

# **Differences in Male and Female Predictors of Success in the Marine Corps: A Literature Review**

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February 2015





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Camp Lejeune, North Carolina — SgtMaj Robin Fortner, left, sergeant major of the Ground Combat Element Integrated Task Force (GCE ITF), speaks with Sgt Jason McMullen, light armored vehicle crewman, Company B, GCE ITF, during a limited technical inspection at the 2<sup>nd</sup> Light Armored Reconnaissance Battalion ramp, September 9, 2014. Each vehicle came with dozens of tools and upkeep equipment. From October 2014 to July 2015, the GCE ITF will conduct individual- and collective-level skill training in designated ground combat arms occupational specialties to facilitate the standard-based assessment of the physical performance of Marines in a simulated operating environment performing specific ground combat arms tasks. (Official Marine Corps photo by Cpl Paul S. Martinez/Released)

**Approved by:**

**February 2015**

A handwritten signature in black ink that appears to read "Anita Hattiangadi".

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## Abstract

As part of the Marine Corps Force Integration Plan considering female integration into previously closed Military Occupational Specialties and units, CNA was asked to support the Marine Corps Recruiting Command's research needs. This research memorandum, which reviews the literature on predictors of male and female Marine performance over the last 25 years, will inform CNA's work examining the impact of previous female integration as well as future trend analysis. Performance measures include attrition and promotion at different milestones. We reviewed studies of Marine Corps performance for enlisted personnel and officers. Some enlisted equations were separately estimated for men and women, but officer equations were not. We observe that some factors are solid predictors of lower Marine Corps enlisted attrition for both men and women, such as time in the Delayed Entry Program, Armed Forces Qualification Test score, education, race/ethnicity, enlistment waivers, and being recruited as a high school senior. Other predictors of enlisted attrition, such as age, vary by gender.

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## Executive Summary

As part of the Marine Corps' consideration of female integration into previously closed Military Occupational Specialties (MOSSs) and units, the Marine Corps Force Innovation Office asked CNA to support the Marine Corps Recruiting Command's (MCRC's) research needs. CNA's support to MCRC as part of the Marine Corps Force Integration Plan (MCFIP) includes a literature review on the predictors of male and female performance, direct support of MCRC in conducting trend analysis, and estimating the size of the qualified officer candidate population.

This research memorandum reviews the literature on predictors of Marine performance, separately for men and women. We reviewed the past 25 years of work on Marine performance for enlisted personnel and the officer corps, which will inform our work examining past gender integration as well as future trend analysis. Many studies of enlisted performance separately estimated effects by gender, but the officer studies did not.

Overall, we find that some factors are solid predictors of Marine Corps enlisted attrition and retention for both men and women. In general, spending more time in the Delayed Entry Program (DEP), having a higher Armed Services Qualification Test (AFQT) score, having a Tier 1 education credential, or being recruited as a high school senior were predictive of lower attrition (i.e., recruit-training and first-term attrition) and an increased likelihood of being recommended and eligible to reenlist for both male and female Marines. In terms of race and ethnicity, white non-Hispanic men and women have higher recruit-training and first-term attrition. Having no enlistment waivers was predictive of lower 24-month and first-term attrition for both men and women.

Other predictors of Marine Corps enlisted attrition, such as age, vary by gender. Being older was a predictor of higher attrition in the DEP, in recruit training, and at 24 months for men, but age was an insignificant predictor of female attrition.

In officer retention, promotion, and Fitness Report (FITREP) studies, researchers did not separately estimate equations by gender. Although we cannot glean anything about gender differences in performance predictors from these studies, we do observe that some factors—such as being married, having a higher ranking at The Basic School (TBS), being commissioned through the United States Naval Academy (USNA), or being a woman—were consistent predictors of higher officer retention, promotion, and FITREP scores at different paygrades and years of service.

Some factors were inconsistent predictors of officer retention, promotion, and FITREP scores at different paygrades, such as being prior enlisted, older, black, or holding an aviation MOS. Other factors were positive predictors of officer retention and promotion but insignificant predictors of officer FITREP scores, such as having a graduate degree or combat experience.

We also look at consistent predictors of enlisted promotion and good conduct. Poor conduct includes such factors as non-judicial punishments (NJPAs) and desertions. Many factors that predicted high rates of enlisted retention also predicted high rates of enlisted promotion and good conduct. These factors included more time in DEP, a Tier 1 education credential, and higher AFQT scores. Among enlistment waiver types, some were consistent predictors of poor conduct, such as “positive drug and alcohol test,” “serious misdemeanor,” and “adult felony” waivers. Other factors, such as ethnicity and marital status, were less consistent predictors of enlisted promotion and good conduct.

There are several similarities between the predictors of enlisted and officer attrition, including such demographic characteristics as age, marital status, and gender. Some predictors, however, are not applicable to both groups. For example, time in DEP and the trimester in which a recruit ships to recruit training will not apply to the officer population. Instead, the officer retention studies investigate how commissioning source and TBS performance help to predict officer retention. Certain factors similarly predict enlisted and officer promotion, such as marital status and race, while other factors uniquely predict officer promotion—again, such as commissioning source and TBS ranking.

By understanding the strong predictors of past performance, we can better estimate the future performance of Marines. The information contained in this literature review will inform CNA’s other MCFIP work in support of MCRC’s research needs. In particular, we can use the identified predictors of Marine performance in (1) regression modeling of above- or below-average performance, as well as the ability or propensity to serve in combat arms MOSs, (2) trend analysis identifying the characteristics of female versus male Marine markets, and (3) analysis of whether the demographics and quality of female enlistees will change over time with the lifting of the combat exclusion policy.

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# Glossary

AFQT	Armed Forces Qualification Test
ASVAB	Armed Services Vocational Aptitude Battery
DAT	Drug and Alcohol Test
DEP	Delayed Entry Program
DTIC	Defense Technical Information Center
ECP	Enlisted Commissioning Program
FITREP	Fitness Report
FMAM	February, March, April, May
GCT	General Classification Test
GPA	Grade Point Average
IST	Initial Strength Test
JJAS	June, July, August, September
MCD	Marine Corps District
MCFIP	Marine Corps Force Integration Plan
MCRC	Marine Corps Recruiting Command
MCRD	Marine Corps Recruiting Depot
MECEP	Marine Enlisted Commissioning Educational Program
MOS	Military Occupational Specialty
NJP	Non-Judicial Punishment
NPE	Not Prior Enlisted
NPS	Naval Postgraduate School
NROTC	Navy Reserve Officer Training Corps
OCC	Officer Commissioning Course
ONDJ	October, November, December, January
PE	Prior Enlisted
PEF	Program Enlisted For
PFT	Physical Fitness Test
PLC	Platoon Leaders Class
PME	Professional Military Education
RO	Reviewing Officer
TBS	The Basic School
USNA	United States Naval Academy
YOS	Years of Service

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# Introduction

As part of the Marine Corps' consideration of female integration in combat arms Military Occupational Specialties (MOSSs) and units under the Marine Corps Force Integration Plan (MCFIP), CNA has been tasked with supporting the Marine Corps Recruiting Command's (MCRC's) research needs. Task 4 includes a literature review of predictors of female versus male Marine performance, direct support for MCRC's trend analysis, and the creation of officer qualified candidate population estimates (adjusted medically, by propensity, and by gender, at the college student level and the college graduate level).

This research memorandum is the deliverable for task 4a. We searched past CNA studies, sources archived in the Defense Technical Information Center (DTIC), and Google Scholar to perform this review of literature from the 1990s to the present on predictors<sup>1</sup> of female versus male Marine performance. This information was necessary to support the research needs and regression modeling in task 4c—direct support for trend analysis. This literature review helps to inform three questions that are part of the task 4c trend analysis:

1. What are the accession characteristics of women with above- or below-average performance?
2. What are the identifying characteristics of the female Marine recruit market when compared with the male Marine recruit market?
3. With the lifting of the combat exclusion policy, will the demographics and quality of female enlistees change over time?

Performance in the Marine Corps can be evaluated across several dimensions. Some studies measure performance across various retention milestones, whereas others evaluate performance at different promotion points. Still other studies predict other

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<sup>1</sup> In this memorandum, the term *predictors of performance* refers to variables that are statistically significantly related to performance outcomes of interest, such as retention and promotion. By using the term *predictors* we do not mean to imply that out-of-sample prediction models have shown these variables to consistently predict the performance outcomes of interest. This would be a much stronger relationship for which many of the studies included in this literature review have not tested.

performance measures, such as the Good Conduct Medal<sup>2</sup> and other personal decorations, such as the Navy and Marine Corps Achievement Medal.

Enlisted women traditionally have had higher attrition than their male counterparts in the Delayed Entry Program, in recruit training, and in the first term, but their long-term retention rates have generally been higher, given that they are retained past their initial contracts. Unfortunately, very few studies separately track male and female predictors of career success. In this report, we highlight differences in male and female success predictors, where observed, but note that the majority of predictors are estimated for both men and women simultaneously.<sup>3</sup> In the future, researchers should separately estimate male and female equations if they are interested in whether the career performance of men and women is affected by different factors in different ways.

In this report, we also distinguish between enlisted and commissioned officer performance predictors because performance measures are different for enlisted Marines and officers. By understanding strong predictors of performance from past Marine Corps studies, we can better identify good candidates for predicting performance in future modeling efforts, such as that in task 4c—direct support for trend analysis.

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<sup>2</sup> This medal is given for every three consecutive years of problem-free enlisted service.

<sup>3</sup> When male and female predictors are estimated simultaneously, the model's coefficients on the predictors are the same for both men and women.

# Identifying Predictors of Retention and Attrition

Retention and attrition metrics are some of the most basic indicators of performance in the Marine Corps. Identifying those who are likely to attrite early is critical if the Marine Corps is to recruit a cost-effective and high-performing force. Predicting whether a Marine stays in the Marine Corps until different career milestones is the focus of several past studies. We first review the predictors of enlisted Marine retention and attrition; then we turn to Marine officer retention. Later in this section, Table 1 presents a summary of the literature on retention and attrition.

## Predictors of Marine Corps enlisted retention and attrition measures

### Delayed Entry Program (DEP) attrition

The Marine Corps makes a significant investment in recruiting, mentoring, and training Marines before they arrive at recruit training. While potential Marines are waiting to ship to recruit training, they enter the DEP; however, not everyone who arrives in the DEP will eventually ship to recruit training. Moreover, those who stay longer in the DEP and do not attrite have lower later attrition rates in the Marine Corps.<sup>4</sup> Thus, while someone attriting from the DEP is expensive, the same person attriting later in his or her Marine Corps career is more expensive. Table 12 in the appendix provides an overview of the DEP attrition literature referenced in this report.

One recent study finds that, between FY 2005 and FY 2012, 20.1 percent of male Marine poolees and 28.6 percent of female Marine poolees attrited from the DEP [1]. Because male and female DEP attrition rates substantially differ, the study goes on to estimate the factors that predict DEP attrition separately for men and women [1]. It is

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<sup>4</sup> We discuss this point in more detail later in this report.

important for recruiters to consider these different predictors of male and female DEP attrition when trying to estimate the percentage of their poolees that will ultimately ship to recruit training. For both men and women, the longer a recruit stayed in the DEP, the more likely he or she was to attrite from the DEP. For men, the following factors all decreased the likelihood of a poolee attriting from the DEP: attending at least some college, being recruited as a high school senior,<sup>5</sup> having an Armed Forces Qualification Test (AFQT) score of 50 or above, or entering the DEP during a period of high unemployment for 16- to 24-year-olds [1]. All of these factors decreased female DEP attrition rates, as well, except attending at least some college, which was not statistically significant [1]. The effects for women were generally larger than the effects for men: for example, women who spent five months in the DEP had DEP attrition rates that were 12.6 percentage points higher than women who spent three months in the DEP, while men who spent five months in the DEP had DEP attrition rates that were 7.8 percentage points higher than men who spent three months in the DEP.

Moreover, Asian, black, and Hispanic men were more likely than white men to attrite from the DEP. However, Hispanic and other-race women were less likely than white women to attrite from the DEP, and there was no statistically significant difference in the DEP attrition rates of Asian and black women compared with white women [1]. Men who were 22 or older were more likely to attrite from the DEP than men who were younger than 22. Age, however, was not related to female DEP attrition. Single men with no dependents were more likely to attrite from the DEP than married men or men with dependents. In contrast, single women with no dependents were no more likely to attrite from the DEP than married women or women with no dependents.

Two earlier Naval Postgraduate School (NPS) theses estimated predictors of DEP attrition simultaneously for men and women, one for FY 2000 to FY 2001 cohorts and the other for FY 2000 to FY 2005 cohorts [2-3]. Both studies found that female, black, or older poolees were more likely to attrite from the DEP than their peers [2-3]. These studies also found that those who were recruited as high school graduates were less likely to drop out of the DEP than those recruited as high school seniors [2-3]. A higher AFQT score was found to increase DEP attrition in the FY 2000 to FY 2005 study [3], but it was an insignificant predictor of DEP attrition in the FY 2000 to FY 2001 study [2].

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<sup>5</sup> The negative relationship between being a high school senior and DEP attrition is found when the number of DEP months is held constant. If DEP months are not held constant, high school seniors (because of their longer average DEP stays) have higher attrition than high school graduates.

The FY 2000 to FY 2005 study found that married poolees or those with dependents were less likely to attrite than unmarried poolees or those without dependents [3]. Similarly, the FY 2000 to FY 2001 study found that those with dependent waivers were less likely to attrite from the DEP than their peers [2]. In fact, those with medical, age, or administrative enlistment waivers were found to be less likely to attrite from the DEP than their nonwaived peers [2].

Those who remained in the DEP longer were more likely to drop out of the DEP [2-3]. In addition, poolees who enlisted on the last day or week of the month were more likely to attrite before they shipped to recruit training [2-3]. The season in which a poolee entered the DEP also was found to be an important predictor of DEP attrition in the FY 2000 to FY 2001 study. Those who signed contracts in the spring were the least likely to attrite from the DEP [2]. The spring is generally a very difficult recruiting period. Those who contract in the spring have already completed high school, so they are available to ship right away and therefore have generally shorter DEP times, on average, which could explain why they attrited from the DEP at lower rates.

These two earlier studies found conflicting results when estimating how a poolee's recruiting district of origin affected DEP attrition. The FY 2000 to FY 2001 study found that those recruited from the 1<sup>st</sup>, 6<sup>th</sup>, and 9<sup>th</sup> Marine Corps Districts (MCDs) (the Northeast, Southeast, and Midwest) were more likely to attrite from recruit training than those recruited from the 4<sup>th</sup> MCD (Eastern and Mid-Atlantic states) [2]. The FY 2000 to FY 2005 study found that those recruited from the 6<sup>th</sup>, 9<sup>th</sup>, and 12<sup>th</sup> MCDs (the Southeast, Midwest, and West) were less likely to attrite than those from the 1<sup>st</sup> MCD (the Northeast); it also found that those recruited from western regions were less likely to attrite than those recruited from eastern regions [3]. DEP attrition by MCD is likely to change over time, as both leadership and economic conditions in the districts change. The FY 2000 to FY 2005 study included variables to represent the health of the economy in various regions and found that those in districts with higher 16- to 24-year-old unemployment rates were less likely to attrite from the DEP than those recruited in districts with lower unemployment rates [3].

The FY 2000 to FY 2001 NPS study includes several other interesting variables not found in any of the other known DEP attrition studies. If poolees took the Armed Services Vocational Aptitude Battery (ASVAB) more than 25 days before enlistment, they were less likely to attrite from the DEP [2]. In addition, those whose recruit-training shipping dates were moved fewer than six times were less likely to attrite from the DEP than those whose shipping dates moved six or more times [2]. Poolees whose enlistment contract sources were recruiter generated (e.g., by recruiter telephone calls or shopping mall canvassing) were more likely to attrite from the DEP than those whose sources were recruitment programs (e.g., DEP referral, command recruiter referral, priority prospect/"hot lead") [2]. Furthermore, those who were

eligible to receive a bonus were more likely to attrite from the DEP than those who were not [2].

In summary, spending less time in DEP, being recruited as a high school senior, having an AFQT score of 50 or above, and higher 16- to 24-year-old unemployment rates are associated with lower male and female DEP attrition rates. Race and ethnicity also were significantly related to male and female DEP attrition rates, but the direction of each factor's relationship to DEP attrition differed by gender; for example, being Hispanic increased attrition likelihood for men, while it decreased it for women [1]. Other factors, such as college attendance, age, and marital and dependent status, were significantly related to DEP attrition for men but did not help to predict female DEP attrition [1]. These subtle differences between male and female predictors of poolee performance are important to keep in mind as we examine the factors that influence performance once poolees ship to recruit training and once those in recruit training become Marines.

## Recruit-training attrition/separation

A significant number of poolees who ship to recruit training do not successfully complete the graduation requirements to become a Marine. From FY 1979 to FY 2009, male recruit-training attrition rates ranged from a high of 16 percent in FY 1982 to a low of 8 percent in FY 2009 [4]. Over the same time period, the female recruit-training attrition rate peaked at 30 percent in FY 1993 and bottomed out at around 12 percent in FY 1981 [4]. In the most recent period studied in [4] (FY 2000 to FY 2009), recruit-training attrition ranged from 15 to 21 percent for women and from 8 to 12 percent for men. With female rates nearly twice those of men, it raises the question of whether the factors that predict recruit-training completion also vary between men and women.<sup>6</sup>

Several studies attempt to answer this question. Table 13 in the appendix summarizes the studies referenced in this report that examine recruit-training attrition. Some studies find a few common factors that predict attrition across men and women. From FY 2002 to FY 2005, unmarried men and women were less likely to attrite from recruit training than married men and women [5]. Two studies that covered FY 1999 to FY 2009 found that black, Hispanic, or other-race men and women were less likely than white men and women to attrite from recruit training [4-5]. Reference [5] also found that younger male Marine recruits were less likely to

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<sup>6</sup> Men and women have different required accession standards. One study compares men and women of similar fitness levels and finds more similar recruit-training attrition rates.

attrite from recruit training but that age was not significantly related to female recruit-training attrition.

The two studies documented in [4-5] find that men and women who spent three or more months in DEP were less likely to attrite from recruit training than those who spent less time in DEP. Those who persist in the DEP might be more committed to becoming Marines and, therefore, be more likely to make it through recruit training. Another study finds that men who were not direct shippers or who attended recruit training at Parris Island were less likely than their peers to attrite from recruit training; it does not find the direct shipper result for women [4].<sup>7</sup>

In addition, two different studies on accession cohorts FY 1999 to FY 2009 and accession cohorts FY 2002 to FY 2005 found that men and women who shipped in October, November, December, or January (ONDJ) or June, July, August, or September (JJAS) were less likely to attrite from recruit training than those who shipped in February, March, April, or May (FMAM) [4-5]. Furthermore, the FY 2002 to FY 2005 accession cohort study found that men and women who were recruited as high school seniors were less likely to attrite from recruit training [5], while the FY 1999 to FY 2009 cohort study found this only for men [4].

Several factors related to academic ability predict recruit-training attrition. Men who had a Tier 1 education credential<sup>8</sup> or higher AFQT scores were less likely to attrite from recruit training [5-6]. Education tier and AFQT were not predictive of female recruit-training attrition in any of the studies.

Also, from FY 2002 to FY 2005, men and women who performed better on Marine Corps Recruit Depot (MCRD) Initial Strength Test (IST) crunches and run times were less likely to attrite from recruit training, although these physical fitness measures were stronger predictors for women than for men [5]. Of interest, these studies find different results when studying the effect on recruit-training attrition of men and women meeting retention height and weight standards. While earlier studies found that meeting height and weight standards was predictive of lower attrition for men and women, recent findings are more mixed. In the FY 1999 through FY 2009 study, meeting retention height and weight standards at accession increased the likelihood of female recruit-training attrition but decreased the likelihood of male recruit-training attrition [4]. In the FY 2002 through FY 2005 study, however, meeting height and weight standards again decreased the likelihood of recruit-training attrition for men but had no effect for women [5].

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<sup>7</sup> It did not include a variable for whether women attended recruit training at San Diego or Parris Island because women attend recruit training only at Parris Island.

<sup>8</sup> Those with Tier 1 education credentials include those with high school diplomas.

Another study estimates the factors that predict recruit-training attrition from FY 2005 to FY 2012 for men and women separately and finds results similar to those of the previous studies [7]. The authors find that certain variables have the same relationship direction for both men and women. Male and female Asians and Hispanics are less likely to attrite from recruit training than are white men and women. Both men and women with IST scores in the middle and bottom thirds are more likely to attrite from recruit training than those with IST scores in the top third [7]. High-quality<sup>9</sup> men and women and those without enlistment waivers are less likely to attrite from recruit training [7]. Those who have spent three or more months in DEP also are less likely to attrite from recruit training. Those who ship to recruit training in ONDJ and FMAM are more likely to attrite from recruit training than those who ship in JJAS [7].

Some variables were significant for only one gender in this study. Male Marines who are older at accession are more likely to attrite from recruit training [7]. Men who are eligible to receive enlistment bonuses are less likely to attrite from recruit training [7]. Black women are less likely to attrite from recruit training than white women; however, there is no statistically significant relationship for black male versus white male recruit-training attrition [7]. Men who went through recruit training at Parris Island are more likely to attrite [7].<sup>10</sup>

An FY 1997 to FY 1999 study assesses the relationship between different enlistment waiver types and recruit-training attrition [8]. It finds that, for women, “drug use in DEP” waivers predict the highest female recruit-training attrition rates. Meanwhile, “dependent,” “drug use,” and “adult felony” waivers predict the highest male recruit-training attrition rates [8].

## First-term attrition

Marine Corps initial enlistment contracts are typically eight years with a three-, four-, or five-year active-duty requirement, which we refer to as their first term, the most common being a four-year first term. Historically, about 30 to 40 percent of first-term attrition has been at recruit training. Recruit training is only three months long, so those initial months are important ones. Table 14 in the appendix summarizes the studies referenced in this report that examine first-term attrition.

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<sup>9</sup> High-quality recruits are those with Tier 1 education credentials and AFQT scores in categories I through IIIA.

<sup>10</sup> Since all women go to recruit training at Parris Island, the comparison of attrition rates between MCRD Parris Island and MCRD San Diego does not apply to them.

There are many reasons for attrition after recruit-training graduation. First, Marines might be honorably discharged because of injury or some other personal hardship. They also might involuntarily leave for reasons including being discharged for failure to maintain discipline or moral and professional standards, or breaking a rule, such as drug use. Also, they might voluntarily choose to leave the service. We first look at predictors of 24-month attrition, then 45- to 48-month attrition.

### *24-month attrition*

Similar to DEP and recruit-training attrition, certain factors predict whether a Marine will persist partway or all of the way through his or her first term. A study examining Marines from FY 2005 to FY 2009 tracked 24-month attrition rates, which typically include half of the active-duty term length and generally encompass all training requirements, including recruit-training, but not the time spent in the DEP [1]. The authors find that 15.3 percent of men and 24.5 percent of women attrite before 24 months of service [1].

The predictors of male and female 24-month attrition are similar to those factors that predict first-term attrition rates, as we later discuss. One study found that white men and women were more likely than Asian, black, Hispanic, or other-race men and women to attrite in the first 24 months [1]. Academic quality mattered for 24-month attrition as well. Men and women who had a Tier 1 education credential or were in AFQT categories I through IIIA had lower 24-month attrition rates than those who did not have these characteristics [1]. Those without enlistment waivers or who spent 3 to 12 months in the DEP were more likely to persist to 24 months [1]. The only difference this study found in male versus female predictors of 24-month attrition was the age of the Marine. Men who were over 21 were more likely to attrite in the first 24 months than those who were younger; however, age was not a significant factor in female 24-month attrition [1].

A more recent study that examined the FY 2005 to FY 2012 cohorts also analyzed characteristics related to male and female 24-month attrition [7]. The authors found that all of the factors that were related to female 24-month attrition also were related to male 24-month attrition and in the same direction. As we saw in the FY 2005 to FY 2009 cohort study [1], when the FY 2010 to FY 2012 cohorts were added to the analysis, male and female Asian, black, and Hispanic Marines were all still less likely to attrite in the first 24 months of service than were white Marines and non-Hispanic Marines [7]. Also, similar to the results of the previous study, high-quality men and women in the FY 2005 to FY 2012 cohorts were less likely than their peers to attrite before 24 months [7]. In addition, for the FY 2005 to FY 2012 cohorts, those in the DEP for 3 or more months or who did not have enlistment waivers were less likely to attrite before 24 months than those who were in the DEP for less time or who had enlistment waivers [7]. Age was not a statistically significant determinant of attrition before 24 months for men or women [7]. Those who shipped in ONDJ or FMAM were more likely to attrite than those who shipped during the summer months [7].

In addition, the FY 2005 to FY 2012 cohort study included a few other variables that were not included in the other attrition models. The authors found that both men and women in the IST middle and bottom thirds were more likely to attrite than those in the IST top third [7]. Men who received an enlistment bonus were statistically significantly less likely to attrite from service than those who did not receive one [7]. There was no statistically significant relationship, however, between enlistment bonuses and female 24-month attrition [7].

#### *First term (45- or 48-month) retention*

Men are more likely than women to complete their first terms [4]. From FY 1985 to FY 2005, male first-term attrition ranged from a low of around 25 percent between FY 2003 and FY 2005 to a high of around 35 percent between FY 1986 and FY 1990. Meanwhile, female first-term attrition ranged from a low of around 32 percent between FY 2004 and FY 2005 to a high of around 55 percent in 1991 [4].

Some studies estimate the predictors of first-term attrition simultaneously for men and women. One study that examined an FY 1984 recruit-training cohort of Marines found that, in general, Marines who were black or Hispanic were more likely than white Marines to complete their first terms [9]. Also, Tier 1 Marines and those with AFQT scores in categories I through IIIA were more likely to complete their first terms [9]. Those who met height and weight standards, had aviation MOSs, were recruited from the western region, spent more time in the DEP, or were JJAS shippers also were more likely to complete their first terms [9].

Some studies estimate the predictors of male and female first-term attrition separately. As with DEP and recruit-training attrition rates, studies of the early 1980s and early 2000s through 2012 found that Asian, black, and Hispanic women were more likely than white women to complete their first terms [4, 7, 10]. As with women, Asian, black, and Hispanic men also were less likely to attrite in their first terms than were white men [4, 6-7].

Whether a Marine was recruited as a high school senior or a high school graduate also is related to first-term completion. From FY 1999 to FY 2005, male and female Marines who were recruited as high school seniors were more likely to complete their first terms [4]. Another study found that, from FY 2005 to FY 2012, older Marines were less likely to attrite from their first terms of service [7]. Whether a Marine is high quality<sup>11</sup> or simply has a high AFQT score also predicts whether he or she will complete his or her first term. Between FY 1999 and FY 2000 and from FY 2005 to FY 2012, high-quality men and women were more likely to complete their first terms [4,

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<sup>11</sup> A high-quality Marine has a Tier 1 education credential and an AFQT score in categories I through IIIA.

7]. Although high-quality men were less likely to attrite in their first terms, when separate AFQT categories also were included for the FY 1999 to FY 2000 cohorts, men in the *lowest* AFQT category (category IV) also were more likely to complete their first terms [4].

Whether a Marine meets the retention height/weight standard is also an interesting metric related to first-term attrition. Researchers find that this metric is usually an effective predictor of male but not female first-term attrition. Between FY 1999 and FY 2005, men who met the Marine Corps retention height/weight standards were less likely to attrite during the first term, while this height/weight metric was not significantly related to female first-term attrition [4]. In addition, IST scores can help to predict whether Marines will complete their first terms of service. Male and female Marines with IST scores in the middle and bottom thirds were more likely to attrite from their first terms of service than those with IST scores in the top third [7].

Receiving an enlistment waiver to join the Marine Corps also helps to determine whether someone will attrite during his or her first term of service. Men and women who did not receive waivers were less likely to attrite than those who received waivers [4, 7-8]. For women, the types of waivers that predicted the highest rates of first-term attrition were pre-service drug use or physical waivers [8]. For men, dependent, drug use, felony, or serious misdemeanor waivers predicted the highest male first-term attrition rates [8]. Men who were not eligible to receive enlistment bonuses also were more likely to attrite before the end of their contracts than men who were eligible to receive them [7].

From FY 1999 to FY 2005, women and men who spent more time in the DEP were less likely to attrite during their first terms [4, 7, 10]. In addition, for both men and women, JJAS shippers were more likely to complete their first terms than those who shipped to recruit training in other trimesters [4, 6].

Geographic origin also has been connected to the likelihood of first-term attrition for men, but not women. Men who attended recruit training at MCRD San Diego were more likely to complete their first terms [4, 7]. Where recruits attend recruit training is related to the part of the country from which they are recruited; in general, men attending recruit training in San Diego are from the western half of the United States, whereas men attending recruit training at Parris Island are usually from east of the Mississippi. All women attend MCRD Parris Island.<sup>12</sup>

The nature of the contract also can help to predict whether Marines attrite during their first terms. From FY 1999 to FY 2005, men who were contract guarantees (i.e., enlisted under a certain PEF (Program Enlisted For)) were less likely to attrite during

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<sup>12</sup> As a result, there were no geographic predictors of first-term attrition for women.

their first terms than those who enlisted on open contracts (and could be placed in any MOS); contract guarantee was not a significant predictor of female first-term attrition [4].

## Recommended and eligible for reenlistment

To reenlist, an enlisted Marine must be recommended and eligible for reenlistment. Table 15 in the appendix summarizes the studies referenced in this report that refer to reenlistment. The one study that looked at predictors of being recommended and eligible to reenlist did not separately estimate predictors for men and women. It found, however, that older Marines, in addition to those who were not married or had no dependents, were more likely to be recommended and eligible for reenlistment [11]. As we observed with most other performance milestones, those who performed stronger academically (i.e., Tier 1 credentials and AFQT categories I through IIIA) were more likely to be recommended and eligible for reenlistment (see Table 2) [11]. In addition, those who shipped in JJAS or FMAM or who spent three or more months in the DEP were more likely to be recommended and eligible for reenlistment than ONDJ shippers or those in the DEP for less than three months [11]. Finally, those without enlistment waivers were more likely to be recommended and eligible for reenlistment [11]. Gender was not significant in this model [11].

## Reenlistment

Once a Marine's initial enlisted contract expires, he or she can choose to either request to reenlist and be approved (assuming the Marine is recommended and eligible for reenlistment) or leave the military. One study of Marines from FY 2000 to FY 2005 estimated a single equation for men and women and found that there were several factors related to whether a Marine chose to reenlist for another term [11]. Those who had any dependents—whether a spouse, children, or both—or who had dependent enlistment waivers were more likely to reenlist in the Marine Corps than those who did not (see Table 2) [11]. It could be that those with dependents were more likely to be the breadwinners for their families and reenlisted to support their dependents through the wages and benefits offered by the military. Those with lower AFQT scores or with ASVAB waivers also were more likely to reenlist after completing their first terms [11]. Those with lower test scores presumably have fewer outside options in the labor market and may be more willing to stay in the Marine Corps instead of searching for civilian jobs. Those with felony waivers at the point of enlistment were more likely to reenlist [11]. Those who committed a felony might be reluctant to enter the civilian job market for fear that their options will be limited, given their criminal records. We find it interesting that JJAS shippers and those who spent less than three months in the DEP also were more likely to reenlist [11]. And, controlling for other factors, women were more likely to reenlist than men [11].

Table 1. Predictors of enlisted retention and attrition measures, separately for men and women<sup>a</sup>

Predictor	DEP attrition [1-3]		MCRD attrition [4-8]		24-month attrition [1, 7]		First-term attrition [4, 6-10]	
	Men	Women	Men	Women	Men	Women	Men	Women
Time in DEP	+	+	—	—	—	—	—	—
Attended some college	—	NS						
Recruited as HS senior <sup>b</sup>	—	—	—	—/NS			—	—
Tier 1 education			—	NS	—	—	—	—
AFQT = 50+	—	—	—	NS	—	—	—	—
High quality			—	—	—	—	—	—
16- to 24-year-old unemployment rate	—	—					—/NS	—/NS
Asian	+	NS	—	—	—	—	—/NS	—/NS
Black	+	NS	—/NS	—	—	—	—/NS	—
Other race	NS	—	—	—	—	—	NS	NS
Hispanic	+	—	—	—	—	—	—	—
Age	+	NS	+	NS	+/NS	NS	—	—
Single	+	NS	—	—				
No dependents	+	NS	—/+	N/A	+	N/A	+	N/A
MCRD Parris Island								
ONDJ/fall and winter shippers			—/+	—/+/NS	+	+	+/NS	+/NS
JJAS/summer shippers				—/NS	—	—	—	—
FMAM/spring shippers			+	+	+	+	+/NS	+/NS
MCRD IST crunches			—	—				
MCRD IST run times			+	+				
MCRD IST middle third			+	+	+	+	+	+
MCRD IST bottom third			+	+	+	+	+	+

Predictor	DEP attrition [1-3]		MCRD attrition [4-8]		24-month attrition [1, 7]		First-term attrition [4, 6-10]	
	Men	Women	Men	Women	Men	Women	Men	Women
<b>Enlistment bonus</b>	—		NS	—	NS	—	—	NS
<b>Met retention height and weight standards</b>	—		+/NS				—	NS
<b>"Drug use in DEP" waiver</b>	+	+					+	+
<b>"Dependent" waiver</b>	+		NS				+	
<b>"Adult felony" waiver</b>	+		NS				+	
<b>"Physical" waiver</b>								+
<b>No waivers</b>	—	—	—	—	—	—	—	—
<b>Enlisted under a PEF</b>							—	NS

a. When findings are inconsistent across studies, we show all findings (e.g., -/NS means that the effect was negative and significant in one study, but not significant in another study).

b. Those recruited as high school (HS) seniors have higher DEP attrition unless one controls for months in the DEP.

Table 2. Predictors of enlisted reenlistment and retention, jointly for men and women<sup>a</sup>

Predictor	Recommended and eligible for reenlistment [11]	Reenlistment [9, 11-12]
<b>Time in DEP</b>	+	-/+
<b>Tier 1 education</b>	+	-/+
<b>AFQT = 50+</b>	+	-
<b>Asian</b>		NS
<b>Black</b>	NS	+
<b>Other race</b>	NS	NS
<b>Hispanic</b>	NS	+
<b>Age</b>	+	
<b>Single</b>	+	-
<b>No dependents</b>	+	-
<b>ONDJ shippers</b>	Omitted	Omitted
<b>JJAS shippers</b>	+	+
<b>FMAM shippers</b>	+	NS
<b>Met retention height/weight standards</b>		+
<b>Underweight</b>		+
<b>"Dependent" waiver</b>		+
<b>"Adult felony" waiver</b>		+
<b>"ASVAB" waiver</b>	NS	+
<b>No waivers</b>	+	
<b>Recruited from South</b>		+
<b>Recruited from West</b>		+
<b>Women</b>	NS	+
<b>Aviation MOSs</b>		+
<b>Administrative MOSs</b>		+
<b>Length of first contract</b>		+
<b>Previously filed for contract extension</b>		+

<sup>a</sup>. When findings are inconsistent across studies, we show all findings (e.g., -/NS means that the effect was negative and significant in one study, but not significant in another study).

Earlier reports on FY 1980-1990 cohorts studied enlisted Marines to see who was most likely to reenlist; they did not estimate predictors separately by gender [9, 12]. As seen when observing other retention metrics, researchers found that black and Hispanic Marines were more likely than whites to reenlist (see Table 2) [9]. From FY 1980 to FY 1990, Marines who were married or had other dependents were more likely to stay than those who were not married [9, 12]. This is similar to the FY 2000-2005 study that found that those with dependents were more likely to reenlist [11].

The two reenlistment studies from FY 1980 to FY 1990 also differed in the estimated relationship between some Marine characteristics and the reenlistment decision. In the FY 1984 cohort study, those with high school diplomas were more likely than those without diplomas to be retained beyond the first term [9]. The study from FY 1980 to FY 1990, however, found the opposite result: those with high school degrees were less likely to reenlist [12]. In addition, as we saw with first-term retention, those in aviation MOSs were more likely to be retained past their first terms in the FY 1984 cohort studies than those in other occupations [9]. In the FY 1980 to FY 1990 studies, those with administrative MOSs were more likely to reenlist than those in any other MOS [12].

The two reenlistment studies from FY 1980 to FY 1990 also included several characteristics in their models different from those in the more recent FY 2000 to FY 2005 study. In the FY 1984 study, those who were underweight or who met retention height and weight standards were more likely to be retained past their first terms than those who were overweight [9]. Marines who were recruited in the South or in the West were more likely to be retained beyond the first term than those who were recruited from other regions [9]. Also, those who spent time in the DEP were more likely to be retained past their first terms than those who did not [9]. In the FY 1980 to FY 1990 study, those who had longer first contract lengths were more likely to reenlist along with those who had previously filed for a contract extension [12].

## Predictors of Marine Corps officer retention and attrition measures

There are several similarities between the predictors of enlisted and officer attrition, including such demographic characteristics as age, marital status, and gender. Some predictors, however, are not universally studied for both groups. For example, such variables as time in DEP and the trimester a recruit ships to recruit training have not been studied for the officer population since they do not have correlates. Instead, officer retention studies investigate how factors, such as commissioning source and performance at The Basic School (TBS), help to predict officer retention. Table 16 in the appendix summarizes the officer retention studies referenced in this report.

### Retention to YOS 7

First, one early study on officers who were commissioned from 1986 to 1992 estimated the likelihood that an officer is retained to seven years of active component service (YOS) [13]. Typically, officer initial service commitments are three to five years, and eight years, on average, for pilots. The average officer retention rate to the seven-year point for these commissioning year cohorts was 73 percent

[13]. Researchers did not estimate male and female equations separately in this study, but they found that female and male seven-year retention rates did not significantly differ in the model [13]. They also found race and ethnicity to be statistically insignificant in the seven-year retention model (see Table 3) [13]. Officers who were married as first lieutenants were 5.3 percentage points more likely to be retained to seven years than those who were not married as first lieutenants [13]. Officers who were older when they commissioned also had a higher likelihood of being retained to seven years [13].

Table 3. Predictors of officer retention and attrition, jointly for men and women<sup>a</sup>

Predictor	Retention to YOS 7 [13]	Retention to YOS 10 [14-15]	Retention to O-5 [16]
<b>Master's degree</b>			+
<b>Unemployment rate</b>			+
<b>Asian</b>	NS		
<b>Black</b>	NS	+	
<b>Other race</b>	NS		
<b>Hispanic</b>	NS		
<b>Age</b>	+	+	
<b>Single</b>	-	-	-
<b>No dependents</b>			-
<b>Women</b>	NS	+	
<b>Commissioning source</b>			
<b>MECEP</b>	NS	+	
<b>USNA</b>	+		-
<b>OCC</b>	NS		
<b>PLC</b>	NS		
<b>ECP</b>	NS		
<b>NROTC</b>	NS		
<b>Combat service support MOSS</b>	-		
<b>Combat service MOSSs</b>	Omitted		
<b>Aviation MOSSs</b>		+	+
<b>Combat arms MOSSs</b>		+	
<b>TBS class standing</b>	+	+	
<b>Prior-enlisted</b>		+	-
<b>FITREP scores</b>			+
<b>Combat experience</b>			+

<sup>a</sup>. When findings are inconsistent across studies, we show all findings (e.g., -/NS means that the effect was negative and significant in one study, but not significant in another study).

Commissioning source and prior-enlisted variables were two of the important officer-specific factors that helped to explain retention to the seven-year mark. Non-prior-enlisted (NPE) United States Naval Academy (USNA) graduates were more likely to be retained than NPE officers who were commissioned via the Platoon Leaders Class (PLC), Officer Candidate Course (OCC), or the Naval Reserve Officer Training Corps (NROTC) [13]. There were similar findings for prior-enlisted (PE) officers commissioned through OCC, the Enlisted Commissioning Program (ECP), and NROTC: officers commissioned through all of these programs were less likely to be retained to seven years than PE officers commissioned through the USNA [13]. However, PE USNA commissioned officers had a retention rate to seven years that was 15.7 percentage points lower than those who were commissioned through the Marine Corps Enlisted Commissioning Educational Program (MECEP) [13].

Those in combat service support MOSSs were less likely to be retained to seven years than those with combat support MOSSs [13]. TBS class rank also was related to seven-year retention. The higher the class standing at TBS graduation, the more likely the officer was retained to seven years [13].

## Retention to YOS 10

Two studies examine officer retention to the 10-YOS milestone [14-15]. In both studies, similar factors predict retention to YOS 10. The first study used commissioning cohort data from FY 1980 to FY 1993 and found that 72 percent of those commissioned during this time were retained to 10 YOS [14]. The other study examines officers who were commissioned between FY 1980 and FY 1990. These studies do not separately estimate equations for men and women. In both studies, as with retention to 7 YOS, those who were married or older at commissioning were more likely to be retained to 10 YOS (see Table 3) [14-15]. In addition, the second study also found that female, black, or PE Marines were more likely to be retained to 10 YOS than those who were male, white, or NPE, respectively [15].

Both studies also found that an officer's ranking at TBS, commissioning source, and MOS were important predictors of 10 YOS retention [14-15]. The higher the final TBS ranking of an officer, the more likely he or she was to be retained to 10 YOS [14-15]. Also, both studies reported that those commissioned through MECEP had the greatest likelihood of being retained to 10 total YOS [14-15]. Those in combat arms MOSSs were the most likely to be retained to 10 YOS, except for pilots [14-15]. Because pilots typically have a 5-year active-duty commitment after completing flight school, many pilots' active-duty Marine Corps commitments do not expire until much closer to the 10-YOS milestone. This could explain why they would be more likely to be retained until that point.

## Retention to O-5

A study of FY 1980 to FY 1984 accession cohorts examined the predictors of officer continuation in the Marine Corps until O-5 promotion boards [16]. This study did not separately estimate equations for men and women. Similar to what is observed in the studies of retention to 7 and 10 YOS, those who were married with dependents were more likely to remain in the Marine Corps until the O-5 promotion boards than those who were single without dependents (see Table 3) [16]. In addition, although an aviator's initial contract has expired by the time he or she is in zone for promotion to O-5, this study found that aviators were more likely than nonaviators to be retained to the O-5 promotion boards [16].

This FY 1980 to FY 1984 cohort study also found that PE Marines were less likely to continue to O-5 promotion boards [16]. This could be because PE time plus commissioned officer time often makes officers retirement eligible before they come in zone for O-5 promotion. Those commissioned in the USNA had the lowest likelihood of being retained to the O-5 promotion boards [16]. Also, this study added variables to the model that were not examined in previous officer retention studies. Those with high fitness report (FITREP) ratings, those with master's degrees, or those with combat experience were more likely to be retained to the O-5 promotion boards [16]. Furthermore, this study accounted for the unemployment rate in its model. The higher the unemployment rate, the more likely a Marine was to stay in the Marine Corps until his or her O-5 promotion boards [16]. Similar to enlisted Marines, an officer's decision to stay in the Marine Corps is sensitive to economic conditions and his or her outside prospects in the civilian labor market.

# Identifying Predictors of Promotion

Promotion is another performance measure that is frequently studied to assess the factors that contribute to Marines' success. Numerous studies for both the Marine Corps' enlisted force and commissioned officers have identified factors that are related to the likelihood of promotion to various grades. In this section, we summarize previous work on Marine Corps promotion and attempt to identify common predictors among studies.

Table 17 and Table 18 in the appendix summarize the enlisted and officer promotion studies referenced in this report, respectively. We also highlight the ways in which the predictors of promotion and retention differ.

## Predictors of Marine Corps enlisted promotion

### Promotion to corporal (Cpl)

Promotion to corporal (E-4) is the first truly competitive promotion point in the enlisted ranks because it is the first promotion that is not based solely on meeting time-in-grade and time-in-service requirements. The number of E-4s is controlled by automated composite score screening, and an E-4 promotion is only granted to fill vacancies in E4 requirements throughout the service [17]. The FY 1984 cohort was analyzed to identify the characteristics of those who were likely to promote to corporal. The study did not separately estimate equations for men and women. White and Hispanic Marines were more likely to promote to E-4 than Marines who were non-white and non-Hispanic (see Table 4) [9]. This is somewhat different from the factors that predict retention, where Marines were more likely to be retained if they were non-white [1, 4, 6-7, 10].

Other factors that predicted promotion to corporal were similar to the factors that predicted retention. Because E-4 is the first competitive promotion point for the enlisted ranks, it is no surprise that academic ability is related to promotion to corporal. High school diploma graduates and those with AFQT scores in categories I through IIIA were more likely to promote to corporal [9]. Those who were married

when joining the Marine Corps also were more likely to be promoted to corporal than those who were unmarried when they initially joined [9]. Those who were underweight or met retention height/weight standards were more likely to be promoted to corporal than those who were overweight [9]. Similar to what was found for retention measures, those who were recruited from the West or who spent time in the DEP were more likely to promote to corporal [9]. Also, those in aviation MOSSs were more likely to promote to corporal than those who were not.

## Meritorious promotion

Per Marine Corps Order, Marines can sometimes be promoted meritoriously before they are in-zone for promotion based on exceptionally strong performance within their paygrades, subject to YOS limitations. One study of FY 2000 to FY 2005 Marines analyzed the factors that predict meritorious promotion in the first 48-months, simultaneously for men and women. Hispanic and other-race Marines were more likely to receive meritorious promotions than non-Hispanic or white Marines, respectively (see Table 4) [11].

Table 4. Predictors of enlisted promotion, jointly for men and women<sup>a</sup>

Predictor	Promotion to corporal [9]	Meritorious promotion [11]
<b>Time in DEP</b>	+	NS
<b>Tier 1 education</b>	+	+
<b>AFQT = 50+</b>	+	+
<b>Asian</b>	—	
<b>Black</b>	—	
<b>Other race</b>	—	+
<b>Hispanic</b>	+	+
<b>Single</b>	—	
<b>No dependents</b>		+
<b>ONDJ shippers</b>		NS
<b>JJAS shippers</b>		+
<b>FMAM shippers</b>		NS
<b>Met height and weight standards</b>	+	
<b>Underweight</b>	+	
<b>"Drug use in DEP" waiver</b>		+
<b>"Dependent" waiver</b>		+
<b>Recruited from West</b>	+	
<b>Women</b>		+
<b>Aviation MOSSs</b>	+	

<sup>a</sup>. When findings are inconsistent across studies, we show all findings (e.g., -/NS means that the effect was negative and significant in one study, but not significant in another study).

In addition, as seen in other studies, those with AFQT scores in categories I through IIIA or those who had Tier 1 education credentials were more likely to be promoted meritoriously. While time spent in the DEP was not significantly related to meritorious promotion, JJAS shippers were more likely to be promoted meritoriously [11]. Note that Marines without dependents were more likely to be promoted meritoriously; however, those with dependent enlistment waivers also were more likely to be promoted meritoriously than those without these waivers [11]. Furthermore, and perhaps counterintuitively, those with drug waivers were more likely to be promoted meritoriously than those without these waivers [11]. Finally, women were more likely than men to promote meritoriously [11].

## Predictors of Marine Corps officer promotion

As was the case for the enlisted versus officer retention models, certain factors similarly predict enlisted and officer promotion, such as marital status and race, whereas other factors uniquely predict officer promotion.

### Promotion to major (Maj)

Three NPS theses, which spanned a similar window of Marines commissioned in the 1980s and 1990s, estimated various multivariate models to explore factors that are related to promotion to major (O-4). To provide perspective on the competitiveness of promotion to O-4, around 82 percent of Marines who were commissioned between 1980 and 1993 and continued to the O-4 promotion boards were eventually promoted to O-4 [14]. Factors from these studies, such as marital status and race, similarly predict enlisted and officer promotion.

In one study of officers commissioned between 1980 and 1990, women were more likely than men to be promoted to O-4 (see Table 5) [15]. In two of the studies of the FY 1980 to FY 1990 cohorts, black officers were less likely to promote to major than white officers [14-15]. In addition, and as seen in the enlisted promotion studies, married Marines were more likely to promote to O-4 than unmarried Marines [15, 18]. PE Marines were less likely to promote to O-4 [15].

Other factors from these promotion studies in the FY 1980 to FY 1990 period uniquely predict officer promotion. As TBS class ranking increased, so did the likelihood of promotion to O-4 [14-15]. Commissioning source was an important predictor of O-4 promotion over this time period. Those commissioned through OCC outperformed those from other commissioning sources in terms of promotion to O-4 [14-15].

Pilots were less likely to promote to O-4 than nonaviators in the FY 1980 to FY 1990 period, although, as earlier discussed, they were more likely to be retained at various promotion points [14-15].

One NPS thesis that examined 2008 promotion board rates included unique variables in the model of promotion to O-4 [18]. The researchers found that those with higher Physical Fitness Test (PFT) scores were more likely to promote to O-4 [18]. Those who have combat water safety swimmer notifications or who were instructors of water survival swimming were more likely to promote to major [18]. Those who received personal awards or attended all appropriate levels of schooling for promotion also were more likely to promote to major [18]. This same study also finds that Marine officers who have Reviewing Officers (ROs) who give higher overall grades compared with other ROs are more likely to promote to O-4.

## Promotion to lieutenant colonel (LtCol)

Promotion to lieutenant colonel is perhaps the most analyzed promotion point in the Marine Corps literature. This promotion point is considerably more competitive than promotion to O-4. Of those who survived to O-5 promotion boards in the FY 1980 to FY 1989 cohorts, only 65 percent were promoted to O-5 [14].

Five NPS theses analyzed promotion to LtCol for officers who commissioned from 1980 on and those who promoted in the FY 2012 promotion cohort. Unfortunately, none of these studies separately estimated the predictors of male and female promotions to LtCol. Several studies found that women were more likely than men to promote to LtCol, all else equal (see Table 5) [14, 16, 19]. More specifically, a study on FY 1980 to FY 1989 commissioning cohorts found that women were 1.5 times more likely than men to promote to O-5 [14].

Married officers were more likely to promote to O-5 than unmarried officers [15, 19]. Also, one study found that those who were younger at commissioning were more likely to promote to O-5 than those who were older at commissioning [14]. PE Marines were less likely to be promoted to O-5 than NPE Marines [15].

Education is also a significant predictor in many studies of promotion to LtCol. Those who completed professional military education [16, 19], have completed a graduate degree [16, 19], or attended the appropriate service school [18] were more likely to be promoted to LtCol.

The physical fitness level of a Marine also has proved to be an important predictor of promotion to O-5. Those with higher PFT scores [18-19] were more likely to promote to O-5. Those with low body fat or who were taller also were more likely to promote to LtCol [19]. Marines, however, must stand out in more ways than just physical fitness to be selected for promotion to O-5. For example, Marines who had higher

FITREP scores [16, 18-19], received awards [16], or qualified as pistol experts [19] also were more likely to be promoted to O-5.

Combat tours also contribute to the likelihood that a Marine will be promoted to LtCol. Having a combat tour [18] or several combat FITREPs [19] was positively related to promotion to O-5. Deploying to the Iraq combat theatre was specifically positively related to promotion to O-5; however, combat deployments to Afghanistan were not [19].

As seen in studies of promotion to lower paygrades, TBS class ranking, commissioning source, and MOS also are important predictors of promotion. A higher TBS class ranking was associated with a higher likelihood that one promoted to O-5 [14-15]. For promotion to O-5, there was no clear commissioning source that dominated the likelihood of promotion to O-5. Commissioning source results differ, depending on the study [14-15, 18]. Aviation MOS results also differ, depending on the study. A few studies found that aviators were more likely to promote to O-5 [15-16], while others found that aviators were less likely to promote to O-5 [19]. The differing results might be attributed to the different time periods over which these studies were conducted.

## Promotion to colonel (Col)

One NPS officer promotion study attempted to identify explanatory factors for promotion rates to colonel for the 2008 promotion board [18]. Contrary to what was observed for promotion to O-4 and O-5, those who were married were less likely to promote to colonel than those who were unmarried (see Table 5). Another interesting result is that those who had a water survival certification waiver were more likely to promote to colonel than those who did not [18]. It is not surprising that those with higher General Classification Test (GCT) scores, a graduate degree, or a higher number of commander billets were more likely to promote to colonel. Those who served one combat tour were more likely to promote to colonel than Marines who had never served in combat, while those who served two combat tours were less likely to promote to colonel than those who had never served in combat [18]. Finally, Marines who commissioned through a PE commissioning program were more likely to promote to colonel than those who commissioned through other sources [18].

Table 5. Predictors of officer promotion, jointly for men and women<sup>a</sup>

Predictor	Promotion to Maj [14-15, 18]	Promotion to LtCol [14-16, 18-19]	Promotion to Col [18]
<b>Graduate degree</b>		+	+
<b>Age</b>		-	
<b>Single</b>	- /NS	-	+
<b>Women</b>	+/NS	+	
<b>Aviation MOSS</b>	+		
<b>Commissioned through OCC</b>	+		
<b>TBS class ranking</b>	+	+	
<b>Prior-enlisted</b>	- /NS	-	+
<b>FITREP scores</b>		+	
<b>Combat experience</b>		+	
<b>PFT scores</b>	+	+	
<b>Combat water safety swimming notification</b>	+		
<b>Instructor of water survival swimming</b>	+		
<b>Received awards</b>	+	+	
<b>Professional Military Education (PME) complete</b>	+	+	
<b>Have ROs who give higher overall grades compared to other ROs</b>	+	+	
<b>Attended service school</b>		+	
<b>Body fat percentage</b>	-		
<b>Height</b>		+	
<b>Pistol experts</b>		+	
<b>Number of combat FITREPs</b>		+	
<b>Deployed to combat in Iraq</b>		+	
<b>Deployed to combat in Afghanistan</b>		NS	
<b>Water survival certification waiver</b>			+
<b>GCT scores</b>			+
<b>Number of commander billets</b>			+
<b>No combat tours</b>			Omitted
<b>One combat tour</b>			+
<b>Two combat tours</b>			-

<sup>a</sup>. When findings are inconsistent across studies, we show all findings (e.g., -/NS means that the effect was negative and significant in one study, but not significant in another study).

# Identifying Predictors of Conduct

## Predictors of enlisted Marine conduct

Good conduct is another Marine performance measure of interest. In these studies, conduct measures are analyzed for enlisted Marines only.

Table 17 in the appendix summarizes the studies cited in this report that examine predictors of good conduct and misconduct.

### Good conduct award

A study of FY 2000 to FY 2005 Marine cohorts examined the predictors of good conduct. Several factors related to whether a Marine received the good conduct award. Typically, recipients of this award had no prior waivers (see Table 6) [11]. Also, those with higher AFQT scores or a Tier 1 education credential were more likely to receive good conduct awards [11]. Furthermore, Marines who were unmarried were more likely to receive good conduct awards than Marines who were married [11]. Finally, recruits who were FMAM or ONDJ shippers or who have spent more than three months in the DEP were more likely to receive good conduct awards [11].

Next, we explore a few performance measures that indicate bad conduct. We expect that the predictors of bad conduct measures will differ or even be the opposite of those that predict good conduct.

### Misconduct separation

The FY 2000 to FY 2005 cohort study also examined predictors of bad conduct. The predictors of misconduct separations are quite different from the predictors of good conduct awards. As we might expect, Marines with dependent, drug, drug and alcohol test (DAT), serious misdemeanor, or felony waivers on shipping to recruit training were more likely to be discharged because of misconduct than those who did not have these types of waivers (see Table 6) [11]. Non-Hispanics, those without dependents (including those who were unmarried), or those who were younger were more likely to have misconduct separations [11]. This is somewhat surprising because unmarried Marines also were more likely to receive good conduct awards

[11]. We see that the opposite is true when it comes to academic ability; those with lower AFQT scores or who had Tier 2 or Tier 3 education credentials, or those with less than three months in the DEP were more likely to separate because of misconduct [11].

Table 6. Predictors of enlisted conduct, jointly for men and women<sup>a</sup>

Predictor	Good conduct award [11]	Misconduct separation [11]	Demotion by 48 months [11]	Desertion by 48 months [11]
Time in DEP	+	-	-	-
Tier 1 education	+	-	-	-
AFQT = 50+	+	-	-	-
Hispanic	-	-	-	+
Age	-	-	-	-
Single	+	-	-	+
No dependents	-	+	-	-
ONDJ shippers	+	-	-	-
JJAS shippers	Omitted	-	-	-
FMAM shippers	+	-	-	-
Waivers	-	-	-	-
Drug use in DEP	+	+	+	+
Dependent	+	-	-	+
Positive DAT	+	+	-	-
Serious misdemeanor	+	+	-	+
Felony	+	+	-	-
No waivers	+	-	-	-

<sup>a</sup>. When findings are inconsistent across studies, we show all findings (e.g., -/NS means that the effect was negative and significant in one study, but not significant in another study).

## Demotion by 48 months

The same study [11] found that Marines who were most likely to be demoted by 48 months shared characteristics with those who separated for misconduct. Those with drug, DAT, serious misdemeanor, or felony waivers were more likely to be demoted by 48 months (see Table 6). Marines who were younger, had lower AFQT scores, had Tier 2 or 3 education credentials, or spent less than three months in the DEP were more likely than their peers to be demoted.

## Desertion by 48 months

Several characteristics are related to desertion. The FY 2000 to FY 2005 study found that Marines with dependent, drug, or serious misdemeanor waivers were more likely to desert than those who had no waivers or who had physical waivers (see Table 6) [11]. Hispanics also were more likely to desert before 48 months of service [11]. As with demotion, those with low AFQT scores and a Tier 2 or 3 education [11], those who were unmarried, or those who spent less than three months in the DEP were more likely than their peers to desert by 48 months of service [11].

# Identifying Predictors of Other Performance Measures

This section summarizes the research on other Marine performance measures that could not be categorized in the previous sections: receiving the Navy and Marine Corps Achievement Medal, and officer FITREP scores.

## Predictors of other enlisted performance measures

### Navy and Marine Corps Achievement Medal

From FY 2000 through FY 2005, enlisted Marines without dependents, with higher AFQT scores, or who were FMAM or ONDJ shippers were more likely than their peers to earn the Navy and Marine Corps Achievement Medal (see Table 7) [11].

Table 17 in the appendix summarizes the study that references predictors of the Navy and Marine Corps Achievement Medal.

Table 7. Predictors of other enlisted performance measures, jointly for men and women<sup>a</sup>

Predictor	Navy and Marine Corps Achievement Medal [11]
AFQT = 50+	+
PFT 1 <sup>st</sup> class	
Reenlisted	
No dependents	+
ONDJ shippers	+
JJAS shippers	NS
FMAM shippers	+

<sup>a</sup>. When findings are inconsistent across studies, we show all findings (e.g., -/NS means that the effect was negative and significant in one study, but not significant in another study).

## Predictors of other officer performance measures

### Fitness Reports (FITREPs)

The last studies that we discuss are those that identify the predictors of officer FITREP scores at each paygrade, from O-1 through O-4 [15]. Table 19 in the appendix summarizes the studies referenced in this report that examine predictors of officer FITREP scores. The number of cohorts that researchers can observe decreases as paygrades increase. For instance, the O-1 model uses cohorts from FY 1980 to FY 1997, the O-2 model uses FY 1980-1995 cohorts, the O-3 model uses FY 1980-1990 cohorts, and the O-4 model uses FY 1980-1983 cohorts [15].

Results for the O-1 model indicated that those who were married at O-1 had higher FITREP scores than those who were unmarried at O-1 (see Table 8) [15]. Marines who were older at commissioning or who were black had lower FITREP scores than their younger or white peers, respectively [15]. As observed in some of the retention and promotion literature, combat service, TBS class ranking, MOS, being PE, and commissioning source also influenced how well someone performed on his or her FITREP. Combat FITREPs generally were scored higher than noncombat FITREPs [15]. Also, those who graduated with higher TBS class standings had better FITREP scores [15]. Those in ground support MOSs had lower FITREP scores than infantry officers, while those in service or aviation support MOSs generally received higher FITREP scores than their peers in infantry MOSs [15]. PE officers also outperformed NPE officers on their FITREPs [15]. Those commissioned through the USNA outperformed those from all other commissioning sources on FITREPs [15]. Finally, female O-1s tend to receive higher FITREP scores than male O-1s, holding all else constant [15].

The sign of the results for the O-2 FITREP model were the same as for the O-1 model, in terms of marital status, commissioning age, gender, the role of combat FITREPs, TBS class rank, and commissioning source. However, white O-2s outperformed other-race O-2s on their FITREPs [15]. In addition to MOSs that were found to be statistically significant for the O-1 FITREPs, O-2 Marines in infantry MOSs outperformed their peers in service MOSs or pilot MOSs [15].

Results for the O-3 model indicated that O-3s who were married, had higher TBS rankings, or were commissioned through the USNA had better FITREP scores than their peers, on average [15]. However, black O-3 Marines had lower FITREP scores than their white peers [15].

Table 8. Predictors of officer FITREP scores, jointly for men and women<sup>a</sup>

Predictor	All officers [20]	O-1 [15]	O-2 [15]	O-3 [15]	O-4 [15]
White	Omitted	Omitted	+	Omitted	Omitted
Black	-	-	NS	-	NS
Other race		NS	Omitted	NS	NS
Hispanic	-				
Age		-	-		
Single	-	-	-		
Women	+	+		NS	NS
Commissioning source					
ECP	Omitted				
MCP	-				
OCC	-				
PLC	-				
MECEP	-				
NROTC	NS				
USNA	-	+	+	+	
TBS class ranking	+	+	+	+	
GCT score	-				
Most competitive institution	+				
College GPA	+				
Business majors	+				
Prior-enlisted		+			
Combat FITREP		+	+		
Ground support MOS		-			
Infantry MOS		Omitted	+		
Service MOS		+	-		
Aviation MOS		+	-		

<sup>a</sup>. When findings are inconsistent across studies, we show all findings (e.g., -/NS means that the effect was negative and significant in one study, but not significant in another study).

For the O-4 FITREP model, black and white officers scored the same on FITREPs, holding all else constant [15]. Also, those who served in a joint O-4 tour had higher FITREP scores than those who did not [15].

Another recent study focused on how various quality measures affected FITREP scores from 1999 to 2011 [20]. The researchers found that TBS class ranking affected

average FITREP scores. Those in the middle and bottom TBS thirds had lower FITREP scores, on average, across all of the paygrades observed [20]. Moreover, as GCT scores increased, FITREP scores decreased [20]. Another predictor of FITREP scores was commissioning source. Those commissioned through OCC, PLC, MECEP, and USNA had lower FITREP scores on average than those commissioned through ECP [20].

In addition, several officer education variables were included in the model of FITREP predictors. Those attending the most competitive institutions had higher FITREP scores, all else equal, than those from institutions that are not as competitive [20]. The authors also found that, as GPA increased, FITREP scores also increased, on average [20]. Business majors were found to have higher FITREP scores than those majoring in other subjects [20]. Furthermore, black and Hispanic Marines had lower FITREP scores than white Marines [20].

## Conclusion

As part of the Marine Corps' consideration of female integration in combat arms MOSs and units, CNA has been tasked with supporting MCRC's research needs. This research memorandum is the deliverable for task 4a, a literature review of predictors of female versus male Marine performance. This information was necessary to support the research needs in task 3b (the relationship between recruit characteristics and female recruit training success) and task 4c (direct support for trend analysis). By understanding the strong predictors of past performance, we can better estimate the future performance of Marines.

We identify the predictors of performance in the Marine Corps across several dimensions. Some studies measure performance at various retention milestones, while others evaluate performance at different promotion points. Still other studies predict performance measures, such as good conduct and personal achievement medals.

Overall, we observe that some factors consistently explain Marine Corps enlisted attrition and retention for both men and women. In general, spending more time in the DEP, having a higher AFQT score, having a Tier 1 education, or being recruited as a high school senior were predictive of lower recruit-training and first-term attrition and an increased likelihood of being recommended and eligible to reenlist for both male and female Marines (see Table 9). In terms of race and ethnicity, white non-Hispanic men and women have higher recruit-training and first-term attrition rates. Having no enlistment waivers was predictive of lower 24-month and first-term attrition for both men and women.

Other predictors of enlisted attrition and retention, such as age, vary by gender. Being older was a predictor of higher attrition in the DEP, in recruit training, and at 24 months for men, but an insignificant predictor for women.

In officer retention, promotion, and FITREP studies, researchers did not separately estimate equations by gender. Although we cannot glean anything about gender differences from these studies, we do observe that some factors—such as being married, having a higher TBS ranking, being commissioned through the USNA, or being a woman—were consistent predictors of officer retention, promotion, and FITREP scores at different paygrades and years of service (see Table 10).

Some factors were inconsistent predictors of officer success at different paygrades, such as being PE (higher retention, promotion, and FITREP scores at some paygrades, lower at others), age (older officers were more likely to retain but less likely to promote and had lower FITREP scores), being a black officer, and aviation MOSSs (both of which were more likely to retain but received lower FITREP scores).

Other factors were positive predictors of officer retention and promotion but insignificant predictors of officer FITREP scores, such as combat experience and having a graduate degree. Still others were positive predictors of only promotion, such as PFT scores, awards received, PME completed, and having a Reviewing Officer who gives higher overall scores compared with other ROs. Having more combat FITREPs was predictive of higher promotion and FITREP scores.

Lastly, we looked at consistent predictors of enlisted promotion, conduct, and other performance measures. Poor conduct includes such factors as desertion, which affects very few people. Many factors that predicted high rates of enlisted retention also predicted high rates of enlisted promotion and low rates of poor conduct (misconduct separation, desertion, or demotion) (see Table 11). These factors included more time in DEP, a Tier 1 education credential, and higher AFQT scores.

Other factors were less consistent predictors of enlisted promotion, conduct, and other performance measures. These factors include ethnicity (Hispanics were more likely to promote and less likely to receive a misconduct separation, but more likely to desert), marital status (single Marines were more likely to receive a good conduct award, but less likely to promote and more likely to desert), and having no dependents (more likely to be meritoriously promoted or receive the Navy and Marine Corps Achievement Medal, but more likely to separate for misconduct).

Among waiver types, some were solely predictors of poor conduct (misconduct separation, desertion, or demotion), such as “positive DAT” waiver, “serious misdemeanor” waiver, and “adult felony” waiver, while others were predictive of higher promotion rates and poor conduct, such as “drug use in DEP” waiver and “dependent” waiver.

This literature review of the predictors of female and male performance will be informative for our research needs in task 4c. In particular, we can use the identified predictors of Marine performance in our (1) regression modeling of above- or below-average performance, (2) trend analysis of identifying the characteristics of the female versus male Marine markets, and (3) analysis of whether the demographics and quality of female enlistees will change over time with the lifting of the combat exclusion policy.

Table 9. Summary table of predictors of enlisted attrition and retention<sup>a</sup>

Predictor	DEP attrition [1-3]		MCRD attrition [4-8]		24-month attrition [1, 7]		First-term attrition [4, 6-10]		Rec./elig. for reenlist- ment [11]	Reenlist- ment [9, 11-12]
	Men	Women	Men	Women	Men	Women	Men	Women		
<b>Women</b>									NS	+
Time in DEP	+	+	—	—	—	—	—	—	+	—/+
College background	—	NS								
Recruited as HS senior <sup>b</sup>	—	—	—	—/NS			—	—		
Tier 1 education			—	NS	—	—	—	—	+	—/+
AFQT = 50+	—	—	—	—	—	—	—	—	+	—
High quality	—	—	—	—	—	—	—	—		
16- to 24-year-old unemployment rate	—	—								
Asian	+	NS	—/NS	—/NS	—	—	—/NS	—/NS		NS
Black	+	NS	—/NS	—	—	—	—/NS	—	NS	+
Other race	NS	—	—	—	—	—	NS	NS	NS	NS
Hispanic	+	—	—	—	—	—	—	—	NS	+
Age	+	NS	+	NS	+/NS	NS	—	—	+	
Single	+	NS	—	—					+	—
No dependents	+	NS							+	—
MCRD Parris Island	—	N/A	+	N/A	+	N/A				
ONDJ shippers	—/+	—/+/NS	+	+	+/NS	+/NS	+/NS	Omitted	Omitted	
JJAS shippers	—	—/NS	—	—	—	—	—	+	+	
FMAM shippers	+	+	+	+	+/NS	+/NS	+	+	NS	
MCRD IST crunches	—	—								
MCRD IST run times	+	+								

Predictor	DEP attrition [1-3]		MCRD attrition [4-8]		24-month attrition [1, 7]		First-term attrition [4, 6-10]		Rec./elig. for reenlist- ment [11]	Reenlist- ment [9, 11-12]
	Men	Women	Men	Women	Men	Women	Men	Women		
MCRD IST middle third	+	+	+	+	+	+	+	+		
MCRD IST bottom third	+	+	+	+	+	+	+	+		
Enlistment bonus	-	NS	-	NS	-	NS	-	NS		
Met height and weight standards	-	+/NS					-	NS		+
Underweight										+
Waivers										
Drug use in DEP	+	+			+	+	+	+		
Dependent	+	NS			+		+			+
Adult felony	+	NS			+		+			+
Physical							+			
ASVAB waiver										+
No waivers	-	-	-	-	-	-	-	-	+	
Enlisted under a PEF							-	NS		
Recruited from South										+
Recruited from West										+
Women										+
Aviation MOSS										+
Administrative MOSS										+
Length of first contract										+
Previously filed for a contract extension										+

a. When findings are inconsistent across studies, we show all findings (e.g., -/NS means that the effect was negative and significant in one study, but not significant in another study).

b. Those recruited as high school (HS) seniors have higher DEP attrition unless one controls for months in the DEP.

Table 10. Summary table of predictors of officer retention, promotion, and Fitness Report scores (FITREPs)<sup>a</sup>

Predictor	Retention to			Promotion to			All officer	O-1	O-2	O-3	O-4	
	YOS 7 [13]	YOS 10 [14-15]	O-5 [16]	Maj [14-15, 18]	LtCol [14- 16, 18-19]	Col [18]	FITREPs [20]	FITREPs [15]	FITREPs [15]	FITREPs [15]	FITREPs [15]	
Master's or graduate degree				+				+	+			
Unemployment rate				+								
White	Omitted						Omitted	Omitted	+	Omitted	Omitted	
Black	NS	+				-				NS	-	NS
Other race	NS							NS	Omitted	NS		
Hispanic	NS				NS				NS	NS		
Age	+	+				-				-		
Single	-	-	-	-	/NS	-	+				-	-
No dependents				-								
Women	NS	+				+/NS	+	+	+	NS	NS	
Commission. source												
MECEP	NS	+				-				NS	NS	NS
USNA	+				-	Omitted				+	+	+
OCC	NS				+				-	NS	NS	NS
PLC	NS				+				-	NS	NS	NS
ECP	NS				NS				Omitted	NS	NS	NS
NROTC	NS				-				NS	NS	NS	NS
Combat service support MOSSs	-											
Combat service MOSSs	Omitted											

Predictor	Retention to			Promotion to			All officer FITREPs [20]	O-1 FITREPs [15]	O-2 FITREPs [15]	O-3 FITREPs [15]	O-4 FITREPs [15]
	YOS 7 [13]	YOS 10 [14-15]	O-5 [16]	Maj [14-15, 18]	LtCol [14- 16, 18-19]	Col [18]					
Aviation MOSs	+	+		-				+	-		
Combat arms MOSs	+										
Ground support MOS								-			
Infantry MOS							Omitted	+			
Service MOS								+	-		
TBS class ranking	+	+		+	+		+	+	+	+	+
GCT score							-				
Most competitive institution							+				
College GPA							+				
Business majors							+				
Prior-enlisted	+	-	-	-	-	+	+				
FITREP scores	+			+							
Combat experience	+			+							
PFT scores				+	+						
Received awards	+			+							
PME complete				+	+						
Have ROs who give higher overall grades than other ROs				+	+						
Number of combat FITREPs					+		+				

a. When findings are inconsistent across studies, we show all findings (e.g., -/NS means that the effect was negative and significant in one study, but not significant in another study).

Table 11. Summary table of predictors of enlisted promotion, good conduct, and other performance measures<sup>a</sup>

Predictor	Promotion to corporal [9]	Meritorious promotion [11]	Good conduct award [11]	Misconduct separation [11]	Demotion by 48 months [11]	Desertion by 48 months [11]	Navy and Marine Corps Achievement Medal [11]
Time in DEP	+	NS	+	-	-	-	
Tier 1 education	+	+	+	-	-	-	
AFQT = 50+	+	+	+	-	-	-	+
Asian	-	NS					
Black	-	NS					
Other race	-	+					
Hispanic	+	+		-		+	
Age				-			
Single	-		+			+	
No dependents		+		+			+
ONDJ shippers		NS	+				+
JJAS shippers		+	Omitted				NS
FMAM shippers		NS	+				+
Met height/weight standards	+						
Underweight	+						
Waivers							
Drug use in DEP		+		+	+	+	
Dependent		+		+		+	
Positive DAT			+	+			
Serious misdemeanor				+	+	+	
Felony				+	+		
No waivers			+				
Recruited from West	+						
Women		+					
Aviation MOSS	+						

<sup>a</sup>. When findings are inconsistent across studies, we show all findings (e.g., -/NS means that the effect was negative and significant in one study, but not significant in another study).

## Appendix: Summary of the Included Literature

The tables in the appendix summarize the studies included in this report. The tables provide the names of the organizations conducting the studies, the years of the studies, the years of the study samples, the dependent variables for each of the studies, and the number of observations for each of the studies.

Table 12. DEP attrition studies

Reference number	Organization	Study year	Sample years	Dependent variable	Number of observations
[1]	CNA Corporation	2013	Entered DEP 2005-2012	Attrition from the DEP	266,170 men 25,004 women
[2]	NPS	2005	Entered DEP 2000-2001	Discharged from DEP	26,616
[3]	NPS	2007	Entered DEP 2000-2005	Attrition from DEP	122,089

Table 13. MCRD attrition studies

Reference number	Organization	Study year	Sample years	Dependent variable	Number of observations
[4]	CNA Corporation	2010	Accessed 1999-2009	Bootcamp attrition	326,247 men 24,966 women
[5]	CNA Corporation	2006	Accessed 2002-2005	Bootcamp attrition	96,202 men 7,200 women
[6]	CNA Corporation	1990	Enlisted 1984	6-month completion	31,791 men 1,831 women
[7]	CNA Corporation	2014	Accessed 2005-2013	Recruit training attrition	257,385 men 21,910 women
[8]	CNA Corporation	1999	Accessed 1995-1997	Bootcamp attrition	6,554 women

Table 14. First-term attrition studies

Reference number	Organization	Study year	Sample years	Dependent variable	Number of observations
[1]	CNA Corporation	2013	Accessed 2005-2009	24-month attrition	145,274 men 11,253 women
[7]	CNA Corporation	2014	Accessed 2005-2012	24-month attrition	207,351 men 17,298 women
			Accessed 2005-2010	45-month attrition	159,613 men 12,925 women
[4]	CNA Corporation	2010	Accessed 1999-2005	45-month attrition	165,324 men 12,657 women
[6]	CNA Corporation	1990	Accessed 1984	45-month completion	31,791 men 1,831 women
[8]	CNA Corporation	1999	Accessed 1992-1994	45-month attrition	4,888 women
[9]	CNA Corporation	1990	Accessed 1984	Completion of first term	33,622
[10]	CNA Corporation	1990	Accessed 1981-1985	First term attrition	8,151

Table 15. Reenlistment studies

Reference number	Organization	Study year	Sample years	Dependent variable	Number of observations
[11]	CNA Corporation	2011	Accessed 2000-2005	Recommended and eligible for reenlistment Reenlistment	Not reported
[9]	CNA Corporation	1990	Accessed 1984	Retention beyond first term	33,622
[12]	CNA Corporation	1991	Recommended and eligible 1980-1990	Reenlisted beyond first term	26,840

Table 16. Officer retention studies

Reference number	Organization	Study year	Sample years	Dependent variable	Number of observations
[13]	NPS	2005	Attended TBS from 1986-1992	Retained to YOS 7	7,134
[14]	NPS	2006	Commissioned 1980-1994	Retained to YOS 10	11,221
[15]	NPS	2003	Commissioned 1980-1990	Retained to YOS 10	13,222
[16]	NPS	2001	Accessed 1980-1984	Retained to the O-5 promotion board	6,507

Table 17. Enlisted promotion, conduct, and medal studies

Reference number	Organization	Study year	Sample years	Dependent variable	Number of observations
[9]	CNA Corporation	1990	Accessed 1984	Promotion to Cpl on completing first term	33,622
[11]	CNA Corporation	2011	Accessed 2000-2005	Meritorious promotion Good conduct award Misconduct separation Demotion by 48 months Navy and Marine Corps Achievement medal	Not reported

Table 18. Officer promotion studies

Reference number	Organization	Study year	Sample years	Dependent variable	Number of observations
[14]	NPS	2006	Commissioned 1980-1994	Promotion to Maj	11,776
			Commissioned 1980-1988	Promotion to LtCol	5,737
[15]	NPS	2003	Commissioned 1980-1990	Promotion to Maj	7,281
			Commissioned 1980-1983	Promotion to LtCol	1,785
[18]	NPS	2008	Considered by Fall 2006 promotion boards	Promotion to Maj	744
				Promotion to LtCol	520
				Promotion to Col	196
[16]	NPS	2001	Considered by 1998-2001 promotion boards	Promotion to LtCol	1,627
[19]	NPS	2011	Considered by 2004-2012 promotion boards	Promotion to LtCol	8,428

Table 19. Officer FITREP studies

Reference number	Organization	Study year	Sample years	Dependent variable	Number of observations
[20]	CNA Corporation	2012	1999-2011	Officer FITREP score	224,233
[15]	NPS	2003	Commissioned 1980-1997 Commissioned 1980-1995 Commissioned 1980-1990 Commissioned 1980-1983	O-1 FITREP score O-2 FITREP score O-3 FITREP score O-4 FITREP score	19,559 21,261 10,507 1,950

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