

An Analysis of Marine Corps Female Recruit Training Attrition

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Photography Credit: Recruits from Company N, 4th Recruit Training Battalion negotiate the "Run-Jump-Swing" on the Marine Corps Confidence Course. Marine Corps Recruit Depot, Parris Island, SC, Oct. 3, 2012. (U. S. Marine Corps photo by Lance Corporal MaryAnn Hill/Released)

Approved by:

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A handwritten signature in black ink that reads "Anita Hattiangadi".

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Abstract

Over the past several years, the Department of Defense has asked the services to pursue expanded opportunities for women in the military. To support this effort, the Marine Corps started a deliberate and measured effort to examine the possible integration of women into ground combat units and military occupational specialties (MOSs) with the development of the Marine Corps Force Integration Plan (MCFIP). In turn, the Marine Corps asked CNA to examine female recruit training attrition. We examined the relationship between female recruit training attrition and four general groups of factors: (1) recruit characteristics, (2) recruiter and recruiter/recruit interaction characteristics, (3) recruiting substation leadership and management metrics, and (4) shipping timing factors. Although recruit characteristics and shipping timing factors continue to be the best predictors of female recruit training success, we found some interesting relationships between attrition and (1) recruiter and recruiter/recruit interaction characteristics and (2) recruiting substation leadership/management metrics. These may merit additional examination in future analyses.

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Executive Summary

As part of its effort to more fully integrate women into previously closed units and military occupational specialties (MOSSs), the Marine Corps asked CNA to examine factors related to female recruit training attrition. Generally, the factors that are related to male recruit training attrition are also related to female recruit training attrition, although the relationships are not as consistently statistically significant across time for women as they are for men. These less pronounced relationships have made it difficult for the Marine Corps to target successful women. Also, the fact that the Marine Corps generally enlists women with lower Armed Forces Qualification Test (AFQT) and Initial Strength Test (IST) scores has contributed to a training attrition rate for women that is consistently higher than that for men.¹

Using data from the Marine Corps Recruiting Information Support System (MCRISS) and Total Force Data Warehouse (TFDW), we examined female recruit training attrition for recruits who accessed during two periods: Fiscal Year (FY) 2005 to FY 2008 (a more difficult recruiting period), and FY 2009 to FY 2013 (a less difficult recruiting period). The literature is replete with evidence that the state of the economy has significant effects on many recruiting outcomes, including recruit training attrition. By segmenting the analysis, we can compare the attrition outcomes from these two time periods; we see that they do in fact turn out to be quite different.

Traditionally, analysts have used recruit characteristics and shipping timing factors to predict recruit training attrition. We expand upon these two groups by including variables that measure: (1) recruiter and recruiter/recruit interaction characteristics, and (2) recruiting substation (RSS) leadership/management factors.²

¹ Previous CNA analysis indicates that male and female recruits of similar physical ability have more similar attrition rates.

² We added these additional factor groups in response to Marine Corps Recruiting Command's request that we expand upon the characteristics and factors traditionally analyzed for recruit training attrition.

Key results within each factor group are as follows:

- Recruit characteristics
 - Tier I (and above) educational credentials and above-average AFQT scores are related to lower female recruit training attrition.
 - Female recruits who are 17 to 18 years old have lower attrition than older female recruits for FY05-08; however, in FY09-13, we found no attrition differences by age.
 - Minority female recruits generally have lower attrition than white female recruits. In FY09-13, however, all minority groups had significantly lower attrition than white women. Non-citizen women also have significantly lower attrition than citizens.
 - Higher physical fitness levels as measured by the IST are related to lower female recruit training attrition.
 - The effect of a woman being under the minimum weight for her height or over the maximum weight for her height (based on retention standards) at accession had particularly interesting results. Although being under the minimum weight is related to higher female recruit training attrition, being above the maximum weight had a statistically significant negative effect on female recruit training attrition. These results suggest that validation of height and weight standards may be needed.
 - Female recruits with open contracts (no specific enlistment guarantee) have higher recruit training attrition than those assigned an enlistment program.
 - There are only small attrition differences between women who have an enlistment waiver and those who do not for FY05-08. For FY09-13, there is no statistically significant difference.
 - There are no consistent differences in attrition among female recruits with different enlistment contract sources.
- Recruiter and recruiter/recruit interaction characteristics
 - Female recruits who are the same race/ethnicity and gender as their recruiters do not have different attrition rates from those who are not the same race/ethnicity and gender as their recruiters.

- Female recruits whose recruiters had a detectability code history (a code that suggests possible irregularity in the enlistment process) for previous recruit training discharges had higher attrition in FY09-13.
- “Pool orphans” (those who do not ship to recruit training until after their recruiters have transferred from recruiting duty) have significantly higher attrition while in the delayed entry program (DEP), but no significant differences in their attrition during recruit training.
- RSS leadership/management metrics
 - We constructed five RSS-level metrics (IST improvement, quality prospecting, DEP attrition, contract sources, and focus on female recruiting) to assess how they are related to female recruit training attrition.
 - The effects of these metrics were not statistically significant when other factors were controlled; however, in the uncontrolled relationships, female recruits from RSSs that did better in these five metrics have as much as 2.0 to 2.5 percentage points lower recruit training attrition.
 - This suggests that future analyses may want to explore these factors further.
- Shipping timing factors
 - Female recruits who ship in the summer have lower attrition than those who ship in the fall, winter, or spring.
 - Female recruits had lower attrition in the FY09-13 period, when the unemployment rate was higher and recruiting was less difficult.

Our findings suggest that to reduce recruit training attrition, the Marine Corps should continue to recruit women who: (1) are at least tier I high school diploma graduates, (2) score well on the AFQT, and (3) are in good physical condition. We recommend further analysis to validate female height and weight standards, and to assess strategies for reducing pool orphan DEP attrition. We also believe that the RSS-level leadership/management metrics findings are particularly relevant for female recruiting due to the small number of women that a recruiting station accesses each year. Although our findings in this regard are quite preliminary and more work is needed to further explore these leadership/management metric effects, they could ultimately suggest policies that could limit which RSSs within a recruiting station are assigned female recruiting missions.

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Glossary

AFQT	Armed Forces Qualification Test
BC	Base Case
CFT	Combat Fitness Test
DEP	Delayed Entry Program
FAH	Flexed-Arm Hang
FY	Fiscal Year
IST	Initial Strength Test
MCFIP	Marine Corps Force Integration Plan
MCRIS	Marine Corps Recruiting Information Support System
MOS	Military Occupational Specialty
NH	Non-Hispanic
PEF	Program Enlisted For
PFT	Physical Fitness Test
PPC	Priority Prospect Card
RSS	Recruiting Substation
TFDW	Total Force Data Warehouse

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Introduction

As part of its ongoing research and analysis related to the integration of women into previously closed military occupational specialties (MOSs) and units, the Marine Corps has asked CNA to analyze female recruit training attrition in order to improve the Marine Corps' understanding of the characteristics and factors that lead to success.

CNA has, over many years, developed a substantial literature that identifies the characteristics and factors that are related to Marine Corps recruit training attrition. This literature has been particularly successful in identifying the characteristics and factors that are related to male recruit training attrition. Successful male recruits:

- Score at the 50th percentile or above on the Armed Forces Qualification Test (AFQT)
- Earn tier I high school diplomas (excluding tier I credentials earned through adult education, semester/quarter hours of college, or home schooling)
- Have no enlistment waivers
- Are within height and weight standards
- Have good physical fitness as measured by the Initial Strength Test (IST), which includes pull-ups, crunches, and a 1.5-mile run
- Are young (typically 17 to 18 years of age and accessed directly after high school)
- Ship to recruit training in the summer, and
- Have had at least three months in the Delayed Entry Program (DEP) to prepare for recruit training. [1]

Although analysts have found that many of these same characteristics are related to female recruit training success, the relationships are not as consistently statistically significant across time as they are for male recruits. These less pronounced relationships have made it difficult for the Marine Corps to target successful women. Also, the fact that the Marine Corps generally accesses women with lower AFQT and

IST scores has no doubt contributed to the Marine Corps' enduring result in recruit training attrition: female recruits attrite at roughly double the rate of male recruits. Beyond recruit training attrition, female recruiting has historically been more challenging and problematic than male recruiting, as evidenced by higher female DEP attrition and lower efficiency in converting prospecting activities into female enlistment contracts.

Traditional hypotheses that recruit training success is related to recruit characteristics and shipping-related factors (e.g., what time of the year the recruit was accessed) have been driven, to some extent, by data availability. We improve upon previous analyses by incorporating additional data sources (described below) that allow us to expand these traditionally analyzed characteristics and factors. Our additions include recruiter characteristics (and the interaction of these characteristics with those of the recruit), and local recruiting leadership/management metrics.³

We also will examine factors that are seemingly more closely related to DEP attrition to determine if they might have persistent effects that manifest themselves in recruit training attrition. For example, when recruiters transfer from recruiting duty before their recruits ship to recruit training, those recruits are commonly referred to as "pool orphans." Other recruiters take over leadership responsibilities for these recruits, to prevent them from losing their motivation; however, these recruits may still attrite from the DEP at a significantly higher rate than those who are not pool orphans. It could be that, even when pool orphans still ship to recruit training, they may do so with lower levels of motivation and preparation because their connections to the Marines who recruited them have been disrupted. Alternatively, pool orphans who stay in the DEP and ship to recruit training may be especially committed to becoming Marines and may have lower attrition, other things being equal.

Data

The data are primarily extracted from the Marine Corps Recruiting Information Support System (MCRISS) and include nearly 22,000 female accessions between FY 2005 and FY 2013. Some recruiter information is available in MCRISS; however, we were able to match MCRISS recruiter data to Marine Corps Total Force Data Warehouse (TFDW) data in order to obtain more complete recruiter characteristics.

³ We added these variable groups in response to Marine Corps Recruiting Command's request to expand the factors traditionally analyzed for recruit training attrition. Also, this hypothesis could be further expanded to include drill instructor characteristics and recruit training leadership and management factors; however, these data are not yet captured in a way that allows us to test this more expansive hypothesis.

Methodology

We measure female recruit training outcomes using attrition from recruit training as an indicator variable; this variable takes a value of one if the recruit attrites and zero if she does not. Our explanatory factors fall into the following groups, which are further defined in the next section of this report:

- Recruit characteristics
- Recruiter and recruiter/recruit interaction characteristics
- Recruiting substation (RSS) leadership/management metrics⁴
- Shipping timing factors.

We use two approaches to measure the relationship between female recruit training attrition and these explanatory variables. First, we compute the female recruit training attrition rate for each variable category without controlling for the effects of other variables.

Second, we measure the relationship between female recruit training attrition and the explanatory variables using the logit regression technique.⁵ This measurement approach enables us to estimate the effect of one explanatory variable on female recruit training attrition while holding the effects of all other explanatory variables constant.

⁴ We selected the RSS level to use for assessing organizational leadership and management because this is the primary level at which recruits are exposed to and interact with recruiting leaders. There are typically 10 to 14 RSSs in each recruiting station—each is led by a staff non-commissioned officer-in-charge and has two to six recruiters assigned to it.

⁵ The logit regression technique allows us to estimate the relationship of explanatory variables to a limited dependent variable (0 or 1) using a non-linear functional form.

In addition, we measure the relationship for two time periods—a more difficult recruiting period (FY05-08) and a less difficult recruiting period (FY09-13)—that largely are differentiated by macroeconomic conditions (i.e., the unemployment rate for 16- to 24-year-olds).⁶ The literature is replete with evidence that the state of the economy has significant effects on many recruiting outcomes, including recruit training attrition. By segmenting the analysis, we can see that these two time periods do have quite different attrition outcomes.

Table 1 shows the unemployment rates, recruit training attrition rates, and sample sizes for the two periods we examined. For FY05-08, there are 9,077 female recruits, with an overall 17.6 percent attrition rate; for FY09-13, there are 11,775 female recruits, with an overall 13.6 percent attrition rate. We also measure the relationships for male recruits, to assist with comparisons of men and women. For FY05-08, there are 119,231 male recruits, with an overall attrition rate of 9.2 percent; for FY09-13, there are 125,574 male recruits, with an overall attrition rate of 6.7 percent.

Table 1. Unemployment rates, recruit training attrition rates, and sample sizes (FY05-08 and FY09-13)

	Women		Men	
	FY05-08	FY09-13	FY05-08	FY09-13
Unemployment rate (16- to 24-year-olds)	10.8%	16.1%	10.8%	16.1%
Recruit training attrition rate	17.6%	13.6%	9.2%	6.7%
Sample size	9,077	11,775	119,231	125,574

Source: CNA Marine Corps manpower files, MCRISS, and the Current Population Survey.

⁶ The youth unemployment rate could have been introduced as a separate variable; if so, we would have included it in shipping timing factors. Instead, we chose to introduce the unemployment rate by segmenting our analysis based on substantially different macroeconomic conditions as indicated by the unemployment rates for 16- to 24-year-olds. Labor force statistics from the Current Population Survey show that the monthly unemployment rate for 16- to 24-year-olds ranged from 9.1 percent to 14.4 percent from FY05 to FY08 (most months were in the 10 to 11 percent range). For FY09 to FY13, the rate ranged from 11.9 percent to 20.0 percent (most months were in the 16 to 17 percent range).

Findings

In this section, we discuss the relationships of female recruit training attrition to each of the characteristics in our four factor groups. For comparison, we also provide selected male recruit training attrition rates. (The complete regression results for both women and men are provided in Table 9 and Table 10 in appendix A.)

Recruit characteristics

We display the relationship between recruit characteristics and female recruit training attrition in four factor groups:

- Education/aptitude (Table 2)
- Demographics (Table 3)
- Physical fitness (Table 4), and
- Other characteristics (Table 5)

In the table headings, the *percentage* shows the share of the sample that is in that category. The *actual attrition rates* are those for which there are no controls for other variable effects. The *marginal effect* shows the percentage-point change in female recruit training attrition relative to the base case (BC) (i.e., omitted variable category) when all other variables/categories are at their mean values.⁷ In Table 2, for example, women with some college who accessed in FY05-08 represented 1.1 percent of the sample, had an actual attrition rate without controlling for other effects of 7.7 percent, and had 10 percentage points lower (statistically significant) recruit training attrition than those women who were only tier I graduates (the base case).

Most of the characteristics in Table 2 through Table 5 are self-explanatory or have amplifying information in the table footnotes; however, the contract source variable

⁷ In cases where the marginal effect is not statistically significant at the 10 percent level or lower, we have so indicated by including (N) after it. The marginal effects displayed in Table 2 through Table 5 correspond to the *derivatives* presented in the technical results in Table 9 of Appendix A.

in Table 5 may be less familiar.⁸ *Contract source* identifies how the recruiter identified the applicant during the prospecting process. Contract sources can be broadly categorized into those that are recruiter generated (the recruiter found the applicant on his or her own, through area canvassing or using a high school list) and those that are generated through other recruiting programs. These other recruiting programs include:

- Command recruiter (e.g., a Marine who is home on leave refers an applicant to the recruiter)
- DEP referral (i.e., a member of the DEP refers an applicant to the recruiter)
- Priority prospect card (PPC) (i.e., the recruiter receives a lead from the Marine Corps' "hot lead" system that is tied to its advertising and marketing program)
- Walk-/call-in (i.e., an applicant walks or calls into the recruiting office), and
- Other (other sources are identified in footnote c of Table 5).

Generally, a good balance of contract sources indicates that recruiters are using all available programs to identify prospects. We will explore the effects of that balance in Table 7 at the RSS level; meanwhile, in Table 5 we assess the relationship between a recruit's contract source and her probability of attriting from recruit training.

Recruit aptitude/education and attrition

Table 2 displays the relationship between female recruit aptitude and education characteristics and female recruit training attrition.

⁸ We found no references in the literature to analysis of contract source and its relationship to recruit training attrition. We include it in this analysis at the request of Marine Corps Recruiting Command.

Table 2. Recruit characteristics (education/aptitude) and female recruit training attrition (FY05-FY13)

Recruit characteristic	Category	Percentage (FY05-08)	Actual attrition rate (FY05-08)	Marginal effect (FY05-08)		Percentage (FY09-13)	Actual attrition rate (FY09-13)	Marginal effect (FY09-13)
Education ^a	College	1.1%	7.7%	-10.0%		1.6%	10.0%	-2.0% (N)
	Tier I	91.4%	17.3%	BC		93.7%	13.4%	BC
	Tier I other	5.5%	20.8%	2.2% (N)		4.4%	17.0%	2.7%
	Tier II or III	1.9%	27.0%	6.1%		0.3%	29.7%	11.5%
AFQT score category ^b	I-III A	64.1%	16.7%	BC		68.9%	13.2%	BC
	III B/IV	35.9%	19.3%	2.0%		31.1%	14.5%	1.2%

Source: CNA Marine Corps manpower files and MCRISS.

^a. *College* includes those recruits who have attained any level of post-secondary education. *Tier I* education status includes traditional high school diploma graduates. *Tier I other* includes recruits who have attained tier I status through adult education programs, completion of 12 or more college semester hours or 18 or more college quarter hours, or home schooling. We categorize tier I and tier I other separately because previous CNA work has indicated that recruit attrition for tier I other is higher than for tier Is. Tier II and III education status indicates that the recruit is a high school dropout—tier II recruits have various alternative education credentials short of a high school diploma (e.g., GED).

^b. AFQT score category I-III A includes recruits who scored at the 50th percentile or above on the AFQT. Those in AFQT score category III B scored in the 31st to the 49th percentile, and those in AFQT category IV scored in the 21st to the 30th percentile. We combined AFQT categories III B and IV because of the very small number of category IV recruits and because category III B and IV recruits had similar attrition rates.

The following highlights the relationship between recruit characteristics examined in Table 2 and recruit training attrition when the effects of other factors are held constant.⁹

- **Education:** In FY05-08, women with some college had 10.0 percentage points lower attrition than those with a tier I credential; however, in FY09-13, the differences in attrition were not statistically significant. In FY05-08, those with a tier I other credential did not have statistically significant differences in attrition compared to those who were tier Is; however, in FY09-13, tier I others had 2.7 percentage points higher attrition than tier Is. In both time periods, tier IIs and IIIs had higher attrition than tier Is: they had 6.1 percentage points

⁹ Unless otherwise indicated, differences cited are statistically significant.

higher in FY05-08, and 11.5 percentage points in FY09-13. By comparison, men have statistically significant differences among all education categories across both time periods. We also note that during both periods, the Marine Corps enlisted a lower share of women with tier II/III education credentials (1.9 and .3 percent, respectively) than men (4.4 and .5 percent, respectively).

- AFQT score category: Women who scored in AFQT categories IIIB or IV had 2 percentage points higher attrition than those scoring in categories I-III A in FY05-08. This difference drops to 1.2 percentage points for FY09-13 but remains statistically significant. These effects are generally consistent with those for male recruits within the same periods. In addition, we note that during FY05-08 and FY09-13, the Marine Corps enlisted a higher share of women with AFQT score categories IIIB and IV (35.9 and 33.0 percent, respectively) than men (31.1 and 26.9 percent, respectively). Although the percentage of low-quality female recruits (as measured by AFQT) went down in better recruiting conditions, the percentage reduction for women was less than that for men. This suggests that even in the less difficult recruiting period, female recruiting was still more challenging than male recruiting.

Recruit demographic characteristics and attrition

Table 3 displays the relationship between female recruit demographic characteristics and female recruit training attrition.

Table 3. Recruit characteristics (demographics) and female recruit training attrition (FY05-FY13)

Recruit characteristic	Category	Percentage (FY05-08)	Actual attrition rate (FY05-08)	Marginal effect (FY05-08)		Percentage (FY09-13)	Actual attrition rate (FY09-13)	Marginal effect (FY09-13)
Accession age	17-18	51.0%	15.4%	BC		47.1%	12.6%	BC
	19-23	44.5%	19.8%	1.5%		47.9%	14.5%	-0.1% (N)
	24+	4.6%	20.7%	4.5%		5.0%	14.2%	-0.2% (N)
Race/ethnicity	Non-Hispanic (NH) white	59.1%	19.3%	BC		54.7%	15.9%	BC
	NH black	13.9%	18.3%	-1.9% (N)		14.2%	12.8%	-3.7%
	Hispanic	21.0%	12.5%	-6.8%		25.2%	9.4%	-6.1%
	Asian	3.5%	17.9%	-0.8% (N)		3.6%	11.2%	-4.5%
	Other	2.5%	17.1%	-3.6% (N)		2.3%	13.9%	-3.8%
Non-citizen	Yes	3.7%	10.0%	-7.3%		3.1%	7.6%	-5.3%
	No	96.3%	17.9%	BC		96.9%	13.8%	BC
Married or dependents at accession	Yes	5.9%	20.7%	2.2% (N)		3.2%	17.6%	2.7% (N)
	No	94.1%	17.4%	BC		96.8%	13.4%	BC

Source: CNA Marine Corps manpower files and MCRISS.

The following highlights the relationship between the recruit characteristics examined in Table 3 and recruit training attrition when the effects of other factors are held constant.

- Accession age: In FY05-08, women who were 19 to 23 years old had higher attrition than those 17 to 18 years of age by 1.5 percentage point. This difference jumps to 4.5 percentage points for those 24 years of age or older. In FY09-13, women in these two older age groups did not have statistically significant differences in attrition from those who were 17 to 18 years old. One possible explanation for this absence of differences in attrition is that commanders may have more closely reviewed enlistments for older women during less difficult recruiting times, knowing that older women attrite at higher rates. This seems unlikely, however, because the percentage of women in these two older groups actually increased somewhat in FY09-13, which suggests that such enlistments were likely not discouraged during this period.

By comparison, the attrition rates of male recruits have statistically significant differences among all age groups across both time periods; those who are older have higher attrition.

- Race/ethnicity: In FY05-08, Hispanic women had lower attrition than white women by 6.8 percentage points, but there were no statistically significant differences in attrition between those in all other racial/ethnic categories and white women. This result changed considerably in FY09-13. Women in all other racial/ethnic categories had lower attrition than white women: 6.1 percentage points lower for Hispanics, 4.5 percentage points for Asians, 3.7 percentage points for African Americans, and 3.8 percentage points for others. For men during both periods, Hispanics and Asians both had lower attrition than whites. There were no statistically significant differences between the attrition of African Americans and others and the attrition of whites. We also note that the percentage of minority female and male accessions increased by 4.4 and 3.8 percentage points, respectively, between these two periods.
- Citizenship: Non-citizen women had 7.3 and 5.3 percentage points lower attrition than those who were citizens in FY05-08 and FY09-13, respectively. Non-citizen men also had lower attrition than citizens, but the effects were smaller (2.1 and 1.5 percentage points, respectively, for the two time periods).
- Married or dependents: The differences in attrition between women who were married or had dependents and those who were not married or had no dependents were not statistically significant in both time periods. Men who were married or had dependents did have slightly higher attrition (.6 for FY05-08 and .7 percentage points for FY09-13) than those who were not married or did not have dependents.

Recruit physical fitness characteristics and attrition

Table 4 displays the relationship between female recruit physical fitness characteristics and female recruit training attrition.

Table 4. Recruit characteristics (physical fitness) and female recruit training attrition (FY05-FY13)

Recruit characteristic	Category	Percentage (FY05-08)	Actual attrition rate (FY05-08)	Marginal effect (FY05-08)		Percentage (FY09-13)	Actual attrition rate (FY09-13)	Marginal effect (FY09-13)
First DEP IST score ^a	≤154	39.1%	23.4%	5.9%		29.7%	18.3%	3.7%
	155-200	32.9%	16.7%	BC		33.6%	13.3%	BC
	201-300	28.0%	10.6%	-5.5%		36.7%	10.0%	-2.3%
First DEP IST run time	13+ minutes	66.0%	19.7%	2.0%		63.1%	16.1%	4.6%
	<13 minutes	34.0%	13.4%	BC		36.9%	9.2%	BC
Retention height and weight standards at accession	Meet	87.7%	17.2%	BC		88.6%	13.4%	BC
	Over	6.3%	18.1%	-1.9% (N)		5.7%	10.8%	-3.8%
	Under	6.0%	22.4%	6.0%		5.7%	18.9%	6.1%

Source: CNA Marine Corps manpower files and MCRISS.

^a. We scale the IST score to have a maximum value of 300, the same as the maximum score for the Marine Corps physical fitness test (PFT). For the crunches and pull-up/FAH components, the score for the IST is computed exactly the same as for the PFT, with a maximum of 100 points in each component; however, unlike the computation of PFT scores, there is no lower bound of 3 pull-ups (15 points), 40 crunches (40 points), and 15 seconds (15 points) on the FAH. For the 1.5-mile run, a time of 9 minutes or less for men and 10.5 minutes or less for women is given 100 points, with one point deducted for each additional five seconds over the respective 9-minute and 10.5-minute thresholds. The score categories roughly separate scores into thirds.

The following highlights the relationship between the recruit characteristics examined in Table 4 and recruit training attrition when the effects of other factors are held constant.

- First IST performance: In both time periods, women who scored better on their first IST in DEP had lower recruit training attrition. Compared to those scoring in roughly the middle third (i.e., 155-200 points), those scoring lower had 5.9 percentage points higher attrition in FY05-08 and 3.7 percentage points higher attrition in FY09-13. Those scoring higher than the middle third had 5.5 percentage points and 2.3 percentage points lower attrition in FY05-08 and

FY09-13, respectively. These results are consistent with those for men.¹⁰ In addition, we also analyzed how the three individual events of the IST are related to recruit training attrition and found that the run time is the most consistent predictor of attrition among the three. Women who ran 1.5 miles at 13:00 or slower had 2.0 and 4.6 percentage points higher attrition in FY05-08 and FY09-13, respectively. These results also are consistent with those for men. We also note the following with respect to female and male IST scores in these two periods:

- The percentage of women who scored in the top IST category improved from 28.0 to 36.7 percent from FY05-08 to FY09-13. The percentage for men increased by an even greater margin—from 30.6 to 44.3 percent. More favorable recruiting conditions appear to have allowed recruiters to select more physically fit female and male applicants, who then graduated from recruit training at higher rates; however, the share of women in the highest fitness category lagged behind that for men in both periods and increased less with improved recruiting conditions. This suggests that even in a less difficult recruiting period, recruiting women was still more challenging than recruiting men.
- The lower female IST scores discussed above indicate that women were less physically fit than men at the starting point. Thus, in addition to being related to higher recruit training attrition, these lower IST scores also are related to higher recruit training injury rates, higher 24- and 45-month attrition rates, and lower PFT and combat fitness test (CFT) scores. [2]
- Retention height and weight standards: Women who weighed less than the minimum weight standard for their height (based on retention standards) when they accessed had 6.0 and 6.1 percentage points higher attrition rates, respectively, for FY05-08 and FY09-13 compared to women who met height and weight standards. Women who weighed more than the maximum weight for their height in FY05-08 had no statistically significant differences in attrition compared to those who met height and weight standards; however, for FY09-13, women who were over standards had 3.8 percentage points lower attrition than those who met the standards. *This is a particularly interesting result as it could indicate that height and weight standards for women may need validation.* It could be that women of larger stature are better able to endure the challenges of recruit training, and that those of smaller stature are more prone to injury and, ultimately, attrition. This assertion is consistent

¹⁰ Although we used the same IST score ranges to create IST categories for our regressions for men and women, we note that the scores are gender-normed and therefore not directly comparable.

with [3] (recently cited in [4]), “Greater height, hip circumference, and overall weight also appeared to be correlated with shorter march times under very heavy loads (90 pounds, or about 67 percent of the average female participant’s body weight).¹¹ We found similar results for men.¹² Men who were under the weight standards when they accessed had approximately 4.2 percentage points higher attrition in both time periods as compared with those who met standards. One particularly surprising result is that men who were over standards in FY05-08 did not have a statistically significant different attrition rate compared to those who met standards. Previous research, particularly during difficult recruiting periods, has found that those who are over standards attrite at higher rates. Even more surprising is that men who were over standards in FY09-13 had a 0.9 percentage point lower attrition rate than those who met standards. This may suggest that during less difficult recruiting times, commanders allowed those who were above retention standards to ship to recruit training only if they were otherwise highly qualified recruits.

Other recruit characteristics and attrition

Table 5 displays the relationship between “other” female recruit characteristics and female recruit training attrition.

Table 5. Recruit characteristics (other) and female recruit training attrition (FY05-FY13)

Recruit characteristic	Category	Percentage (FY05-08)	Actual attrition rate (FY05-08)	Marginal effect (FY05-08)		Percentage (FY09-13)	Actual attrition rate (FY09-13)	Marginal effect (FY09-13)
DEP months	3+	57.1%	15.3%	-1.3% (N)		65.8%	12.8%	-0.7% (N)
	<3	42.9%	20.6%	BC		34.2%	15.2%	BC
Open contract ^a	Yes	8.7%	22.1%	3.0%		8.6%	16.4%	3.0%
	No	91.3%	17.2%	BC		91.4%	13.3%	BC

¹¹ These characteristics may, however, be at odds with the Marine Corps’ plan to require female Marines to do pull-ups for the PFT.

¹² Note that Marine Corps height and weight standards are gender-normed.

Recruit characteristic	Category	Percentage (FY05-08)	Actual attrition rate (FY05-08)	Marginal effect (FY05-08)		Percentage (FY09-13)	Actual attrition rate (FY09-13)	Marginal effect (FY09-13)
Enlistment waiver	Yes	41.3%	20.0%	2.2%		25.2%	14.8%	-0.1% (N)
	No	58.7%	15.9%	BC		74.8%	13.2%	BC
Contract source	DEP referral	25.0%	16.3%	-1.6%(N)		23.9%	12.1%	-2.0%
	PPC	10.8%	18.7%	-0.4%(N)		11.4%	14.5%	0.0%(N)
	Command recruiter	19.0%	17.1%	-2.4%		14.8%	13.1%	-1.5%(N)
	Recruiter-generated ^b	33.9%	18.9%	BC		36.1%	14.2%	BC
	Walk-/call-in	6.6%	16.3%	-4.2%		7.8%	16.8%	2.1%
	Other ^c	4.7%	16.0%	-3.6%		6.0%	11.1%	-3.3%

Source: CNA Marine Corps manpower files and MCRISS.

^a. *Open contract* means that the recruit has no enlistment guarantee. Traditionally, this was indicated by an absence of a program enlisted for (PEF), which is an enlistment program that guarantees that a recruit will be classified into one of a group of related MOSs for which he or she is qualified. Starting in FY09, open contract became its own PEF. There are, however, small numbers of recruits from FY09 and beyond who have no open contract (or any other) PEF—we considered these recruits as having open contracts.

^b. Recruiter-generated contract sources include: (1) area canvassing, (2) list canvassing, and (3) local mail back.

^c. *Other* includes: (1) Marine Corps Reserve referrals, (2) reenlistment card, (3) prior service recruiter, (4) temporary additional duty officer selection officer, and (5) other.

The following highlights the relationship between the recruit characteristics examined in Table 5 and recruit training attrition when the effects of other factors are held constant.

- Time in the DEP: Women who had three or more months in the DEP did not have attrition differences from those with less DEP time. This result is consistent across both time periods and is at odds with the results for men—men with three or more months in DEP have statistically significant lower attrition during both periods. We note, however, that the percentages of women and men shipping with three or more months in DEP in FY05-08 compared to those percentages in FY09-13 are strikingly different. For women, 57.1 percent shipped with three or more months of DEP time in FY05-08 but, despite the significant improvement in recruiting conditions in FY09-FY13, that percentage only increased to 65.8 percent. For men, the percentage rose from 57.0 percent to 82.6 percent. *This indicates that, even in the most*

favorable recruiting conditions in the All-Volunteer Force era, recruiters still struggled to develop the female DEP, shipping nearly 35 percent of all women with less than three months of DEP time.¹³

- Open contract: Women with an open contract had 3.0 percentage points higher attrition in both FY05-08 and FY09-13. These results are consistent with those for men during the same periods; however, approximately 9 percent of women ship with an open contract whereas only about 5 percent of men do. This could be related to an insufficient supply of traditional female enlistment programs (e.g., administration) which could cause recruiters to encourage female recruits to take their chances for getting their MOS preferences through open contracts. It also could be related to male recruits having higher AFQT scores than women which may result in men having higher enlistment program qualification rates than women.
- Enlistment waivers: We used having a waiver (or waivers) instead of waiver type to estimate the effect on attrition because we found in our preliminary analysis that across virtually all waiver types, the relationships were roughly the same (those with waivers attrited at higher percentages than those without).¹⁴ In FY05-08, women with a waiver had 2.2 percentage points higher attrition than women without a waiver; however, the difference between attrition rates for those with and without a waiver in FY09-13 was not statistically significant. For men with a waiver, we found no statistically significant differences in attrition for FY05-08, but in FY09-13 those with a waiver had slightly higher attrition (0.4 percentage point).
- Contract source: For FY05-08, we found that women whose contract source was command recruiter, walk-/call-in, or “other” had lower attrition than those whose source was recruiter generated. Attrition was 2.4 percentage points lower for command recruiter, 4.2 percentage points lower for walk-/call-in, and 3.6 percentage points lower for “other.” Those whose contract source was pool referral or PPC did not have statistically significant differences in attrition from those whose source was recruiter generated. For FY09-13, the results were different. Compared to those whose contract source was recruiter generated, those whose source was pool referral or “other” had lower attrition—2.0 and 3.3 percentage points, respectively. Those whose contract

¹³ We also did some initial investigation of whether women who were shipped early to fill vacant shipping slots attrited at higher levels—we found no differences in attrition for these recruits.

¹⁴ The felony waiver category was the only waiver category for which waived recruits had lower attrition (when other factors were not controlled for). The number of these waivers is, however, too small to provide reliable attrition estimates. Further, these recruits would have received significant scrutiny in the waiver process and been otherwise very highly qualified.

source was walk-/call-in had 2.1 percentage points higher attrition than those whose source was recruiter generated. Those whose source was command recruiter or PPC did not have statistically significant differences in attrition compared to those with a recruiter-generated source. For men in FY05-08, those with a contract source of command recruiter or pool referral had slightly (less than one percentage point) lower recruit training attrition than those with a recruiter-generated source—attrition differences for other contract sources were not statistically significant. In FY09-13, men with a contract source of command recruiter, pool referral, or “other” had slightly lower attrition (less than one percentage point but statistically significant) than those whose contract source was recruiter generated. Those whose source was PPC or walk-/call-in had no statistically significant differences in their attrition compared to those whose source was recruiter generated. We also investigated a conventional adage that a higher percentage of women have a contract source of walk-/call-in than men, and found that the percentages were quite similar. For FY05-08, 6.6 percent of women and 6.1 percent of men were walk-/call-ins, and in FY09-13, 7.8 percent of women and 7.6 percent of men were walk-/call-ins.

Recruiter and recruiter/recruit interaction characteristics

Table 6 shows the relationship between recruiter and recruiter/recruit interaction characteristics and female recruit training attrition.^{15, 16}

¹⁵ Each recruit’s MCRISS record includes his or her recruiter’s identifying information, which allowed us to match the recruit’s record to recruiter characteristics from the TFDW.

¹⁶ We also explored recruiter rank (as a proxy for leadership experience) and recruiter PFT score (as a proxy for setting an example) but found that variation in these factors did not have reliable or stable relationships to variation in female recruit training attrition. Further, we explored the relationship between the distribution of a recruiter’s contract type and female recruit training attrition. Discussions with several current and previous district commanders revealed some conjecture that the best recruiters tend to focus on the primary contract type: regular component, tier I, AFQT score category I-III A men. They further conjectured that less effective recruiters tend to focus more on other contract types and that perhaps recruits enlisted by these recruiters have less success in recruit training. Our analysis does not support this conjecture and, thus, we have not included the associated variable in our final regression results.

Table 6. Recruiter and recruiter/recruit interaction characteristics and female recruit training attrition (FY05-FY13)

Recruiter and recruiter/recruit interaction characteristic	Category	Percentage (FY05-08)	Actual attrition rate (FY05-08)	Marginal effect (FY05-08)	Percentage (FY09-13)	Actual attrition rate (FY09-13)	Marginal effect (FY09-13)
Recruiter race/ethnicity and gender = recruit race/ethnicity and gender	Yes	1.7%	18.7%	0.9%(N)	1.5%	9.9%	-2.7%(N)
	No	98.3%	17.6%	BC	98.5%	13.6%	BC
Recruiter has detectability code history ^a	Yes	32.1%	18.1%	1.4%(N)	45.7%	15.2%	2.9%
	No	67.9%	17.4%	BC	54.3%	12.3%	BC
Pool "orphan" (recruiter transfer date before recruit accession date)	Yes	11.3%	14.3%	-1.3%(N)	17.1%	12.1%	-1.4%(N)
	No	88.7%	18.0%	BC	82.9%	13.9%	BC

Source: CNA Marine Corps manpower files, TFDW, and MCRISS.

^a Chapter 7, section F-012 of the Marine Corps' *Guidebook for Recruiting Station Operations* (Volume III) requires that a detectability code be assigned to each recruit who is discharged from recruit training. The code indicates whether the reason for discharge should have been detected before the recruit shipped to recruit training. There are three such codes. Detectability Code 1 means that the reason for the discharge existed prior to enlistment and should have been detected by the recruiting station which processed the recruit for enlistment. This is the code of major concern for a recruiting station and requires an investigation. Detectability Code 2 indicates that the reason for the discharge existed prior to enlistment and should have been detected by the medical examining facility that processed the recruit for enlistment. Detectability Code 3 means that the reason for the discharge existed prior to enlistment but would have been difficult for the recruiting station or military entrance processing station to detect.

Following are the highlights from the relationships shown in Table 6:

- Recruiter and recruit race/ethnicity and gender: For women in FY05-08 and FY09-13 and men in FY05-08, we found no statistically significant differences in attrition for recruits whose race/ethnicity and gender were the same as the recruiter's. For men in FY09-13, we found that when the race/ethnicity and

gender were the same, attrition was slightly (less than 0.3 percentage points) higher.

- Recruiter detectability code history: For FY05-08, women whose recruiter had a detectability code history did not have statistically significant attrition differences; however, in FY09-13, those whose recruiter had a detectability code history had 2.9 percentage points higher attrition. For men in both time periods, attrition was slightly higher for those men whose recruiter had a detectability code history (1.7 and 0.6 percentage points, respectively, for the two periods).
- Pool orphan: Although the DEP discharge rate for pool orphans is particularly high for women (and men),¹⁷ those who do ship to recruit training do not have statistically significant differences in attrition from those who are not pool orphans. For men, we found differences in attrition only in FY05-08: pool orphans had 1.0 percentage point lower attrition than non-orphans. These findings suggest that pool orphans who do not attrite from the DEP may have higher levels of commitment that transcend the recruiter/recruit relationship.

RSS leadership/management metrics

The Marine Corps has long emphasized that “leadership matters.” Therefore, we attempted to measure the relationship between metrics that indicate how well an RSS is being led/managed and female recruit training attrition. Our hypothesis is that effective RSS leadership and management result in persistent effects that can be observed throughout the recruit training process. We estimate RSS leadership/management effects associated with the following recruiting activities/processes and the metrics we have constructed to measure them:¹⁸

- RSS quality prospecting: We measure this by computing the RSS’s percentage of waived recruits that enlisted in the year prior to the recruit’s contract date. Lower percentages of waived recruits suggest that recruiters are

¹⁷ Preliminary analysis of FY05 through FY13 DEP discharge rates (not controlling for other factors) shows that female pool orphans had a 38.4-percent DEP attrition rate, compared to 24.5 percent for non-orphans. Male pool orphans had a 25.8-percent DEP attrition rate, compared to 17.8 percent for non-orphans.

¹⁸ Although Marine Corps Recruiting Command uses many metrics to measure RSS performance, we were limited to metrics that we could create by aggregating individual recruit information at the RSS level (i.e., the recruit’s record includes the RSS from which he or she was recruited).

prospecting for high-quality applicants, which we would expect to reduce female recruit training attrition.

- RSS pool leadership, sales effectiveness, and service after the sale: We measure this by computing the RSS's DEP discharge rate for the year preceding the recruit's contract date. Lower DEP discharge rates suggest good pool leadership and sales training, which we would expect to reduce female recruit training attrition.
- RSS adherence to systematic recruiting: We measure this by computing the percentage of the RSS's recruits that enlisted in the year prior to the enlistment of the recruit whose contract source is recruiter generated.¹⁹ Lower percentages suggest that recruiters are effectively using the full array of supporting systematic recruiting programs (pool referrals, command recruiters, PPCs, etc.) to generate prospects. Thus, we expect lower recruit training attrition when the percentage of recruits with a recruiter-generated source is lower.
- RSS focus on the female recruiting mission: We measure this by computing the RSS's percentage of total enlistment contracts that were women over the year prior to the recruit's contract date. Lower percentages may suggest inadequate focus on female recruiting missions, which we would expect to increase female recruit training attrition.²⁰ It also may be that women perform better in recruit training if they are accompanied by a larger percentage of women in the DEP.
- RSS recruits' improvement in IST scores: We measure this by computing the average difference between the score for the first IST taken in the DEP and the score for the IST taken just prior to accession for all recruits who accessed from the RSS in the year preceding the recruit's accession date.²¹ Greater positive differences could suggest a stronger focus on recruit physical conditioning, which may reduce female recruit training attrition.

Table 7 shows the relationships between these RSS-level leadership/management metrics and female recruit training attrition without controlling for other factors. When we controlled for other factors in an otherwise already-crowded regression equation (significant number of independent variables), the differences shown in Table 7 were not statistically significant. Thus, we did not include the RSS-level

¹⁹ Recruiter-generated contract sources include: (1) area canvassing, (2) list canvassing, and (3) local mail.

²⁰ The percentage of total contracts that are women will naturally be low, as women account for only about 7 to 8 percent of the overall recruiting mission.

²¹ Recruits typically take an IST near the date on which they enlist into the DEP and then take the IST monthly thereafter until they are accessed.

leadership/management variables in our final regression equations. We believe, however, that there are some interesting attrition differences in the uncontrolled relationships that could be further explored in future analyses. In Table 7, those attrition rates that are statistically different in a simple test of proportion means are in italics.

Table 7. RSS leadership/management metrics and female recruit training attrition (FY05-FY13)

RSS metric	Category	Actual attrition rate (FY05-08)	Actual attrition rate (FY09-13)
RSS contract waiver percentage ≥ 50	Yes	<i>19.1%</i>	<i>17.0%</i>
	No	16.9%	13.4%
RSS DEP attrition percentage ≥ 25	Yes	18.0%	14.1%
	No	17.5%	13.5%
RSS percentage of recruiter-generated contracts ≥ 50	Yes	17.3%	13.9%
	No	17.6%	13.5%
RSS percentage of contracts that are women ≤ 5	Yes	18.4%	<i>15.7%</i>
	No	17.5%	<i>13.3%</i>
RSS average IST improvement ≥ 20 points	Yes	18.6%	<i>12.7%</i>
	No	17.4%	<i>14.4%</i>

Source: CNA Marine Corps manpower files and MCRISS.

The attrition rates in italics have differences that are statistically significant at the 5 percent level of significance in a two-tail, two-sample test of proportion means which requires a z-statistic with an absolute value of at least 1.96.

The following highlights are provided for the RSS-level leadership/management metrics in Table 7.

- RSS quality prospecting: In both periods, female recruits from RSSs that enlisted at least 50 percent of their applicants with waivers had roughly 2 to 3 percentage points higher recruit training attrition than those from RSSs with less than 50 percent waivers.
- RSS pool leadership, sales effectiveness, and service after the sale: In both periods, female recruits from RSSs that had at least 25 percent DEP attrition had recruit training attrition that was marginally higher (but not statistically significant) than those from RSSs with less than 25 percent DEP attrition.
- RSS adherence to systematic recruiting: For FY05-08 and FY09-13, we had mixed results. For FY05-08, female recruits from RSSs that had at least 50 percent recruiter-generated contracts had slightly lower attrition than those from RSSs with less than 50 percent recruiter-generated contracts. In FY09-13, however, female recruits from RSSs that had at least 50 percent recruiter-generated contracts had slightly higher attrition. In both periods, the differences were not statistically significant.
- RSS focus on the female recruiting mission: For FY05-08, female recruits from RSSs that enlisted no more than 5 percent female applicants had slightly higher attrition than those from RSSs that enlisted greater than 5 percent female applicants, but the difference is not statistically significant. For FY09-13, female recruits from RSSs that enlisted greater than 5 percent females had 2.4 percentage points lower attrition, which is statistically significant.
- RSS recruits' improvement in IST scores: In FY05-08, female recruits from RSSs whose recruits had 20 points or more improvement on the IST had slightly higher attrition than female recruits from RSSs whose recruits had less than 20 points improvement, but the difference is not statistically significant. In FY09-13, however, those from RSSs with 20 points or more improvement had 1.7 percentage points lower (statistically significant) recruit training attrition.

We are unaware of any previous research that has attempted to relate unit-level recruiting performance metrics to recruit training attrition and, thus, we have no basis of comparison for these results from the literature. The results in Table 7 are not unique to women (we found similar but more statistically significant results for men—see appendix B); however, we believe these results could be particularly relevant for female recruiting due to the small number of women that a recruiting station accesses each year. Although our findings in this regard are quite preliminary and more work is needed to further explore these leadership/management metric effects, they could ultimately suggest policies that could limit which RSSs within a recruiting station are assigned female recruiting missions.

Shipping timing factors

Table 8 shows the relationship between shipping factors and female recruit training attrition.

Table 8. Shipping timing factors and female recruit training attrition (FY05-FY13)

Shipping timing factors	Category	Percentage (FY05-08)	Actual attrition rate (FY05-08)	Marginal effect (FY05-08)		Percentage (FY09-13)	Actual attrition rate (FY09-13)	Marginal effect (FY09-13)
Accession trimester	ONDJ	30.4%	19.4%	3.4%		31.3%	14.7%	2.7%
	FMAM	25.5%	21.7%	4.8%		28.0%	15.3%	2.8%
	JJAS	44.1%	14.0%	BC		40.7%	11.5%	BC

We also included control variables for each contract year (excluding the base case year) in each equation.

Source: CNA Marine Corps manpower files and MCRISS.

From Table 8, we see that recruits who ship in the spring (FMAM) attrite at the highest rates; those who ship in the fall (ONDJ) attrite at the next highest rates; and those who ship in the summer (JJAS) attrite at the lowest rates. These attrition differences are consistent with those for men; however, we note that the shares of women that were shipped in the summer (when attrition is lower) are smaller than the corresponding shares of men. In FY05-08, 44.1 percent of women were shipped in the summer; in FY09-13, 40.7 percent were shipped in the summer. For men, the shares were 49.7 in FY05-08 and 49.1 percent in FY09-13. These differences could be related to constraints on the capacity for female recruit training at Marine Corps Recruit Depot Parris Island, but nevertheless could be one reason that recruit training attrition is higher for women than for men.

In addition, we see that female recruit training attrition was higher in FY05-08 than it was in FY09-13. As previously discussed, this is most likely related to markedly different macroeconomic conditions. Men also had higher recruit training attrition in FY05-08 than in FY09-13.

Recommendations and Conclusions

Our findings suggest that to reduce recruit training attrition, the Marine Corps should continue to recruit women who: (1) are at least tier I high school diploma graduates, (2) score well on the AFQT, and (3) are in good physical condition. Recruiters also should be made aware that non-citizen women graduate from recruit training at a significantly higher rate than those who are citizens.

Our analysis also suggests that retention height and weight standards may need validation. Although women who are under standards have higher recruit training attrition, those who are above standards had 3.8 percentage points (statistically significant) lower recruit training attrition in FY09-13 than those who met standards. This could suggest that women with larger statures are more capable of enduring the physical challenges of recruit training.

In addition, our findings suggest that recruiters can improve female recruit training success if they ensure that recruits are not shipped with open contracts. Although we found that women with less than three months of DEP time do not attrite at higher rates than those with more than three months when all other factors are held constant, we believe that there is sufficient evidence throughout the literature and across time to indicate that preparation time in the DEP is important for both men and women. Of course, a recruiter's ability to ship women with at least three months of DEP time depends on whether the recruiting station achieves sufficient pool development levels so that applicants who might have been successful in recruit training with sufficient DEP time are not prematurely forced to ship. One area that requires additional analysis but could help improve female pool development is the leadership and management of "pool orphans." Curbing the high DEP discharge rate for these female recruits could help to markedly conserve DEP strength and reduce the need to ship female recruits with less than three months in DEP.

We also recommend further examination of recruiter and recruiter/recruit interaction characteristics and RSS-level leadership/management metrics and their relationship to recruit training attrition. Our work should be considered preliminary in this regard, but we do believe that there is some promising evidence in these variable categories that could expand traditional explanations for recruit training attrition. The average recruiting station ships only about 50 women to recruit training each year (3 to 5 per month). With such small female shipping missions, commanders may be able to curb high attrition by ensuring that only recruiters and

RSSs with characteristics/performance related to female recruit training success are assigned female recruiting missions. More analysis is required to inform such a policy option, however.

Appendix A: Regression Results

Table 9 and Table 10 are the complete logit regression results for female and male recruit training attrition for FY05-08 and FY09-13. For each factor, we include the mean (the percentage of the sample in that factor when multiplied by 100), the logit regression coefficient with an indicator of the level of statistical significance (see table footnotes), and the factor's derivative. The derivative is the percentage-point change (when multiplied by 100) in recruit training attrition rate for a given factor relative to the base case (i.e., omitted variable category) when all other factors are held constant.

Table 9. Logit regression results for female recruit training attrition (FY05-08 and FY09-13)

Factor	FY05-08				FY09-13		
	Mean	Coeff (z)	Derivative		Mean	Coeff (z)	Derivative
Some college	0.011	-0.994** [2.62]	-0.100		0.016	-0.192 [0.74]	-0.020
Tier I other	0.055	0.153 [1.29]	0.022		0.044	0.224+ [1.79]	0.027
Tier II/III	0.019	0.394* [2.21]	0.061		0.003	0.792* [2.13]	0.115
AFQT IIIB/IV	0.359	0.145* [2.34]	0.020		0.311	0.104+ [1.69]	0.012
Age 19-23	0.445	0.106+ [1.66]	0.015		0.479	-0.01 [0.17]	-0.001

Factor	FY05-08			FY09-13		
	Mean	Coeff (z)	Derivative	Mean	Coeff (z)	Derivative
Age \geq 24	0.046	0.309*	0.045	0.050	-0.021	-0.002
		[2.18]			[0.15]	
Hispanic	0.210	-0.527**	-0.068	0.252	-0.570**	-0.061
		[6.51]			[7.69]	
Asian	0.035	-0.051	-0.008	0.036	-0.394*	-0.045
		[0.33]			[2.44]	
Black	0.139	-0.131	-0.019	0.142	-0.320**	-0.037
		[1.53]			[3.82]	
Other race	0.025	-0.256	-0.036	0.023	-0.327+	-0.038
		[1.40]			[1.77]	
DEP months \geq 3	0.571	-0.096	-0.013	0.658	-0.058	-0.007
		[1.51]			[0.92]	
First IST score \leq 154	0.391	0.388**	0.059	0.297	0.298**	0.037
		[5.79]			[4.45]	
First IST score \geq 201 \leq 300	0.280	-0.475**	-0.055	0.367	-0.220**	-0.023
		[5.64]			[3.00]	
First IST run \geq 13:00	0.660	0.144*	0.020	0.631	0.424**	0.046

Factor	FY05-08			FY09-13		
	Mean	Coeff (z)	Derivative	Mean	Coeff (z)	Derivative
		[2.05]			[6.07]	
Non-citizen	0.037	-0.631**	-0.073	0.031	-0.566**	-0.053
		[3.34]			[2.77]	
Over retention weight standard	0.063	-0.143	-0.019	0.057	-0.384**	-0.038
		[1.23]			[2.95]	
Under retention weight standard	0.060	0.391**	0.060	0.057	0.467**	0.061
		[3.49]			[4.36]	
Open contract	0.087	0.206*	0.030	0.086	0.245*	0.030
		[2.12]			[2.56]	
Enlistment waiver	0.413	0.154**	0.022	0.252	-0.005	-0.001
		[2.62]			[0.07]	
Married or dependents	0.059	0.149	0.022	0.032	0.225	0.027
		[1.28]			[1.55]	
Source is command	0.190	-0.176*	-0.024	0.148	-0.135	-0.015

Factor	FY05-08			FY09-13		
	Mean	Coeff (z)	Derivative	Mean	Coeff (z)	Derivative
recruiter						
		[2.17]			[1.58]	
Source is DEP referral	0.250	-0.112	-0.016	0.239	-0.183*	-0.020
		[1.48]			[2.46]	
Source is other	0.047	-0.265+	-0.036	0.060	-0.313*	-0.033
		[1.84]			[2.41]	
Source is PPC	0.108	0.028	0.004	0.114	0	0.000
		[0.29]			[0.00]	
Source is walk-/call-in	0.066	-0.313*	-0.042	0.078	0.168	0.021
		[2.53]			[1.64]	
Recruiter and recruit race/ gender same	0.017	0.063	0.009	0.015	-0.256	-0.027
		[0.29]			[1.01]	
Recruiter has detectability code history	0.321	0.101	0.014	0.457	0.253**	0.029
		[1.64]			[4.51]	
Pool orphan	0.113	-0.093	-0.013	0.171	-0.124	-0.014
		[0.93]			[1.55]	

Factor	FY05-08			FY09-13		
	Mean	Coeff (z)	Derivative	Mean	Coeff (z)	Derivative
Shipped Oct.- Jan.	0.304	0.252**	0.034	0.313	0.242**	0.027
		[3.56]			[3.52]	
Shipped Feb.- May	0.255	0.348**	0.048	0.280	0.253**	0.028
		[4.57]			[3.46]	
Constant		-1.744**			-2.015**	
		[14.58]			[17.20]	
Observations		9,077			11,775	
Chi square (df = 33 & 34)						

Source: CNA Marine Corps personnel files and MCRISS.

Absolute value of z statistics in brackets: + significant at 10%; * significant at 5%; ** significant at 1%. Note: These regressions also controlled for accession FY.

Derivatives are converted to percentage-point changes and referred to as marginal effects in Table 2 through Table 5.

Table 10. Logit regression results for male recruit training attrition (FY05-08 and FY09-13)

Factor	FY05-08			FY09-13		
	Mean	Coeff (z)	Derivative	Mean	Coeff (z)	Derivative
Some college	0.005	-0.615** [3.68]	-0.038	0.009	-0.465** [3.01]	-0.023
Tier I other	0.055	0.149** [3.55]	0.013	0.040	0.134* [2.45]	0.009
Tier II/III	0.044	0.421** [10.21]	0.039	0.005	0.439** [3.49]	0.032
AFQT IIIB/IV	0.330	0.215** [9.88]	0.018	0.269	0.151** [5.87]	0.010
Age 19-23	0.495	0.111** [4.71]	0.009	0.511	0.089** [3.41]	0.005
Age ≥ 24	0.050	0.490** [11.21]	0.045	0.048	0.261** [4.78]	0.017
Hispanic	0.161	-0.376** [11.60]	-0.028	0.188	-0.342** [9.94]	-0.019
Asian	0.030	-0.376** [5.42]	-0.028	0.033	-0.436** [5.63]	-0.024
Black	0.078	-0.006 [0.16]	-0.001	0.090	-0.054 [1.33]	-0.003

Factor	FY05-08			FY09-13		
	Mean	Coeff (z)	Derivative	Mean	Coeff (z)	Derivative
Other race	0.013	-0.04	-0.003	0.009	0.116	0.008
		[0.45]			[1.07]	
DEP months ≥ 3	0.570	-0.093**	-0.008	0.826	-0.067*	-0.004
		[3.97]			[2.16]	
First IST score ≤ 154	0.337	0.364**	0.033	0.205	0.267**	0.019
		[14.71]			[8.66]	
First IST score ≥201≤300	0.306	-0.386**	-0.026	0.443	-0.357**	-0.020
		[13.11]			[12.98]	
First IST run ≥ 13:00	0.146	0.336**	0.030	0.117	0.249**	0.016
		[12.43]			[7.26]	
Non-citizen	0.031	-0.285**	-0.021	0.024	-0.275**	-0.015
		[4.15]			[3.15]	
Over retention weight standard	0.213	-0.019	-0.001	0.149	-0.154**	-0.009
		[0.75]			[4.68]	
Under retention weight	0.040	0.446**	0.042	0.034	0.549**	0.042

Factor	FY05-08			FY09-13		
	Mean	Coeff (z)	Derivative	Mean	Coeff (z)	Derivative
standard						
		[9.79]			[10.74]	
Open contract	0.047	0.280**	0.025	0.060	0.261**	0.018
		[6.61]			[6.03]	
Enlistment waiver	0.438	-0.008	-0.001	0.264	0.060*	0.004
		[0.37]			[2.33]	
Married or dependents	0.037	0.089+	0.007	0.034	0.097+	0.006
		[1.78]			[1.66]	
Source is command recruiter	0.162	-0.099**	-0.008	0.127	-0.105**	-0.006
		[3.27]			[2.80]	
Source is DEP referral	0.258	-0.058*	-0.005	0.268	-0.068*	-0.004
		[2.15]			[2.32]	
Source is other	0.036	-0.06	-0.005	0.046	-0.098+	-0.006
		[1.07]			[1.69]	
Source is PPC	0.113	-0.039	-0.003	0.115	-0.02	-0.001
		[1.10]			[0.52]	

Factor	FY05-08			FY09-13		
	Mean	Coeff (z)	Derivative	Mean	Coeff (z)	Derivative
Source is walk-/call-in	0.061	-0.02	-0.002	0.076	-0.016	-0.001
		[0.47]			[0.35]	
Recruiter and recruit race/gender same	0.555	0.013	0.001	0.549	0.046+	0.003
		[0.61]			[1.94]	
Recruiter has detectability code history	0.321	0.201**	0.017	0.440	0.092**	0.006
		[6.91]			[3.89]	
Pool orphan	0.120	-0.130**	-0.010	0.219	-0.04	-0.002
		[3.60]			[1.37]	
Shipped Oct.-Jan.	0.289	0.228**	0.018	0.308	0.055*	0.003
		[9.07]			[1.99]	
Shipped Feb.-May	0.214	0.236**	0.019	0.201	0.177**	0.011
		[8.44]			[5.63]	
Parris Island	0.479	0.214**	0.017	0.490	0.211**	0.013
		[7.69]			[8.93]	
Constant		-2.614**			-2.640**	
		[55.35]			[52.91]	

Factor	FY05-08			FY09-13		
	Mean	Coeff (z)	Derivative	Mean	Coeff (z)	Derivative
Observations		119,231			125,574	
Chi square (df = 35 & 37)						

Source: CNA Marine Corps personnel files and MCRISS.

Absolute value of z statistics in brackets: + significant at 10%; * significant at 5%; ** significant at 1%. Note: These regressions also controlled for accession FY.

Appendix B: RSS Metrics and Male Recruit Training Attrition

Table 11 provides male recruit training attrition rates by RSS-level metrics categories.

Table 11. RSS leadership/management metrics and male recruit training attrition (FY05-FY13)

RSS metric	Category	Actual attrition rate (FY05-08)	Actual attrition rate (FY09-13)
RSS contract waiver percentage ≥ 50	Yes	<i>9.4%</i>	<i>8.4%</i>
	No	<i>9.0%</i>	<i>6.6%</i>
RSS DEP attrition percentage ≥ 25	Yes	<i>10.1%</i>	<i>6.5%</i>
	No	<i>8.9%</i>	<i>7.2%</i>
RSS percentage of recruiter-generated contracts ≥ 50	Yes	<i>9.4%</i>	<i>6.4%</i>
	No	<i>9.1%</i>	<i>6.7%</i>
RSS percentage of contracts that are women ≤ 5	Yes	<i>9.1%</i>	<i>6.5%</i>
	No	<i>9.2%</i>	<i>7.1%</i>
RSS average IST improvement ≥ 20 points	Yes	<i>8.4%</i>	<i>5.9%</i>
	No	<i>9.3%</i>	<i>7.3%</i>

Source: CNA Marine Corps manpower files and MCRISS.

The attrition rates in italics have differences that are statistically significant at the 5 percent level of significance in a two-tail, two-sample test of proportion means which requires a z-statistic with an absolute value of at least 1.96.

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