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Recruitment Potential: "Sailors" Who have Never Seen the Ocean

March 2022

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Prepared for the Naval Postgraduate School, Monterey, CA 93943

ACQUISITION RESEARCH PROGRAM
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ABSTRACT

In 2017, the Navy began a transformation in recruiting, moving away from the generalist recruiter model to specialization in different areas of the recruiting process. In this thesis, the author uses recruit-level accession data from all U.S. military services, from 2010 to 2019, to document any changes in the Navy recruiting share relative to the other services, on the coasts and in the Midwest. Over the past decade, Navy recruiting has suffered in the Midwest relative to the other services, likely due to fewer resources used in that region. Using an event-study quantitative analysis approach, the author evaluates the effects of the transformation on the quality of Navy recruits in the five recruiting districts that have transitioned to the new model of recruiting during the time frame studied in the thesis. The findings indicate that the initial phases of the transformation faced difficulties in meeting the same percentage of quality recruits generated under the legacy model. To fully evaluate the impact of the policy shift, further analysis is needed to evaluate the other recruiting districts as they transition to the new model of recruiting.

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ACKNOWLEDGMENTS

I would not have been able to accomplish this thesis without the support of my amazing wife, Cynthia. Without her patience, love, encouragement, sacrifice, and support, this would not have been possible.

I would also like to thank my daughter, Britton, for being patient while I was writing and researching at my desk. Soon, we will be able to create all of your new inventions in the garage.

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LIST OF ACRONYMS AND ABBREVIATIONS

AFQT	Armed Forces Qualification Test
ASVAB	Armed Services Vocational Aptitude Battery
CNA	Center for Naval Analysis
CNRC	Commander Naval Recruiting Command
DOD	U.S. Department of Defense
IDA	Institute for Defense Analysis
JAMRS	Joint Advertising and Marketing Research Studies
NPS	Non-Prior Service
NRC	Naval Recruiting Command
NRD	Naval Recruiting District
NTAG	Naval Talent Acquisition Group
RDI	Recruiting Difficulty Index
RRM	Recruiting Resource Model
RST	Recruit Selection Tool
TAOC	Talent Acquisition and Onboarding Center

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I. INTRODUCTION

Recruiting young men and women to serve in our nation's military is an essential task that must succeed to protect the security of our nation. The United States has been an all-volunteer force since 1974, and we have continually asked our citizens to put their sons and daughters into harm's way for the betterment of the American dream. When the United States shifted to an all-volunteer force, there were concerns about the sustainability of maintaining a force level sufficient to meet the requirements set forth for military strength by congress each year. The services were forced to strike out into the local communities and canvas high schools and colleges across the nation to entice the youths of the nation to leave their homes, family and friends and join the military. In 2007, the Department of Defense (DOD) spent over $3 billion on recruiting (Dertouzos, 2008).

> Approximately 4 million Americans turn 18 each year, but only 30 percent of them can meet the minimum requirements for enlistment, leaving 1.2 million able to serve. The propensity (willingness) to serve is approximately 15 percent, leaving 1,020,000 able but unwilling to serve, and 180,000 able and willing to serve. Each year, the military must recruit about 150,000 enlistees. (Laich, 2019, para. 9)

This shrinking pool of available applicants has created increased competition with the services to meet their recruiting goals.

In the past few years, the Navy has seen a decrease in the number of new recruits from the central region compared to the other services (Goldberg et al., 2018). In this thesis, I use DOD-wide accession data to analyze the extent to which there has been any decrease in the Navy's share of accessions in the Midwest region of the United States relative to the other services. I then use that data to look deeper into the Midwest region and see if this is a trend that the Navy should be concerned with or if that is just a product of changing demographics. Also, in 2017, the Navy instituted a major shift in its recruiting policy called transformation. Referred to as a transformation in talent acquisition, this change shifted the efforts of recruiting into a segmented process with some recruiters acting as scouts, others handling the application package, and another recruiter preparing the future sailor for onboarding (Jarrett, 2019). This is a distinct change from the legacy model of one recruiter

handling all these roles with each sailor. This thesis conducts a difference-in-differences calculation of the initial areas that implemented the new policy to determine if the policy had a negative effect on recruit quality.

A. RESEARCH QUESTIONS

This thesis addresses the following questions.

1. What is the overall recruiting share for the Navy, relative to the other services, on both coasts and in the Midwest region in terms of all accession and compared against quality accessions?

2. How has Navy recruiting performed after restructuring its recruiting model to the assembly line approach? How has the new recruiting model affected accession quality?

B. APPROACH

To address the research questions, in this thesis I first use descriptive statistics to analyze accession trends for the fiscal years 2010–2019 Navy recruiting shares relative to the other military services. The trend analysis is conducted at the national, regional and district level as defined by the U.S. Census geographic definitions. Additionally, in this thesis, I attempt to estimate the effects of the change in recruiting approach for the first two regions to undergo recruiting transformation. To that end, I use an event-study quantitative analysis approach with staggered rollout, which provides a difference-in-difference estimator to examine the percentage of high-quality recruits that access into the Navy after a region undergoes a shift to the new recruiting model. The analysis covers the performance of the areas in the 12 months leading up the shift and the 12 months following the shift and compares the Navy to the aggregate performance of the other services. The data uses the first five regions to shift to the new policy and aggregated them into a model that showed the before and aftereffects of transformation, revealing a small decline in percentage of quality recruit in those areas.

The rest of the thesis is organized as follows: Chapter II presents a brief background on how the Naval Recruiting Command (NRC) has structured the recruiting mission.

Chapter III contains the literature review. Chapter IV describes the data and methodology used in the study, and Chapter V provides the regression results and discussion. Finally, Chapter VI presents conclusions and recommendations drawn from the study.

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II. BACKGROUND

A. HISTORY

For almost 50 years, the U.S. military has been an all-volunteer force. The last time there was a draft was June 30, 1973. Since then, the United States has relied on young men and women around the country to raise their right hand and volunteer for military service.

The U.S. military is composed of over 1.4 million active duty servicemembers and over 8,509 members of the reserve and National Guard. Less than 1% of the American population currently serves on active duty, and to meet end strength requirements, the U.S. military must recruit over 150,000 new members each year into the five services. (Laich, 2019). That is a tall task considering that annually only 180,000 eighteen-year-olds demonstrate a willingness to serve (Laich, 2019). This small pool of available recruits has created intense competition between all the services as they work to meet their recruiting goals with a finite number of new available applicants per year.

Navy recruiting has existed since 1775, so there is a long history of trying to entice young men and women to serve in the U.S. Navy. Per the Navy Recruiting Command website: The Navy uses over 4,200 recruiters at any given time to canvass high schools, colleges and the public for qualified individuals that are willing to raise their right hand and serve. Each year, the Navy needs to recruit approximately 45,000 new recruits across both officer and enlisted as well as active duty and a reserve component. The Navy currently maintains a total end strength of over 325,000 service members, and as Table 1 shows, they have successfully met their recruiting goals every year since 1980 except for 1998 (earliest data available) (Navy Recruiting Command [NRC], 2021).

Table 1. Navy enlisted Recruiting Performance since 1991.
Source: NRC (2021).

Navy Recruiting Enlisted Active Goal/Accessions			
Fiscal Year	**Goal**	**Accessions**	**End Strength**
2017	35,200	35,200	-
2016	30,986	30,986	323,792
2015	34,990	35,004	325,000
2014	33,740	33,765	325,000
2013	40,112	40,112	323,051
2012	36,275	36,329	324,209
2011	33,400	33,444	325,123
2010	34,140	34,180	329,629
2009	35,500	35,527	330,621
2008	38,419	38,485	332,436
2007	37,000	37,361	338,735
2006	36,656	36,679	349,788
2005	37,635	37,704	365,900
2004	39,700	39,868	373,800
2003	41,359	41,376	382,235
2002	46,150	46,155	385,051
2001	53,520	53,690	377,810
2000	55,000	55,147	373,193
1999	52,524	52,595	373,046
1998	55,321	48,429	382,338
1997	50,135	50,135	395,564
1996	48,206	48,206	416,735
1995	48,637	48,637	434,617
1994	53,892	53,892	468,662
1993	63,073	63,073	509,950
1992	58,203	58,203	541,886
1991	68,311	68,311	570,262
1990	72,836	72,846	579,417
1989	95,186	95,186	592,652
1988	93,939	93,939	592,570
1987	92,909	92,909	586,842
1986	94,878	94,878	581,119
1985	87,593	87,593	570,705
1984	82,907	82,907	564,638
1983	82,790	82,790	557,573
1982	92,784	92,784	552,996
1981	104,312	104,312	540,219
1980	97,678	97,678	527,153

Historically, the Navy has been more successful in recruiting from the coastal regions of the country. It makes sense that people who have lived near the ocean would be more likely to join the service that primarily operates on the water. However, as competition increases for a smaller supply of recruits, it is important that the Navy continues to recruit from the Midwest to have continued success in meeting its annual recruiting goals.

B. NAVY RECRUITING STRUCTURE

The Navy has traditionally used a one-recruiter, one-recruit model. A single recruiter would be responsible for canvassing local high schools, finding potential recruits, persuading them to the join the service, assisting them with the application process, getting them prepared for boot camps and physically getting them to the Military Entrance Processing Station (MEPS) and out the door to boot camp. This was a very hands-on process, and while it created a good relationship with between the recruiter and the recruit, it was very time intensive and caused recruiters to work long hours to handle different phases of the recruiting process. With recruiters expected to produce around one recruit per month, there is always a certain level of stress that is applied to the recruiters. Military recruiters face multiple job stressors, varying from pressure to meet monthly recruitment quotas and extended time away from their families due to unpredictable working hours. Their work also requires individual effort, which means they operate with limited support networks and teamwork opportunities. This tends to lead to burnout for the recruiters and can cause their home life to suffer (Jarrett, 2019). The Navy has attempted to ease the burden on recruiters and shift from a one-on-one model to more of an assembly line approach.

1. Transformation

In 2017, NRC began formally transforming the way that recruiting is conducted. "The transformation was designed to streamline the recruiting command structure and improve the quality of life for recruiters, by placing individuals in specialized jobs to support the growing Navy vision" (Breum, 2017, para 1). Instead of a single recruiter being attached to a recruit for the entire process, from initial contact to leaving for boot camp, the tasks are now separated, and the recruit moves through more of an assembly line process.

> The new model splits recruiters' tasks into three separate recruiting disciplines; talent scouts, assessors, and on boarders. Under the old NRD construct, recruiters had to focus on and be experts in all of the aspects of the three disciplines. However, under the new concept, recruiters refine their focus of the specified discipline they work under. (Breum, 2017, para, 3)

The idea behind the separation of duties is that it allows individual recruiters to perform to their specific strengths. The three disciplines that recruiter will focus on are prospecting, assessing, and onboarding.

a. Prospecting

This is the act of going to a school and talking to students, following leads and making contact with individuals who have expressed interest in joining the military. This is a perfect job for outgoing personalities that enjoy interacting with people and extolling the virtues and opportunities that the Navy can offer.

b. Assessing

Once a recruit has decided that they wish to enlist in the Navy, they must begin the application process and prepare their enlistment package. Assessing helps get potential recruits ready for the Military Entrance Processing Station.

c. Onboarding

This is the process of physically and mentally preparing a future sailor for boot camp. It may include scheduling physical training to prepare a future sailor for the rigors of bootcamp, or it can be assisting the recruit in getting affairs in order before leaving home to start their journey in the Navy.

C. NAVY RECRUITING GOING FORWARD

The Navy has recognized that there is growing competition for a dwindling supply of available recruits. This means that the Navy must be prepared for an intensifying competition between for the services of the best recruits in the country. In order to successfully compete, the Navy has put a much larger emphasis into recruiting. In addition to transformation, the Navy has raised enlistment bonuses and is reassessing medical requirements to entice a wider pool of potential recruits to enlist. (Faram, 2018). In 2018, the Navy hit its goal of 39,000 enlisted recruits in May, which was four months ahead of schedule (Faram, 2018).

In addition to the new recruiter specialization, the Navy has begun a ramp up in its recruiting force. In 2009, the Navy had 4,200 active duty recruiters and in 2016 that number had shrunk to 2,900 (Faram, 2018). The Navy put an emphasis on increasing the size of its recruiting force and the NRC website state that there are currently over 4,200 active and reserve recruiters (NRC, 2021).

Along with the increase in the number of recruiters, the NRC has created teams of cyberspace recruiters that specialize in reaching potential recruits online and through social media. Once an online lead is generated, that person's information is then passed to a recruiter operating in the area as a strong potential lead. The NRC is hoping this shift in focus and strategy will create a more effective and efficient recruiting force that will peak the interest of the youth population and entice them to consider naval service.

D. HISTORY OF NAVY RECRUITING

We have been recruiting young men and women into naval service since 1775, as the nation fought the war for independence. Following establishment of the United States, the Secretary of the Navy directly oversaw Navy recruiting until responsibility was transferred to the Bureau of Construction and Repair, and then to the Bureau of Navigation, with assignment to the Bureau of Naval Personnel in 1942 (NRC, 2021) .

From 1942 to 1971, the Chief of Naval Personnel oversaw the Navy's recruiting mission. With the termination of the draft, the Navy established the Naval Recruiting Command (NRC) in April 1971. The NRC would report directly to the Chief of Naval Personnel and be hold the responsibility to meeting the Navy's annual recruiting requirements (NRC, 2021).

Navy Recruiting Commands' establishment coincided with the last days of the military draft. The Navy was going to have to find ways to entice young men and women to serve their country as the United States moved on from the Vietnam War. NRC was headquartered in Washington, D.C., until 1999, when it moved to its current location in Millington, TN.

As the mission of the Navy has changed and evolved over the years, so has the mission of the recruiter. From recruiting sailors to firing cannons aboard sail-powered ships to using sophisticated technical equipment aboard aircraft, ships, and submarines, the Navy asks a lot out of its volunteers, and finding the right people for the job takes a large and concentrated effort.

1. Mission

According to the Commander, Navy Recruiting Command,

> The mission of the NRC is: Leverage an inspirational culture to inform, attract, influence, and hire the highest quality candidates from America's diverse talent pool to allow America's Navy to assure mission success and establish the foundation for Sailors to thrive in a life-changing experience. (NRC 2021).

E. LEGACY MODEL COMMAND STRUCTURE

1. Navy Recruiting Command

The Navy Recruiting Command acts as the headquarters for all recruiting activity within the Navy. The NRC falls under the purview of the Chief of Naval Personnel and receives yearly and long-term personnel requirements for the service. Using that information, the NRC establishes polices, goals and procedures to their subordinate command in order to meet the manpower requirements for the Navy.

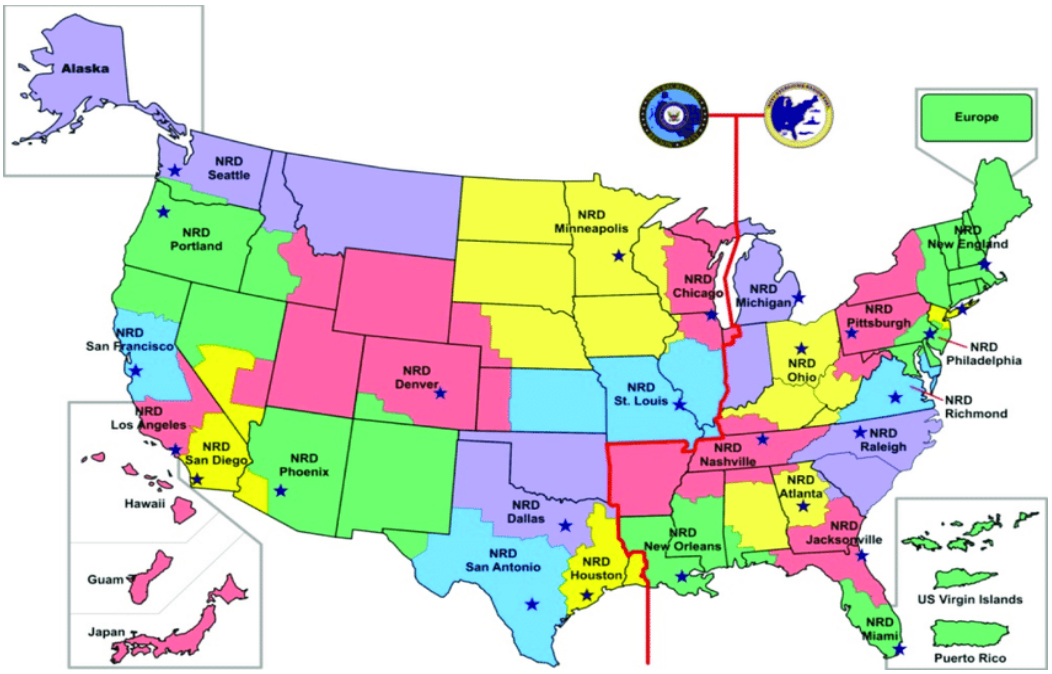

Figure 1. NRD Map. Source: NRC (2021).

2. Navy Recruiting Regions

Under the legacy model, the Navy divided the nation into two regions, East and West. Each region was further broken down into Navy Recruiting Districts with 26 in total. The line between east and west is depicted by the red line in Figure 1, and the districts were split evenly with thirteen in each region to include Puerto Rico, Guam, Japan, Europe and the Virgin Islands

3. Navy Recruiting Districts

The 26 Navy districts were designed as intermediate-level commands that were strategically placed to ensure adequate coverage and equitable distribution of population centers.

4. Navy Recruiting District Divisions

Each NRD was further divided into smaller geographic districts. Each NRD consisted of 6–10 districts.

5. Navy Recruiting Stations

Navy Recruiting Stations are the small buildings strategically located throughout the country to attract recruits. They are located in areas such as strip malls and near college campuses. These are the traditional recruiting centers that are tasked with finding and grooming potential sailors. Every ZIP code in the United States is assigned to a specific Recruiting Station.

F. TRANSFORMATIONAL MODEL COMMAND STRUCTURE

Navy Recruiting Transformation was designed to allow regional commanders more flexibility to meet the demands of their assigned areas. With a large and diverse country, the Navy felt that adding a central region would allow for that increased mobility to meet region specific demands. While some of the geographic areas remain the same, specifically at the district level, their role and command structure have undergone significant changes. Figure 2 shows the revised recruiting map that the Navy has implemented as part of its recruiting transformation.

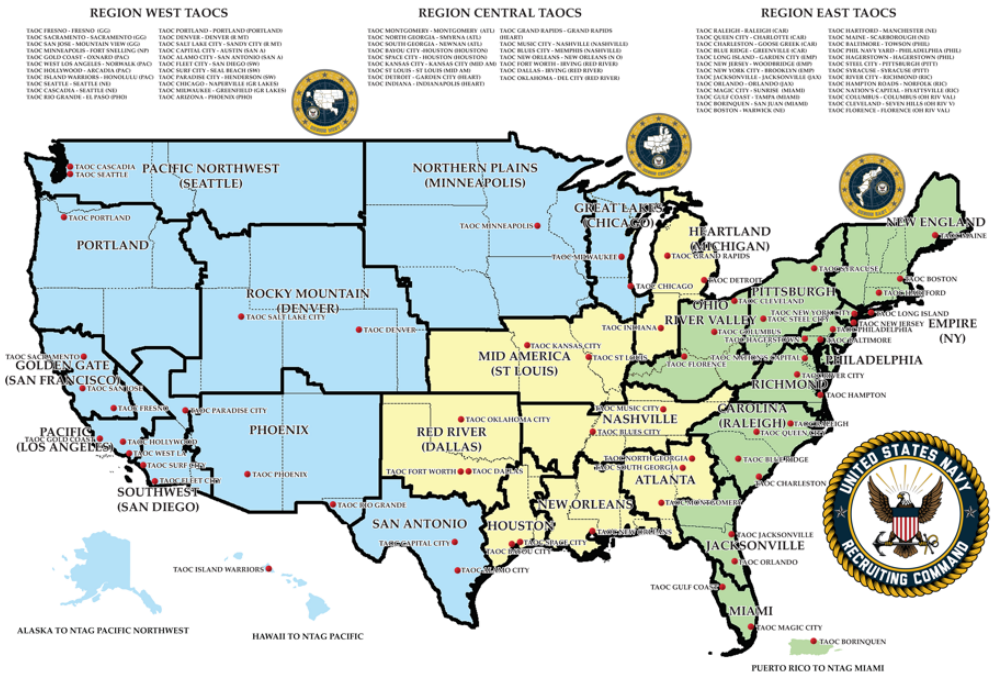

Figure 2. NRD Map Post Transformation. Source: NRC (2021).

1. Navy Recruiting Region

In the initial phases of the recruiting transformation, the recruiting regions were to remain unchanged with the status quo of the country being spilt into east and west: "However, as the recruiting enterprise continued to transform, NRC determined that a third recruiting region was essential to maximizing the mission impact of recruiting personnel" (Eshleman, 2020, para, 3). The idea behind a third region is that smaller regions would allow the commanders to have more flexibility to meet the different demands and demographics of their assigned area of responsibility (Eshleman, 2020). On Oct 1, 2020, Navy Region Central was officially established.

2. Navy Talent Acquisition Group (NTAG)

With the shift to transformation, the NRDs underwent a name change to Navy Talent Acquisition Groups. The number of NTAGs would remain at 26 with nine in the west and central and eight NTAGs in the east region. In addition to the name change, the NTAGs assumed more of a headquarter responsibility. The NTAG assumed a greater administrative responsibility from the smaller areas to allow recruiters to concentrate more on the mission of recruiting rather than focusing on secondary responsibilities.

3. Talent Acquisition Onboarding Centers (TAOC)

One of largest changes of transformation was the changes from district divisions to Talent Acquisition Onboarding Centers. Transformation established 64 TAOCS throughout the country with most NTAGs having two to three TAOCS under its command. The TAOCS are responsible for governing the Talent Acquisition Stations in their area of responsibility

4. Talent Acquisition Station

Navy Talent Acquisition Stations remain at the forefront of the talent acquisition process. These are the traditional recruiting stations that are found in areas throughout the country.

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III. LITERATURE REVIEW

A. OVERVIEW

This chapter reviews prior studies conducted on national recruiting efforts for the military covering the propensity to enlist, population representation in the services, and presents the main take away from the relevant prior research on Navy and military recruiting to guide the framework of analysis used in Chapter V.

B. JOINT ADVERTISING AND MARKET RESEARCH STUDIES

A common tool created by the Department of Defense to assess people propensity to join the military is the Joint Advertising and Market Research & Studies (JAMRS, 2020).

> JAMRS is the official DOD program for joint military advertising, market research & studies. One of JAMRS' objectives is to explore the perceptions, beliefs, and attitudes of American youth as they relate to joining the Military. Understanding these factors is critical to the success of sustaining an All-Volunteer Force and helps ensure recruiting efforts are directed in the most efficient and beneficial manner. (JAMRS, 2020)

The studies focus on two groups, the youths who will soon be, or already are, military age, and the parents, grandparents and teachers who can influence the opinions of those youths.

In focusing on whether youths have an interest in joining the military JAMRS (2020) asked, "In the next few years how likely is it that you will be serving in the military?." Possible responses were Definitely, Probably, Probably Not, or Definitely Not. As Figure 3 illustrates, those that responded Definitely or Probably has hovered in the 11 to 15 percent range for the last 20 years, with a noticeable decline in 2007 and a gradual decline from 2018 to 2020.

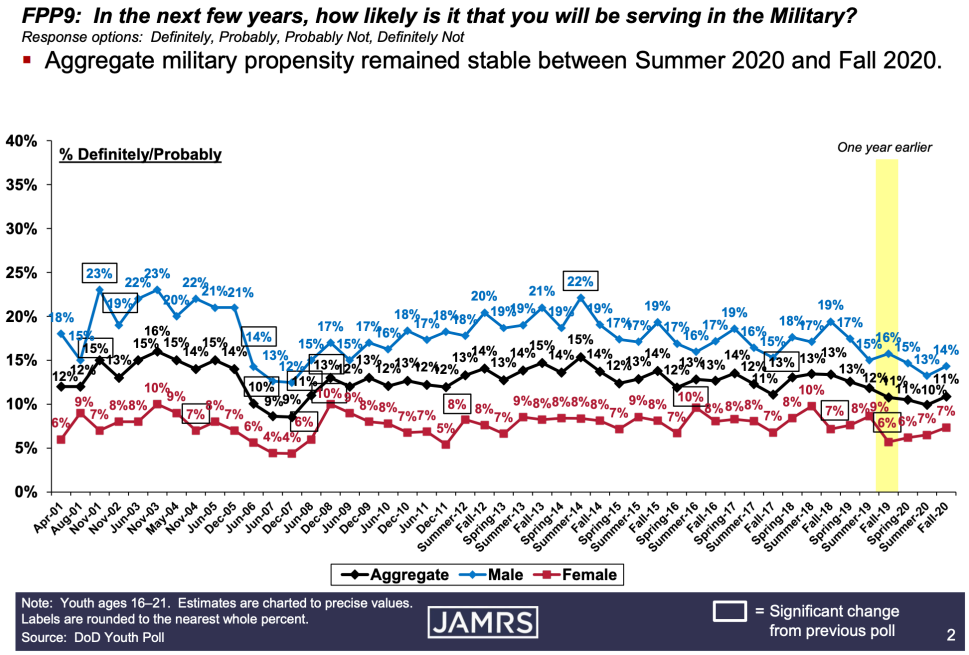


Figure 3. Survey of How Likely Youths Think They Will Serve in the Military in the Next Few Years. Source: JAMRS (2020).

Another question posed by the poll relates to which service a youth would be most likely to join. This is used as an excellent tool to evaluate which services are the most popular among potential recruits. This poll shows that generally, youths surveyed perceive military services as stable and that recruiting efficiency therefore should be somewhat stable as well.

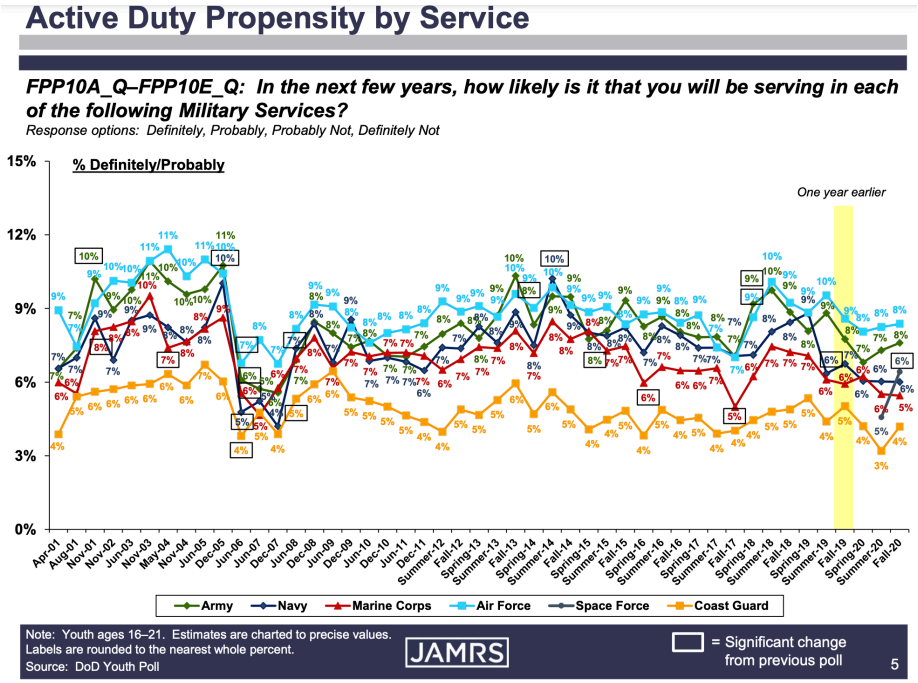


Figure 4. Which Service Youths are Most Likely to Join. Source: JAMRS (2020).

C. CENTER FOR NAVAL ANALYSES

The Center for Naval Analyses (CNA) is a federal research and development center for the Department of the Navy that is designed improve the efficiency and effectiveness of U.S. defense efforts (CNA, 2019). One such product that is produced annually is the *Population Representation in the Military Services: Fiscal Year Summary Report*, this is an annual report that has been provided since 1974, and the report is centered around historical personnel trends in the armed services and the Coast Guard. The report encompasses all members of military service, both the active component (AC) and the reserve component (RC). The report provides a comparison between all military applicants as well as those who are serving, with similar civilian populations (CNA, 2019).

One of the key aspects of the report is a breakdown of what parts of the country that enlisted active-duty accessions are coming from. The report highlights that the south, and the west are the largest contributors to the DOD, but that is largely due to their having the largest populations of 18–24-year-olds, as demonstrated in the breakdown of accession share versus geographic population share in FY19.

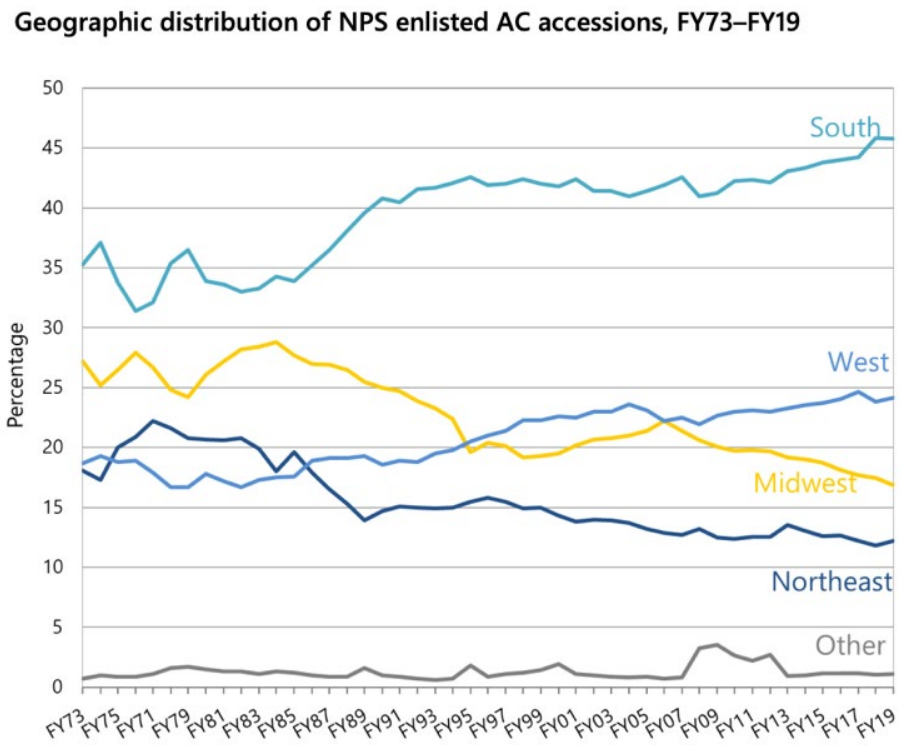


Figure 5. Geographic Distribution of Non-prior Servicemember Accessions
Source: CNA (2019).

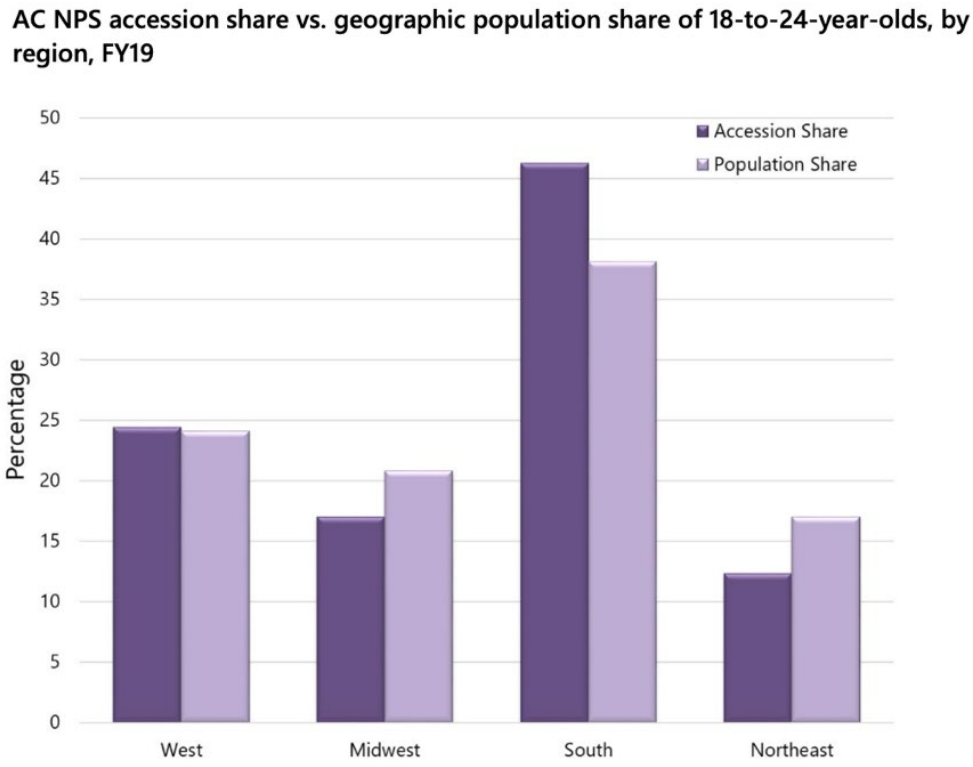
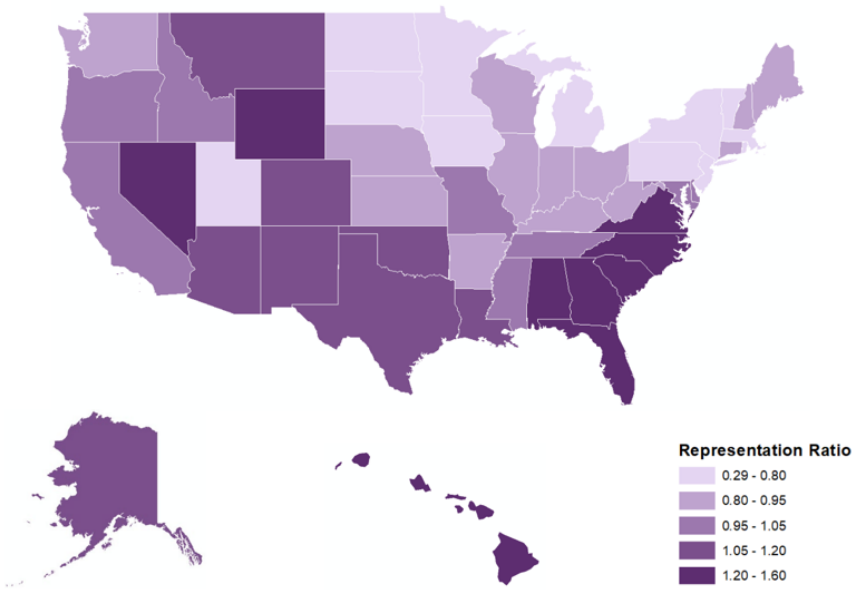


Figure 6. Accession Share versus Population Share FY19.
Source: CNA (2019).

The report further breaks down the geographic accensions by state and uses a ratio comparing the state's population percentage of 18–24-year-olds compared to its share of enlisted accessions. A representation ratio of 1 implies that the state's share of enlisted accessions was equal to its share of 18-to-24-year-olds.

Figure 8. AC NPS enlisted accession representation ratio, by state, FY19



Source: Table B-46.
Note: The representation ratio is calculated by dividing a given state's FY19 NPS accession share (number of accessions from the state divided by total accessions) by the state's 18-to-24-year-old population share (number of 18-to-24-year-olds from the state divided by the total US 18-to-24-year-old population). Ranges in the heat map are chosen to be centered on 1 and to contain roughly equivalent numbers of states. All ranges include 9 to 12 states.

Figure 7. Accession Representation Ratio by State. Source: CNA (2019).

The graph shows that the South and the West are still the primary contributors to the DOD enlisted accessions, both in likelihood to enlist and in overall number of enlistments. The report also demonstrated that the youth in the Midwest and Northeast are less likely to enlist than other parts of the country.

D. CURRENT AND EMERGING ARMY RECRUITING CHALLENGES

The RAND corporation was asked to conduct research on how the Army could grow the size of the force while the available talent pool is shrinking, especially with a well performing civilian job market (circa 2019). The research paper is designed to give the Army the necessary tools to work smarter in their attempts to recruit new soldiers.

The research article outlined several policy opportunities that could be implemented in order to meet recruiting targets (Asch, 2019). . The opportunities included using models to optimize recruiting opportunities and available resources to create a more

effective recruiting effort. The geographic areas of focus that the article presented reflected adjusting recruiting goals considerably across market demographics, economic conditions, market size and other factors. The article also suggested using different selling points on the benefits of service in different regions of the country to reflect the values of that area. For example, career opportunities in the northeast, patriotism in the south

Another major factor that the article briefed on is how the military is a family business. In a 2016 recruit survey, 63 percent of new recruits had a family member who had served and 27 percent had a parent (Asch, 2019). . This presents a challenge for the Navy as they have a much smaller presence in Midwest and with struggle to capitalize on that family connection when many of their members serving closer to the two coasts.

The article focused on applying models such as the Recruiting Difficulty Index (RDI) which is designed to provide a one- and two-year outlook on the recruiting environment. The Recruit Selection Tool (RST) which estimates an outcome of different recruit demographics, physical abilities, and mental aptitude (Asch, 2019). The Recruiting Resource Model (RRM) is designed to provide the Army with the optimal combination of recruiting resources to meet the annual accession goals. The RRM is a combination of the inputs provided by both the RDI and the RST to provide the optimal resources plan to maximize recruiting effectiveness (Asch, 2019).

E. LEVERAGING BIG DATA ANALYTICS TO IMPROVE MILITARY RECRUITING

This RAND article by Lim et al. focused on using data technology to improve targeting and recruiting outcomes and was intended for those who carry out and oversee military marketing outreach and recruiting. The article was designed to enable the services to use technologies that would enable them to target individuals who are more likely to join the service and provide a more personalized recruiting process for those selected individuals. It looks at what technologies large corporations are utilizing for recruiting and how the DOD can adopt those same technologies to aid in its recruiting efforts. The article described how each service used data analytics differently in its recruiting efforts. The Navy uses data to:

> generate monthly production reports, trend and risk analyses, relationships among data elements, and recruiting predictive tools. Production reports are used both as descriptive summaries of historical data and for predictive and prescriptive reporting. The Navy's analytics inform much of its recruiting decision making, including manpower and resource allocation, as well as program and process improvements. (Lim et al., 2019, p. 22 para 4)

The article describes the content of big data and how it can be divided into segments such as geographic, health, demographic, lifestyle, etc., to assist the DOD into targeting people with a higher propensity to join the military. Use of technology and big data allows for a more efficient use of limited resources available to recruiters. The authors contend that use of big data would give recruiters a more detailed playbook to meet their recruiting goals and provide a narrower search field when looking for potential recruits.

F. AN ANALYSIS OF NAVY RECRUITING GOAL ALLOCATION MODELS

This CNA study was conducted in 2010 at the request of the CNRC to find a better way to improve how the Navy allocates its recruiting models. One of the main reasons for the adjustment has been the Navy's emphasis on meeting detailed goals of demographic diversity

Keeping these goals in mind CNA was asked "to examine NRC's goaling processes with an eye toward making maximum use of available market information and efficient use of recruiting resources" (Pinelis et al., 2011). The three research questions that the paper asked were: "What is the most effective goaling level or unit of analysis? What market, demographic, and resource factors should be included in each model? What method should be used to allocate recruiting goals?" (Pinelis et al., 2011, p. 7, para 2).

The paper conducted an analysis of how the Navy and the other services set their recruiting goals for a particular region in a year. The authors found that all of the services use a combination of past recruiting production and population distribution of 17–24-year-olds in the area. The paper recommended against basing recruiting goals heavily around past performance because it provided a disincentive to excel in a given year as well as emphasizing modeling at the ZIP code level as that provides a much more targeted approach and allows for a more precise allocation of limited recruiting resources. In

addition to the narrower scope ZIP code level modeling provides, it also allows the Navy to focus more on changing demographic needs, allowing the Navy to move resources that will attract specific needs. The paper used a Poisson model to estimate which types of ZIP codes were more likely to produce quality enlistment contracts, and the authors found that ZIP codes located within or near universities produced a lower number of enlisted contracts. This is intuitive because colleges are filled with the key age demographic; however, those with college degrees are less likely to enlist than those who are not attending college. Additionally, the paper found the distance to the nearest recruiting station to be statistically, as expected, a larger Navy presence in a ZIP code produced more contracts. This goes further to explain the Navy's struggles in the middle of the country where there are fewer naval bases.

G. GEOGRAPHIC DIVERSITY IN MILITARY RECRUITING

In 2018, the Institute for Defense Analysis (IDA) did an extensive report on geographic distribution throughout out the military. One of a few advantages of the draft was that created an automatic geographic distribution with draftees being pulled randomly from the country. With the dissolution of the draft the military was forced to market themselves to potential recruits. One of the trends that has emerged with recruiting is that the military is a family business, meaning that youths who have family members who are currently serving in the military are significantly more likely to enlist. Another major factor that the study found was that proximity to military bases had a positive effect on recruiting as well. With warmer weather being more conducive to training, many military bases are located in southern climates, which has shifted a propensity to enlist being more likely in the south. This creates a shortage of geographic diversity in areas with fewer bases, specifically the Northeast and the Midwest. In 2016, then-Secretary of Defense Ash Carter stated that

> too many of America's young men and women have no personal connection to our military. As a result, they give no real consideration to the possibility of joining us … It is my firm conviction that the Department of Defense must have access to 100 percent of America's population for our all-volunteer force to be able to recruit and retain the highly qualified men and women needed for the Force of the Future. (Goldberg et al., 2018, p. iii, para 3)

To compound Secretary Ash's concern was that in 2016, just over forty percent of all NPS accessions came from just six states: California, Texas, Florida, New York, Georgia, and North Carolina. However, those are also the six states with the largest populations of 18–24 years old as well. Therefore, their higher percentage is justified as those six states produced 43% of all NPS enlisted accessions and had 41% of the nationwide youth population. Figure 8 shows the performance of the six top producing states relative to their youth population. The four southern states all performed better than the national average whereas California and New York performed below. (Goldberg et al., 2018).

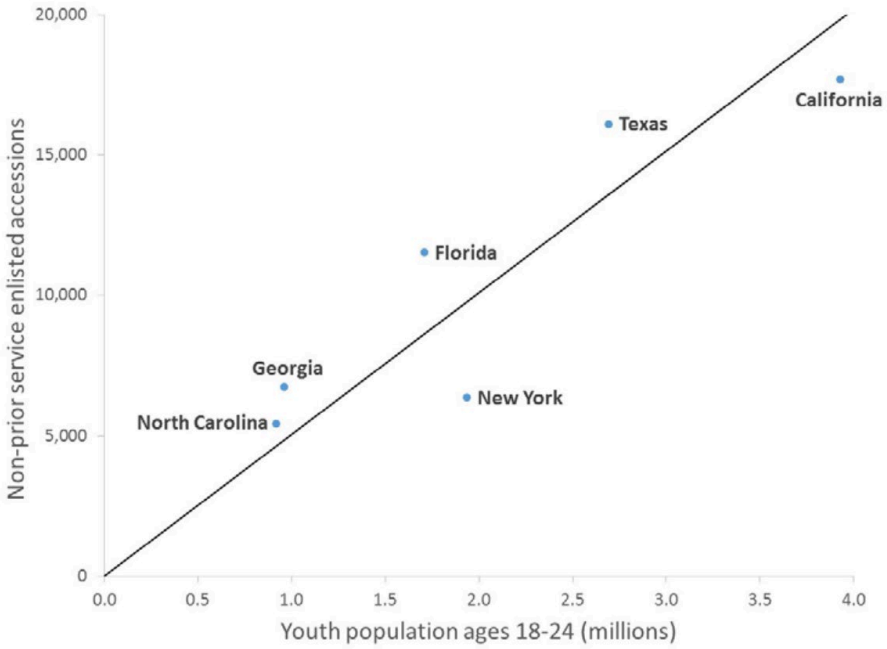


Figure 8. Six States that Yielded the Most Enlisted Accessions for the Active Components in FY 2016. Source: Goldberg et al. (2018).

When further breaking the recruiting difficulties by geographic region, the paper used U.S. Census data to break down the country into four regions as demonstrated in Figure 9.

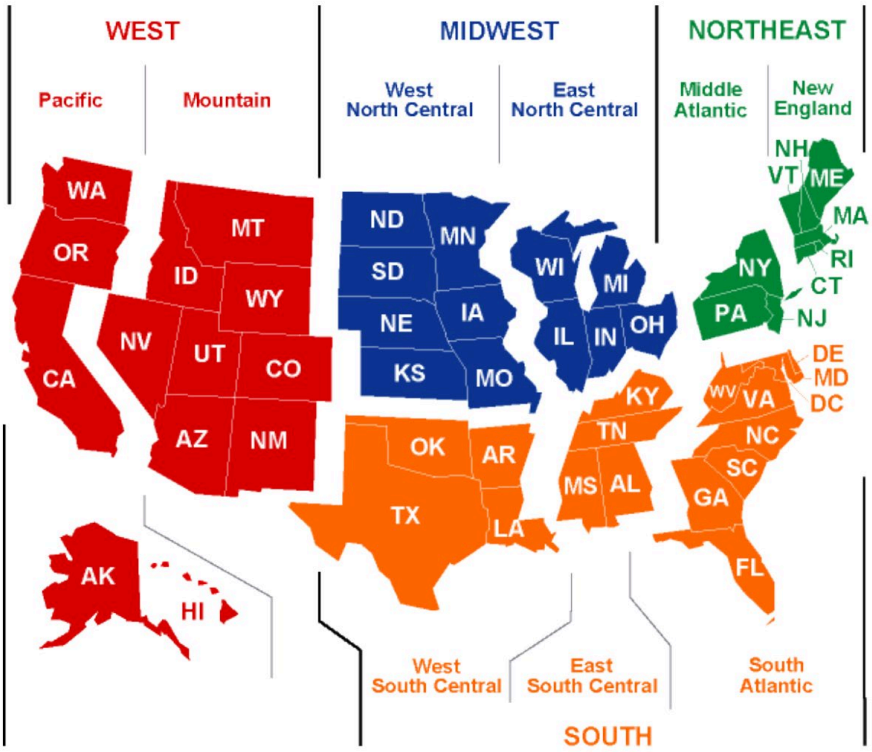


Figure 9. U.S. Census Regions and Divisions. Source: Goldberg et al. (2018).

This data was used to break down the representation ratio of the regions for each of the services from 1990 to 2016. The below graphs for each of the services show that the northeast is unrepresented in all four services, but it also shows that the Midwest has a better showing for the Air Force and Marine Corps

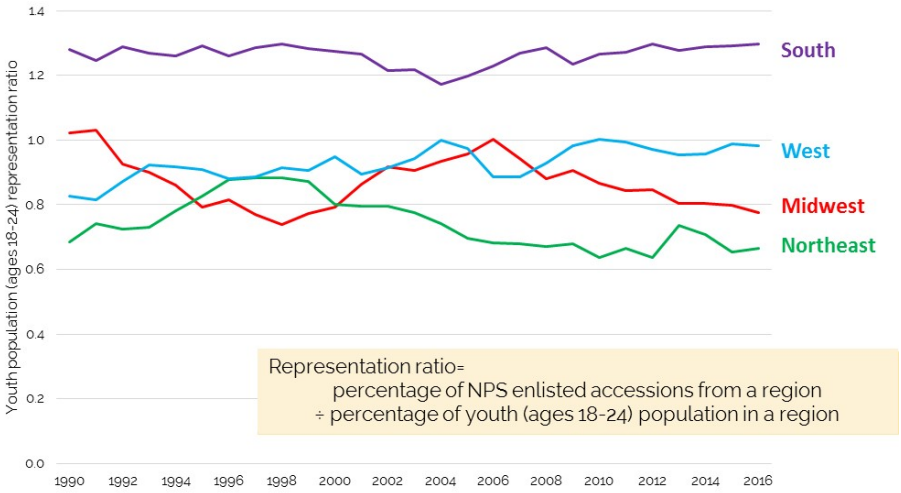


Figure 10. Army Enlisted Regional Representation Ratios. Source: Goldberg et al. (2018).

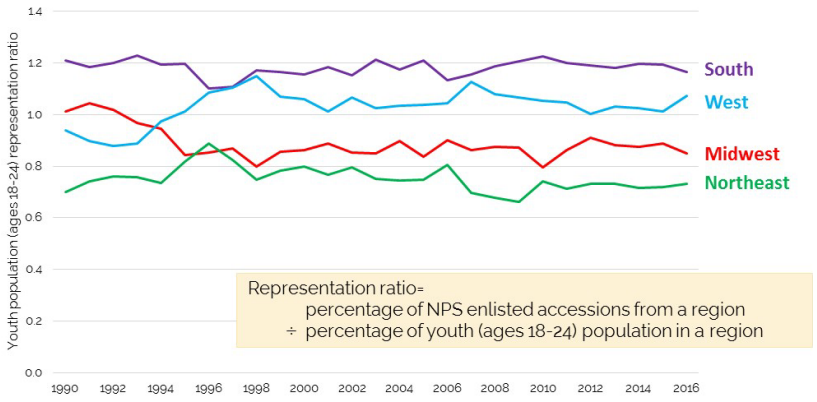


Figure 11. Navy Enlisted Regional Representation Ratios. Source: Goldberg et al. (2018).

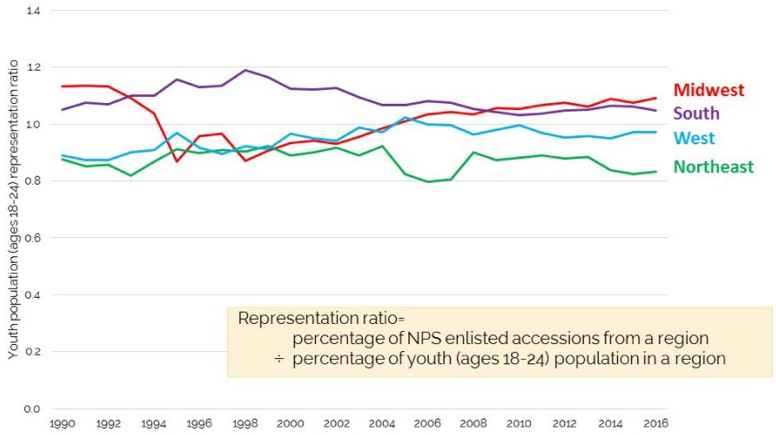


Figure 12. Marine Corps Enlisted Regional Representation Ratios. Source: Goldberg et al. (2018).

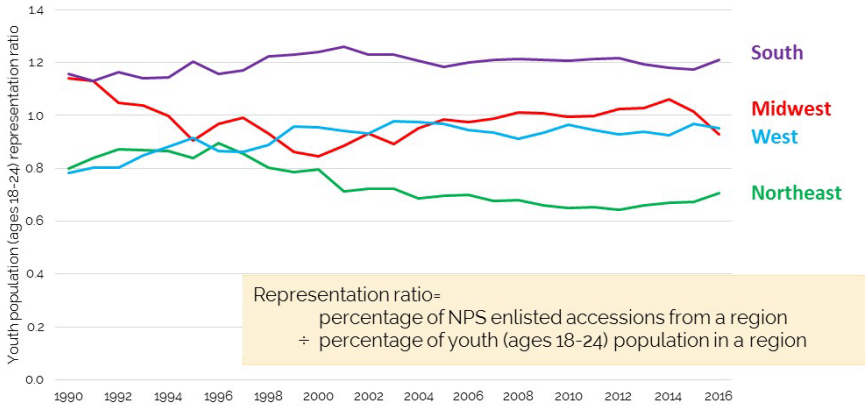


Figure 13. Air Force Enlisted Regional Representation Ratio. Source: Goldberg et al. (2018).

The biggest commonality for all the services is that the Northeast has the lowest representation ratio, and the South is usually at or near the high-performing region for all four services. Except for the Marine Corps, the Midwest is the second worst performing region for the DOD as well. Another key point of the graphs show that the Navy and the Army had the lowest representation ratio within the Midwest region, showing that they were struggling in that area relative to the Marines and Air Force.

1. Machine Learning on predictors of accessions

The study then moved on to analyze what were predictors of accessions within a given region. The study first analyzed youth unemployment rates withing a region to see if that had a correlation with that regions representation ratio. The study compared the regional unemployment rate to the national average at the time, to account for regional economies rather than the national economy. The study found that the Midwest and the West were the only two regions that showed statistically significant results for regional youth unemployment.

> the interpretation of the magnitude for the Midwest is that a 1-percentage point increase in the deviation of a state's unemployment rate from the Midwest regional average is associated with a 1.5-percentage point increase in that state's representation ratio. In the West, a 1-percentage point deviation from that region's average unemployment rate is associated with a 3.7-percentage point increase in a state's representation ratio. Both effects measure the improved recruiting environment among states whose economies perform worse than the average in their respective region. For the Northeast and South regions, the annual and state-to-state variations in representation ratios are apparently driven by cultural or demographic factors, or possibly economic factors that are more subtle than simply the youth unemployment rate.(Goldberg et al. 2018, p. 27, para 1)

In addition to looking at the regional economies, the authors attempted to find other variables that would increase accession ratio within an area. The study used machine learning and used a set of 106 different variables to find the most important drivers of accessions within the data set. Some of the variables that showed statistical significance related to military presence in the area such as veteran presence, Junior Reserve Officer Training Corps (JROTC), and higher education in the area.

The results showed that exposure to the military increased accessions, whether that be from family and friends or through school. Areas with a high percentage of veterans showed increased accession and schools that had JROTC programs showed increased accessions as well. One thing to note is that many of the JROTC programs are clustered in the southern region, so correlations does not necessarily mean causation. The study also found that a high prevalence of colleges and universities decreased accessions in that area, they attributed two possible factors for the decrease: colleges created higher-than-normal

populations of 18–24-year olds in an area and living near a campus can provide local culture that creates a predisposition to military culture (hippies).

The study also accounted for variables such as household income, number of household vehicles, home cost, home ownership, and government jobs in the area. The machine learning concluded that while holding the factors of youth unemployment constant, recruiting success at the local level is largely influenced by demographics and cultural factors. (Goldberg et al., 2018)

The authors found that people being exposed to the military, whether from living with or around veterans, JRTOC, or having access to the ASVAB test are all positive influences on recruiting in a particular region. While the study was not fully able to take economic effects into account in its modeling, it was able to get a better understanding of socioeconomic factors that can positively affect recruiting performance for a specific region.

H. THE ALL-VOLUNTEER FORCE AND THE NEED FOR SUSTAINED INVESTMENT IN RECRUITING

In 2020, CNA conducted an in-depth analysis on service-wide recruiting, encompassing the challenges that our country is facing with providing an all-volunteer force. They study included and in-depth look at the history of recruiting since 1973 and provided key projections for the future. The study broke down three main factors that primarily affect recruiting which are environmental, recruiting resources and policy considerations (Gilroy et al., 2020).

1. Environmental Factors

The Gilroy et al. (2020) study broke environmental factors into two distinct categories: those that can be affected by the DOD and those that cannot. The biggest factor affecting recruiting is always going to be the pool of potential recruits. It is estimated that the population of youths aged 17–24 is going to remain stable at about 35 million until 2030, and will see a slow increase to 36.5 million by 2060. As previously stated, a fraction of those potential recruits are fully eligible to enlist, only 29 percent in fact, as shown in

Figure 14. The study further breaks that 29 percent down by removing the 12 percent that are already enrolled in college and the number drops to 17 percent.

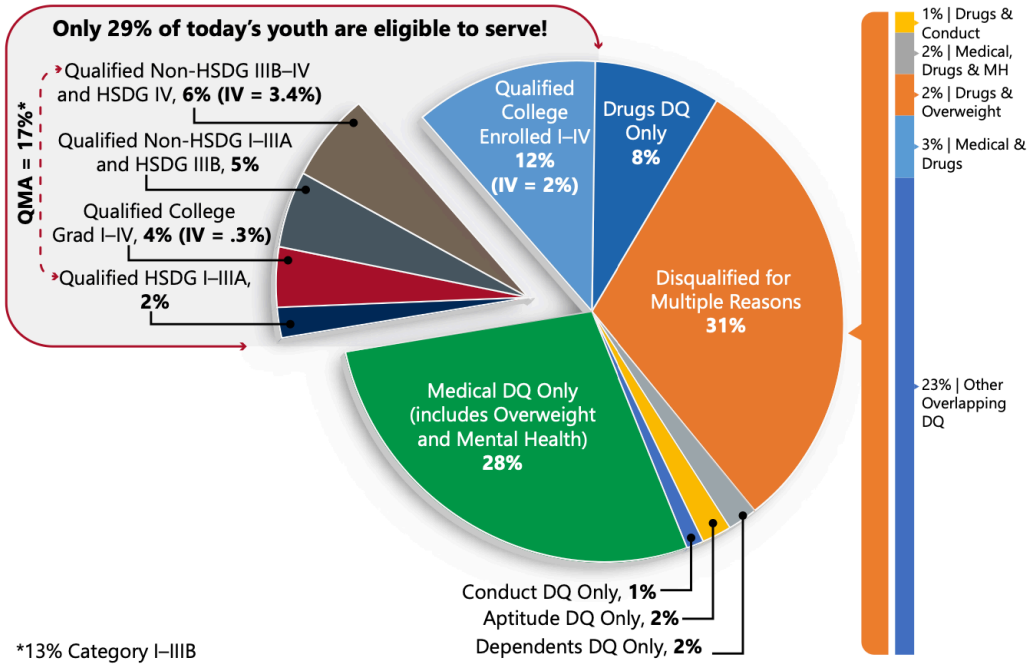
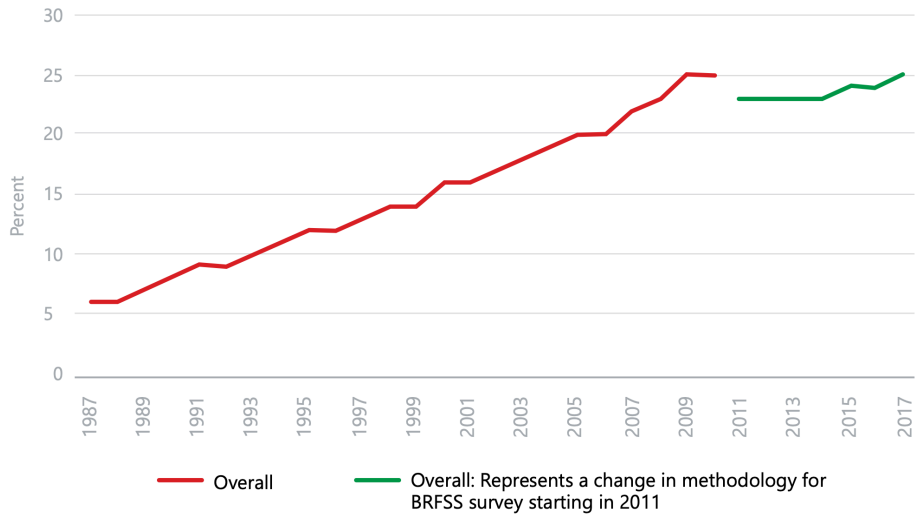


Figure 14. Youth Eligibility for Military Service. Source: Gilroy et al. (2020).

With an already small portion of the youth population eligible for military service there is a strong concern of that pool shrinking as U.S. obesity rates rise. The steadily increasing obesity rates prompted a message from our nation's top civilian and military leaders to the nation about how unhealthy lifestyles were preventing willing members from being eligible to join the military (Goldberg et al., 2018). Figure 15 demonstrates the alarming rise in obesity rate from 6 percent in 1987 to 25 percent in 2017 (Gilroy et al., 2018).



Note: Obesity is defined as Body Mass Index (BMI) ≥ 30. BRFSS = Behavioral Risk Factor Surveillance System.

Figure 15. Obesity Rates for 18–35-year-old U.S. Population Source: Gilroy et al. (2020).

Other factors that were beyond DOD control included the economy, particularly the youth unemployment rate. The CNA study was able to compare the rate of high-quality enlistments to the youth unemployment rate and was able to find a strong correlation between the two.

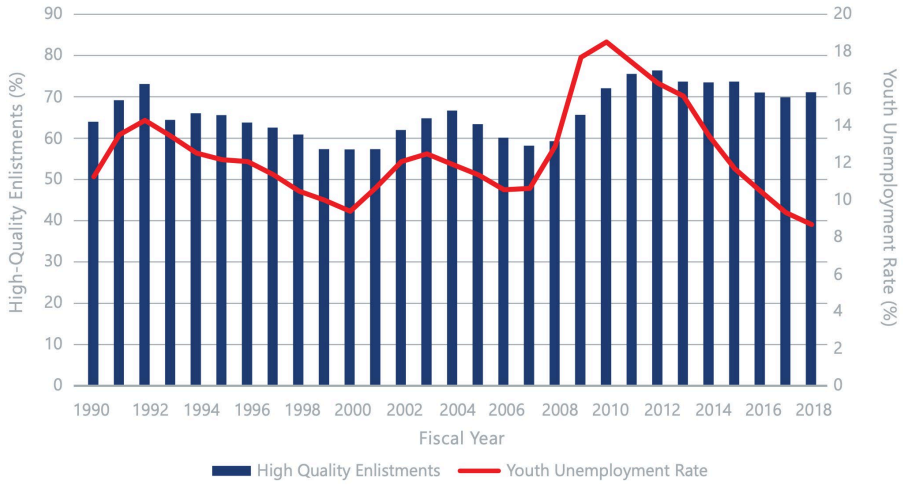


Figure 16. High-quality enlistments and youth unemployment, 1990–2018 Source: Gilroy et al. (2020).

To maintain adequate force levels that meet the needs of the DOD, it is important that the DOD meet its recruiting goals despite of adverse economic condition or external factors. Some of the factors that the study discussed that the DOD could control are factors such as marketing during military engagements, exposure to military life in school and through influencers, and education about the benefits of military service.

2. Recruiting Resources

In 2018, the DOD spent over $3.13 billion on recruiting (Gilroy et al. 2020). While the government cannot control many of the factors of the recruiting environment, it can mitigate the effects of a negative recruiting environment with timely investments in recruiter force, advertising, and enlistment bonuses to meet the manpower requirements for the force. The DOD must keep a constant watch over how their budget matches the recruiting environment. Figure 17 demonstrates that recruiting resources has a correlation to high-quality contracts and that since 1995, the DOD also has been forced to spend more money for few contracts. This highlights the increased difficulty of today's recruiting environment.

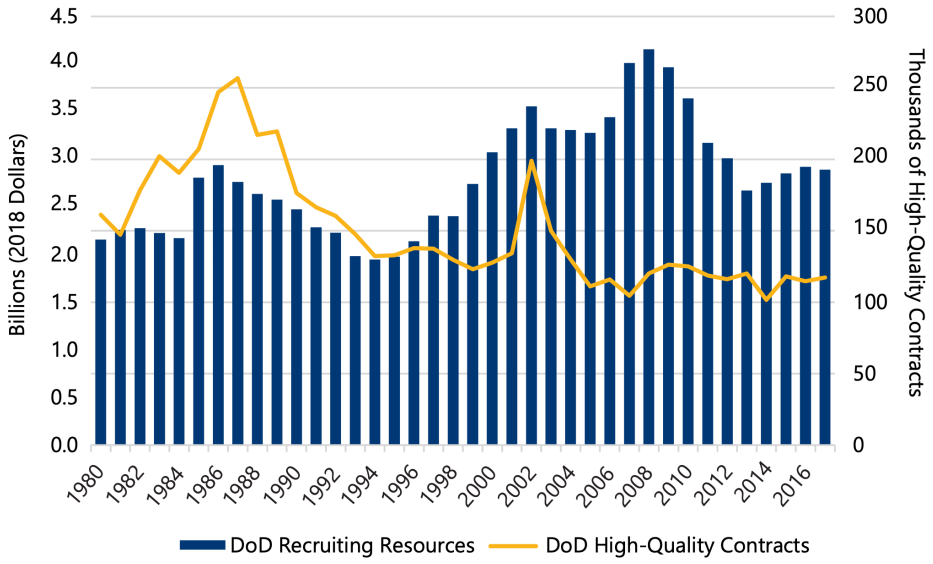


Figure 17. DOD recruiting resources and high-quality enlistment contracts, 1980–2017 Source: Gilroy et al. (2020).

How those resources are spent changes throughout the years, but in 2018, 51 percent of the $3.13B budget went to paying the recruiting force. Figure 18 gives the approximate breakdown of the resource investments.

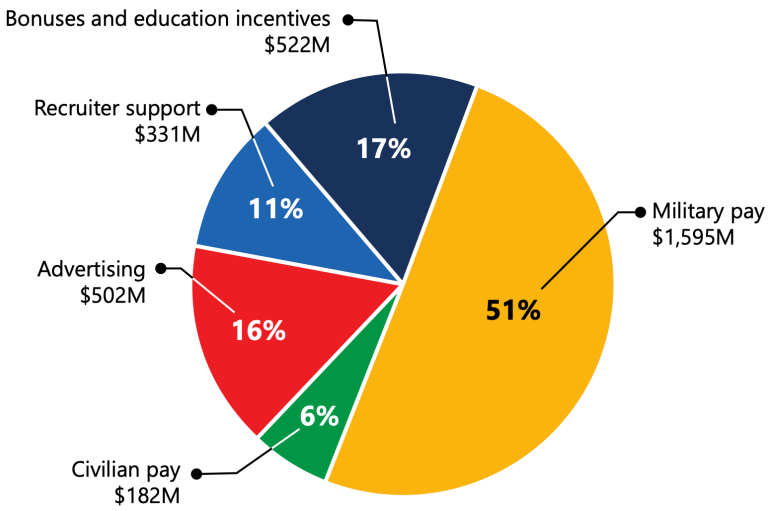


Figure 18. 2018 DOD Recruiting Budget. Source: Gilroy et al. (2020).

While the large portion of the budget goes to the recruiting force, the Gilroy et al. study suggests that it is money well spent. as recruiters are the most important cog in the machine that is the recruiting process. "As members of the sales force, recruiters have a positive and significant effect on enlisting high-quality recruits. A few studies suggest that, on average, the effect of a 10-percent increase in the number of recruiters leads to an increase in high-quality enlistments of 3 to 6 percent" (Gilroy et al., 2020, p. 25). The study suggests that adjusting the size of the recruiting force as the recruiting market fluctuates is a risky proposition. As a 10 percent reduction in force has a greater negative effect than the gain from a 10 percent increase. Much of this is due to the value of an experienced recruiter and that effect is greater and when rebuilding the recruiting the force a service must deal with an influx of inexperience. Figure 12 shows the size of the recruiting force of the services from 1987 to 2017. The Navy and the Army have fluctuated the size of their force much more than the Air Force and the Marines. The study suggests that the Army

and Navy should dampen these fluctuations to have a more stable recruiting force to react when the recruiting market strengthens or weakens.

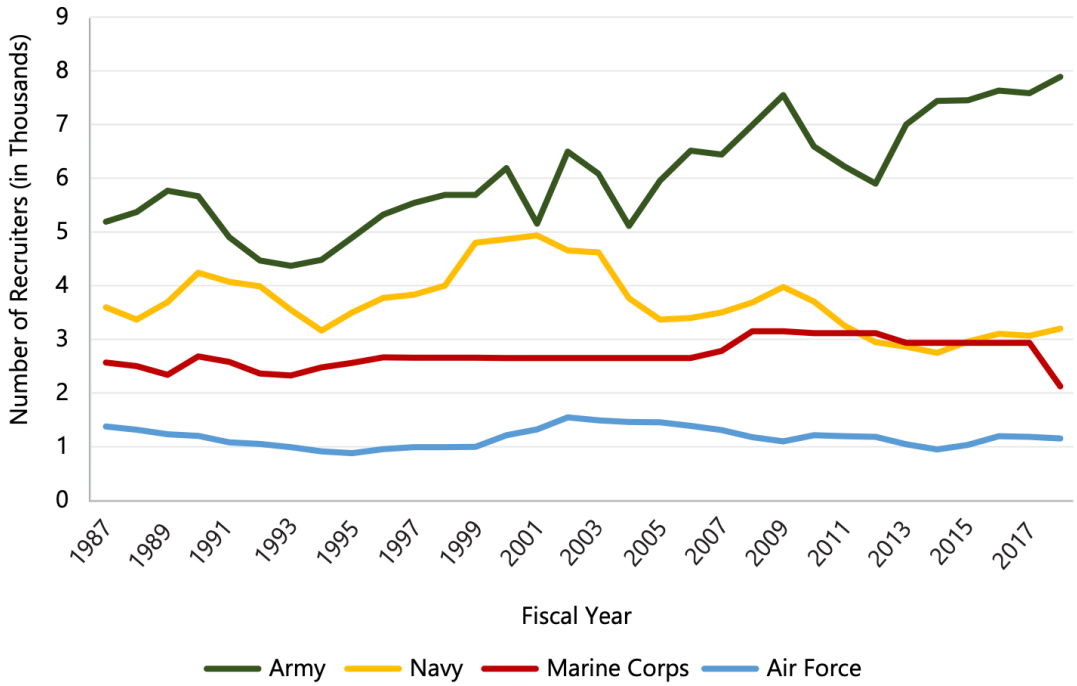


Figure 19. Annualized Monthly Average of Recruiter Count, by Service. Source: Gilroy et al. (2020).

The Gilroy et al. (2020) study also found several other factors of how recruiters can directly affect recruiting within an area. An increase in recruiters for one service that produces high quality enlistments may decrease the number for a rival service, but an increase in total recruiters in an area should increase total accessions, as a larger presence tends to have positive effects. Additionally, diversity is important in recruiting, as minority recruiters have more success in recruiting people who have similar demographic backgrounds. Finally, one aspect that also can affect recruiter production is the setting of realistic and achievable goals (Gilroy et al., 2020).

3. Policy Considerations

The Gilroy et al. (2020) study also assessed several different policy tools at the DOD's disposal for use to attract quality recruits. These policies included retirement

benefits, tuition assistance, student loan repayments, and the post 9/11 GI bill. While all of these provide benefits to potential recruits, there is minimal differentiation of the policies between the services. At times, some of the services may increase student loan repayments to attract more recruits and others may offer larger enlistment bonuses for certain hard-to-fill jobs. Generally, many of the DOD policies have a similar effect across all the different service branches.

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IV. DATA AND METHODOLOGY

A. DATA

The data set used in this thesis comes from the Defense Manpower Data Center (DMDC) which serves "under the Office of the Secretary of Defense to collate personnel, manpower, training, financial, and other data for the Department of Defense. These data catalogue the history of personnel in the military and their family for purposes of healthcare, retirement funding and other administrative needs" (DMDC Website, 2022, para 1).

The DMDC provided the Military Entrance Processing Command (MEPCOM) data set. The data set used includes data fields on personnel identifier for individuals who joined the military, their home state of record, demographic characteristics, contract details, ASVAB scores, MEPS stationed processed at, what service they joined, and where they joined from. I requested all accession data from 2010–2019 for all the U.S. armed services. This data allows me to identify areas within the country where the Navy has shown an increase or decrease in market share for the decade in question, as well as what census region or district they fall under.

B. DATA CLEANING

The data set that was provided by the DMDC had 6,028,168 unique data points. Upon further inspection of the data, much of the information in the data was incomplete, with no evidence that the subject ever accessed into the service. After removing from the data set the identifiers with missing critical data to identify them as accessed, and after removing all reserves and national guard, the remaining data set contains data on 1,616,331 accessions. To cross-check the suitability of the data, I compared its accession numbers in the data used here against the NRC accession data. Table 2 shows that the two data sets are comparable; therefore, the data set used in this thesis is a good representation of the population I analyze.

Table 2. Comparison of DMDC-based Thesis Data.

Fiscal Year	NRC Accessions Data	DMDC Sourced Data	Difference	Accuracy
2017	35,200	35,043	157	99.6%
2016	30,986	30,493	493	98.4%
2015	35,004	34,916	88	99.7%
2014	33,765	33,643	122	99.6%
2013	40,112	39,936	176	99.6%
2012	36,329	36,209	120	99.7%
2011	33,444	33,416	28	99.9%
2010	34,180	34,146	34	99.9%

Sources: See Chapter IV, Section A for discussion of DMDC data; NRC (2021).

To prepare the data for analysis, I created several variables to support addressing the research questions on recruiting trends over the decade and on the potential effects of the transformation in recruiting.

Table 3 shows the total number of accessions by service by fiscal year as a representation of comparison of the annual recruiting numbers of each service

Table 3. Accessions by Service FY2010-2019.

FY	Navy	Army	Marine Corps	Air Force	Coast Guard
2019	38,303	64,756	31,480	31,897	2,526
2018	38,815	67,150	31,379	30,226	3,372
2017	35,043	65,847	31,842	30,923	3,593
2016	30,493	61,619	30,315	32,167	3,269
2015	34,916	58,545	29,439	24,150	2,891
2014	33,643	56,577	25,995	24,211	2,468
2013	39,936	68,580	32,156	26,542	1,442
2012	36,209	60,163	30,474	29,240	2,363
2011	33,416	63,673	29,776	28,638	3,305
2010	34,146	74,371	28,093	28,560	2,118

See Chapter IV, Section A for discussion of data source.

C. VARIABLES DEFINITION

The focus of this study is on the effect that geographic location has had on Navy recruiting in the last decade. I define several variables to be able to examine the recruiting trends that have developed in different parts of the country. The definitions of each variable created are discussed in the sections that follow.

1. Census Regions and Districts

The Census Bureau divides the country in four different geographic regions: the West, Midwest, South, and Northeast. The states that comprise each of these regions are shown in Figure 2 and are used in this thesis to recognize regional trends for the services. I defined four region variables that identify each census geographic region, where each of the four region variables takes the value of 1 if the home of record of an accession record falls within the respective census geographic region, a value of 0 otherwise. The four region variables are Midwest, Northeast, South, West, and, if the accession came from outside the U.S., outside U.S. Table 3 shows the distribution of the total number of accessions by service for the full dataset by the geographic regions, noting the largest contribution coming from the South recruiting region. The service variables included in Table 4 take the value of 1 if the recruit accessed that respective service, and 0 otherwise.

Table 4. Accessions by Service and Census Region FY2010-2019.

Region	Navy	Army	Marine Corps	Air Force	Coast Guard
Midwest (1)	62,672	107,905	66,762	59,416	2,902
Northeast (2)	45,860	75,392	45,294	34,062	4,349
South (3)	154,694	299,487	114,914	125,538	13,334
West (4)	89,424	148,116	72,167	65,835	6,121
Outside U.S. (5)	2,270	10,381	1,812	1,703	641

See Chapter IV, Section A for discussion of data source.

A second variable was created to further analyze historic and emerging trends in Navy recruiting and to track accessions by recruiting districts. I created ten district indicator variables, similar to the recruiting region variables, but at a more disaggregated level, based on each census district. In the United States, the West, Midwest, and Northeast

are split into two districts each, while the South is divided into three separate districts. Further separating the accession data into districts allow for deeper analysis of areas of strengths and weakness. Table 5 shows the different census districts and the total number of accessions by service for the full dataset.

Table 5. Accessions by Service and Census District FY2010-2019.

District	Navy	Army	Marine Corps	Air Force	Coast Guard
West North Central (1)	17,028	31,607	20,569	18,951	523
East North Central (2)	45,644	76,298	46,193	40,465	2,379
Middle Atlantic (3)	35,203	55,227	33,195	24,798	2,900
New England (4)	10,657	20,165	12,099	9,264	1,449
West South Central (5)	52,127	91,719	36,834	41,581	3,160
East South Central (6)	20,130	42,379	16,700	19,470	1,348
South Atlantic (6)	82,437	165,389	61,380	64,487	8,826
Pacific (8)	62,038	97,849	49,411	41,520	4,937
Mountain (9)	27,386	50,267	22,756	24,315	1,184
Outside U.S (10)	2,270	10,381	1,812	1,703	641

See Chapter IV, Section A for discussion of data source.

2. Coastal States

Given the interest in recruiting on the coast versus the Midwest, an indicator variable was generated for whether a state resided on the Pacific or the Atlantic coast. This was done to analyze whether having more exposure to the ocean coastal environment would increase a person's propensity to enlist in the Navy. Due to the Navy's lack of regular presence in the Gulf of Mexico, the gulf states of Texas, Mississippi and Alabama were not included in the coastal variable. The states that were included in the variable are AK, HI, WA, OR, CA, ME, MA, RI, CT, NJ, NY, DE, MD, DC, VA, NC, SC, GA, and FL. I defined the indicator (dummy) variable Coast to take the value of 1 if the home of record of an accession record falls within one of the states listed above, and 0 otherwise. All the other states are included in the indicator variable Inland. Table 6 shows the annual distribution of accessions between coastal and inland states in my dataset, showing an even distribution between Coast and Inland home of record states for navy recruits.

Table 6. Accessions by Fiscal Year and Coastal Status.

Fiscal Year	Inland (0)	Coast (1)
2010	89,446	77,842
2011	83,960	74,848
2012	82,876	75,573
2013	86,926	81,730
2014	73,425	69,469
2015	77,151	72,790
2016	81,773	76,090
2017	86,746	80,502
2018	88,379	82,563
2019	85,749	83,213

See Chapter IV, Section A for discussion of data source.

3. Navy States

In the studies reviewed in the literature review, factors that were attributed to a state's recruiting performance was exposure to the military, whether that came from family members serving, contact with the military or association with veterans. The 2018 CNA study concluded that interaction with the military increased accession. To account for expose to the military factor, we generate indicator variables that categorize the states based on the amount of active duty Navy personnel permanently stationed within those states. We consider four categories, each identified with an indicator variable: states with over 10 thousand personnel (high exposure), 10–5 thousand (medium exposure), 5–1 thousand (low exposure), and less than 1 thousand (very low exposure). Table 7 shows the four categories and the accessions by service for the full dataset.

Table 7. Accessions by Service and Navy Active-Duty Presence FY2010-2019.

Exposure to Navy Personnel	Navy	Army	Marine Corps	Air Force	Coast Guard
High Exposure	109,650	182,785	84,848	75,755	10,057
Medium Exposure	71,028	132,440	50,396	55,105	4,851
Low Exposure	27,655	57,217	23,239	24,417	2,391
Very Low Exposure	146,587	268,839	142,466	131,277	10,048

See Chapter IV, Section A for discussion of data source.

4. Quality Recruits

An essential tool that the military uses to assess the quality of any applicant is the Armed Services Vocational Testing Battery (ASVAB). The ASVAB is a multiple-choice test that consists of ten subtests that measures an applicant's aptitude for the skills required by the armed forces. Within the ASVAB, several of the math and verbal subtests are used to give the applicant a score for the Armed Forces Qualification Test (AFQT). The AFQT is used as a measure of general cognitive ability and the applicants are assigned an AFQT category based on their percentile score. The categories are shown below in Table 8.

Table 8. AFQT Categories and Percentile Ranges. Source: Culver (n.d.).

AFQT Category	Percentile Score Range
I	93 – 99
II	65 – 92
IIIA	50 – 64
IIIB	31 – 49
IV	10 – 30
V	1 – 9

For this thesis, I categorized any applicant who scored in the AFQT categories I or II and graduated high school as a quality recruit, for each the dummy variable "qual" takes a value of 1, and 0 otherwise. The qual variable is intended to give a more in-depth look at the effectiveness of recruiter in a specific region. Table 8 shows the distribution of quality recruits by service. In the graphs and regression in the results section below, I will show that the Navy is outperforming the other services, but it is important to note that the Navy is outperforming the average of the other services combined. In the decade of data, the Navy had almost 50% of their recruits fall into the quality category and the Air Force and Coast Guard had more of their accessions be categorized as quality than not. Table 9 shows the comparison of quality recruits by service. It is important to note that the Navy has a

higher percentage of quality recruits that the combined numbers of the Air Force, Army, and Marines as those figures will be used in the results section.

Table 9. Quality Recruits by Service from 2010–2019.

qual	Navy	Army	Marine Corps	Air Force	Coast Guard
0	179,431	426,027	193,423	130,532	11,218
1	175,489	215,254	107,526	156,022	16,129

See Chapter IV, Section A for discussion of data source.

5. Switch Variable

For each of the NRDs that went through the recruiting transformation beginning in mid-2017 and before 2019, we defined a variable to indicate the month when the transformation was undertaken: for NRD Portland that was in April 2017, NRD New Orleans in June 2017, NRD Rocky Mountains in December 2017, NRD Great Plains in April 2018 and NRD Nashville in 2018. Each switch_state variable takes a value of 0 for each observation that occurred prior to the month of transformation and a value of 1 for each observation after transformation. Based on the switch_state indicator variables, I define the switch variable to indicate the month 0 of the transformation for the states that have undergone the change in recruiting before 2019. Variable switch takes values of 0 for the months prior to the transformation month, and 1 for the months post-transformation. In Table 9 it shows that 19 percent of the monthly observations for the NRDs that transitioned occurred after the transformation, with more monthly observations available in in the data set from prior to the transformation. In my analysis, I select an equal number of months (quarters) before and after the switch to evaluate the effect of the transformation on the proportion of quality recruits accessed into the Navy relative to the other services. Only about 200 thousand recruits in the data set come from the NRDs who transitioned before 2019, and therefore observed in this data set.

6. Service and Demographic Variables

For the regression analysis dummy variables were created for each of the five services and well as some basic demographic information. Each service dummy variable was created with a value of 1 if the accession occurred in that service and a value of 0 if it did not. Additionally, I controlled for gender by creating a male variable with a value of 1 for male and 0 for female. As the indicated that the highest percentage of the accession were white, a dummy variable was created for that well, a value of 1 indicates the recruit had a race code of white and a value of 0 indicates they had a different race listed.

Table 10 refers to a list of statistics used in the regression analysis to estimate the effects of a NRD undergoing transformation.

Table 10. Summary Statistics of Variables Used in Event Study.

variables	count	mean	sd	min	max
qual	1611051	0.416	0.4929172	0	1
male	1611051	0.824	0.3810915	0	1
white	1611051	0.722	0.4482472	0	1
airforce	1611051	0.178	0.3824015	0	1
army	1611051	0.398	0.4894963	0	1
coastguard	1611051	0.017	0.1291763	0	1
marines	1611051	0.187	0.3897533	0	1
navy	1611051	0.22	0.4144513	0	1
switch	209314	0.194	0.3956961	0	1

See Chapter IV, Section A for discussion of data source.

This thesis attempts to explain changes in quality recruits accessed by the Navy through the different regions of the United States.

To do so, we have split the country into several different geographic regions to assess if there are certain areas of strengths or weaknesses or if areas are showing trends of moving in a certain direction. I elected not to use demographic characteristics in the analysis because our focus is on where people are joining the Navy from and not what type of people are joining. Since the DMDC provided 10 years of recent data, we were able to

see any trends that developed over the course of the decade. As we are attempting to compare naval recruiting performance relative to the other services, the focus was emphasized on market share for a given region.

All the data for this research was conducted using a combination of Stata statistical software and Excel. Stata was used for the analysis and was then exported to Excel to be converted into graphs and tables. For the analysis, we created percentage tables for each of the variables listed above, to create a simple visual representation of which services are attracting the most recruits in a specified area. This allowed for a comparison of recruiting shares over time to examine if the Navy is seeing an increase or decrease in market share of accessions for a particular area. These comparisons were generated for all accessions as well as quality accessions to see if there is a trend of the most desirable recruits showing a preference for the Navy or another service.

D. COMPARISON OF MEANS

1. National-Level Analysis

To get a better idea of how Navy recruiting is performing in different areas of the country, it is important to compare its performance with the other services at the national level. Figure 13 shows that the Navy averages a 22% annual market share in recruiting from 2010 to 2019 and a 26% annual market share of high-quality recruits during that same timeframe. Of note, the graph shows a 17% decrease in market share in 2016, which can be explained by the Navy's 11.5% decrease in accession goals from 2015 to 2016. During the same time frame, the other services increased their accession goals, with the Air Force having a 33% accession increase that year. Throughout the decade, the Navy also had a higher market share of quality recruits when compared to their share of total recruits. The Army's larger share compared to the rest of the services shows that the Army tends to get the lion's share of recruits nationally and in any given region (shown in Figures 20 and 21).

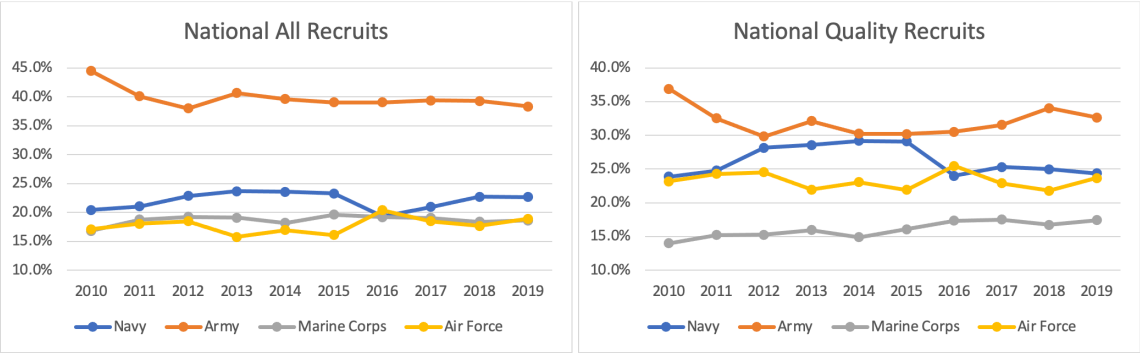

Figure 20. National Accession Market Share by Service

2. Midwest Analysis

The Midwest region has historically been an area of weakness for Naval recruiting.

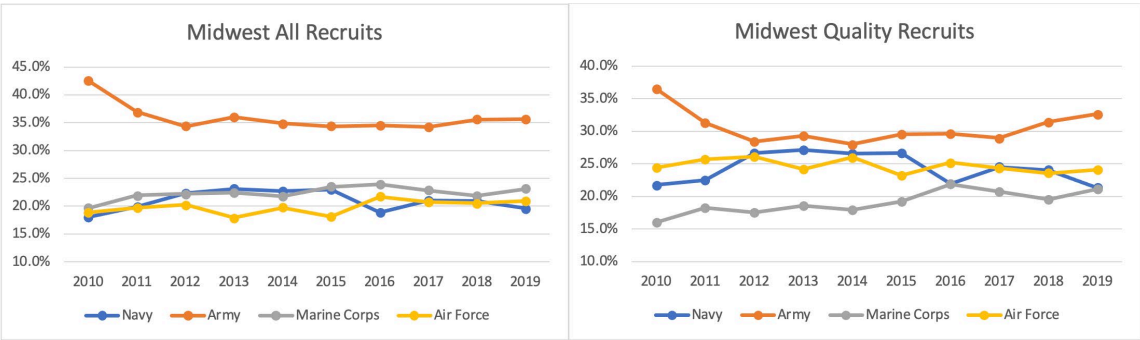

Figure 21. Accession Market Share in the Midwest Region by Service

The two graphs in Figure 21 show that the Navy has underperformed within the Midwest region through the years, with a further declining market share since 2016. It is also important to note that the Navy is being outperformed by the Marine Corps in the Midwest, even though the Navy is a significantly larger service (180K vs 340K active-duty strength). This is important because the Navy has a larger presence in the region, with Naval Station Great Lakes located in northern Illinois, while the Marine Corps does not have any major bases stationed in the region. This suggests the Marine Corps should have a smaller influence over potential recruits as there is less chance of direct association with the service, which would be expected to result in a smaller proportion of recruits.

In terms of quality accessions, the Navy has historically performed well in the region, but since 2016 they have seen a decline in market share as well. From 2012 to 2015, the Navy had approximately a 25% annual market share of quality recruits in the region and the graph shows they were performing almost on par with the Army who has historically been the most successful in the region. However, after 2016, the Navy started showing a significant decline in quality recruits as well with the trend worsening through 2019. This demonstrates that the Navy is trending in a downward direction in a region that typically provides about 20% of the annual accessions.

To take a deeper look at where the Navy is underperforming in the Midwest region, we looked at recruiting market share for the West North Central district, which consists of ND, SD, NE, KS, MN, IA, and MO. Due to a smaller population, this is not a district that has historically produced a high number of enlistments for any of the services, we can see in Figure 22 that the Navy is being heavily outperformed by its peers.

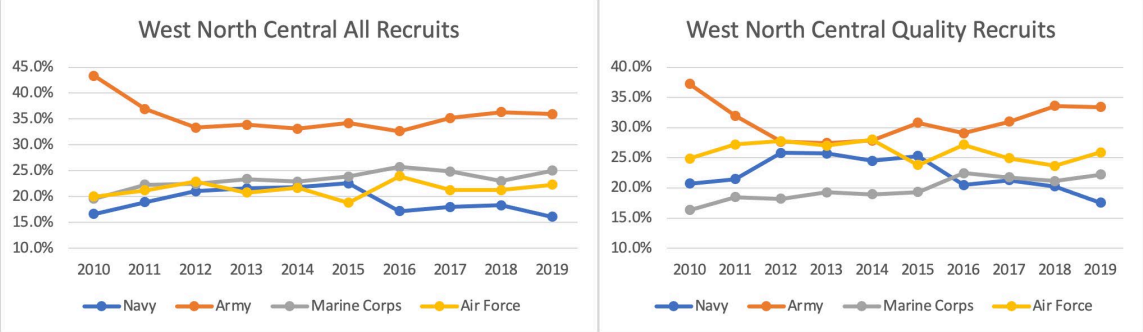

Figure 22. Accession Market Share in the West North Central District (in the Midwest Region) by Service

It is apparent that the Navy has not made this area of the country a priority for recruiting. The table in Appendix A shows that the Navy has only five active-duty sailors permanently stationed in North and South Dakota. it is reasonable to assume that those five servicemembers are recruiters and that is a large area for such a small force to effectively recruit new sailors. As a whole, the Navy has a small amount of active duty in the district (889), which most closely compares to the much smaller Coast Guard, which has 440 active-duty members stationed in the region. It is to be expected that the Navy would be

much less effective at recruiting in the district when they lack sufficient manpower to effectively reach potential recruits.

3. Naval Presence

As Goldberg et al. detailed in his 2018 study, recruiting numbers are affected by exposure to the services, or areas with a high number of military servicemembers tend to have higher enlistments ratios. To assess this, we looked at the effect that having a high number of naval personnel permanently stationed in a state would have on Navy recruiting market share. We took the six states with over 10,000 active-duty Navy personnel stationed and lumped those into a variable called "Navy States"; however, it is important to note that Hawaii and Washington both had more Army members stationed within those two states. Figure 23 shows that the Navy has a small increase in market share when compared to the National average for accessions as well as quality accessions. It also shows that from 2016 to 2019, the Navy has seen a steady increase in their market share that can in part be attributed to the established naval presence in those areas.

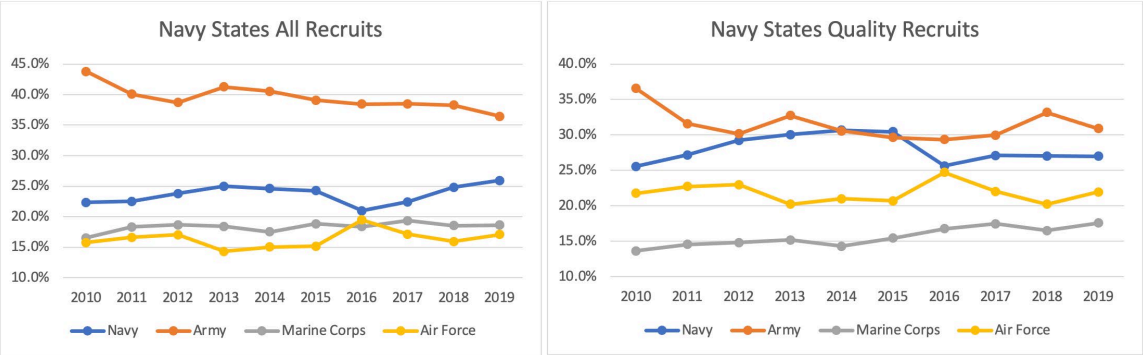

Figure 23. Accession Market Share for Navy States by Service

4. Coastal States

Another possible effect that was analyzed in addition to the effect of Naval presence in an area was the effect that being adjacent to our bordering oceans would have on propensity to enlist in naval service. Figure 24 demonstrates that that effect has been

marginal but there is a growing divide since 2017. While there is a difference between the two groups, as of 2019, it does not appear to be a major factor going forward.

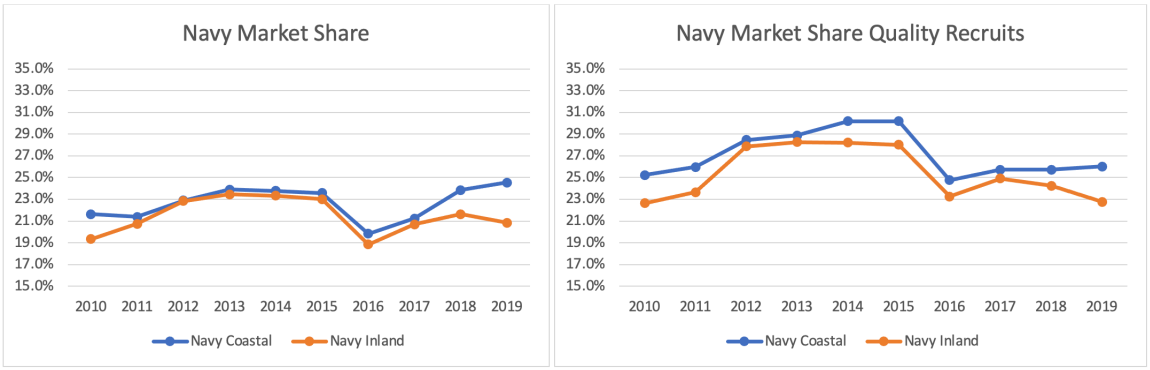

Figure 24. Navy Accession Market Share for Coastal and Inland States

a. Transformation

In 2017, the Navy announced the first major change in recruiting structure in years. The transformation from NRDs to NTAGs was designed to improve the Navy's recruiting performance in the 21st century and allow for more flexibility in an increasing digital environment. NRD Portland was the first recruiting district to undergo a transformation in 2017 (Jarrett 2019) and offered the first glimpse into how the new process performed through 2019.

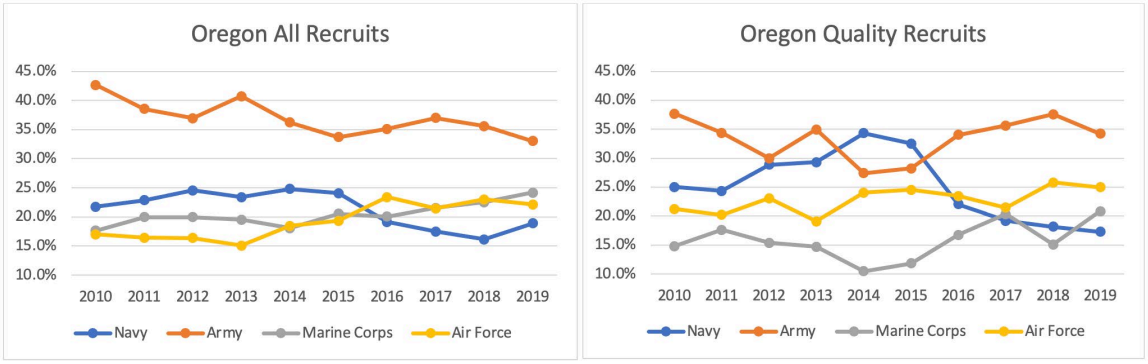

Figure 25. Accession Market Share for the State of Oregon by Service

As Figure 25 illustrates, the Navy saw the expected drop in 2016 from the decreased recruiting goal, but never recovered after completing transformation. In 2019, the Navy's market share started an upward trend, which is a hopeful sign that the new model has had a chance to assess strengths and weaknesses and begin to generate positive returns. However, in terms of quality accessions the results are much less promising. In 2014, the Navy had recruited 34% of all quality accessions in the state of Oregon. By 2019, that percentage was halved to 17%. This suggests that the most desired recruits in the area were not responding well to the transformed model.

In mid-2018 the New Orleans NRD was the second district to transform into a NTAG. Unfortunately, due to our data only running through 2019, we could only see a small sample size of the performance of the area after undergoing transformation. NTAG New Orleans covers most of Louisiana and Alabama, so those two states accession results were used in Figure 26 to assess the performance of the NTAG.

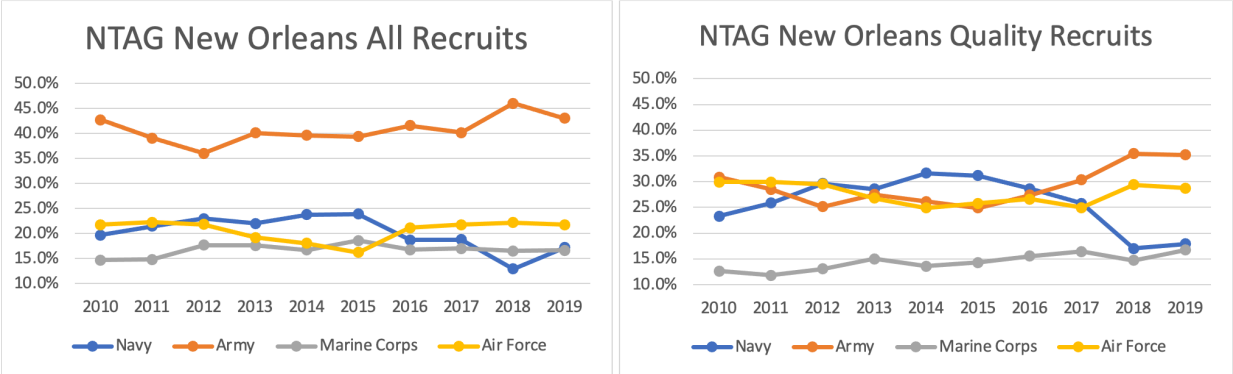

Figure 26. Accession Market Share for the NTAG New Orleans Region by Service

As Figure 26 demonstrates, the shift to the transformational model of recruiting for NTAG New Orleans was met with similar challenges to Portland. The market share of all recruits showed a sharp decline in 2018, which is understandable as the recruiters were undergoing training on a new method of operating.

5. Methodology

I conducted an analysis of the effect of the transformation on the percent of quality recruits accessed for each service. The transformation began in mid-2017, continuing through 2021, therefor I was able to take an in-depth look at the first five NRDs to undergo transformation: NRD Portland, NRD New Orleans, NRD Rocky Mountains, NRD Great Plains, and NRD Nashville. The data used for this analysis ended at the beginning of 2020; therefore, the event-study analysis was limited to the NRDs that adopted the new recruiting model before 2019 and thus had sufficient time to be observed post-transition.

In chronological order as they each went through transformation, I created five separate regressions for those five NRDs that allowed for deeper analysis. I tested the percentage of quality of recruits before transformation and after transformation using the difference in difference estimation technique where the Navy was my treatment group, and the remaining services were my control group. The treatment that the Navy received was undergoing transformation at month 0. Each NRD's month zero is listed in Table 11.

Table 11. Subject NRDs and Month of Transformation

NRD	Month 0
Portland	Apr-17
New Orleans	Jun-17
Rocky Mtns	Dec-17
Great Plains	Apr-18
Nashville	Jun-18

The idea behind the using the difference-in-difference regression model was to analyze of the effects of the "treatment" of policy change in recruiting on the percentage of quality recruits in a given area. For all the difference-in-difference models, the control group was the other services (Army, Air Force, Coast Guard and Marine Corps) and the treatment group was the Navy. The first five districts to undergo transformation are shown

in chronological order, while each contain different accession demographics, it does show that the Navy's performance in the two years after treatment changed as the Navy gained experience in shifting NRDs to NTAGs under the new policy. To further analyze the effects of transformation, I combined the five NRD's into one larger event study, allowing a broader picture of the before and after performance of transformation to be demonstrated overall. To avoid collinearity, the variable Navy was omitted from all regressions as it is the variable that the treatment is being applied to. The important statistic is the function the variable navy's interaction with the switch variable. The equation used for the regression analysis is as follows:

$$Percentage\ of\ quality\ recruits = \alpha_1 airforce + \alpha_2 army + \alpha_3 marines + \alpha_4 coastguard + \alpha_5 navy + \gamma Switch^{NRD} + \beta navy * Switch^{NRD} + X$$

In this equation, α represents quality recruit percentage before the switch for all services, and γ is % of qual after switch of all services except Navy. β is the interaction of Navy after the switch of a specific NRD and is therefore the difference in difference of the treatment, and finally, X is the control for gender and race, with variables male and white included in the estimation models.

The results of the equation provided a look at the statistical change after the switch event. It was designed so that all the accession from FY2010 up to transformation would be analyzed and any change in the performance after transformation up through FY2019 would be included after the switch. It is important to note that this did not provide equal time periods before and after the date of treatment (transformation).

I attempted to look at the overall effect of transformation across the five subject NTAGs and I wanted to focus on the 24 months leading up to and the 24 months after transformation. To do this, I dropped all accessions that occurred in each of the NTAGs outside of the 4- month window. I then used the same equation with all the different NRDs' transformation dates absorbed into the switch variable to get a more focused look at the overall performance of transformation.

V. RESULTS

A. DISCUSSION OF EVENT STUDY OF TRANSFORMATION

1. NTAG Portland

To evaluate the effects of transformation, I conducted a difference-in-differences analysis of the effect of the policy change on each NTAG that transitioned before 2019. Figure 27 shows the percentage of quality accessions of out of total accessions for NTAG Portland.

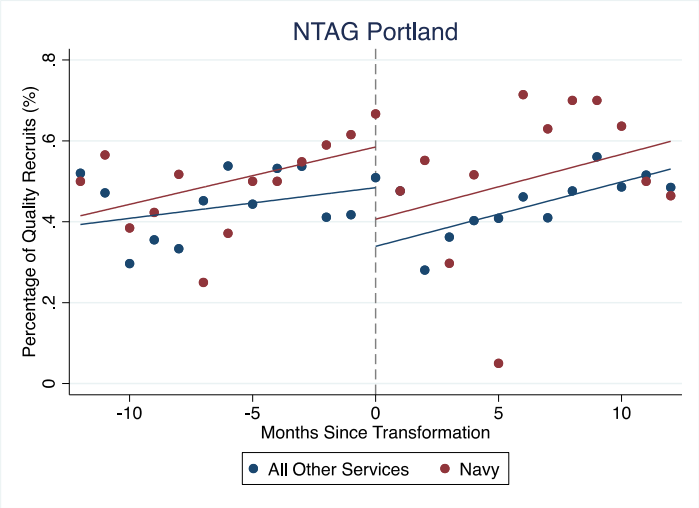

Figure 27. NTAG Portland Quality Accessions before and after April 2017

This is a scatter plot of monthly percentage of quality Navy and non-Navy recruits in the months before and after transformation. The blue dot at month = -5 shows that 5 months before the transformation month, the non-Navy services had about 42% of all their accessions that month classified as quality recruits, while the maroon dot shows the Navy had about 49% of accessions that month considered to be quality recruits. The maroon and blue lines are lines of best fit for the Navy and the other services on either side of the transformation cutoff (month 0). This is used to show trends, an upward sloping line shows a positive trend in quality recruit percentage over time and a negative slope indicates decreasing proportions of quality recruits over time. If the dots are tightly clustered along

the line it indicates a stronger correlation and a more accurate trend line. Outliers can also have a large effect on a trend line as well. In Figure 27 the Navy experiences an outlier at month 5, causing a decrease in the trend line. It is important to note that the figure does not show the amount of quality recruits for any given month, only a percentage of that month's total. This means that one quality accession gained or lost will have a greater effect on the monthly percentage of the Navy than it will have on the other services as they have a larger pool of accessions each month. The figure shows that in both instances the Navy had a higher percentage of quality recruits, but this was expected as the Navy has a higher percentage of quality recruits when compared to the other services nationally. After transformation (month 0) the other services combined did not see a statistically significant change in percentage of quality recruits compared to the months prior to the transformation. However, the Navy experiences a 12.4 percentage points (ppts) or a 22.8 percent decrease in the share of quality recruits relative to their share before month 0, which it is statistically significant at the 99.9% level. These estimation results are displayed in Appendix B. The estimates also show that whites are, on average, 4.7 percentage points more likely to be quality recruits than non-whites, while males are an average 7.75 percentage points more likely to be quality recruits compared to females who accessed into the Navy during the same time window.

The estimations using data for Portland NRD transformation show that in the 12 months after the transformation there was a decrease in recruiting performance as measured by the proportion of quality recruits relative to the other services. With Portland being the first NRD to transform into a NTAG, growing pains can be expected with an entirely new recruiting concept being implemented. Additionally, this was the first transformation out of a total of 26, as the process moves to the others NRDs would be expected that performance would increase as they learn from any mistakes made in Portland.

2. NTAG New Orleans

Two months after NTAG Portland completed transformation, NTAG New Orleans was the second region to shift to the new recruiting model in June 2017. Figure 28 demonstrated to performance of the district both before and after June 2017.

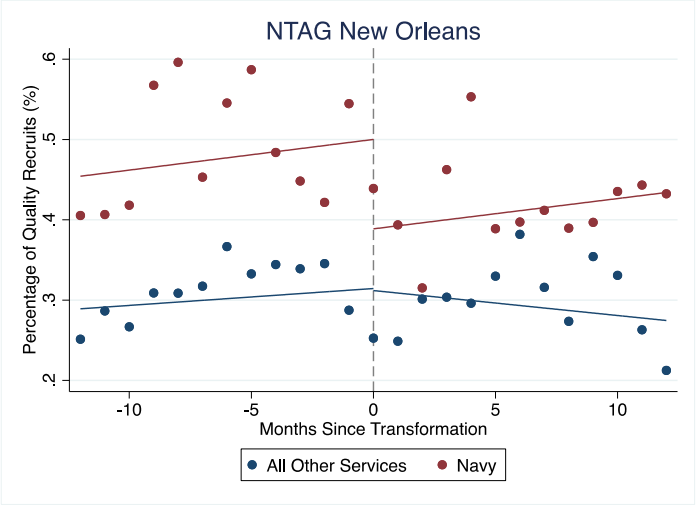

Figure 28. NTAG New Orleans Quality Accessions before and after June 2017

Like NTAG Portland, NTAG New Orleans showed a decline in performance after transformation. The detailed regression output shown in Appendix B shows that the Navy experienced a 5.6 ppts decline in share of quality accessions compared to a 2 ppts decline for the other services. Both estimates have a 99.9% confidence level. Figure 28 also shows the increase variance that the Navy sees in share if recruit quality in the months leading up to transformation, with the percentages of quality recruits varying from .59 to .41. After transformation the Navy experienced a much more predictable quality percentage from months 5 to 12 as the dots are much closer to the trend line. This is encouraging that the Navy saw improvement in post transformation performance when compared to NTAG Portland as NRD New Orleans produced 2.5 times more accessions during the 24 months depicted in Figure 27.

3. NTAG Rocky Mountains

In December of 2017, NRD Rocky Mountains was the third district to make the policy switch and transform into a NTAG. During this period, the other services did not see a statistically significant change in recruit quality percentage of their own accessions while the Navy experience a statistically significant 3.4 ppts decline in the month post month 0 compared to the performance prior to the transformation. Showing continued

improvement in the effects of transformation as the percentage point decline continued to shrink from Portland to New Orleans to Rocky Mountains. It is important to note that during the 24 months depicted in Figure 29 the Navy saw a high degree variance in the difference between the recruit quality percentages with values ranging from 71% to 38% quality recruits percentage two months later. This level of variance created a difficult to follow trend line for the Navy both pre- and post-transformation. The unexpected results continued after transformation and factored into a lower confidence level of the results. Figure 29 shows the difference in difference estimates for NTAG Rocky Mountains, with the detailed estimates displayed in Appendix B.

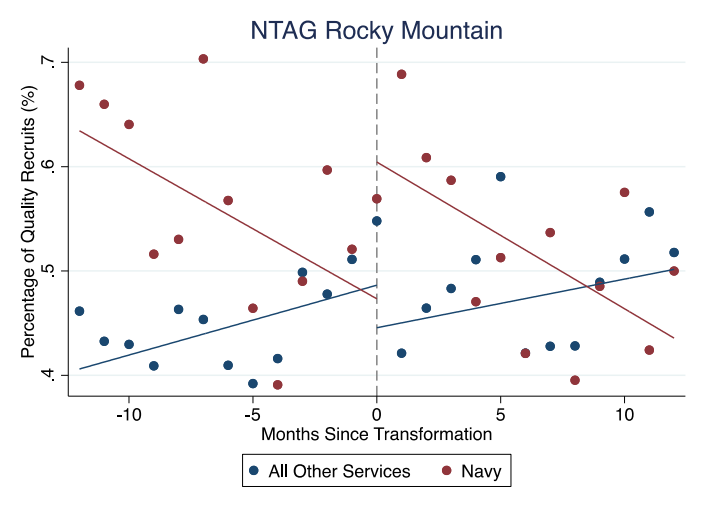

Figure 29. NTAG Rocky Mountain Quality Accessions before and after December 2017

4. NTAG Northern Plains

In the Northern Plains district, the other services did not see a statistically significant change after month 0 while the Navy experienced a 4.3 ppts (at a 95% confidence level) decline in the share of quality recruits from own accessions following the transformation. While NTAG Northern Plains and NTAG Rocky Mountains are in different census regions (Pacific and Midwest), the two districts reside in close geographic proximity, therefore, seeing similar results is not surprising. Figure 30 shows the difference

in difference estimates for NTAG Northern Plains, while the detailed estimates are presented in the Appendix B table.

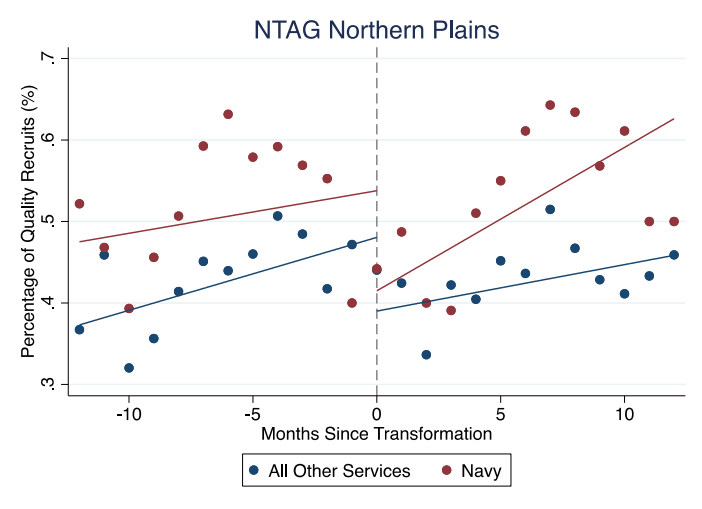

Figure 30. NTAG Northern Plains Quality Accessions before and after April 2018

5. NTAG Nashville

The last NTAG that I included in the analysis of the transformation in recruiting is NTAG Nashville. NRD Nashville transformed into a NTAG in June 2018, and it appears to be the most efficient of the five transformations that were analyzed. The other services experienced a 2.2 ppts decline in own share of recruit quality at a 99.9% confidence level whereas the Navy experienced 3.6 ppts decline at a 95% confidence interval. Also, of note in the chart is the slope of the Navy's trendline after month zero, indicating possible increased performance in FY20 and 21. While the Navy did experience an overall drop in performance, this is the first NTAG that depicts a positive outlook for the future beyond the period analyzed. Results are shown in Figure 31, with the detailed estimates shown in Appendix B.

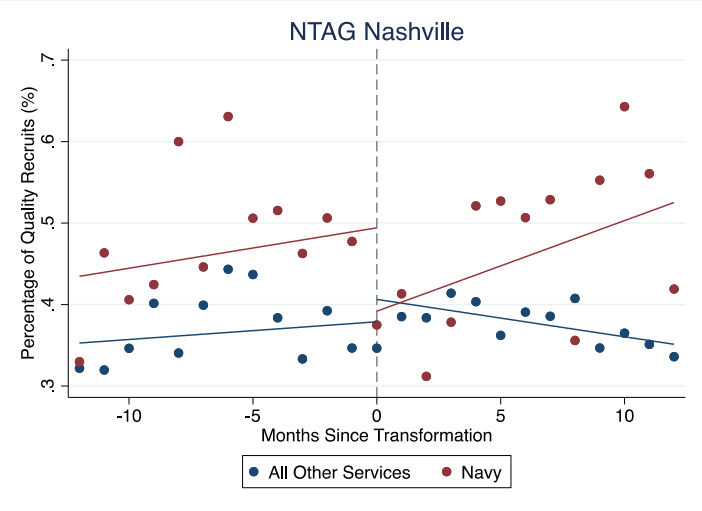

Figure 31. NTAG Nashville Quality Accessions before and after June 2018

6. Aggregate Transformation Event Study

In looking at the aggregate performance of the five different NTAGs for a smaller timeframe of the 24 months before and after transformation, I found that, on average, the Navy performed 9 percentage points worse post-transformation, while the other services experienced a 3.2 percentage points decline in the share of quality recruits from their own accessions. Both declines were significant at a 99.9% confidence level. Figure 32 shows the combined performance of the five NTAGs' performances after their transition dates. Like the previous figures, the dots show the percentage of all accessions that month that were quality accessions. The main difference in this chart versus the previous five is that it shows the effect of transformation on all the five studied NTAGs combined and encompasses the 24 months before and after the Navy NRDs underwent transformation to the new NTAG policy. The decline post transition is very apparent in month 17 when the Navy has a lower percentage of quality recruits than the other services, something that never occurred in the 24 months leading up to transformation. Additionally, the gap between the figures narrows as the Navy experienced a greater decline in quality accession percentage compared to the other services.

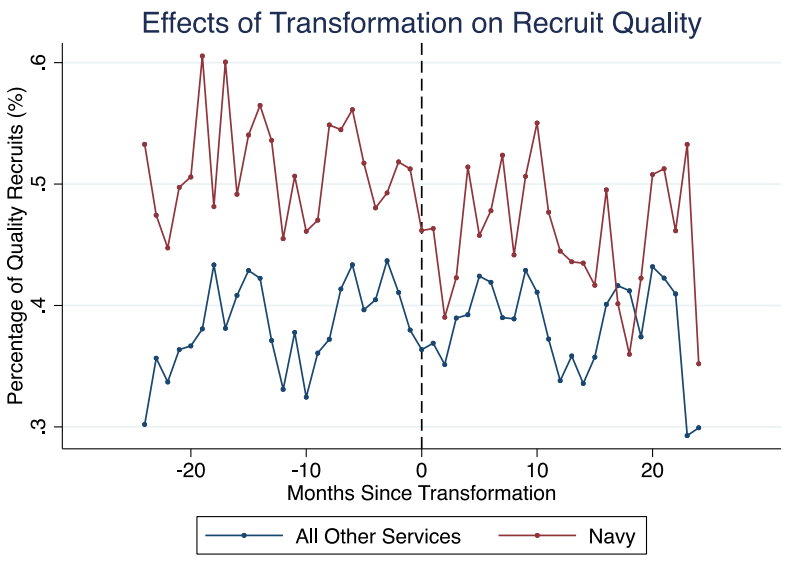

Figure 32. Quality Accessions Comparison of the First Five NRDs to Undergo Transformation

Appendix C shows the detailed estimations, with the 3.2ppt decrease for all services and the 9 ppt decrease suffered by the Navy. This average decline in the share of quality recruits within the Navy accessions experiences after the transformation is concerning for the long-term prospects of success for the new recruiting model and it is something the Navy needs to continually monitor as the rest of the NRD's undergo the process of transformation to the new recruiting model. However, it is important to note that transformation represents a major change in recruiting policy from a method that has been in practice for decades. Growing pains are to be expected as the Navy recruiting force adjust to the new policy and creates a new standard of best practices to increase recruiting performance. Moreover, this analysis does not include the NRDs that transitioned after NTAG Nashville.

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VI. CONCLUSION

A. FINDINGS

The United States Navy's mission statement is as follows:

> The United States is a maritime nation, and the U.S. Navy protects America at sea. Alongside our allies and partners, we defend freedom, preserve economic prosperity, and keep the seas open and free. Our nation is engaged in long-term competition. To defend American interests around the globe, the U.S. Navy must remain prepared to execute our timeless role, as directed by Congress and the President. (Navy.mil, n.d.).

To achieve that goal, the Navy must entice the young men and women of America to leave their homes and enlist in naval service. It is a large undertaking and takes a talented team of recruiters to successfully meet that mission.

For my thesis, I asked two research questions: the first was whether the Navy was experiencing a declining market share in recruits and quality recruits in the Midwest region. This thesis showed that the Navy is experiencing a declining market share in the Midwest and how that may be caused by a lack of naval presence in the region. If the Navy wishes to fulfill its ranks with a geographically diverse set of recruits, it needs to give areas such as the Midwest adequate resources to properly find and recruit potential sailors. The Navy will always have a large presence on the coasts of our nation, and therefore, recruiting in those areas will be more effective and generally take less effort as the constant military exposure creates a stronger propensity to enlist. The Navy will be challenged to have a large presence in the Midwest, and to overcome that deficit, it must allocate more resources in the form of more recruiters to increase the population's awareness of the benefits that naval service can provide. States such as South Dakota will struggle to be successful with only two active-duty personnel stationed in the state; assuming both are recruiters, they have an uphill task of reaching all the potential recruits in that region. Until the Midwest is given adequate resources, it will continue to underperform.

The Navy must also question whether the value of increasing the market share of the Midwest is worth the effort. In 2019, the Navy had 1,321 accessions from the Midwest's West North Central District. If that were to double, the Navy would have 2,600 recruits,

which would result in a 32% market share for the region, not a reasonable request. On the other hand, the Navy had 10,046 accessions from the South Atlantic district. If the Navy were to generate those additional 1,300 recruits from the South Atlantic, the Navy would have to increase its market share in the district from 24% to 27%, which is a much more realistic expectation. The Navy must decide if it wants to be competitive throughout the country or specialize in areas where there is a higher propensity to enlist in naval service. If the Navy chooses to specialize, then it risk losing long-term market share in certain regions of the country. As 2016 showed, the competition for recruits is intense, and it is hard to regain any lost market share in any region of the country.

The second research question I posed in this thesis was how has Navy recruiting performed after restructuring its recruiting model to the assembly line approach? I covered the effect that transformation has had on the percentage of quality recruits that the Navy has been able to attract in the first five NRDs to undergo transformation, while the data showed an initial decline in quality with the first regions to shift, that effect was minimized as the Navy gained experience with the new policy. As the NRC continues to execute transformation of all the recruiting districts throughout the country, it is important that performance is continually monitored to ensure that that Navy is developing a recruiting model that will meet the manpower goals of the fleet. While my data has shown that the initial results of transformation have not produced the same results under the legacy model, it is important that the Navy continues to provide the recruiters with plenty of resources as they adjust to the new style of recruiting. It is strongly recommended that NRC keeps a close eye of the performance of the TAOCs throughout the country as they assess the performance in the different geographic regions. The first five NRD's that have undergone transformation have underperformed relative to their prior performance, but that decline is getting smaller as the Navy becomes more practiced at executing the shift from NRD to NTAG. Transformation is the future of Navy recruiting only if the Navy can continue to meet its annual recruiting goals. If the Navy struggles to increase its market share in key areas, then it must reassess the assembly line approach to attracting potential recruits.

APPENDIX A. ACTIVE DUTY PERMANENTLY STATIONED BY STATE

DUTY STATE / COUNTRY	ACTIVE DUTY					
	ARMY	NAVY	MARINE CORPS	AIR FORCE	COAST GUARD	TOTAL
WASHINGTON	26,733	24,536	765	6,402	1,966	**60,402**
ILLINOIS	1,002	15,649	397	4,460	138	**21,646**
HAWAII	15,346	13,558	6,453	5,403	1,260	**42,020**
MARYLAND	8,410	9,929	1,835	8,456	879	**29,509**
SOUTH CAROLINA	12,295	7,734	10,681	8,738	872	**40,320**
TEXAS	73,311	6,083	2,175	39,306	1,806	**122,681**
GEORGIA	52,957	5,818	1,391	9,181	489	**69,836**
MISSISSIPPI	502	5,224	508	6,254	250	**12,738**
CONNECTICUT	117	5,090	59	37	711	**6,014**
NORTH CAROLINA	44,881	4,533	44,471	6,705	1,689	**102,279**
RHODE ISLAND	143	2,770	214	73	313	**3,513**
DISTRICT OF COLUMBIA	1,721	2,440	2,233	1,823	1,794	**10,011**
OKLAHOMA	13,089	1,512	456	7,320	19	**22,396**
TENNESSEE	408	1,507	165	167	160	**2,407**
NEVADA	224	966	55	10,187	1	**11,433**
NEW YORK	17,230	952	670	416	1,014	**20,282**
NEW HAMPSHIRE	58	849	35	116	160	**1,218**
COLORADO	25,818	800	231	8,966	47	**35,862**
PENNSYLVANIA	1,028	645	384	235	328	**2,620**
NEW JERSEY	664	453	376	4,858	1,786	**8,137**
LOUISIANA	8,013	416	739	5,292	1,196	**15,656**
ARIZONA	4,525	395	4,050	10,711	7	**19,688**
MASSACHUSETTS	402	392	209	1,130	1,589	**3,722**
NEBRASKA	163	351	90	5,606	16	**6,226**
MISSOURI	10,929	296	1,391	4,239	187	**17,042**
OHIO	547	243	287	5,503	397	**6,977**
MICHIGAN	454	232	186	90	1,103	**2,065**
OREGON	111	160	122	151	1,031	**1,575**
MINNESOTA	192	143	119	52	125	**631**
INDIANA	632	108	189	92	33	**1,054**
MAINE	51	84	19	10	645	**809**
KANSAS	18,397	74	107	3,149	77	**21,804**
NEW MEXICO	385	69	68	12,065	5	**12,592**
ALABAMA	4,749	65	144	3,405	940	**9,303**
ALASKA	9,803	44	19	7,455	1,934	**19,255**
UTAH	187	42	91	4,243	0	**4,563**
WISCONSIN	511	41	116	117	290	**1,075**
IDAHO	63	35	41	3,401	4	**3,544**
KENTUCKY	31,782	33	90	238	162	**32,305**
IOWA	120	20	73	27	35	**275**
DELAWARE	72	15	20	3,422	39	**3,568**
ARKANSAS	144	9	170	3,380	19	**3,722**
VERMONT	57	9	8	50	36	**160**
MONTANA	69	6	23	3,252	0	**3,350**
NORTH DAKOTA	15	3	14	7,297	0	**7,329**
WEST VIRGINIA	67	3	37	18	64	**189**
SOUTH DAKOTA	78	2	10	3,352	0	**3,442**
ARMED FORCES EUROPE	0	1	1	0	0	**2**
WYOMING	38	1	10	3,093	0	**3,142**
ARMED FORCES PACIFIC	0	0	0	0	0	**0**
ZZ-UNKNOWN	5,749	0	0	0	0	**5,749**
UNITED STATES TOTAL	**430,358**	**295,132**	**153,425**	**273,891**	**39,598**	**1,192,404**

Source: DMDC Website (2018).

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APPENDIX B. REGRESSION OUTPUT FOR DIFFERENCE IN DIFFERENT ESTIMATES OF PERCENTAGE OF QUALITY ACCESSIONS OF NTAGS

	Portland qual	New Orleans qual	Rocky Mtns qual	Northern Plains qual	Nashville qual
white	0.0470***	0.1840***	0.0966***	0.0940***	0.1880***
	(4.24)	(44.63)	(14.14)	(14.31)	(36.94)
male	0.0775***	0.0678***	0.0874***	0.0980***	0.0738***
	(8.17)	(13.30)	(13.71)	(14.64)	(12.41)
airforce	-0.0270*	0.0028	0.0399***	-0.0301***	0.0355***
	(-2.29)	(0.40)	(5.12)	(-3.89)	(5.12)
marines	-0.2220***	-0.2000***	-0.149***	-0.1880***	-0.1530***
	(-18.94)	(-27.53)	(-19.12)	(-24.72)	(-20.88)
army	-0.1620***	-0.2000***	-0.1460***	-0.1450***	-0.1650***
	(-15.57)	(-33.32)	(-21.23)	(-20.09)	(-27.11)
coastguard	0.0851***	0.0119	0.1270**	0.1380***	0.1430***
	(3.30)	(0.80)	(2.82)	(3.83)	(6.25)
Switch All other Svc	-0.00919				
	(-1.03)				
Switch Navy	-0.1240***				
	(-6.52)				
Switch All other Svc		-0.0203***			
		(-4.14)			
Switch. Navy		-0.0562***			
		(-5.39)			
Switch All other Svc			-0.0101		
			(-1.51)		
Switch Navy			-0.0335*		
			(-2.52)		
Switch All other Svc				-0.00515	
				(-0.72)	
Switch Navy				-0.0430*	
				(-2.47)	
Switch All other Svc					-0.0226***
					(-3.30)
Switch Navy					-0.0360*
					(-2.55)
_cons	0.4700***	0.288 ***	0.4120***	0.3820***	0.2870***
	(33.87)	(44.07)	(45.94)	(42.67)	(39.30)
N	20260	52549	43141	43692	49672

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

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APPENDIX C. REGRESSION OUTPUT FOR EVENT STUDY ESTIMATES OF PERCENTAGE OF QUALITY ACCESSIONS OF 5 NTAGS 24 MONTHS BEFORE AND AFTER TRANSFORMATION

	Portland qual	New Orleans qual	Rocky Mtns qual	Northern Plains qual	Nashville qual	Annual qual
white	0.0470***	0.187***	0.184***	0.167***	0.172***	0.157***
	(4.24)	(49.84)	(56.54)	(57.33)	(68.00)	(9.44)
male	0.0775***	0.0722***	0.0773***	0.0845***	0.0820***	0.0799***
	(8.17)	(15.95)	(20.82)	(25.99)	(28.72)	(27.09)
navy	-0.0851***	-0.0247	-0.0195	-0.0309**	-0.0558***	0
	(-3.30)	(-1.91)	(-1.55)	(-2.61)	(-5.30)	(.)
airforce	-0.112***	-0.0374**	-0.0133	-0.0382**	-0.0524***	0
	(-4.40)	(-2.92)	(-1.07)	(-3.25)	(-5.01)	(.)
marines	-0.307***	-0.236***	-0.207***	-0.220***	-0.236***	0
	(-12.08)	(-18.38)	(-16.60)	(-18.70)	(-22.50)	(.)
army	-0.247***	-0.224***	-0.203***	-0.208***	-0.229***	0
	(-9.92)	(-17.98)	(-16.60)	(-17.87)	(-22.18)	(.)
switch	-0.00919	-0.0195***	-0.0245***	-0.0210***	-0.0202***	
	(-1.03)	(-4.50)	(-6.69)	(-6.44)	(-6.91)	
1.navy#1.s~h	-0.115***	-0.0613***	-0.0432***	-0.0444***	-0.0366***	-0.0900***
	(-5.47)	(-6.03)	(-5.12)	(-5.77)	(-5.32)	(-6.47)
coastguard						0
						(.)
0.navy#1.s~h						-0.0320**
						(-3.93)
2015.year						0
						(.)
2016.year						0.0786***
						(17.02)
2017.year						0.0795***
						(14.64)
2018.year						0.109***
						(14.43)
2019.year						0.121***
						(10.54)
_cons	0.555***	0.333***	0.343***	0.364***	0.377***	0.140***
	(20.35)	(25.55)	(27.11)	(30.36)	(35.44)	(11.28)
N	20260	72809	115950	159642	209314	79856

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

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LIST OF REFERENCES

Asch, B. J. (2019). *Navigating current and emerging Army recruiting challenges: What can research tell us?* RAND. *https://www.rand.org/pubs/research_reports/RR3107.html*

Breum, A. (2017). N*avy Recruiting Command sees future for third regio*n. Navy Recruiting Command. https://www.cnrc.navy.mil/news-stories-2020/region-three.html

CNA. (2019). Population representation in the military services. https://www.cna.org/research/pop-rep

Culver, V. (n.d.). Enlistment eligibility. ASVAB. Retrieved February 3, 2022, from *https://www.officialasvab.com/applicants/enlistment-eligibility/*

Dertouzos, J. N. (2009). The cost-effectiveness of military advertising: Evidence from 2002–2004. RAND. https://www.rand.org/pubs/documented_briefings/DB565.html

DMDC Website. (2018). DOD personnel, workforce reports & publications. https://dwp.dmdc.osd.mil/dwp/app/dod-data-reports/workforce-reports

DMDC Website. (2022). Overview. Retrieved February 17, 2022, from https://dwp.dmdc.osd.mil/dwp/app/about/overview

Eshleman, Z. (2020.). Navy Recruiting Command establishes Region Central. https://www.dvidshub.net/news/380046/navy-recruiting-command-establishes-region-central

Faram, M. (2018, November 2). Navy sees recruiting challenges on the horizon. *Navy Times*. https://www.navytimes.com/news/your-navy/2018/11/02/navy-sees-recruiting-challenges-on-the-horizon/

Gilroy, C., Clelan, E., Horvath, J., & Gonzales, C. (2020). *The All Volunteer Force and the need for sustained investment in recruiting.* Center for Naval Analyses, Arlington. https://apps.dtic.mil/sti/pdfs/AD1102738.pdf

Goldberg, M. S., Cheng, K., Huff, N. M., Kimko, D. D., & Saizan, A. M. (2018). *Geographic diversity in military recruiting*. Institute for Defense Analyses. https://www.ida.org/-/media/feature/publications/g/ge/geographic-diversity-in-military-recruiting/d-9079.ashx

JAMRS. (2020). Fall 2020 propensity update. Office of People Analytics. https://jamrs.defense.gov/Portals/20/YP48Fall2020PUBLICRELEASEPropensityUpdate_20210628.pdf

Jarrett, P. (2019). Transformation: evolving the business of Navy recruiting. DVIDS. *https://www.dvidshub.net/news/338785/transformation-evolving-business-navy-recruiting*

Laich, D. (2019, July 23). Manning the military: America's problem. *Military Times. https://www.militarytimes.com/opinion/commentary/2019/07/23/manning-the-military-americas-problem/*

Lim, N., Orvis, B. R., & Curry Hall, K. (2019). *Leveraging big data analytics to improve military recruiting*. RAND. ahttps://www.rand.org/pubs/research_reports/RR2621.html

Navy Recruiting Command (NRC). (2021). Navy recruiting facts and statistics. Retrieved January 6, 2022, from *https://www.cnrc.navy.mil/pages-nrc-links/nrc-facts-stats.htm*

Navy.mil.. (n.d.). Mission. Retrieved March 1, 2022, from https://www.navy.mil/About/Mission/

Pinelis, Y. K., Schmitz, E. J., Miller, Z. T., Rebhan, E., & Schmitz, E. J. (2011). An analysis of Navy recruiting goal allocation models. Center for Naval Analysis . https://www.cna.org/CNA_files/PDF/D0026005.A2.pdf

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