relative to males from the two largest naval bases – Norfolk and San Diego are one percentage point and 0.1 percentage point, respectively. The analysis on the largest sample population in this data set—Norfolk and San Diego combined—found no evidence to support that female and male retention are any different from each other.

Figure 10. Female Sailors Retention Relative to Male Sailors by Ports.



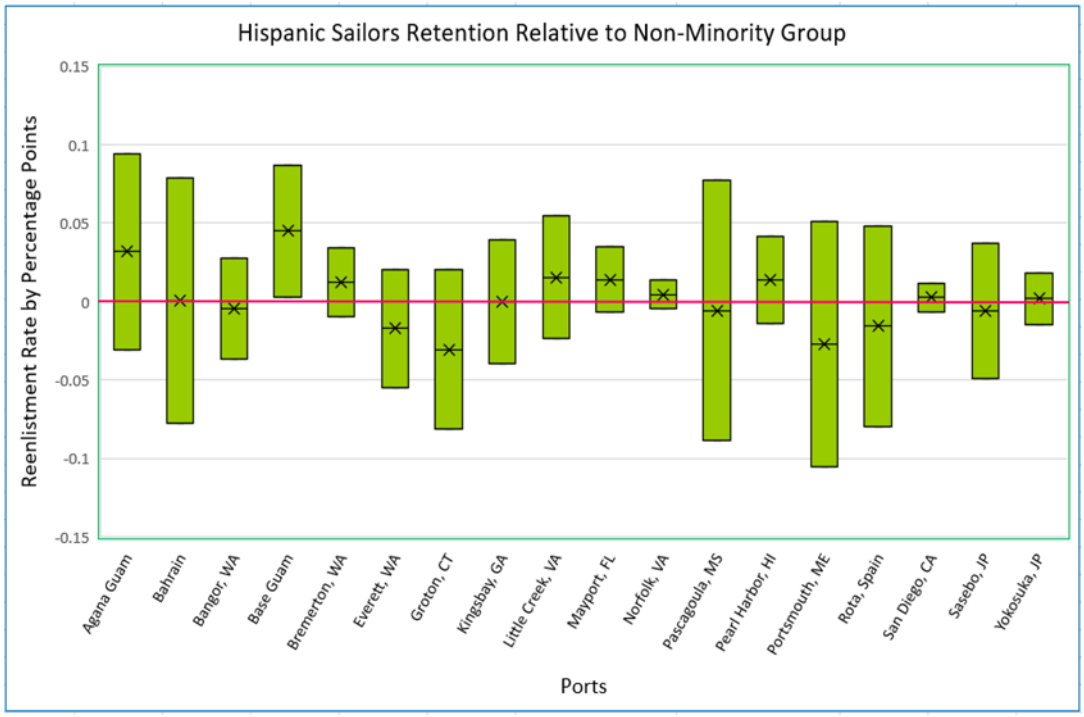
Therefore, the findings suggest that across all locations, overall female retention is approximate at the same level with male retention, with no evidence implying female Sailors are more likely to leave the service than male Sailors.

### *c. Hispanic Sailors Relative to Non-Minority Group*

First-Term enlisted Hispanic Sailors' reenlistment rates compared with those of non-minority are presented in Figure 11. While some ports have higher Hispanic retention relative to the non-minority group, other locations show smaller relative retention rates, and the rest of the ports have close to zero differences in retention rates of Hispanics and majority Sailors. Another piece of important finding is that from all 18 ports, the relative retention effects between the two groups are within +/-5 percentage points, indicating the magnitude of differences in retention not significant.

The ports that have positive relative Hispanic retention include Guam, Little Creek, Mayport, and Pearl Harbor; while the ones that have negative relative effects include Everett, Groton, Portsmouth, and Rota. The ports Bahrain, Bangor, Kingsbay, Norfolk, San Diego, Sasebo, and Yokosuka practically have indifferent relative retention effects. With such ports distribution, these results seem random as there is no obvious evidence or any meaningful patterns that could possibly classify these locations and make suggestions on Hispanic relative retention. Based on the findings, Hispanic first-termers retention is largely indifferent from the non-Hispanic group across all naval ports.

Figure 11. Hispanic Sailors Retention Relative to Non-Minority Group by Ports.




To note, an issue encountered when conducting research concerning the ethnic category of Hispanic is that, although the Hispanic group is commonly classified as one overall ethnic category, it encompasses a very diverse group of subcategories within which each subcategory has their own unique culture, tradition, and group characteristics. These subcategories of Hispanics are likely to have different response in and preference to policies and organizational climates. Likewise, Hispanic Sailors with different sub-ethnicity backgrounds might have various retention effects and when they are measured as one group it is likely that their individual effects are "neutralized" or cancelled-out, thus showing no collective effect.

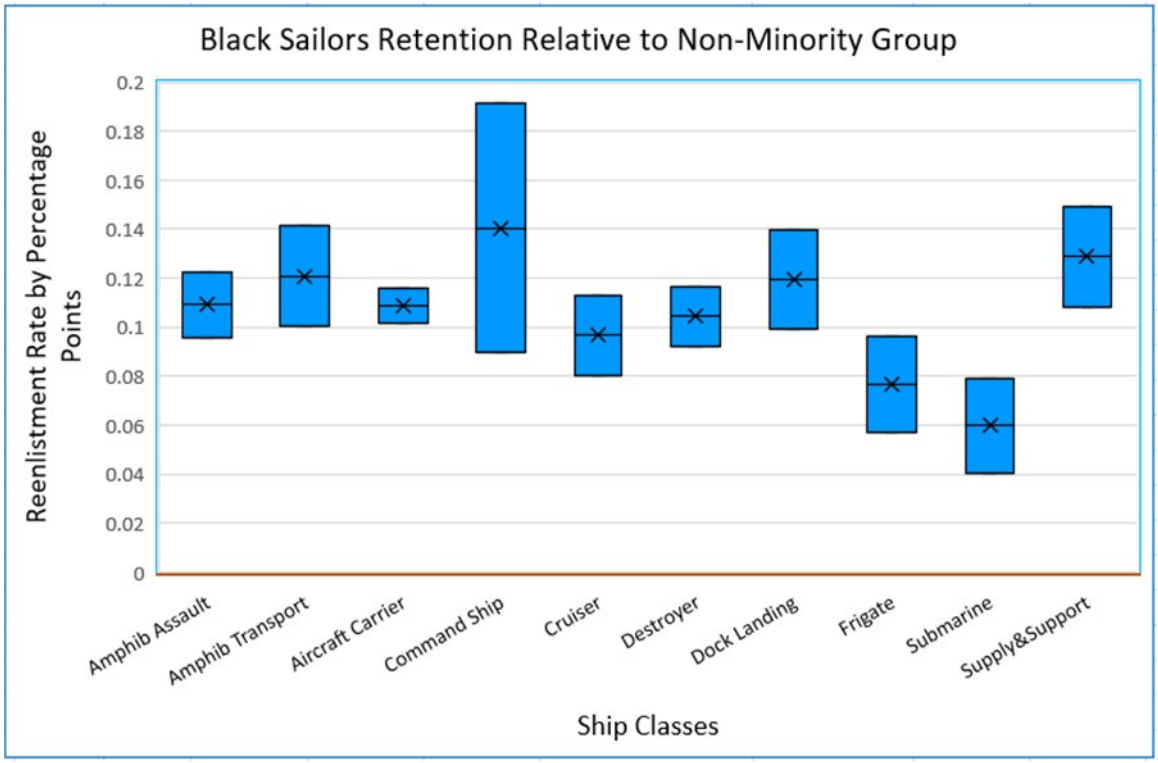
### 2. Relative Retention Effects by Ship Classes

#### *a. Black Sailors Relative to Non-Minority Group*

The regression results presented in Figure 12 show that first-term black Sailors outperform their majority counterpart in retention on all operational platforms—from small-size to large-size ships—with the average relative effects ranging from +6 to +14 percentage points. It is another strong evidence that suggests black Sailors are more likely to decide to stay and continue their naval careers. This is also in consistence with the findings from Greene (2019) and Hernandez-Rodriguez & Serna (2020).

The reasons for higher black retention relative to non-minority group that were discussed in the port section would also apply here, including that black Sailors in general appreciate the Navy's efforts in improving diversity and enhancing an inclusive culture.

Figure 12. Black Sailors Retention Relative to Non-Minority Group by Ship Classes.

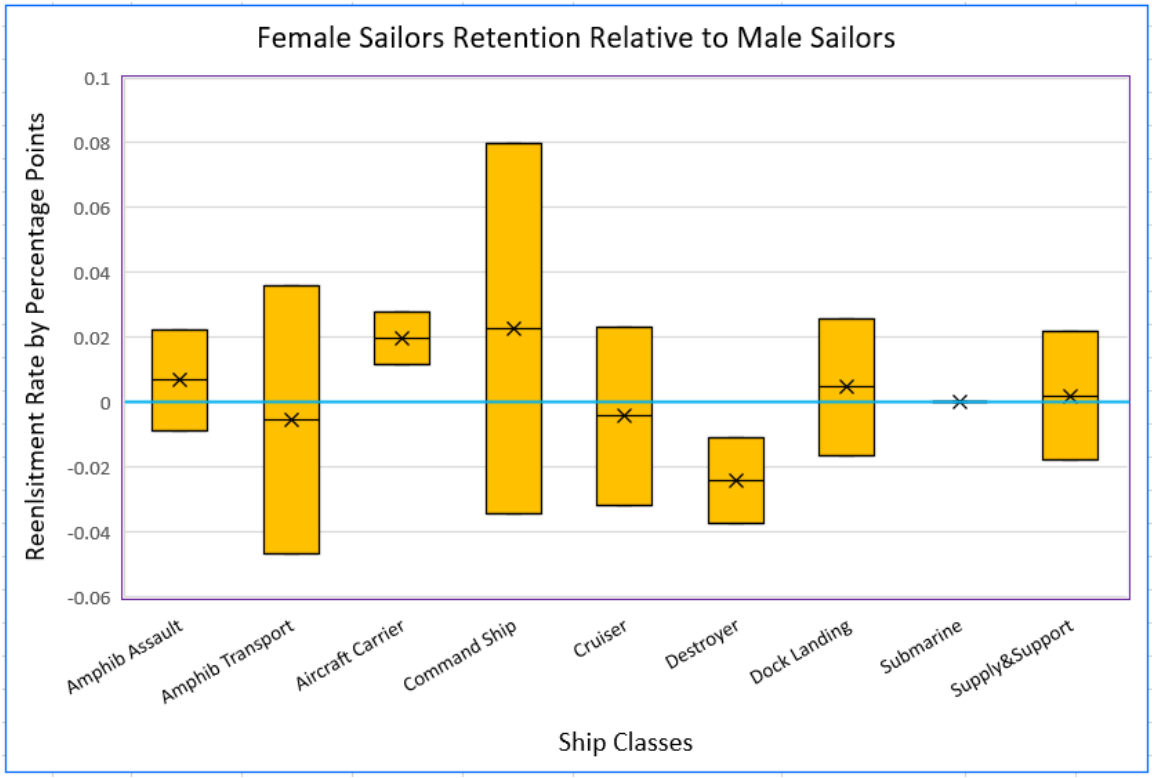


### *b. Female Sailors Relative to Males*

Based on results shown in Figure 13, the regression estimates provide no evidence to suggest any significant disparities between female and male retention across all Navy operational platforms. Most effects are not significant in magnitude as they are within +/- 2.5 percentage points of the zero (no effect) line. Similar to the findings on female retention relative to males, by ports, female retention shows no significant difference with that of males when estimated by ship class.

It is worth to mention that there is one outlier in the outcome that implies first-term enlisted female retention is significantly worse than that of males in the category of Frigates. However, this is more likely due to miscoding or measurement errors as Frigates did not have female enlisted Sailors onboard.

Figure 13. Female Sailors Retention Relative to Male Sailors by Ship Classes.

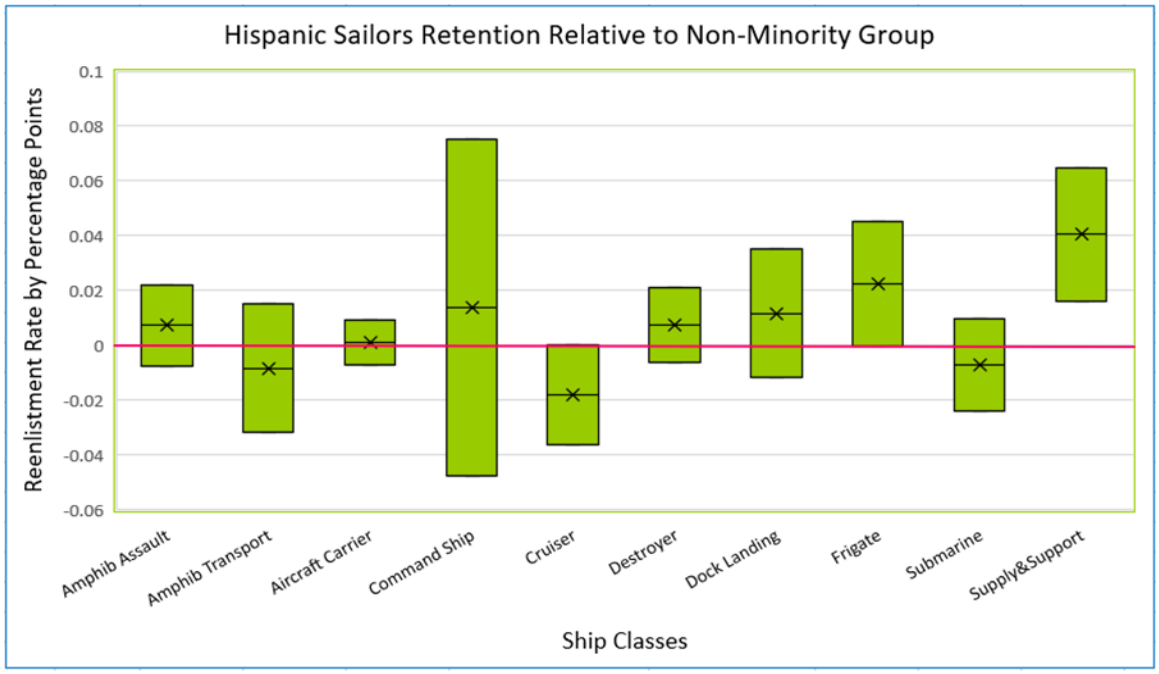


### *c. Hispanic Sailors Relative to Non-Minority Group*

Figure 14 shows the first-term Hispanic Sailors relative retention on all Navy platforms. Firstly, among the 10 platforms, Amphibious Transport, Cruiser, and Submarine classes have negative relative effects, while Amphibious Assault, Aircraft Carrier, Command Ship, Destroyer, Dock Landing, Frigate, and Supply classes have various levels of positive effects, but there is no clear pattern or linkage indicating what types of platforms are more conducive to first-term Hispanic Sailors retention. Secondly, most effects are within the range of -2 to +2 percentage points differences, suggesting there are no substantial disparities in retention between Hispanic and non-Hispanic groups.

This result tells a similar story on Hispanic retention relative to non-Hispanic groups by ship classes as to by ports. In general, first-term enlisted Hispanic Sailors are just about as likely to reenlist as their ethnic counterparts on all Navy surface platforms.

Figure 14. Hispanic Sailors Retention Relative to Non-Minority Group by Ship Classes.

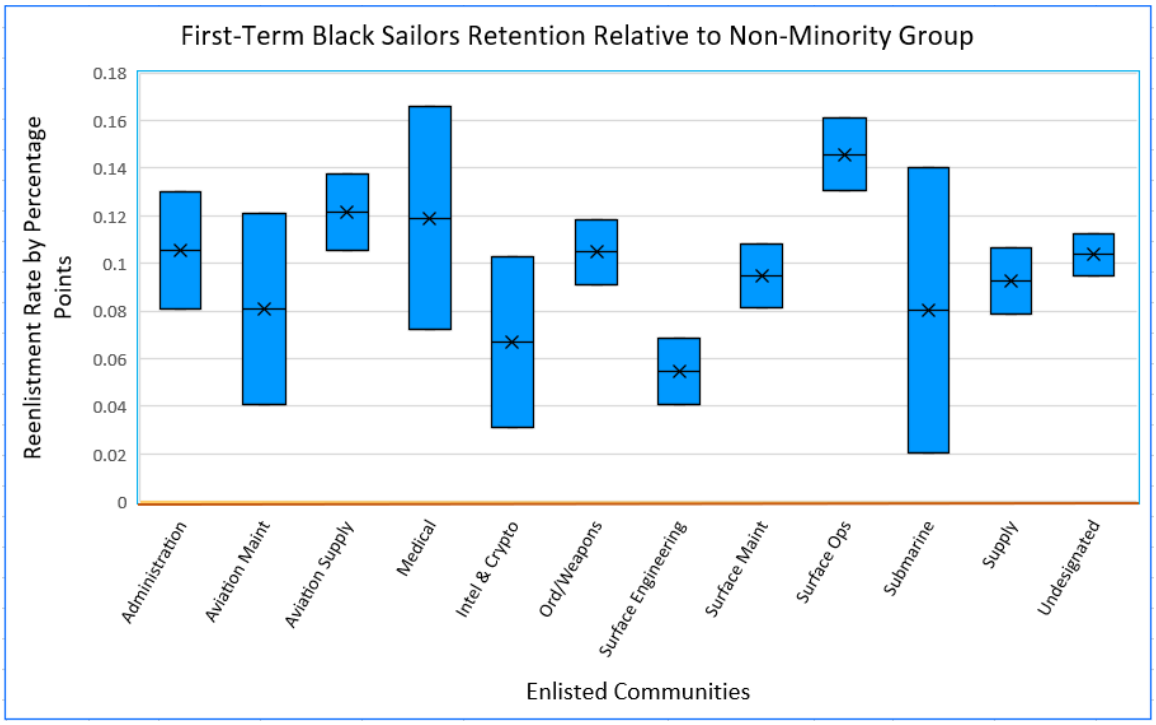


### 3. Relative Retention Effects by Enlisted Communities

#### *a. Black Sailors Relative to Non-Minority Group*

The relative black retention results by enlisted communities tell the same narrative as that of the analysis by port and operational platform settings: first-term blacks enlisted Sailors are more likely to reenlist than the non-minority group across all different occupational fields. This finding is shown in Figure 15.

Figure 15. Black Sailors Retention Relative to Non-Minority Group by Enlisted Communities.

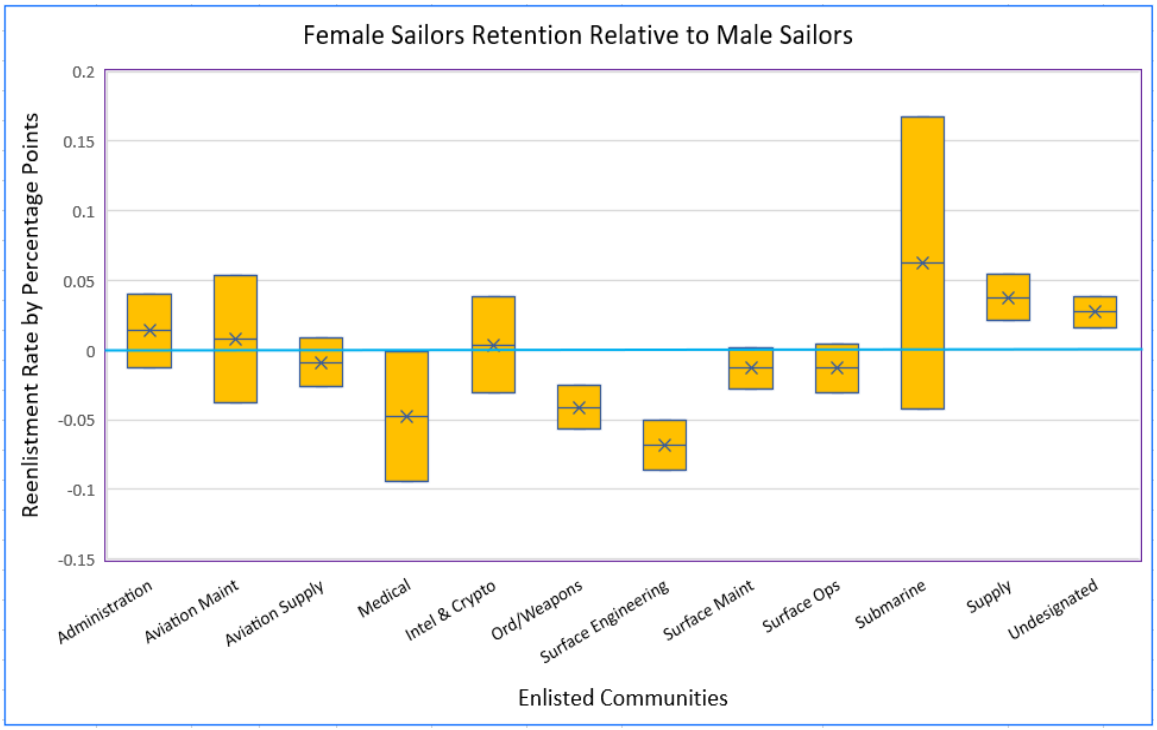



#### *b. Female Retention Relative to Males*

Figure 16 presents first-term female Sailors' retention compared to their male counterpart, by enlisted communities. The results of female relative retention can be interpreted in two folds. Firstly, of the 12 enlisted occupational fields, six of them are better at female retention while the other half are worse, with most of the effects ranging from -6.8 to +3.8 percentage points. The highest effect is +6.2 percentage points for submarine;

however, considering that only limited numbers of submarine billets were opened to female Sailors in recent years, this outcome is not representative. Overall, this result indicates that when considering communities as a whole, there is no evidence for any systemic advantages or disadvantage for female retention. This finding is consistent with the result of all-Navy-level estimate on female relative retention effects that female Sailors' retention is approximately the same with males.

Figure 16. Female Sailors Retention Relative to Male Sailors by Enlisted Communities.




Secondly, a pattern can be identified through examination of the communities where females do not reenlist as well as males. These communities are Medical, Ordnance and Weapons, Surface Engineering, Surface Maintenance, and Surface Operations. Considering this together with the findings in the port and ship class settings, where female Sailors reenlist as well as males, and that females Sailors traditionally prefer administrative and supply career fields over engineering, maintenance, ordnance and weapons handling (Kofoed, 2019, p.13), it is more likely that the lag in female retention in the above

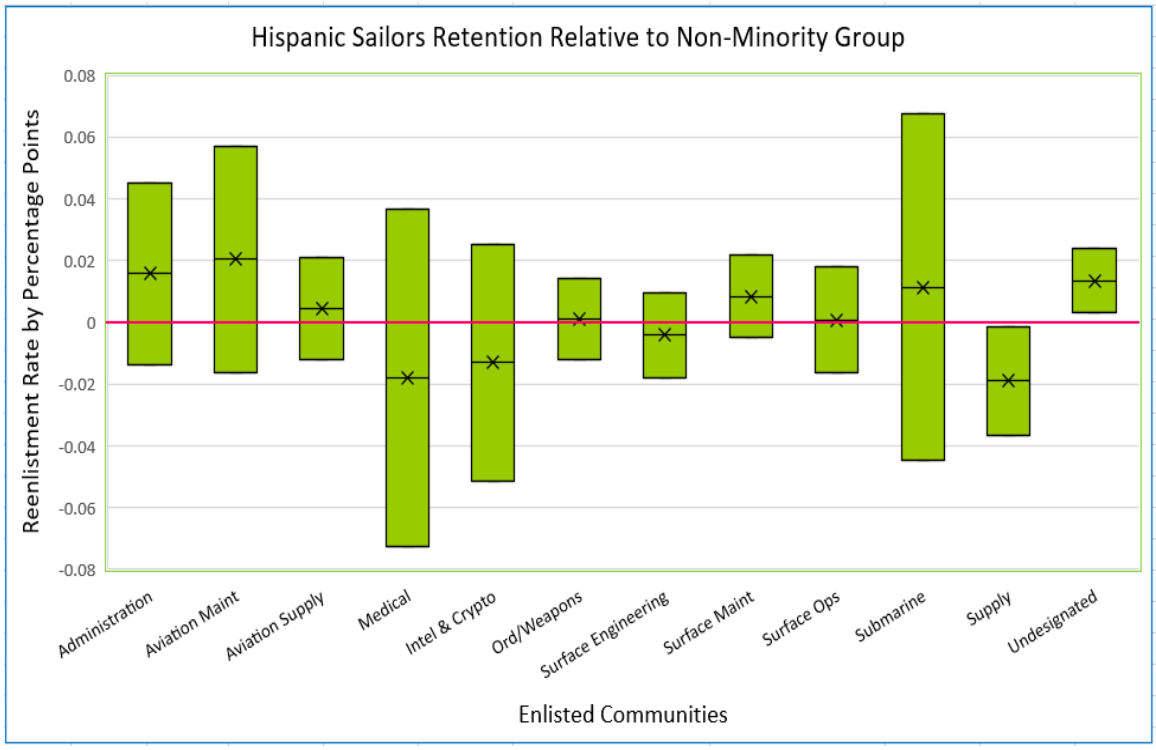
mentioned communities is due to occupational preferences rather than diversity and culture of inclusion behaviors within those communities.

Nevertheless, the finding here indicates potential areas for investment in D&I competencies development and enlisted community management in order to attract more female to stay in their occupations and in the Navy.

### *c. Hispanic Sailors Relative to Non-Minority Group*

Figure 17 presents first-term Hispanic Sailors' relative retention effects by different enlisted communities. It shows that from 12 communities four of them have negative relative retention for Hispanics, while the effects are within the range of -2 to +2 percentage points for all communities and within the range of -1 and +1 percentage point for six communities. The small magnitudes of effects suggest that Hispanic Sailors' retention is practically no different with that of the non-minority group.

Figure 17. Hispanic Sailors Retention Relative to Non-Minority Group by Enlisted Communities.



## C. LIMITATIONS

One limitation in this study comes from measurement errors. As introduced in previous chapters, measurement errors inevitably existed in data selection and data management processes, coming from factors such as the coding issues with respect to race and ethnicity, the criteria used to define initial enlistment contracts and reenlistment decisions, and the ships possibly having more than one homeport during services. These measurement errors produce inaccuracies and cause negative biases to the analysis outcomes, which could possibly explain that the general results on female and Hispanic relative retention are not significant. When the actual female and Hispanic retention effects probably do exist but are weak, measurement errors diminish and even "hide" those effects.

# VI. CONCLUSIONS AND RECOMMENDATIONS

This thesis builds upon and extends the work of Greene (2019), Terranova (2019), Hernandez-Rodriguez and Serna (2020), and Arkes et al. (2020)'s. This study examines the minority groups retention relative to non-minority groups in the Navy overall, and by ports, ship classes, and enlisted communities.

Using individual level, quarterly observations on first-term enlisted Sailors' reenlistment decisions made from FY 1998 to FY 2017, and a difference-in-difference research approach, the Linear Probability Model estimates with fixed effects controls aimed to address the following research questions:

1. How does the reenlistment rate of minority groups (by gender, race, and ethnicity) compare with that of non-minority groups?
2. How does the reenlistment rate vary among enlisted communities, geographical locations (naval bases), and platforms (ship classes) for minority groups (by gender, race, and ethnicity) compared to that of non-minority groups?

This thesis found evidence that suggests a higher tendency—in the Navy overall—for reenlistment for first-term enlisted black Sailors relative to white Sailors in the same categories, and a notion that first-term enlisted female Sailors and Hispanic Sailors are as likely to reenlist as their male and non-Hispanic counterparts, respectively. The study also revealed similar outcomes on how black, female, and Hispanic Sailors' retentions compare to their respective reference non-minority groups by different ports, ship classes, and enlisted communities.

## 1. Minority Retention at the Navy Level

Black Sailors' reenlistment rates are estimated to be 10 percentage points higher than the first-term white Sailors population. This could be a combination of external reasons—such as economy and employment opportunities, and internal reasons—such as improved inclusivity for the blacks in the services. The finding conveys a strong message

to the Navy that the decades-long efforts in D&I did positively influence black Sailors' propensity for staying in the Navy.

The results show that female Sailors are largely indifferent with males on retention, contrary to the common assumption that female are more likely to leave the Navy. Similarly, Hispanic Sailors' retention is at the same level with that of non-Hispanic Sailors, neither better nor worse.

### 2. Minority Relative Retention by Homeports, Ship Classes, and Enlisted Communities

The findings suggest that black Sailors outperformed their non-minority counterpart in retention in all ports, ship classes, and enlisted communities, with reenlistment rates at 0.6 to 16.3 percentage points above those of the non-minority group.

In the port and ship class settings, first-term enlisted female Sailors' retention are estimated to be the same as males. The only considerable disparities in female relative retention are reported in the enlisted communities setting, where in the Medical, Ordnance and Weapons, Surface Engineering, Surface Maintenance, and Surface Operations communities females seemed to be less likely to reenlist, but there is no compelling evidence that links this to the reason of D&I issues.

For first-term Hispanic Sailors, the findings indicate that their retention is at the same level with that of the non-Hispanic groups in all ports, ship classes, and enlisted communities.

### 3. Summary of Findings

The main theme of the findings is that first-term black Sailors are more likely to reenlist relative to white Sailors in the Navy and all other contexts. Female Sailors are as likely to stay in the Navy as male Sailors are, and Hispanic Sailors are as likely as non-Hispanic group is in all contexts. This study did not find strong evidence to identify which ports, operational platforms, or communities do particularly better or worse on minority retention. Yet, the research findings provide some evidence that, with improving and sustaining D&I, first-term black Sailors are doing better than white Sailors at retention,

while female Sailors and Hispanic Sailors are doing no worse than non-minority groups on retention.

## B. RECOMMENDATIONS FOR THE WAY FORWARD

Diversity and inclusivity remain a critical factor in maintaining our forces' collective strength and strategic advantage. Previous studies findings suggest that the Navy's long-term investments in diversity and inclusion have achieved significant improvements on diversifying our forces and retaining talents from all aspects. As the Navy moves forward in strengthening D&I, the focal points should be the minorities' representation in the force, as well as the opportunities for minorities' performance, recognition, and promotion. The Navy can incorporate D&I controls in each step of the manpower management process, from determination to recruitment, to detailing, to promotion, and to retention.

Echoing Greene (2019) and Hernandez-Rodriguez & Serna (2020), thoroughly understanding all determinants on minority underrepresentation and retention is a complex task. However, each additional research with more current and accurate data should lead us closer to that objective. Considering the measurement errors in the data set for my thesis, I would also recommend using more accurate data collected for the purpose of D&I studies, with precise definitions on minority classification (race, gender, and ethnicity), leadership, contract terms, ships' homeports. Additional research using more precise data may reveal meaningful insights.

Lastly, considering that the diversity and inclusion research aims to develop D&I metrics to understand minority representation and assess the impact of education/training of D&I competencies, I recommend using promotion, in addition to retention, as another important metric. As retention has been regularly used as an ultimate D&I metrics in research, the metric of promotion offers equally valuable insights on D&I. Yet "promotion" in this sense should not be the mere comparison of minorities composition at each paygrade. Although such comparison does tell a general trend of minorities composition, many factors could happen during the time lapse between paygrades, thus confounding the

reasons that could lead to the changes on the numbers of minority Sailors from one paygrade to the next.

An accurate way of evaluating promotion as a D&I metric is to measure the diversity change candidate pools by paygrade immediately after and before each individual promotion board or Navy advancement exam (by rating or community), in these cases would be the minorities diversity levels among the selectees and the respective original candidate pools. This immediate comparison on minority promotion opportunities provides direct and accurate information on the D&I climate. The Navy can appoint a specific committee to collect and build a longitudinal pooled sectional data set with minority promotion information and use such data set for future empirical research on diversity culture and inclusion behaviors in the Navy.

# APPENDIX A. MINORITY RETENTION BY PORTS TABLE

**Minority Retention Relative to Non-Minority by Ports**

| Minority-Port Interaction at | Black | Female | Hispanic |
|---|---|---|---|
| Port 1 (Agana Guam) | 0.083*** | -0.039 | 0.032 |
| | (0.029) | (0.029) | (0.032) |
| Port 2 (Bahrain) | 0.163*** | 0.066 | 0.001 |
| | (0.037) | (0.047) | (0.040) |
| Port 3 (Bangor, WA) | 0.070*** | 0.000 | -0.004 |
| | (0.020) | (.) | (0.016) |
| Port 4 (Base Guam) | 0.148*** | 0.007 | 0.045** |
| | (0.019) | (0.017) | (0.021) |
| Port 5 (Bremerton, WA) | 0.086*** | -0.036*** | 0.012 |
| | (0.011) | (0.011) | (0.011) |
| Port 6 (Everett, WA) | 0.092*** | -0.040 | -0.017 |
| | (0.019) | (0.026) | (0.019) |
| Port 7 (Groton, CT) | 0.015 | 0.000 | -0.031 |
| | (0.029) | (.) | (0.026) |
| Port 8 (Kingsbay, GA) | 0.007 | 0.000 | -0.000 |
| | (0.022) | (.) | (0.020) |
| Port 9 (Little Creek, VA) | 0.126*** | 0.029 | 0.015 |
| | (0.016) | (0.018) | (0.020) |
| Port 10 (Mayport, FL) | 0.102*** | -0.006 | 0.014 |
| | (0.009) | (0.012) | (0.011) |
| Port 11 (Norfolk, VA) | 0.114*** | 0.012*** | 0.005 |
| | (0.004) | (0.005) | (0.005) |
| Port 12 (Pascagoula, MS) | 0.079** | -0.019 | -0.006 |
| | (0.032) | (0.106) | (0.042) |
| Port 13 (Pearl Harbor, HI) | 0.063*** | -0.082*** | 0.014 |
| | (0.015) | (0.018) | (0.014) |
| Port 14 (Portsmouth, ME) | 0.086* | 0.000 | -0.027 |
| | (0.045) | (.) | (0.040) |
| Port 15 (Rota, Spain) | 0.114*** | 0.017 | -0.016 |
| | (0.026) | (0.028) | (0.033) |
| Port 16 (San Diego, CA) | 0.104*** | 0.001 | 0.003 |
| | (0.005) | (0.005) | (0.005) |
| Port 17 (Sasebo, Japan) | 0.116*** | -0.013 | -0.006 |
| | (0.020) | (0.022) | (0.022) |
| Port 18 (Yokosuka, Japan) | 0.096*** | -0.009 | 0.002 |
| | (0.008) | (0.009) | (0.008) |
| Constant | 0.384*** | 0.408*** | 0.408*** |
| | (0.002) | (0.002) | (0.002) |
| Observations | 256076 | 264440 | 252065 |
| $R^2$ | 0.043 | 0.035 | 0.035 |

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Coefficients expressed as minority retention relative to non-minority by percentage points.
Produced by a Difference-in-Difference Linear Probability Model with Fixed-effect control.
Values of '0' are omissions due to collinearity.

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# APPENDIX B. MINORITY RETENTION BY CLASSES TABLE

**Minority Retention Relative to Non-Minority by Ship Classes**

| Minority-ShipClass Interaction at | Black | Female | Hispanic |
|---|---|---|---|
| Type 1 (Amphibious Assault) | 0.109*** | 0.007 | 0.007 |
| | (0.007) | (0.008) | (0.008) |
| Type 2 (Amphibious Transport) | 0.121*** | -0.005 | -0.008 |
| | (0.010) | (0.021) | (0.012) |
| Type 3 (Aircraft Carrier) | 0.109*** | 0.020*** | 0.001 |
| | (0.004) | (0.004) | (0.004) |
| Type 4 (Command Ship) | 0.141*** | 0.023 | 0.014 |
| | (0.026) | (0.029) | (0.031) |
| Type 5 (Cruiser) | 0.097*** | -0.004 | -0.018* |
| | (0.008) | (0.014) | (0.009) |
| Type 6 (Destroyer) | 0.104*** | -0.024*** | 0.007 |
| | (0.006) | (0.007) | (0.007) |
| Type 7 (Dock Landing) | 0.119*** | 0.005 | 0.012 |
| | (0.010) | (0.011) | (0.012) |
| Type 8 (Frigate) | 0.077*** | -0.389*** | 0.022* |
| | (0.010) | (0.006) | (0.012) |
| Type 9 (Submarine) | 0.060*** | 0.000 | -0.007 |
| | (0.010) | (.) | (0.009) |
| Type 10 (Supply) | 0.129*** | 0.002 | 0.040*** |
| | (0.010) | (0.010) | (0.012) |
| Constant | 0.419*** | 0.440*** | 0.436*** |
| | (0.005) | (0.004) | (0.005) |
| Observations | 256076 | 264440 | 252065 |
| $R^2$ | 0.044 | 0.036 | 0.036 |

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Coefficients expressed as minority retention relative to non-minority by percentage points.
Results produced by a Difference-in-Difference Linear Probability Model with Fixed-effect control.
Values of '0' are omissions due to collinearity.

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# APPENDIX C. MINORITY RETENTION BY COMMUNITIES TABLE

**Minority Retention Relative to Non-Minority by Enlisted Communities**

| Minority-Community Interaction at | Black | Female | Hispanic |
|---|---|---|---|
| CMU 1 (Administration) | 0.105*** | 0.014 | 0.016 |
| | (0.013) | (0.014) | (0.015) |
| CMU 2 (Aviation Maintenance) | 0.081*** | 0.008 | 0.020 |
| | (0.020) | (0.023) | (0.019) |
| CMU 3 (Aviation Supply) | 0.122*** | -0.009 | 0.005 |
| | (0.008) | (0.009) | (0.008) |
| CMU 4 (Medical) | 0.119*** | -0.048** | -0.018 |
| | (0.024) | (0.024) | (0.028) |
| CMU 5 (Intelligence & Crypto) | 0.067*** | 0.004 | -0.013 |
| | (0.018) | (0.018) | (0.020) |
| CMU 6 (Ordnance, Law, Weapons) | 0.105*** | -0.041*** | 0.001 |
| | (0.007) | (0.008) | (0.007) |
| CMU 7 (Surface Engineering) | 0.055*** | -0.068*** | -0.004 |
| | (0.007) | (0.009) | (0.007) |
| CMU 8 (Surface Maintenance) | 0.095*** | -0.013* | 0.008 |
| | (0.007) | (0.008) | (0.007) |
| CMU 9 (Surface Operations) | 0.146*** | -0.013 | 0.001 |
| | (0.008) | (0.009) | (0.009) |
| CMU 10 (Submarine) | 0.080*** | 0.062 | 0.011 |
| | (0.031) | (0.053) | (0.029) |
| CMU 11 (Supply & Support) | 0.092*** | 0.038*** | -0.019** |
| | (0.007) | (0.009) | (0.009) |
| CMU 12 (Undesignated Personnel) | 0.104*** | 0.027*** | 0.013** |
| | (0.004) | (0.006) | (0.005) |
| Constant | 0.403*** | 0.429*** | 0.429*** |
| | (0.001) | (0.001) | (0.001) |
| Observations | 256076 | 264440 | 252065 |
| $R^2$ | 0.038 | 0.030 | 0.030 |

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Coefficients expressed as minority retention relative to non-minority by percentage points.
Results produced by a Difference-in-Difference Linear Probability Model with Fixed-effect control.
Values of '0' are omissions due to collinearity.

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